



Kiama Council

Annual Surface & Groundwater Monitoring Report (EPL) Gerroa Waste Disposal Depot (May 2016 to May 2018)

Report E2W-025 DR001 (V1)

22 August 2018



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Environmental & Groundwater Consulting



Client: Kiama Municipal Council

Project: Annual Surface & Groundwater Monitoring Report
Gerroa Waste Disposal Depot
(May 2016 to May 2018)

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Water Sampling & Laboratory Analyses Completed By:
ALS Environmental Pty Ltd; May 2016 to May 2018 (9 rounds)



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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 The GWDD Environment Protection Licence (EPL) was revoked in May 2008, and altered the previous reporting periods from August-July, to 1 April 2008 - 31 March 2009.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 previous EPL reports (2010-2016) were provided as annual reports which included results from four regular quarterly monitoring events (May, August, November and February), however this annual report includes nine (9) quarterly monitoring events from May 2016 to May 2018.

This annual EPL report (May 2016 to May 2018) by E2W includes an assessment of nine monitoring events (31 May 2016, 12 August 2016, 10 November 2016, 20 February 2017, 18 May 2017, 17 August 2017, 30 November 2017, 8 February 2018, 24 May 2018). The monitoring was conducted by ALS Environmental Pty Ltd with some peer review provided by E2W. This EPL report (2016-2018) is the thirteenth provided by E2W to the NSW EPA on behalf of Council, and meets the general conditions outlined in the previous EPL (Lic No: 5959, R1.10).

This EPL report follows NSW EPA correspondence and E2W previous report entitled “Second Interim Groundwater Report- Gerroa Waste Disposal Depot”, dated 14 May 2018 which outlined the rising ammonia trends at several deep wells (e.g. MW-1D, MW-3, MW-4, MW-5, MW-6D, MW-7D, Appendix D). Additional monthly monitoring is being conducted to assess the variable ammonia trends at key groundwater well locations at the landfill site.

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 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 2016, 12 August 2016, 10 November 2016, 20 February 2017, 18 May 2017, 17 August 2017, 30 November 2017, 8 February 2018, and 24 May 2018. 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-51). 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 previously completed by E2W for the 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, and 2015-2016 monitoring periods. Council has indicated (2017) that EPL reports are no longer required, however monitoring is conducted to assess the water quality and address any requirements for site management or remediation.

E2W completed 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 2016 to May 2018 to provide information in accordance with Section R1.10 of the EPL (No. 5959). The annual report is to include the following:

¹ November 2008 was the first time ML-5 had been sampled since October 2004.

1. Tabulation of the monitoring data obtained for the period.
2. Graphical representation of the current and previous monitoring data. Statistically significant variations or anomalies will be highlighted.
3. Analyses and interpretation of monitoring data.
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 (Appendix C).
- 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).

Table 3.1: Surface and Groundwater Monitoring Requirements

Parameters	Monitoring Frequency - Groundwater	Monitoring Frequency – Surface water
Alkalinity	Quarterly (#1)	Quarterly (#1)
pH	Quarterly (#1)	Quarterly (#1)
Conductivity	Quarterly (#1)	Quarterly (#1)
Total Dissolved Solids	Quarterly (#1)	Quarterly (#1)
Nitrogen (Ammonia)	Quarterly (#1)	Quarterly (#1)
Phosphorous (Total)	Quarterly (#1)	Quarterly (#1)
Nitrate	Quarterly (#1)	Quarterly (#1)
Nitrite	Quarterly (#1)	Quarterly (#1)
Total Kjeldahl Nitrogen	Quarterly (#1)	Quarterly (#1)
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).

Quarterly (#1) = monitoring is conducted on quarterly basis by KMC, however EPL requires sampling only “twice a year”.

The parameters listed in Table 3.1 were included in the nine quarterly monitoring events from May 2016 to May 2017 (Table 6). Annual parameters were sampled during the August 2016 and August 2017 monitoring periods. Ongoing quarterly monitoring with the same parameters is proposed for the future monitoring reports. A temporary monthly monitoring program is underway (Since late 2017) to address the rising ammonia trends in several key wells at the landfill site.

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 ANZECC (2000) trigger values 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. These ponds are now lined and used to hold groundwater pumped from the site to enable irrigation on the landfill mound.
- A night soil deposit, which historically accepted night soil sludge; and
- A small recycling facility.

The former night soil depot was 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/Gerroa received approximately 1559 mm of rain from February 2015 to February 2016² (Appendix B). The highest months of above average rainfall were recorded in April 2015 (426.4 mm), and August 2015 (378 mm), whilst January 2015 (316 mm i.e. just prior to reporting period).

The rainfall in 2016 and 2017 was only 953 mm/year and 889 mm/year (January to December) indicating drought conditions. The rainfall from January to July 2018 is 429 mm/7 months indicating the persistence of dry weather. The below average rainfall over the past few years is considered to be key factor in localised ammonia trends around the landfill mound due to less dilution from the reduced runoff.

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.

² Information obtained from the Bureau of Meteorology website (www.bom.gov.au/climate).

The groundwater quality varies from potable to saline, with electrical conductivities ranging from 0.3 to 50 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 diffuses/infiltrates 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 2016 and May 2018 was undertaken by ALS Environmental. Sampling was carried out on the following dates:

- 31 May 2016,

- 12 August 2016,
- 10 November 2016,
- 20 February 2017,
- 18 May 2017,
- 17 August 2017,
- 30 November 2017,
- 8 February 2018, and
- 24 May 2018

The recommended procedure for sample collection, storage, handling and quality control generally employed by ALS is outlined in the NEPM (2013). E2W used the November 2008 sampling round to instruct Council staff on surface and groundwater sampling protocol. The samples are all 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 (i.e. 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, nor during 2014 to 2018). 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).

6.2 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)³ - 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.

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

- 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.
- 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.

6.3 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 2016 to May 2018

Sample ID	Screen Interval (m AHD) & Sample Location	May 2016 to May 2018
MW-1S	Approx. 0 to -3	Mostly Dry (except for 18-5-18)
MW-1D	Approx. -4 to -7	X
MW-3	0 to 1.5	X
MW-4	0.79 to -0.71	X
MW-5	0.55 to -0.95	X
MW-6S	Approx 0 to -3	Mostly Dry (except for 18-5-18)
MW-6D	Approx -4 to -7	X
MW-7S	Approx 0 to -3	X
MW-7D	Approx -4 to -7	X
MW-9	-0.53 to -1.53	X
MW-10	-0.525 to -1.525	X
MW-11	0.095 to -0.905	X
ML-1	Upstream of landfill	No access
ML-2	Downstream of landfill	X
ML-3	Upstream of landfill	No access
ML-4	Upstream of landfill	No access
ML-5	Opposite landfill	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).

6.4 Sample Collection and Laboratory Analysis

The surface and groundwater analytical program from May 2015 to February 2016 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 4 (i.e. MW-1, MW-6, MW-7). The results from the nested wells are graphed separately for the water quality trend assessment.

7. Water Monitoring Results

All groundwater and surface water analytical results from 2003 to 2018 are presented in Tables GW-1 and SW-1, with the most recent (9) monitoring data highlighted. The field records and laboratory reports are presented in Appendix A and Table 6 (summary of data set).

Compliances exceedances are noted in Appendix C (i.e. ML-5 ammonia= 2.82 in May 2017).

⁴ The bundled wells were believed to provide spurious results due to the low purge volumes.

A summary of all available monitoring data (2003 to 2018) is presented in Graph-01 to Graph-07. The graphs illustrate ammonia and total phosphorous concentrations (key indicators of leachate impact) for the groundwater wells⁵ and surface water sampling locations as well as the depth to groundwater (m AHD, 2001 to 2018).

The graphs illustrate the ammonia concentrations in the shallow (Graph 1) and deep monitoring wells separately (Graph 2). 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.

The monitoring data shows that ammonia concentrations at MW-3 and MW-5 have returned to low levels (below ANZECC 2000) in late 2017 to April 2018. Elevated ammonia concentrations at two wells (MW-1D and MW-6D) require further monitoring to assess the trends, and need for any remedial actions (as required).

7.1 Groundwater Data

Groundwater was collected from a network of twelve monitoring wells at onsite and offsite locations (Figure 2) from May 2016 to May 2018. 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 2018 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 moderate 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 2011-2012-2013, 2014-2015 monitoring round are similar to slighter lower than the 2015-2016 monitoring period, reflecting variable rainfall patterns and leachate movement over time. The 2015-2016 wet weather and higher water table is similar to the February 2011 wet period. Recent water levels (2016-2018) show a decline due to lower than average annual rainfall during 2016 to 2018.

⁵ Results from multilevel piezometers MW-1, MW-6 and MW-7 (Graph-01 & Graph-03) are considered anomalous.

The inferred groundwater contours for the site are presented in Figures 3A & 3B (reflecting dry and wet weather periods with corresponding shallow and deep water tables). 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).

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.

7.1.3 pH (field) and Redox

The groundwater pH measured from the twelve wells ranges from approximately pH 5 to PH 8 (MW-10 & MW-7s). The pH in each well was generally stable over the monitoring rounds (May 2016 to February 2018).

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 is not consistently measured during monitoring periods. Redox potential is measured annually (August 2016 & 2017) with slightly positive (100 mV) to negative (-140 MV) readings and is generally comparable to previous monitoring periods.

7.1.4 Total Dissolved Solids (TDS and EC)

The TDS levels in groundwater collected from the site range from approximately 230 to 37,400 mg/L (fresh to brackish). The lowest and highest TDS levels were obtained from MW-5 and MW-9, respectively. The TDS level for MW-9 is related to the well's proximity to Blue Angle Creek and associated tide and estuary mouth closure influences.

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).

7.1.5 Dissolved Oxygen (DO)

Field analyses from the twelve wells recorded dissolved oxygen (DO) concentrations ranging from between approximately 2.6 and 5.0 mg/L. The concentrations of DO reported for the site from 2003 to 2018 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) and poor flushing due to the landfill capping.

7.2 Nutrients

7.2.1 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 from leachate.

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).

At least one groundwater samples collected from MW-3, MW-5, MW-6D, exceeded the ANZECC (2000) trigger value for ammonia. These monitoring wells are located adjacent or 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, except MW-03 in February 2016 which is inferred as an anomaly). Groundwater from deep wells (MW-1D, MW-6D and MW-7D) show a clear declining trend, and now cycling above/below the ANZECC guidelines.

The two wells (MW-6D and MW-1D) show an irregular ammonia trend with some elevated concentrations in 2017 and 2018 (Appendix D).

The ammonia concentrations show a clear reduction in nutrient loading in the deep aquifer (ammonia generally below 5 mg/L in the 3 key deep wells) and water quality improvement at the site since landfill closure and rehabilitation.

Nitrate was analysed for all samples with MW-1D, MW-6S, MW-6D, MW-7D, MW-9, MW-10 are generally below or marginally exceeded the ANZECC (2000) guideline (fresh water trigger value, 0.7 mg/L).

All groundwater samples analysed on at least occasion from all wells during May 2016 to May 2018 exceed 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 (below) and Figure 4 provide an overview of groundwater ammonia trends from May 2016 to February 2018 reporting period.

Table 7.1.3: Groundwater Ammonia Trends - May 2016 to May 2018

Well ID	Ammonia Trend	Exceedance of ANZECC (2000) Ammonia	Trigger 20% exceedance (Ammonia)	Comment
MW-1S	Decreasing trend. below ANZECC	No exceedance	No exceedance	Shallow sample - east of landfill
MW-1D	Overall decreasing trend. Since mid 2016 to 2018 data is variable with significant ammonia spikes. All results in 2018 exceed ANZECC (April; 22.8 mg/L)	Exceedance	No exceedance	Deep sample - east of landfill
MW-3	Overall decreasing trend. Anomalous result in February 2016 (20.9 mg/L) and 4.31 mg/L in May 2016. Stable/decrease ammonia in 2017-2018	Exceedance	No exceedance	North of landfill. Re-sample of Feb 2016 required
MW-4	Decreasing/stable trend. below ANZECC	No Exceedance	No exceedance	West of landfill
MW-5	Overall decreasing trend. Two ammonia results in mid 2016 exceed ANZECC (6.93 mg/L). Stable/decrease ammonia in 2017-2018	Exceedance	No Exceedance	North of landfill.
MW-6S	Stable trend below ANZECC	No Exceedance	No Exceedance	Shallow sample - down-gradient of night soil deposit
MW-6D	Overall decreasing trend. Elevated and spiked ammonia results in 2017-2018 indicating variability. Results in 2018 exceed ANZECC	Exceedance	No Exceedance	Deep sample - down-gradient of night soil deposit
MW-7S	Decreasing/Stabilising trend. below ANZECC	No exceedance	No exceedance	Shallow sample - down-gradient and adjacent to Crooked River Road
MW-7D	Decreasing/Stabilising trend. Ammonia generally below 1mg/L, with exception of April 2018	Exceedance	No Exceedance	Deep sample - down-gradient and adjacent to Crooked River Road
MW-9	Stable/decreasing trend. below ANZECC	No exceedance	No exceedance	Next to Blue Angle Creek
MW-10	Stable/decreasing trend. below ANZECC	No exceedance	No exceedance	As above
MW-11	Stable/decreasing trend. below ANZECC	No exceedance	No exceedance	As above

Note: Three wells (MW-9, 10, 11) are located on the creek bank, potentially affected by flood waters and vegetation. 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 (refer to Appendix C). ML-5 (ammonia of 2.82 mg/L) on 20 February 2017 exceeded to the 10% trigger.

7.2.2 Total Phosphorus (TP)

The ANZECC (2000) TP guideline for fresh and marine ecosystems is 0.05 and 0.025 mg/L, respectively. Between May 2016 and May 2018, all groundwater sample results exceeded the ANZECC (2000) trigger values (Table GW-1 and Graphs 3 & 4).

The well MW-6D (former night soil deposit) reported a maximum of 12.1 mg/L on 10 November 2016. TP was at 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 and 2014 -2015 total phosphorous was a maximum of 9.07 mg/L and 3.93 mg/L, respectively indicating variability.

In November 2015 the TP was reported at 12 mg/L at MW-6D. MW-7D reported a maximum (TP =8.14 mg/L in November 2015) which is similar to previous years (TP =8.46 mg/L, November 2014). TP at MW-6D and MW-7D (near former night soil) shows variability (Graph-4) and may relate to the 2013 dewatering/sludge pond decommissioning and mobilisation of nutrients during rainfall.

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 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 to MW5. The TP plume is also detected at MW-4 (south of the night soil deposit).

The TP concentrations of TP on the east/north (MW-3/MW-1) are likely to originate from the landfill mound. TP concentrations at MW-1S (eastern side of landfill) show a variable trend.

The TP results show variability and likely to be linked to flushing and desorption/sorption from the sandy aquifer matrix following from high rainfall events.

7.3 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 some 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 the 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).

7.3.1 Inorganic Contaminants (Iron, Manganese and Fluoride)

Iron concentrations were only analysed for samples collected in August 2016 & 2017. Concentrations of iron (filtered at the laboratory) ranged between <0.05 and 5.03 mg/L (MW-3 @ maximum). Several wells (MW-3,4,6D,9,10,&11) reported concentrations were above the

ANZECC (2000) guideline for iron in fresh water ecosystems (0.3 mg/L). Multiple natural and landfill related sources of iron are likely to exist at the site and offsite area (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 analysed for samples collected in August 2016 & 2017. Concentrations of manganese ranged between 0.004 and 0.252 mg/L (MW-4), without exceeding the ANZECC (2000) fresh water guideline (1.9 mg/L).

The levels of filterable iron and manganese are generally similar to previous reporting periods. Variation in the concentrations may also reflect turbidity of water samples and filtering procedures.

Concentrations of fluoride (analysed in August 2016 & 2017) ranged from <0.1 to 0.4mg/L, which are similar to previous reporting periods. No reliable ANZECC (2000) guideline exists for fluoride in fresh or marine waters.

7.4 Organic Contaminants

Dissolved organic carbon (DOC) concentrations were only analysed for samples collected on the August 2016 & 2017. The concentration of dissolved organic carbon (DOC) in samples from the twelve wells ranged from 4 mg/L to 135 mg/L (MW-11). The results are generally comparable to previous monitoring periods, with lower concentrations noted in this period. No recommended ANZECC (2000) guidelines exist for DOC, but can be used to indicate organic carbon related to landfill leachate.

7.5 Discussion and Trends - Groundwater

The key trends in groundwater levels and nutrient contamination from 2003 to 2018 are presented in Graph-01 to Graph-05. The recent variable ammonia trends (2015 to 2018) at deep wells (MW-1D, MW-3, MD6D) are presented in Appendix D. The three deep wells are monitored on a monthly basis to assess if any remedial/control measures are required to address the variable ammonia trends.

The monitoring data indicates that ammonia concentrations in the deep groundwater are close to ANZECC guidelines (i.e. results at above and below ANZECC as shown in Graph-02). Trends for the deep wells (MW-1D, MW-6D and MW-7D) show a clear declining trend since August 2009 (Graph-02), however some ammonia spikes are occurring due to the prevailing drought conditions.

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 (including estuary mouth closures).

Graph-01 indicates ammonia concentrations in the shallow wells have steadily decreased (generally below guidelines) 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 (Graph-02) more slowly as flushing is lower at deeper levels in the aquifer (i.e. below sea level and across the groundwater divide).

7.6 Surface Water

Surface water sampling was undertaken in 9 quarterly events from May 2016 to May 2018. 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 with 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.

Blue Angle Creek is tidally influenced and has a marine water influence at all sample locations, as shown by the broad range of TDS/conductivity 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).

7.6.1 Field Parameters

pH (field) and Redox

The pH was similar at ML-2 and ML-5, and ranged from pH 6.6 to 7.3. Sampling results indicate that pH is slightly more acidic at upstream areas with Blue Angle Creek and may relate to the acid soils in the area.

Redox was only measured in August 2016 & 2017 monitoring period, at ML-2 (1 mV) and ML-5 (32 mV).

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 2016 and May 2017 at the downstream location ML-2 were brackish to saline⁶ (TDS = 15,800 to 27,200 mg/L), while samples from the midstream location ML-5 were slightly fresher (TDS = 627 to 31,300 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 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 2016 and May 2018. This data indicates that tidal waters from Crooked River Estuary can influence water quality and elevate the salinity of the 3 wells (MW-9, MW-10 and MW-11). Higher salinity reduces (as more marine water) the possibility of detecting leachate derived from the landfill.

7.6.2 Nutrients

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). The upstream catchment area of Blue Angle creek is improved pastures and grazing (i.e. agricultural sources of nutrients).

Table 7.2.2: Surface Water Ammonia Trends - May 2016 to May 2018

Sample ID	Minimum (mg/L)	Maximum (mg/L)	Trend	Comments & Trigger 10% Exceedance of Ammonia
ML-1	-	-	-	No site access
ML-2	0.11	1.21	Variable, generally decreasing	No. All below ANZECC guidelines
ML-3	-	-	-	No site access
ML-4	-	-	-	No site access
ML-5	0.27	2.82 (May 2017)	Variable, generally decreasing	Yes. 10% Exceedance in May 2017 (2.82 mg/L) Generally below ANZECC guidelines, except for May 2017.

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

Highest ammonia (2.82 mg/L) concentration is associated with high TKN (4.2 mg/L), brackish water (TDS= 6540 mg/L) which is inferred to reflect background water quality (downstream of fertilised farms, sewerage treatment plant and former landfill).

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), indicating multiple pollutant sources and tidal influence.

⁶ Possibly reflecting collection of samples during high and low tide and stormwater runoff and rainfall

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 (& variable TKN concentrations) 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 upstream location (ML-5, 4.2 mg/L in May 2017), which may indicate the influence of fertiliser. Concentrations of TKN in groundwater are elevated and variable.

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. Sewerage discharges into sand dunes may also occur due to capacity issues at the Gerroa sewerage treatment plant.

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 2016 to 2018 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 exceeded at ML-5 in May 2017 (Appendix C). 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).

Total Phosphorous (TP)

Concentrations of TP from Blue Angle Creek were analysed from all samples collected in May 2016 to May 2018 (Table SW-1).

Previous levels (2011-2012 monitoring period) reported an increase in TP concentrations, which exceeded the IIWL7 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

⁷ ANZECC (2000) *Indicative Interim Working Levels (IIWLs)*.

⁹ *Laboratory Level of Reporting (LOR)*

guidelines for ML-2 in May 2013 & February 2014 (0.09 mg/L and 0.12 mg/L respectively) and one exceedence at ML-5 in 2013 (0.06 mg/L).

TP concentrations at ML-2 ranged from 0.04 mg/L to 0.09 mg/L and continue to show a variable trend for 2016-2018. The trend may be associated with the dynamic nature of the surface water and surrounding environment.

ML-5 reported all TP concentrations ranged from 0.05 mg/L to 0.08 mg/L in the 2016-2018 reporting period, indicating variability over time (Graph-07). The variability is considered to reflect the dynamic nature of a tidal environment.

7.6.3 Bacteriological Contaminants

Surface water sample locations (ML-2 and ML-5) were analysed for thermotolerant (faecal) coliforms and enterococcus coliforms in August 2016 and 2017 (Table SW-1).

Samples result from ML-2 (44 CFU) in August 2017 for enterococcus was above ANZECC (2000) fresh and marine guidelines (35 CFU/100 mL). For August 2016 and August 2017, the downstream sample (ML-2) reported enterococcus of 28 to 44 CFU/100 mL, whilst the midstream sample (ML-5) reported 21 to 6 CFU/100 mL, respectively. The results are considered to reflect seasonal and biological conditions, and not the leachate. Both locations are significantly lower than 2010-2011 monitoring period results (ML-2, 1300 CFU/100 mL and ML-5, 1200 CFU/100 mL, November 2010) but above the 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 (150 CFU/100 mL) for marine and fresh water ecosystems at ML-2 (18 to 94 CFU/100 mL) and ML-5 (38 to 118 CFU/100 mL).

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

7.6.4 Inorganic Contaminants

Dissolved organic carbon (DOC) concentrations were not analysed during the 2016-2018 monitoring periods.

Surface water samples from August 2016 and 2017 reported elevated concentrations of iron (ML-5 = 1.15 mg/L, 0.32 mg/L and ML-2 = 1.07 mg/L, 0.88 mg/L) above ANZECC 2000 guidelines (0.3 mg/L). However, the ANZECC (2000) guideline for iron in fresh water is a low reliability IWL.

Manganese concentrations for ML-2 (0.042 mg/L, 0.028 mg/L) & ML-5 (0.052 mg/L, 0.034 mg/L) were reported below the ANZECC (2000) fresh water guidelines (low reliability IWL).

7.6.5 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.

7.6.6 Quality Assurance/Quality Control

Interpretive Quality Control Reports (QCI, Appendix A) were not provided by ALS (Sydney) for the surface and groundwater laboratory data. ALS is NATA accredited for the analyses performed and appropriate sample bottles and analyses were carried for the monitoring works. Sample bottles are despatched (same day) from the site to the laboratory under chain of custody procedures with appropriately trained field sampling technicians.

The analytical data is considered suitable for the quarterly monitoring events during 2016 to 2018.

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 generation and migration of ammonia has 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 over time).

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. Deep groundwater takes longer to improve due to the slower groundwater flushing. 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 has shrunk due to a decrease in leachate generation (capping of landfill causing an increase in runoff) as well as from natural attenuation processes (including dilution). The time series trends show that significant groundwater quality improvements occurred after approximately 5 years.

Monitoring results indicate a clear improvement in water quality and aquifer restoration. Landfill rehabilitation is considered to have achieved a practical and successful outcome over a 10 year period.

Some elevated phosphorous occurs around the former night soil and is interpreted to arise from rainfall and land disturbance around the source area (i.e. removal of lined ponds in ~2011).

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 but has begun to fall below the ANZECC 2000 guidelines in the deep groundwater, E2W consider that water quality will continue to improve in shallow/deep aquifer due to reduced leachate generation and ongoing natural attenuation. The decreasing ammonia trends in the groundwater are affected by the climate, with noticeable fluctuations arising from dry weather conditions.

The surface water results from the 2016-2018 monitoring period reported one guideline exceedence at ML-5 in May 2017 (2.82 mg/L). The surface water environment is dynamic and influenced by tidal flushing and discharges (runoff, seepage, baseflow) from the surrounding catchment and aquifer.

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 creek, flows and tidal movements within the creek and estuary and oxidation of the ammonia to nitrate/nitrite and generation of nitrogen gas.

9. Conclusions

Surface and groundwater quarterly monitoring (9 rounds) was completed at the GWDD by ALS from May 2016 to May 2018. The data has been assessed by E2W to identify potential impacts to the groundwater and surface water systems. This EPL report follows E2W previous report “Second Interim Groundwater Report- Gerroa Waste Disposal Depot” dated May 2018, which assessed the variable ammonia trends in several deep wells (e.g. MW-1D, MW-3, MW-6D).

The following conclusions are offered:

- The rehabilitation of the landfill mound and night soil depot (completed February 2005) has demonstrated a measurable improvement of the local groundwater quality. The improvement to local surface water quality is not clear, and impacts are not readily discernible from landfill or background sources (agricultural, tidal water quality etc).
- 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 shallow and deep wells located next to the landfill mound and former night soil deposit. Some elevated ammonia exists for the 2016-2018 monitoring period (e.g. MW-03 ammonia= 4.3 mg/L, MW-5 =6.93 mg/L, MW-1D =15.80 mg/L, MW-6D=19.60 mg/L) and are currently being addressed with future monthly monitoring events.
- Elevated concentrations (above ANZECC 2000) of nutrients, in particular ammonia, continue to be detected in the shallow (MW-5) and deep groundwater (MW-6D, MW-7D) with results cycling slightly above and below the ANZECC (2000) guidelines.
- Catchment area characteristics, climate and tidal regime all influence water quality in Blue Angle Creek and the adjacent wells (MW-9, MW-10 and MW-11).
- Concentrations of total phosphorous (TP) in the shallow/deep groundwater is generally variable, with elevated and variable trends at MW-3, MW-4, MW-5, MW-6D, MW-7D. Areas of variable TP is associated to the former night soil deposits, and likely mobilisation during rainfall and land disturbances.
- Ammonia within surface water samples collected at downstream locations (Blue Angle Creek) are generally variable and similar to previous years. An exceedance (greater than 10% above ammonia values in Appendix C) was noted at ML-5 for May 2017 (2.82 mg/L). Based on the low (below guidelines) ammonia results from monitoring wells (MW-9, MW-10, MW-11, Graph 1) in proximity to the creek, ammonia in 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 <0.02 to 0.1 mg/L, whilst TP ranged from <0.05 mg/L to 0.09 mg/L at ML-2. The TP in surface water is generally variable due to the dynamic nature of the tidal creek. It is likely that water quality in Blue Angle Creek reflects other nutrient sources (as per the high TKN levels) in the catchment as well as from the GWDD.
- All other water quality indicators were consistent with the previous monitoring results.
- Monitoring results indicate a clear improvement in water quality and aquifer restoration at Gerroa. Landfill rehabilitation is considered to have achieved a practical and successful outcome over a 10 year monitoring period.

The monitoring data shows that ammonia concentrations at MW-3 and MW-5 have returned to low levels (below ANZECC 2000) in late 2017 to April 2018. Elevated ammonia concentrations at two

wells (MW-1D and MW-6D) require further monitoring to assess the trends, and need for any remedial actions (as required).

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 and mobilised by rainfall). 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. The "surface and shallow" groundwater quality is showing signs of more frequently meeting the ANZECC (2000) guidelines. More consistent water quality and meeting of the guidelines is expected in the near future, especially when the annual rainfall returns to average conditions (e.g. 1.2 m/year, rainfall from 2016 to date is ~0.9 m/year)

Based on recent groundwater trends, it is interpreted that the deep groundwater quality is beginning to meet (on some sampling events) the ANZECC (2000) guidelines for ammonia (key landfill leachate indicator) and demonstrating the effectiveness of landfill rehabilitation.

9.1 Recommendations

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

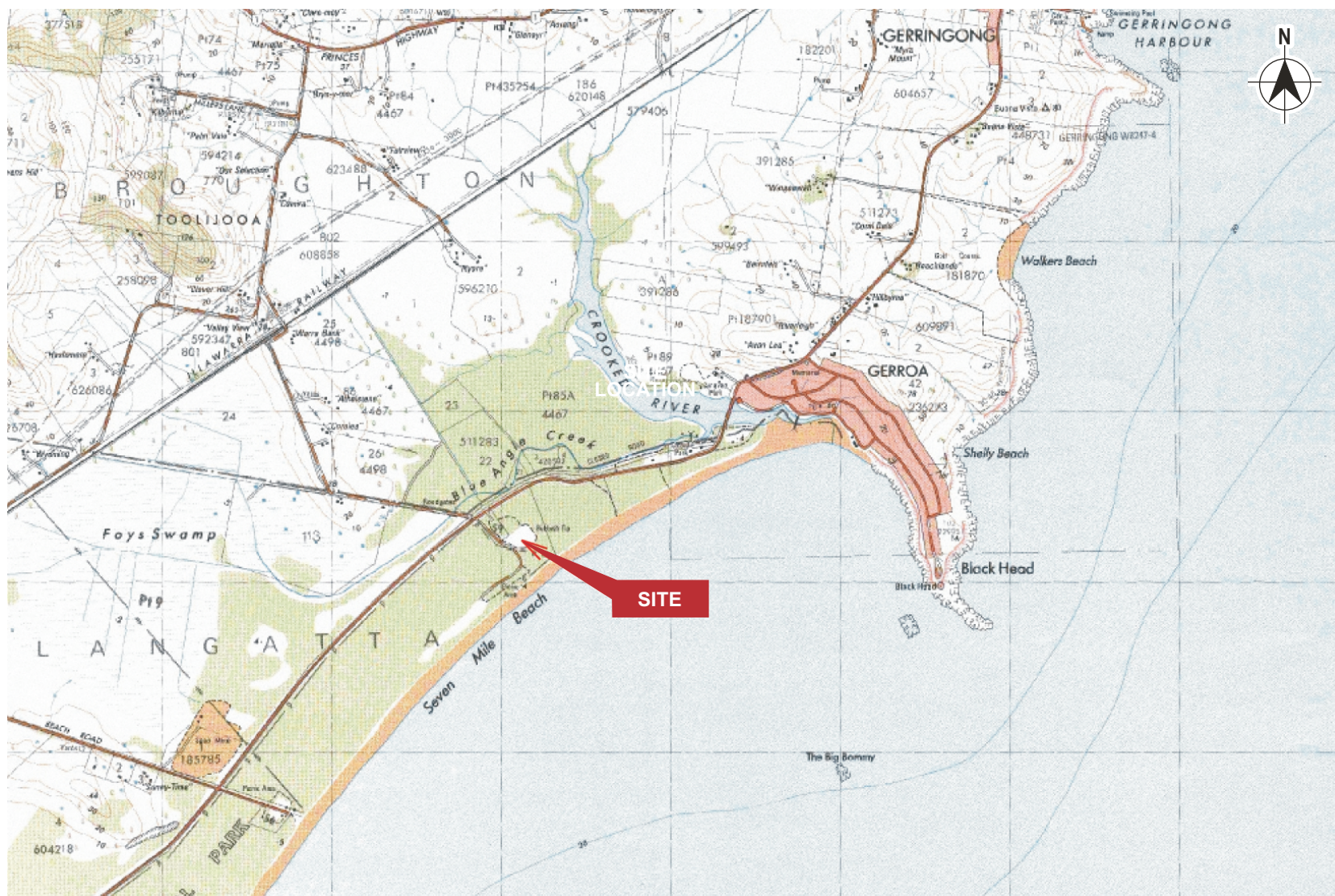
- Obtain survey details (RL) for the 6 piezo-meter wells (MW-1S/D, MW-6S/D and MW-7S/D) to enable reduction of groundwater levels to mAHD.
- Assess quality assurance and control from laboratory and perform re-analyses for elevated results.
- Perform reactive phosphorus (total & reactive) analyses at key wells (e.g. 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 investigation of 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).
- Discontinue bacteriological monitoring of surface water samples (i.e. not an EPL requirement and unlikely to indicate leachate discharges).



Figures

&

Graphs



Source: Neil Charters Pty Ltd

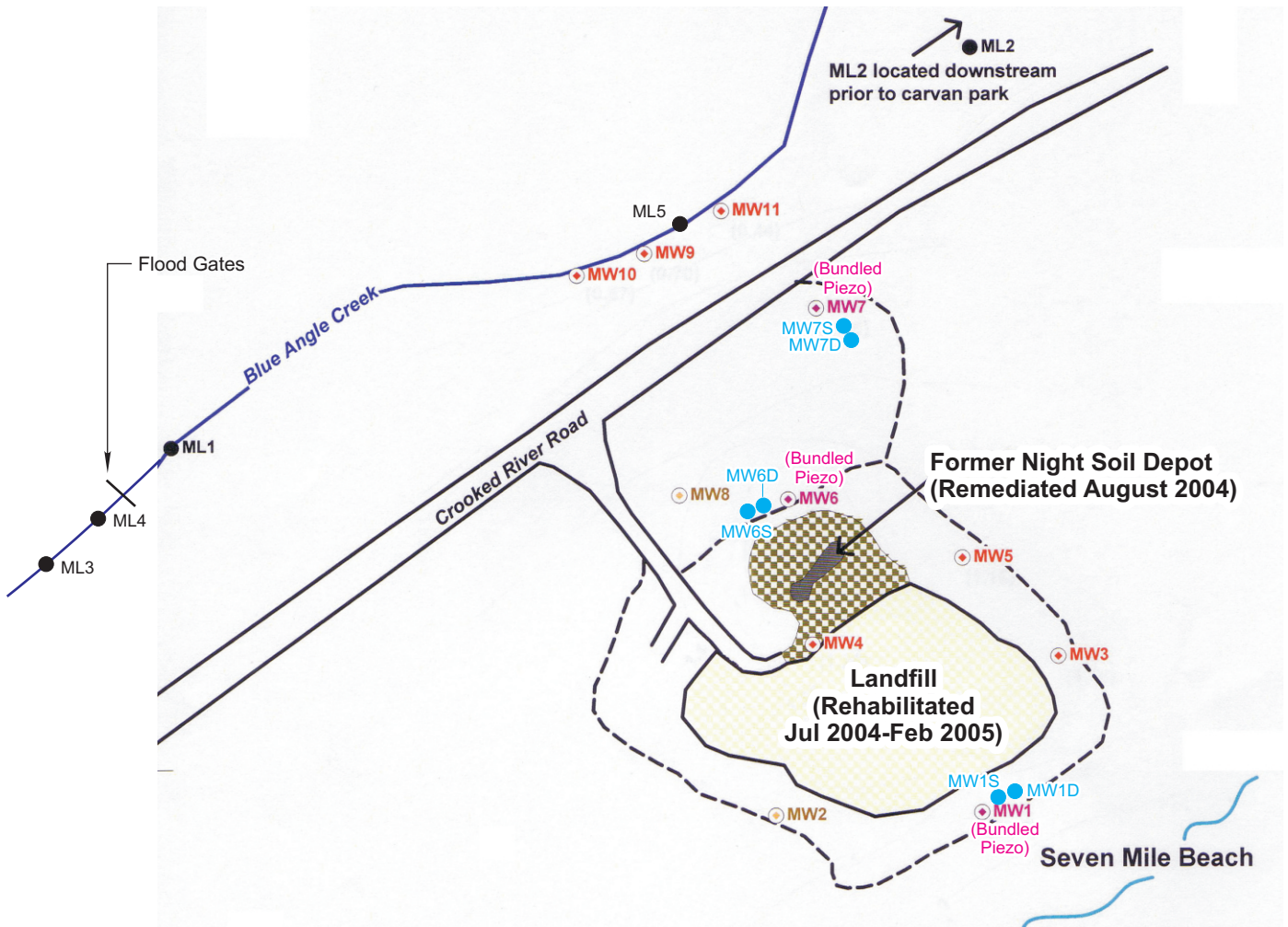
SITE LOCATION

Date: Aug 2018

GERROA ANNUAL MONITORING REPORT (2016-2018)

Reference: E2W-025_55.cdr

Figure 1



KEY

MW1S ● Monitoring Well - Shallow, August 2006

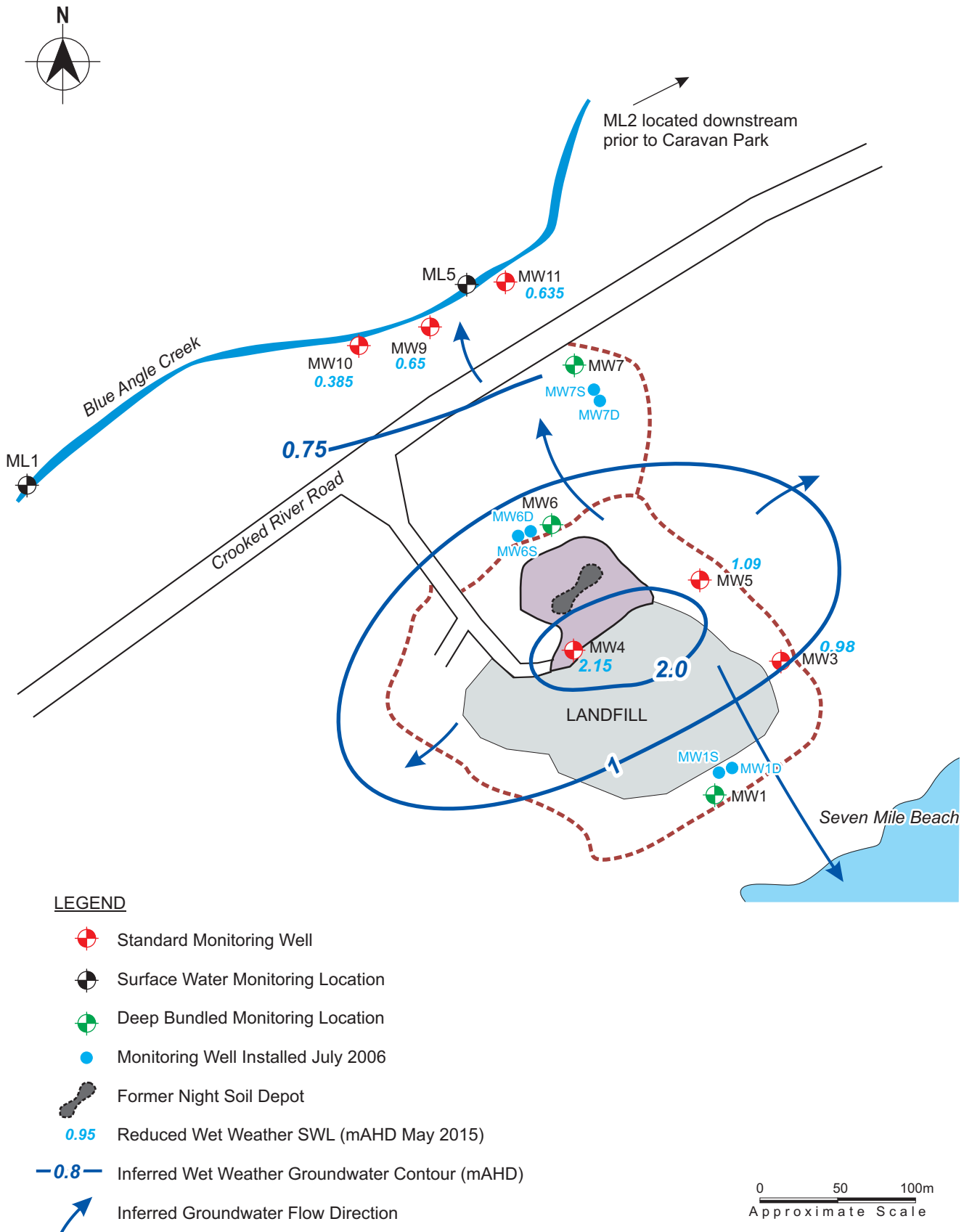
MW1D ● Monitoring Well - Deep, August 2006

MW1 ● Standard Monitoring Well

ML1 ● Surface Water Monitoring

Note: Bundled Piezometers MW1,6,7 - not sampled
ML-3 no longer sampled, ML-2 and ML-4 no access

0 50 100m
Approximate Scale



Source: URS Australia Pty Ltd- baseplan

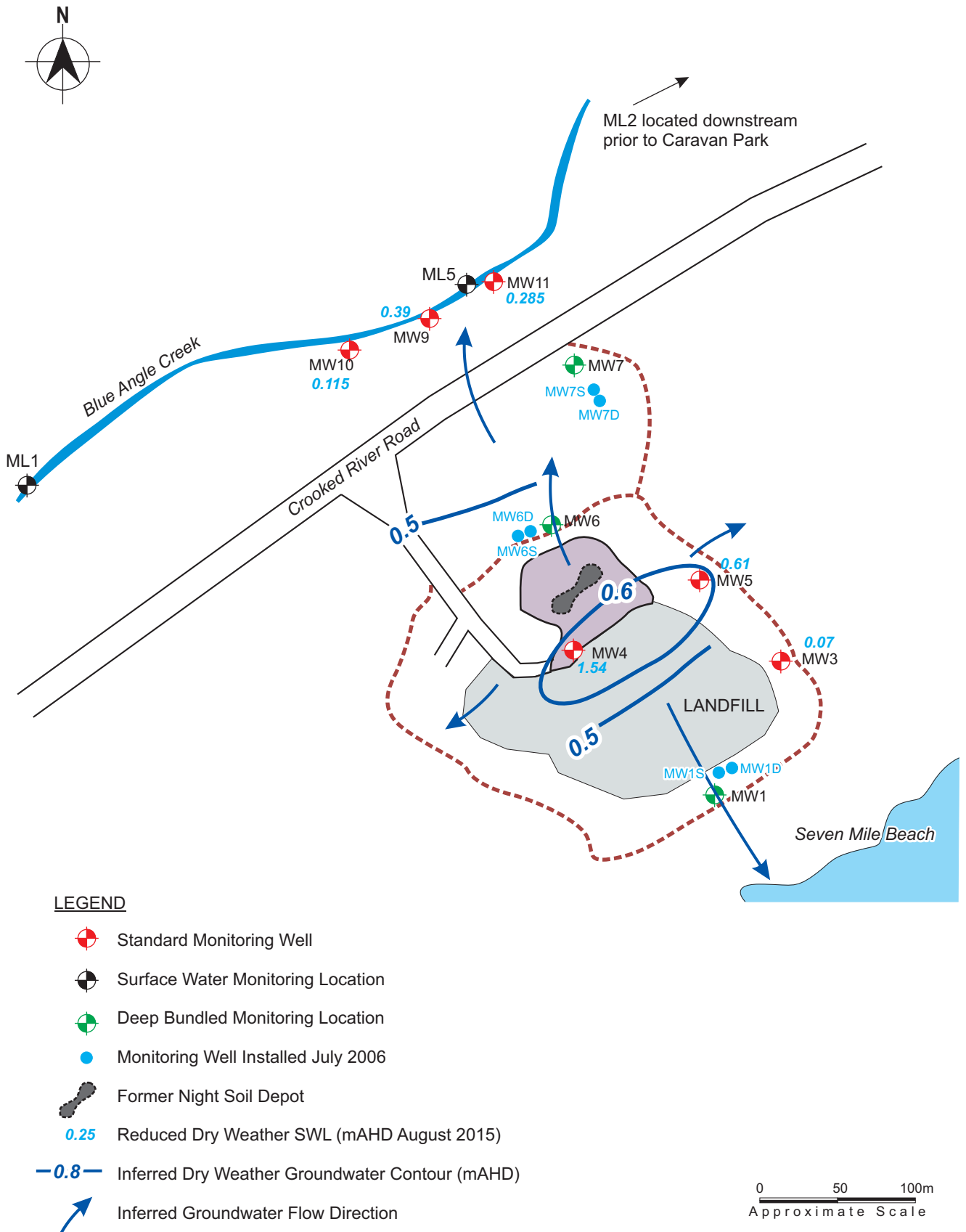
INFERRED GROUNDWATER FLOW REGIME (Wet, 18 May 2017)

GERROA ANNUAL MONITORING REPORT (2016-2018)

Date: Aug 2018

Reference: E2W-025_59.cdr

Figure 3A



Source: URS Australia Pty Ltd- baseplan

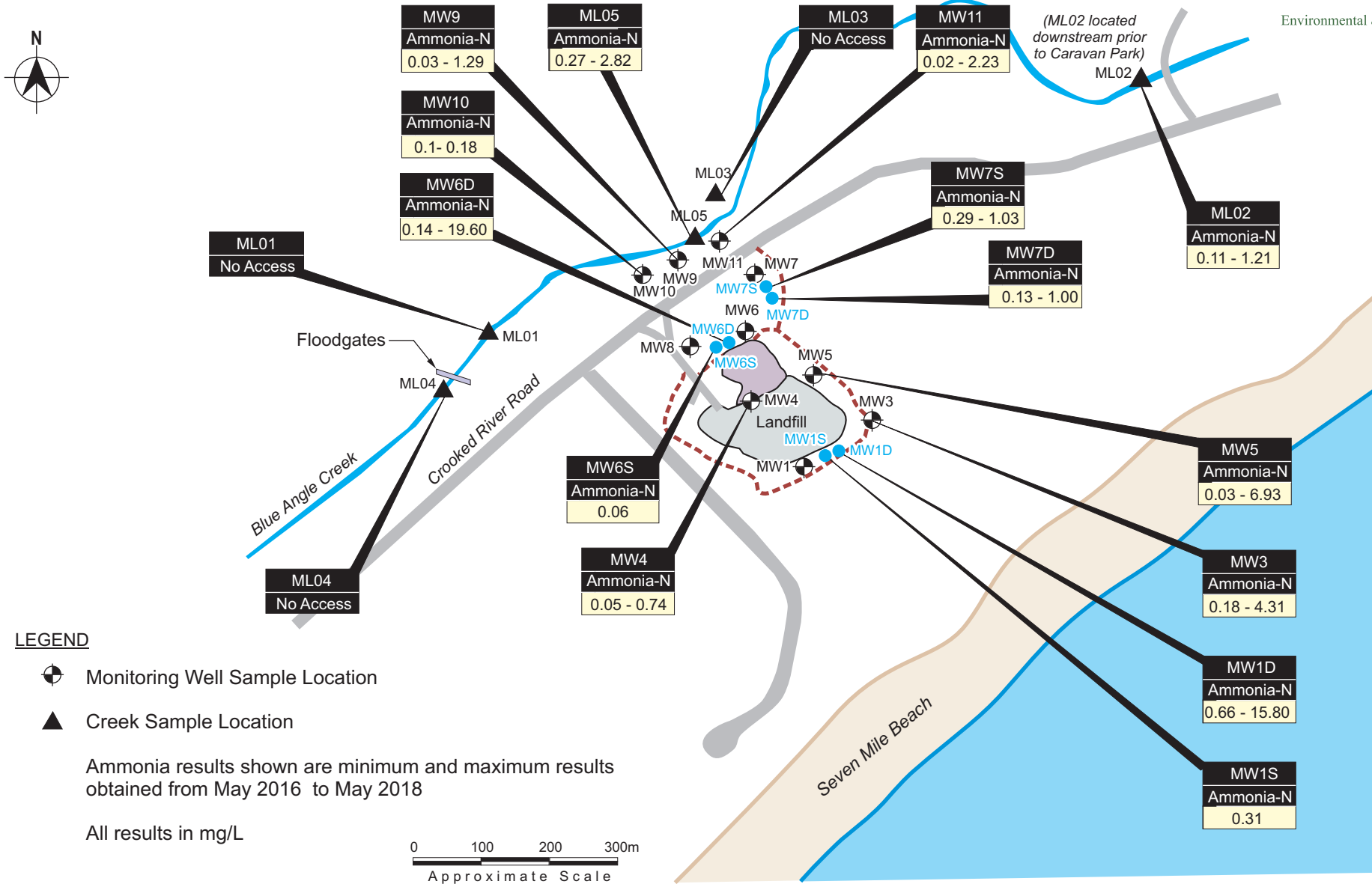
INFERRED GROUNDWATER FLOW REGIME (Dry, 8 Feb 2018)

GERROA ANNUAL MONITORING REPORT (2016-2018)

Date: Aug 2018

Reference: E2W-025_59.cdr

Figure 3B



Source: Base Plan, URS Australia Pty Ltd

AMMONIA RESULTS (mg/L) 2016 to 2018

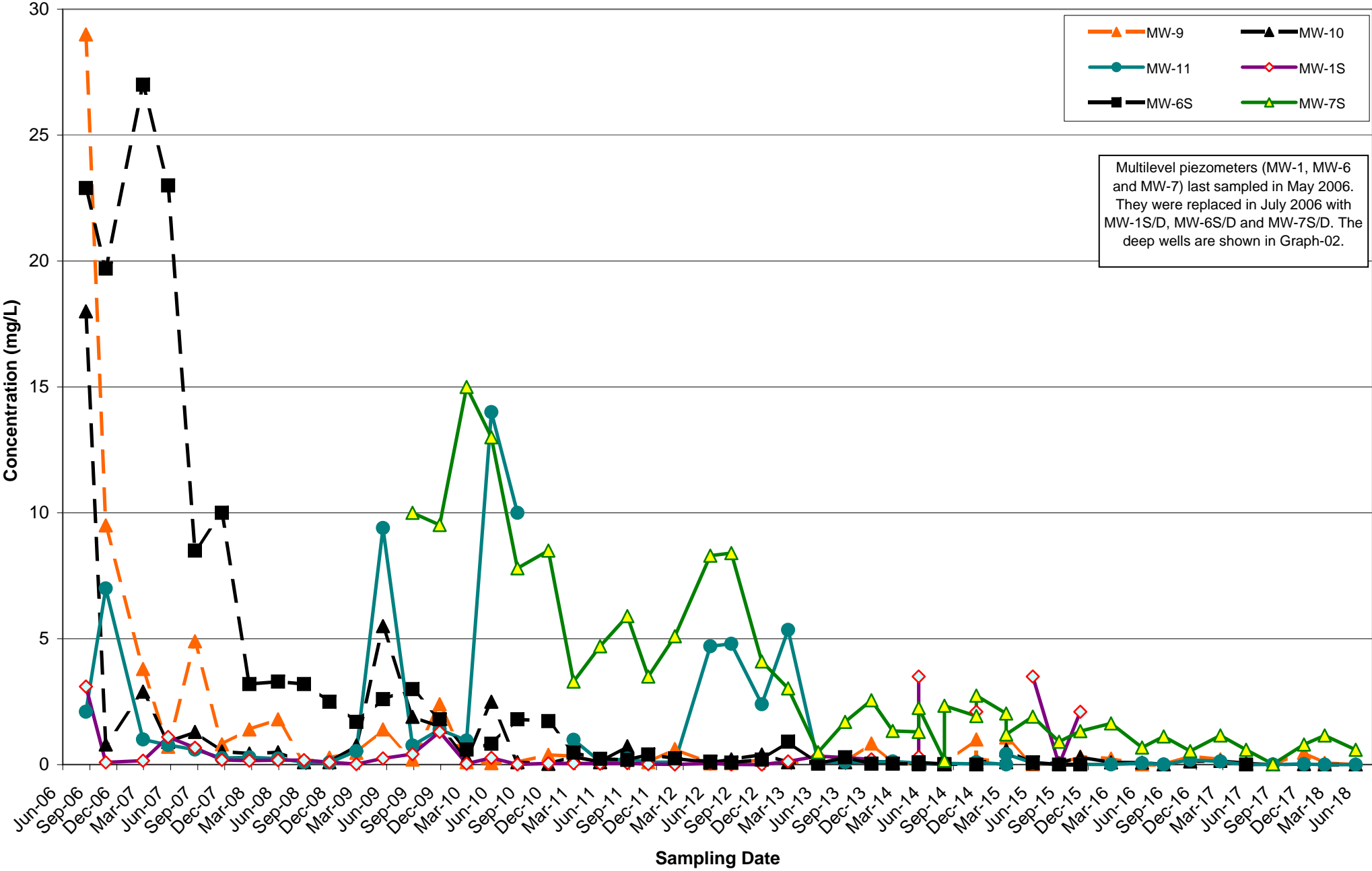
GERROA ANNUAL MONITORING REPORT (2016-2018)

Date: August 2018

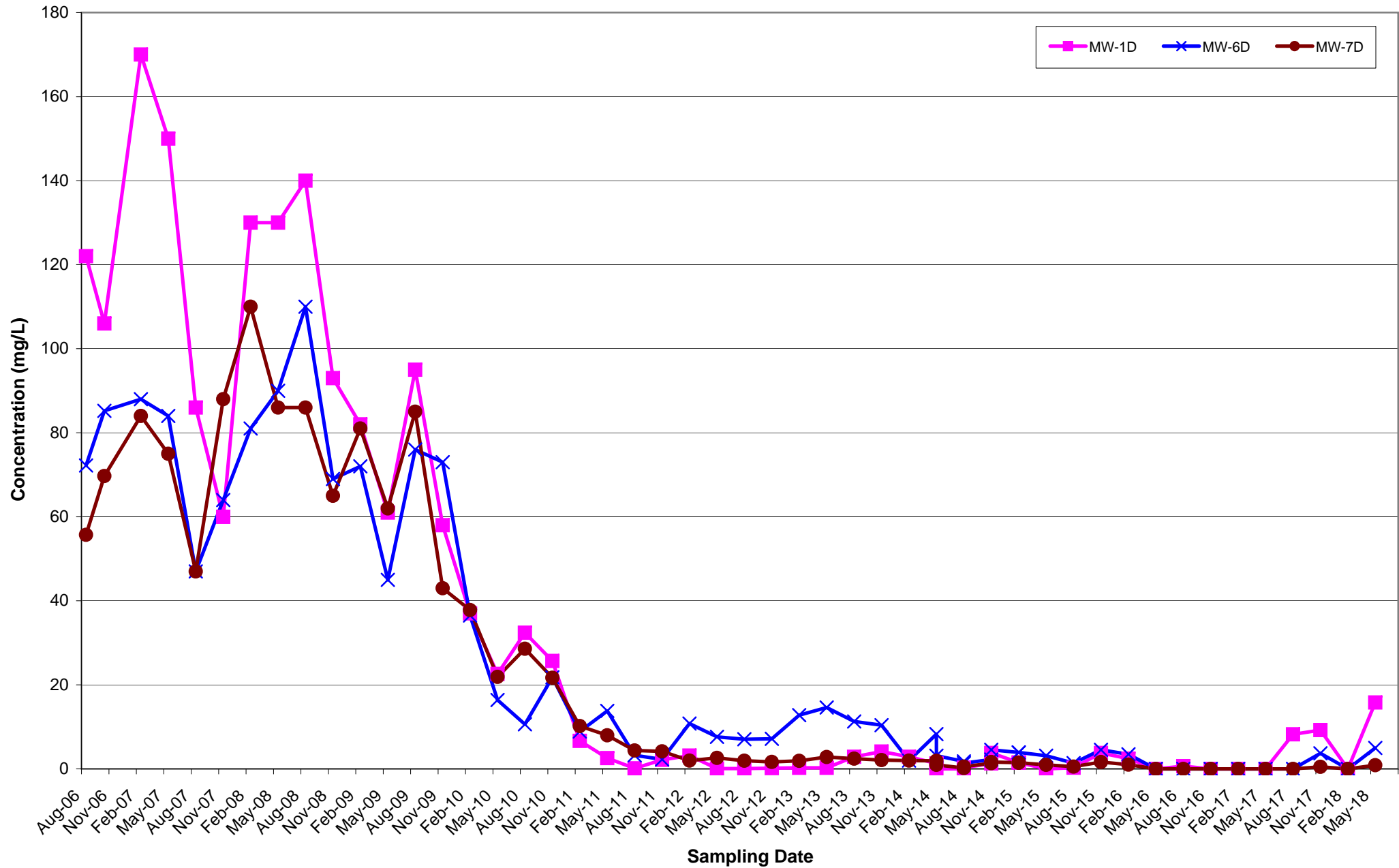
Reference: E2W_025_58.cdr

Figure 4

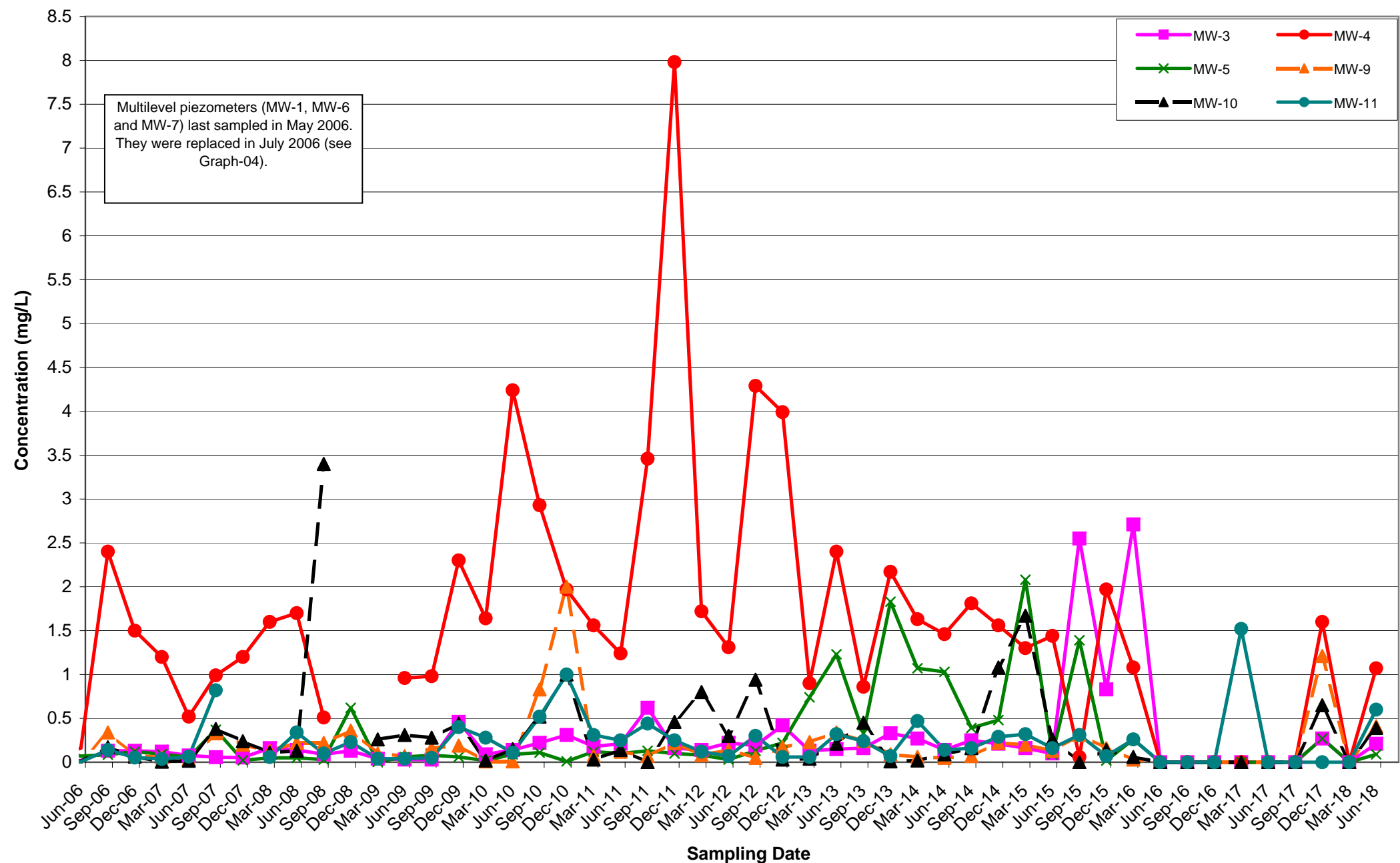
Graph-01: Groundwater Ammonia Time-Series Trends - Shallow & Creek Wells (2006 to 2018)



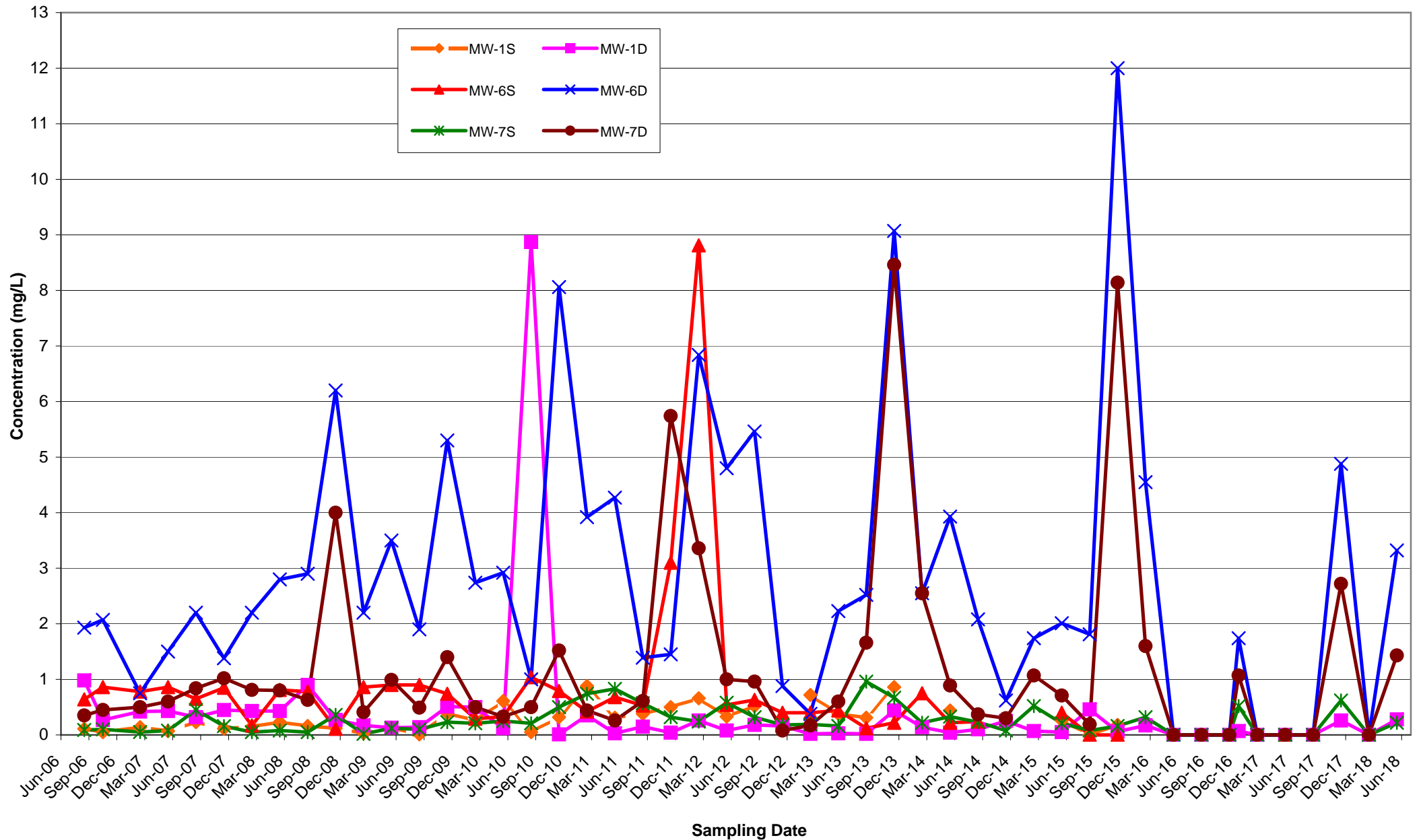
Graph -02: Groundwater Ammonia Time-Series Trends - Deep Wells (2006 to 2018)



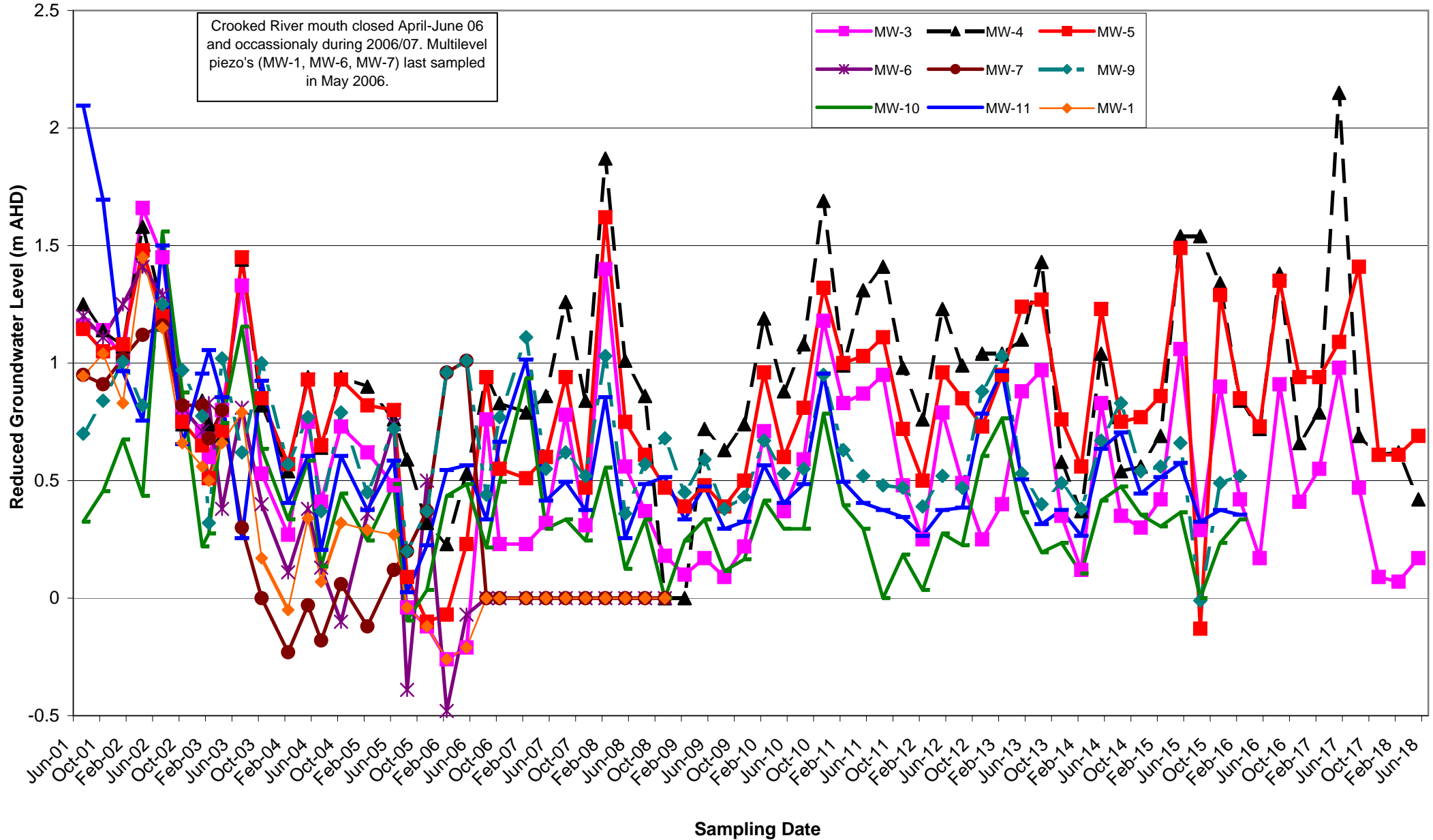
Graph-03: Groundwater Total Phosphorous Time-Series Trends - Standard Wells (2006 to 2018)



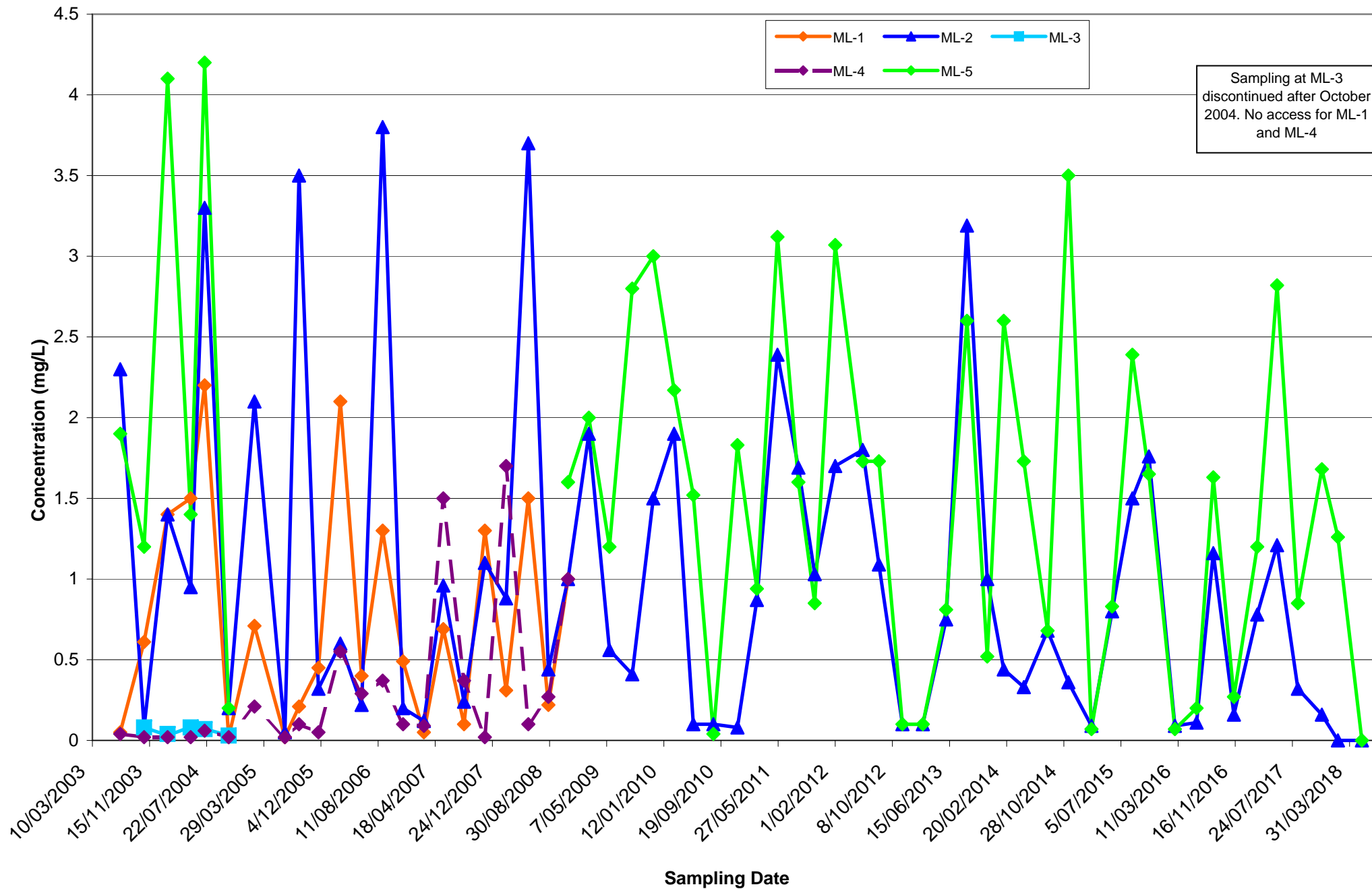
Graph-04: Groundwater Total Phosphorous Trends - New Shallow & Deep Wells (2006 to 2018)



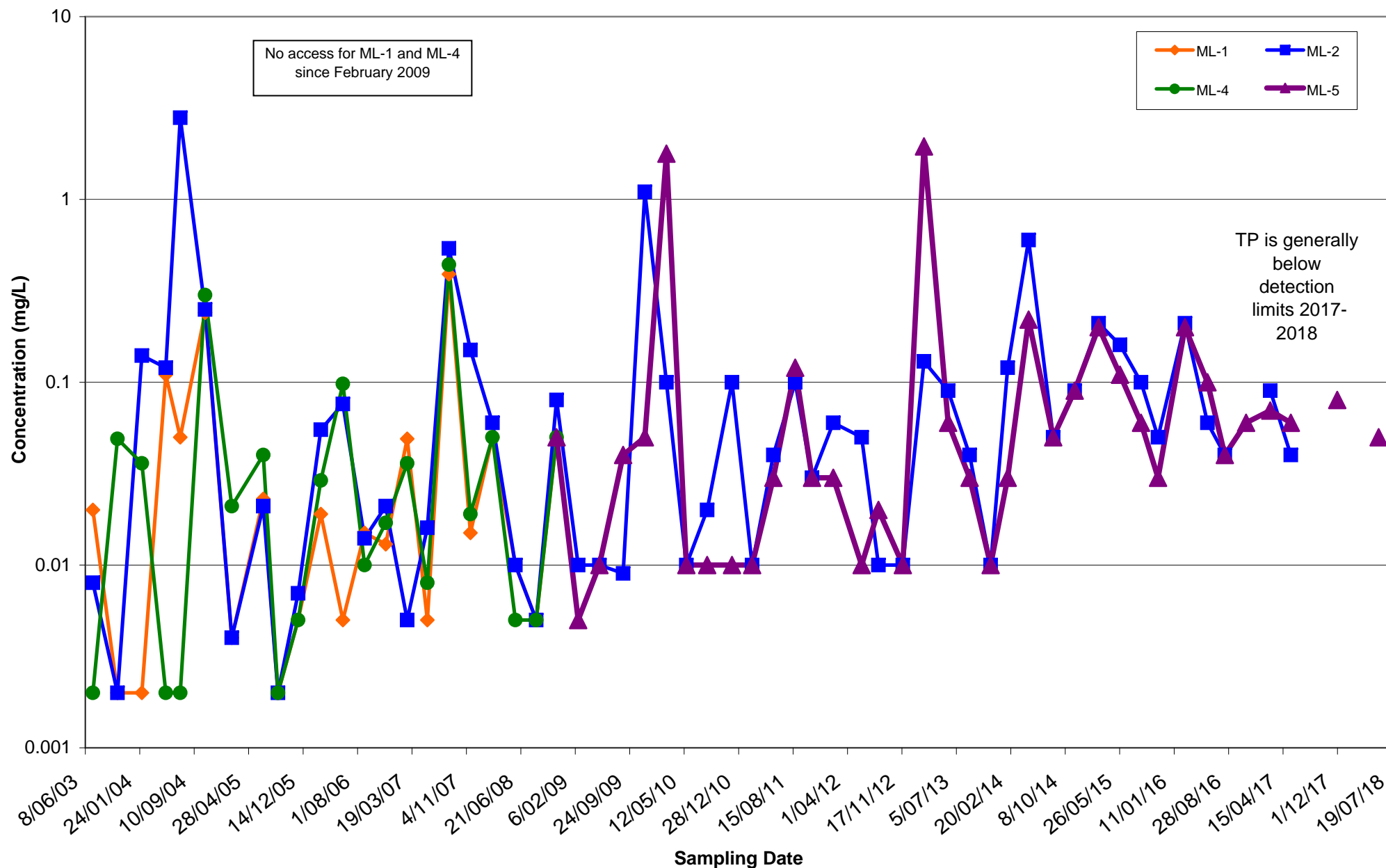
Graph-05: Depth to Groundwater (m AHD) trends; 2001 to 2018



Graph-06: Surface Water Ammonia Trends (2003 to 2018)



Graph-07: Surface Water Total Phosphorus Trends (2003 to 2018)



Tables

T-1 Summary GW (MW-1S)

Gerroa Waste Disposal Depot (2010-2018)

Sample ID	ANZECC, 2000		MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	
Field Measurements	Fresh	Marine	21/5/10	18/2/13	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18
Ground Level (m AHD)			NA																
Depth to Groundwater (m AHD)																			
Groundwater depth (m bTOC)			3.74	3.75	NA	NA	3.06	----	3.2	NA	NA	NA	NA	NA	3.11	NA	NA	NA	NA
Height of Stick up (m)			0.65	0.65			0.65		0.65						0.65				
Groundwater Depth (mbgl)			3.09	3.1			2.41	----	2.55						2.46				
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.8	7			6.2	----	6						6.4				
Temperature (T deg C)			-																
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.95	1.1			772	----	342						691				
Salinity (ppt)			-																
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	1.39	1.48			2.19	----	2.2						2.29				
Dissolved Oxygen (%)			-																
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-																
Redox Potential (mV)			-																
Comments			nc	nc															
Sodium			-																
Potassium			-																
Calcium			-																
Magnesium			-																
Chloride			-																
Alkalinity (as CaCO3)			386	362			102	----	51						139				
Bicarbonate			386	362			102	----	51						139				
Carbonate (as CaCO3)			<1	<1			<1	----	<1						<1				
Sulphate (SO4)			-																
pH (lab)			-																
Total Dissolved Solids (TDS)			1300	640			734	----	385						561				
Hardness (as CaCO3)			-																
Total Suspended Solids (TSS)			-																
Iron (filtered)	0.3 (1)		-																
Manganese	1.90		-																
Nitrate (NO3 as N)	0.7 (7)		0.26	<0.10			<0.01	----	<0.01						<0.01				
Nitrite (NO2 as N)			<0.01	<0.10			<0.01	----	<0.01						<0.01				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.27	0.13			0.09	----	0.23						0.31				
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	4.4	1.8			3.5	----	2.1						5.5				
Dissolved Organic Carbon			-																
Fluoride (Electrode)			-																
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.61	0.72			0.26	----	0.2						0.50				

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

Focus of this monitoring report

nc = no comment

NA = not available

35

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

T-1 Summary GW (MW-1D)

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW1D	MW 1D	MW 1D	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
Field Measurements	Fresh	Marine	215/10	178/10	301/11/0	232/11/0	245/11	248/11/1	311/11/1	12/12	315/12	10/8/12	211/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18
Ground Level (m AHD)	-	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater (m AHD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Groundwater depth (m bTOC)	3.62	3.39	2.77	3.16	3.12	3.04	3.5	3.73	3.2	3.48	3.77	3.6	3.1	3.1	3.64	3.54	3.15	3.65	3.68	3.54	2.92	3.84	3.09	3.6	7.81	3.08	3.56	3.46	2.99	3.46	3.9	3.90	3.83		
Height of Slick up (m)	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Groundwater Depth (mbgl)	3	2.77	2.15	2.54	2.5	2.42	2.88	3.11	2.58	2.86	3.15	2.98	2.48	2.38	3.02	2.92	2.53	3.03	3.06	2.92	2.3	3.22	2.47	2.98											
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	7.2	6.8	7	7.30	7.60	7.60	7.50	7.80	7.5	7.5	7.5	7.30	7.5	7.5	7.5	7.6																
Temperature (T deg C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Electrical Conductivity (mS/cm)	0.125-2.2 (a)	-	2.4	2.43	2.22	1.95	1.72	11.00	1.26	0.99	0.59	<1	0.657	0.695	0.63	0.624	0.624	0.59		0.467	0.622	0.636	707	709	803	631	652	735	992	844	834	862	884	1040	1380
Salinity (ppt)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.56	2.59	1.67	2.31	1.54	2.51	1.72	2.60	5.30	2.2	1.98	2.6	1.97	1.62	2.50	1.82	1.88	3.50	2.90	2.50	3.45	3.05	1.71	3.7	3.00	1.98	3.40	2.97	3.20	2.90	3.1	2.12	2.74
Dissolved Oxygen (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Redox Potential (mV)	-	-	-	-	-	-	-	-91.6	-	-	-	-	<0.1	-	-	-78	-	-	-	60					-37								-115		
Comments	-	-	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	-	-	239	-	-	-	-	118	-	-	-	22	-	-	-	22	-	-	-	14				37									48		
Potassium	-	-	44	-	-	-	15	-	-	-	11	-	-	-	-	15	-	-	-	13				13											
Calcium	-	-	115	-	-	-	68	-	-	-	64	-	-	-	-	62	-	-	-	72				62											
Magnesium	-	-	64	-	-	-	27	-	-	-	23	-	-	-	-	24	-	-	-	24				22									20		
Chloride	-	-	488	-	-	-	146	-	-	-	-	12	-	-	-	20	-	-	-	21				37									63		
Alkalinity (as CaCO3)	611	494	231	345	297	316	322	363	279	288	293	292	284	316	298	254	283	225	280	296	272	262	291	252	287	298	298	309	302	302	286	<1	<1	<1	
Bicarbonate	611	494	231	345	297	316	322	363	259	288	293	292	284	316	298	254	283	225	280	296	272	262	291	252	287	298	309	302	302	286	333	371	358		
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	21.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Sulphate (SO4)	-	-	160	-	-	-	34.00	-	-	-	6	-	-	-	6	-	-	-	-	7.20	7.60	6.40	7.20												
pH (lab)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Dissolved Solids (TDS)	1340	1330	1420	1160	940	700	772	580	340	264	418	320	372	328	328	309	272	334	397	355	379	443	480	419	378	408	476	440	460	400	466	542	671		
Hardness (as CaCO3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Suspended Solids (TSS)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Iron (filtered)	0.3 (1)	-	-	-	-	-	-	0.10	-	-	-	<0.05	-	-	-	<0.05	-	-	-	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	0.05	
Manganese	1.90	-	-	-	-	-	-	0.008	-	-	-	-	0.001	-	-	0.010	-	-	-	0.000	-	-	-	-	0.006	-	-	-	-	-	-	-	0.013	-	
Nitrate (NO3 as N)	0.7 (7)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrite (NO2 as N)	-	-	1.36	4.91	0.86	0.76	1.55	2.39	1.79	<0.01	1.57	2	2.13	2.38	1.06	0.97	0.03	0.11	0.17	2.1	1.4	0.35	1.87	0.02	0.13	0.02	0.16	2.04	0.02	0.53	0.03	1.09	0.79	0.03	0.04
Nitrogen (NO2 as N)	0.06	0.09	0.12	0.02	0.08	0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	0.07	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.12	2.57	0.27	2.56	0.17	2.16	0.32	0.29	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	0.17	0.26	
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	45.2	53.2	31.3	9.6	4.60	1.70	3.30	4.00	1.50	1.4	1.9	1.2	1.10	3.4	4.4	3.1	1.6	0.6	2.1	1.8	0.6	0.7	4.6	3.3	2.6	1.4	15.8	8.7	13.9	9	9.24	13.1	
Dissolved Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fluoride (Electrode)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.12	8.87	<0.01	0.35	0.03	0.15	0.04	0.26	0.08	0.18	0.16	0.02	0.03	0.02	0.44	0.1	0.0	0.1	0.3	0.1	0.05	0.46	0.06	0.17	0.39	0.02	0.59	0.42	0.30	0.24	0.26	0.26	0.28

Note:

Exceeds ANZECC (2000) guidelines

marine/fresh water ecosystems

ocus of this monitoring report

nc = no comment

NA = not available

Notes:

1. Trigger value is an indicative interim working level only (IIWL).

2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.

3. Trigger value for oxides of Nitrogen (NO_x) for lowland rivers in NSW

4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.

5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.

7. Trigger value for a 95% protection level.

8. Guideline for water quality and aesthetics: primary contact

a. Reference only, not directly applicable to groundwater.

a. Reference only, not directly applicable to groundwater.

T-1 Summary GW (MW-3)

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW3	MW 3	MW 3	MW3	MW 3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	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	31/1/11	12/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	
Ground Level (m AHD)			4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	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	0.83	0.35	0.30	0.42	1.06	0.29	0.90	0.42	0.17	0.91	0.41	0.55	0.98	0.47	0.09	0.07	0.17	
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	3.62	4.1	4.15	4.03	3.39	4.16	3.55	4.03	4.28	3.54	4.04	3.90	3.47	3.98	4.36	4.38	4.28	
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	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	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	3.17	3.65	3.70	3.58	2.94	3.71	3.10	3.58	3.83	3.09	3.59	3.45	3.02	3.53	3.91	3.93	3.83	
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	7.1	7.3	7.2	7	7.1	7.3	7.2	7	7.0	7.09	7.6	7.1	7.3	7.4	7.3	7.2	7.3	
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		0.946	0.932	0.812	598	962	843	822	701	840	795	755	733	625	425	394	391	
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	2.69	1.4	2	3.8	3.05	3.21	1.54	2.8	1.38	2.46	3.01	1.86	2.41	1.80	2.88	2.27	3.53	
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sodium			-	-	71	-	-	37	-	-	-	27	-	-	-	49	-	-	-	86	-	-	-	73	-	-	-	89	-	-	-	-	65	-	-	
Potassium			-	-	3	-	-	2	-	-	-	3	-	-	-	3	-	-	-	3	-	-	-	3	-	-	-	2	-	-	-	2	-	-		
Calcium			-	-	90	-	-	88	-	-	-	102	-	-	-	79	-	-	-	117	-	-	-	98	-	-	-	73	-	-	-	50	-	-		
Magnesium			-	-	6	-	-	8	-	-	-	9	-	-	-	8	-	-	-	12	-	-	-	13	-	-	-	11	-	-	-	7	-	-		
Chloride			-	-	127	-	-	53	-	-	-	130	-	-	-	92	-	-	-	205	-	-	-	106	-	-	-	126	-	-	-	52	-	-		
Alkalinity (as CaCO3)			329	274	215	171	125	259	193	235	165	183	295	270	238	227	216	194	292.00	211	245	236	204	250	169	230	238	253	217	254	201	208	<1	<1	<1	
Bicarbonate			329	274	215	171	125	259	193	235	157	183	295	270	238	227	216	194	292.00	211	245	236	204	250	169	230	238	253	217	254	201	208	216	188	172	
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	8.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Sulphate (SO4)			-	-	28	-	-	3	-	-	-	<1	-	-	-	6	-	-	-	11.00	-	-	-	-	-	-	-	13	-	-	-	1	-	-	-	
pH (lab)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	7.1	6.2	6.8	-	-	-	-	-	-	-	-	-	-	-	-		
Total Dissolved Solids (TDS)			384	436	484	318	390	414	322	340	238	496	432	268	298	363	494	443	387	729	585	485	366	565	488	476	446	440	464	432	412	355	292	267	195	
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Iron (filtered)	0.3 (1)		-	-	14.3	-	-	7.55	-	-	-	9.44	-	-	-	6.86	-	-	-	15.0	-	-	-	-	-	-	-	0.32	-	-	-	-	5.03	-	-	
Manganese	1.90		-	-	0.109	-	-	0.07	-	-	-	0.069	-	-	-	0.064	-	-	-	0.127	-	-	-	-	-	-	-	0.110	-	-	-	-	0.092	-	-	
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	<0.01	<0.01	<0.01	0.06	0.01	0.03	0.02	0.02	0.04	0.08	0.09	0.05	0.05	0.01	1.1	1.1	0.9	
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.03	<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	0.13	0.17	0.32	0.18	0.15	0.15	0.74	20.9	4.31	0.56	1.30	0.43	0.18	0.19	0.24	0.27	0.3	
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	0.5	0.9	0.7	0.7	0.5	0.6	2.1	58.1	5.9	2.9	3.4	3.2	1.2	1.3	0.02	0.05	0.03	
Dissolved Organic Carbon			-	-	11	-	-	10	-	-	-	6	-	-	-	12	-	-	-	18	-	-	-	12	-	-	-	11	-	-	-	21	-	-		
Fluoride (Electrode)			-	-	<0.1	-	-	0.1	-	-	-	0.1	-	-	-	0.1	-	-	-	<0.1	-	-	-	0.10	-	-	-	0.2	-	-	-	0.2	-	-	-	
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	0.14	0.25	0.21	0.16	0.1	2.55	0.83	2.71	0.95	0.90	0.52	0.69	0.20	0.28	0.27	0.34	0.21	

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

Focus of this monitoring report

nc = no comment

NA = not available

1. Trigger value is an indicative interim working level only (IWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics; primary contact.
- a. Reference only, not directly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW4	MW 4	MW 4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4				
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	31/11/11	12/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	6/5/14	18/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18				
Ground Level (m AHD)			4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79				
Depth to Groundwater (m AHD)			0.88	1.08	1.69	0.99	1.31	1.41	0.98	0.76	1.23	0.99	1.04	1.04	1.1	1.43	0.58	0.37	1.04	0.54	0.56	0.69	1.54	1.54	1.34	0.84	0.72	1.38	0.66	0.79	2.15	0.69	0.61	0.62	0.42				
Groundwater depth (m bTOC)			4.36	4.16	3.55	4.25	3.93	3.83	4.26	4.48	4.01	4.25	4.2	4.2	4.14	3.81	4.66	4.87	4.2	4.7	4.68	4.55	3.7	3.7	3.9	4.4	4.52	3.86	4.58	4.45	3.09	4.55	4.63	4.62	4.82				
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	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)			3.91	3.71	3.1	3.80	3.48	3.38	3.81	4.03	3.56	3.80	3.75	3.75	3.69	3.36	4.21	4.42	3.75	4.25	4.23	4.1	3.25	3.25	3.45	3.95	4.07	3.41	4.13	4	2.64	4.1	4.18	4.17	4.37				
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	6.8	6.4	6.4	6.80	6.80	6.90	6.90	6.80	7	6.8	7	6.30	7	7.1	7		7.1			6.6	7	6.4	6.1	6.6	6.3	7.1	6.6	6.8	6.8	7	6.3	7				
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.75	0.81	0.468	0.47	0.73	0.68	0.72	0.70	0.58	<1	0.7	0.829	0.44	0.47	0.632	0.683		0.472							555	555	418	207	685	392	561	580	523	675	738	774	834
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.55	2.32	1.46	2.21	1.78	3.09	2.64	2.34	3.22	1.1	2.48	1.7	2.26	2.49	2.32	1.97	4.10	2.70	2.10	3.60	3.57	3.39	3.03	2.4	2.12	2.23	3.68	1.34	3.45	3.20	3.72	2.79	5.1				
Dissolved Oxygen (%)			-	-	15.90	-	-	-	-	-	-	-	10.8			-	-	-	-																				
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Redox Potential (mV)			-	-	-	-	-	-41.5	-	-	-	<0.1			-	-34	-	-	-	-128							76												
Comments			nc	nc	nc	nc	-	-	-	-	nc	-			-	13	-	-	-	10																			
Sodium			-	-	14.00	-	-	12	-	-	-	13			-	13	-	-	-	10																			
Potassium			-	-	1.00	-	-	2	-	-	-	4			-	4	-	-	-	3																			
Calcium			-	-	91.00	-	-	109	-	-	-	117			-	68	-	-	-	88																			
Magnesium			-	-	7.00	-	-	7	-	-	-	6			-	6	-	-	-	5																			
Chloride			-	-	23.00	-	-	25	-	-	-	14			-	13	-	-	-	11																			
Alkalinity (as CaCO3)			274	303	234	151	248	282	251	296	293	323	315	227	137	215	276	284	250	220	258	231	215	230	178	137	348	162	227	237	224	310	<1	<1	<1				
Bicarbonate			274	303	234	151	248	282	251	296	293	323	315	227	137	215	276	284	250	220	258	231	215	230	178	137	348	162	227	237	224	310	380	399	432				
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1				
Sulphate (SO4)			-	-	11.00	-	-	10.00	-	-	-	<1			-	10	-	-	-	7.00																			
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	6.8	7.1	6.2	6.3																	
Total Dissolved Solids (TDS)			354	352	330	252	318	400	388	382	342	376	406	278	262	248	314	351	304	326	376	311	295	330	258	228	426	208	342	317	308	364	422	442	416				
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Iron (filtered)	0.3 (1)		-	-	21.40	-	-	17.10	-	-	-	7.98			-	-	1.61	-	-	10.3																			
Manganese	1.90		-	-	0.38	-	-	0.35	-	-	-	0.299			-	-	0.272	-	-	0.424																			
Nitrate (NO3 as N)	0.7 (7)		0.26	0.03	0.06	0.31	0.39	0.04	0.1	0.04	0.07	0.19	0.05	0.15	0.36	0.09	0.03	0.02	0.28	0.03	<0.01	0.19	0.16	0.09	<0.01	0.02	0.11	0.60	0.03	0.03	0.12	0.12	0.01	0.01	<0.01				
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.88	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.38	0.44	0.22	0.91	1.16	0.58	0.64	0.68	0.18	0.1	0.15	0.44	1.86	<0.01	0.37	0.22	0.28	0.09	0.35	0.09	0.75	0.02	0.26	0.12	0.74	0.16	0.11	0.05	0.12	0.13	0.15	0.10	0.06				
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.3	1.5	1.5	3.1	2.60	1.70	2.60	1.60	0.90	1.2	1.2	0.8	15.30	0.6	1.7	0.7	1.0	0.7	0.8	0.9	2.1	0.3	0.7	0.6	2.7	0.8	1.6	1.0	1.2	0.9	0.8	0.8	0.6				
Dissolved Organic Carbon			-	-	6	-	-	9	-	-	-	7			-	12	-	-	-	9																			
Fluoride (Electrode)			-	-	0.20	-	-	0.2	-	-	-	0.2			-	0.2	-	-	-	0.2																			
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	4.24	2.93	1.97	1.56	1.24	3.46	7.98	1.72	1.31	4.29	3.99	0.9	2.4	0.86	2.17	1.6	1.46	1.81	1.56	1.3	1.44	0.06	1.97	1.08	2.42	1.74	2.43	1.82	0.94	1.17	1.6	1.29	1.07				

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems
Focus of this monitoring report
nc = no comment

NA = not available

1. Trigger value is an indicative interim working level only (IWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
a. Reference only, not directly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW5	MW 5	MW 5	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				
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	12/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18				
Ground Level (m AHD)			4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55				
Depth to Groundwater (m AHD)			0.6	0.81	1.32	1	1.03	1.11	0.72	0.5	0.96	0.85	0.73	0.95	1.24	1.27	0.76	0.56	0.56	1.23	0.75	0.77	0.86	1.49	-0.13	1.29	0.85	0.73	1.35	0.94	1.09	1.41	0.94	0.61	0.61	0.69				
Groundwater depth (m bTOC)			4.15	3.94	3.43	3.75	3.72	3.64	4.03	4.25	3.79	3.9	4.02	3.8	3.51	3.48	3.99	4.19	3.52	4	3.98	3.89	3.26	4.88	3.46	3.9	4.02	3.40	3.81	3.66	3.34	3.81	4.14	4.14	4.06	4.06				
Height of Stick up (m)			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				
Groundwater Depth (mbgl)			3.95	3.74	3.23	3.55	3.52	3.44	3.83	4.05	3.59	3.7	3.82	3.6	3.31	3.28	3.79	3.99	3.99	3.32	3.8	3.78	3.69	3.06	4.68	3.26	3.7	3.82	3.2	3.61	3.46	3.14	3.61	3.94	3.94	3.86				
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.8	7.7	7.2	7.6	8	8	8	7.9	8.1	7.7	7.7	7	7	7.7	7	7.3								7.5	8.00	7.80	7.00	7.1	7.3	7.7	6.9	7.8	7.9	7.80	7.7	7.80		
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.52	0.51	0.414	0.31	0.44	0.31	0.38	0.345	0.36	<1	0.477	0.297	0.13	0.427	0.395	0.425							0.126			361	331	410	123	430	350	264	236	276	328	292	310	392
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.81	3.08	2.14	2.22	4.15	2.88	2.15	2.32	2.41	0.9	1.77	1.8	1.52	1.62	2.13	2.09	2.09	2.74	3.2	3.1	2.4					1.39	1.42	3.49	1.63	2.87	2.57	3.64	2.50	3.1				
Dissolved Oxygen (%)			-	-	22.60	-	-	-	-	-	-	-	9.3		-	-	-	-	-																					
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Redox Potential (mV)			-	-	-	-	-	-25	-	-	-	-	-	-	-	-147	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Comments			nc	nc	nc	nc	-	-	-	-	-	nc	<0.1			-	nc	nc	nc										-144					-20.6						
Sodium			-	-	16	-	-	7	-	-	-	9			-	15	-	-																						
Potassium			-	-	6	-	-	4	-	-	-	5			-	5	-	-																						
Calcium			-	-	53	-	-	44	-	-	-	60			-	54	-	-																						
Magnesium			-	-	10	-	-	6	-	-	-	8			-	7	-	-																						
Chloride			-	-	30	-	-	13	-	-	-	15			-	34	-	-																						
Alkalinity (as CaCO3)			142	144	142	120	177	128	147	144	126	179	198	112	172	170	158	155	155	158	41	118	113	102	118	147	72	186	166	96	109	99	127	<1	<1	<1				
Bicarbonate			142	144	142	120	177	128	147	144	121	179	198	112	172	170	158	155	155	158	41	118	113	102	118	147	72	186	166	96	109	99	127	133	135	180				
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Sulphate (SO4)			-	-	14	-	-	4.00	-	-	-	7			-	4	-	-																						
pH (lab)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Dissolved Solids (TDS)			311	238	258	268	252	197	258	204	170	264	326	166	240	224	219	264	264	216	164	234	138	225	199	254	162	270	190	136	197	168	174	180	241	220				
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Iron (filtered)	0.3 (1)		-	-	<0.05	-	-	<0.05	-	-	-	-	<0.05		-	3.22	-	-																						
Manganese	1.90		-	-	0.002	-	-	0.001	-	-	-	-	0.001		-	0.041	-	-																						
Nitrate (NO3 as N)	0.7 (7)		5.15	10.4	4.44	0.96	0.44	0.14	0.02	1.08	1	1.44	0.03	1.81	<0.01	0.06	0.14	0.61	0.61	<0.01	0.63	0.61	<0.01	0.11	1.4	0.07	0.02	1.40	<0.01	0.10	<0.01	0.09	<0.01	0.06	<0.01	<0.01				
Nitrite (NO2 as N)			0.22	0.21	0.14	0.15	<0.01	0.02	<0.01	0.12	0.18	0.1	0.08	0.03	0.01	0.01	<0.01	0.11	0.11	<0.01	0.03	0.09	<0.01	<0.01	0.05	0.06	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.08	<0.01	0.04	0.03	0.03	0.03	0.08	0.02	0.03	0.05	0.23	0.55	0.45	0.06	5.88	0.64	0.64	4.47	1.28	1.4	14.5	0.03	1.77	0.03	<0.01	6.93	2.34	0.17	0.15	0.04	0.03	0.12	0.14	0.08				
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.7	2.6	2.7	0.6	0.80	0.30	0.70	1.30	1	1.4	2	2.6	17	1.1	9	2.2	2.2	6.3	2.5	3.2	18.9	0.6	2.0	0.40	1.0	12.8	3.0	2.8	18.0	1.9	1.0	2.3	0.8	0.5				
Dissolved Organic Carbon			-	-	6	-	-	5	-	-	-	6			-	12	-	-																						
Fluoride (Electrode)			-	-	0.1	-	-	0.20	-	-	-	0.2			-	0.1	-	-																						
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.09	0.11	<0.01	0.12	0.1	0.13	0.1	0.08	0.03	0.13	0.22	0.74	1.23	0.33	1.83	1.07	1.07	1.03	0.39	0.48	2.08	0.09	1.39	0.02	0.26	2.24	0.31	0.35	1.59	0.16	0.10	0.27	0.13	0.09				

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems

Focus of this monitoring report

nc = no comment

NA = not available

1. Trigger value is an indicative interim working level only (IWL).

2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.

3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.

4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.

5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.

7. Trigger value for a 95% protection level.

8. Guideline for water quality and aesthetics: primary contact.

a. Reference only, not directly applicable to groundwater.

T-1 Summary GW (MW-6s)

Gerroa Waste Disposal Depot (2010-2018)

Sample ID	ANZECC, 2000		MW6S	MW 6S	MW 6S	MW6S	MW6S	MW 6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S
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	7/2/14	6/5/14	1/8/14	27/5/15	MW6S
Ground Level (m AHD)			NA												-	-	-	-				NA	Note #
Depth to Groundwater (m AHD)			NA												-	-	-	-				NA	
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	4.94	4.37	4.77	4.2	4.33
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	0.6	0.6	0.6	0.6	0.6
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	4.34	3.77	4.17	3.6	3.73
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			7.3	6.2	6.6
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			0.659	573	644
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	2.33	1.85	2	3.48	3.21
Dissolved Oxygen (%)			-	-	27.70	-	-	-	-	-	-	-	11.8		-	-	-	-			20.9		
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Redox Potential (mV)			-	-	-	-	-	-33.80	-	-	-	<0.1			-	-57	-	-			65		
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	-	-	-	-					
Sodium			-	-	8	-	-	44	-	-	-	14			-	30	-	-			24		
Potassium			-	-	6	-	-	8	-	-	-	8			-	6	-	-			6		
Calcium			-	-	80	-	-	41	-	-	-	75			-	75	-	-			124		
Magnesium			-	-	9	-	-	7	-	-	-	6			-	7	-	-			10		
Chloride			-	-	14	-	-	42	-	-	-	21			-	34	-	-			30		
Alkalinity (as CaCO3)			182	263	208	176	130	133	196	226	227	202	237	315	62	217	273	248	<1	182	262	40	80
Bicarbonate			182	263	208	176	130	133	196	226	206	202	237	315	62	217	273	248	248	182	262	40	80
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	21	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	26	-	-	40.00	-	-	-	18			-	34	-	-			60		
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-			7	7	
Total Dissolved Solids (TDS)			314	350	308	332	280	334	328	342	286	314	372	616	286	309	364	356	356	280	504	320	343
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-					
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-					
Iron (filtered)	0.3 (1)		-	-	5.59	-	-	3.13	-	-	-	<0.05			-	1.17	-	-			<0.05		
Manganese	1.90		-	-	0.116	-	-	0.06	-	-	-	0.025			-	0.019	-	-			0.03		
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	0.05	0.06	8.3	<0.01	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	0.04	<0.01	0.75	<0.01	<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	0.04	0.03	0.02	0.09	0.06
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	0.6	1.5	2.0	2.9	4.2
Dissolved Organic Carbon			-	-	8	-	-	7	-	-	-	4			-	9	-	-			10		
Fluoride (Electrode)			-	-	0.3	-	-	0.60	-	-	-	0.6			-	0.4	-	-			0		
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	0.8	0.2	0.2	0.4	0.42

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

35

Focus of this monitoring report

nc = no comment

NA = not available

Note #: Well is seldom sampled due to being dry at time of sampling

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW6D	MW 6D	MW 6D	MW6D	MW6D	MW 6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	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	31/11/11	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	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	
Ground Level (m AHD)			NA												-	-	-	-																			
Depth to Groundwater (m AHD)															-	-	-	-																			
Groundwater depth (m bTOC)			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	5.2	4.64	5.03	5.01	4.94	4.47	4.63	4.71	5	5.06	4.64	4.86	4.83	4.56	4.92	5.24	5.20	5.08	
Height of Stick up (m)			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	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	0.7		
Groundwater Depth (mbgl)			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	4.5	3.94	4.33	4.31	4.24	3.77	3.93	4.01	4.3	4.36	3.94	4.16	4.13	3.86	4.22	4.54	4.5	4.38	
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7	7	6.6	6.8	7.1	7.2	7.1	6.9	7	7.1	7.2	7.2	7.2	7.2	7.1	7.5			7.1			7	7.2	7	6.8	6.9	7.1	7.3	6.8	7.0	6.9	7.1	6.2	7.1	
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		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			0.599				821	801	953	732	788	723	840	841	940	1360	863	904	952
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	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	2.75	1.85	1.1	3.1	1.9	2.38	2.51	1.47	2.8	1.52	2.00	4.09	1.82	2.98	2.12	4.05	2.87	3.69	
Dissolved Oxygen (%)			-	-	14.10	-	-	-	-	-	-	-	10.6	-	-	-	-	-	-			11.7															
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Redox Potential (mV)			-	-	-	-	30.90	-	-	-	-	<0.1	-	-	-	13	-	-			43				30												
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc																			
Sodium			-	-	18	-	20	-	-	-	-	15	-	-	-	16	-	-			10			13										53			
Potassium			-	-	19	-	11	-	-	-	10	-	-	-	-	15	-	-			6			6										24			
Calcium			-	-	120	-	142	-	-	-	120	-	-	-	-	141	-	-			122			139										140			
Magnesium			-	-	14	-	16	-	-	-	11	-	-	-	-	10	-	-			8			11										16			
Chloride			-	-	24	-	31	-	-	-	21	-	-	-	-	14	-	-			12			17										73			
Alkalinity (as CaCO3)			544	409	441	408	396	399	375	410	388	332	342	348	386	375	358	208	325	346	248	271	331	292	305	347	318	347	368	334	352	366	517	<1	<1		
Bicarbonate			544	409	441	408	396	399	375	410	388	332	342	348	386	375	358	208	325	346	248	271	331	292	305	347	318	347	344	334	352	366	517	340	388		
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	340	388	400		
Sulphate (SO4)			-	-	8	-	27	-	-	-	33	-	-	-	-	107	-	-			71			69									29				
pH (lab)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			6.8	7.1	6.7	6.6									6.9				
Total Dissolved Solids (TDS)			473	504	496	542	534	586	694	636	460	484	508	436	454	496	475	280	438	418	514	497	514	468	522	574	486	496	468	466	493	514	554	522	577	526	
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Iron (filtered)	0.3 (1)		-	-	9.48	-	-	<0.05	-	-	-	<0.05	-	-	-	0.07	-	-			<0.05												0.64				
Manganese	1.90		-	-	0.184	-	-	0.119	-	-	-	0.122	-	-	-	0.161	-	-			0.11												0.143				
Nitrate (NO3 as N)	0.7 (7)		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	0.05	0.16	2.92	1.79	0.06	1.13	0.33	<0.01	0.26	0.08	3.06	0.04	0.06	0.04	0.24	<0.01	0.03		
Nitrite (NO2 as N)			<0.01	0.09	<0.01	<0.01	0.02	0.04	0.32	<0.01	<0.01	0.62	0.08	0.17	0.21	0.03	0.06	0.04	<0.01	0.01	0.08	0.12	0.03	0.06	0.01	<0.01	<0.01	<0.01	0.01	0.06	<0.01	<0.01	0.01	0.02	<0.01		
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	16.4	10.6	21.8	8.9	13.80	3.24	2.25	10.80	7.01	7.08	7.17	12.8	14.60	11.30	10.40	1.97	9.08	8.27	1.79	2.23	3.92	3.13	1.38	4.53	3.48	4.55	0.14	3.10	2.96	5.76	19.6	3.71	3.85		
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (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	9.4	8.4	2.8	2.9	4.3	3.20	2.20	6.00	4.20	4.9	1.2	4.3	4.2	7.4	21.5	4.50	4.5		
Dissolved Organic Carbon			-	-	15	-	-	11	-	-	11	-	-	-	-	21	-	-			11			8.00					7				20				
Fluoride (Electrode)			-	-	0.4	-	0.4	-	-	-	0.4	-	-	-	-	0.4	-	-			0.4			0.40					0.4				0.4				
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	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	3.86	3.93	2.08	0.62	1.74	2.01	1.81	12.00	4.55	3.95	0.60	12.1	4.88	4.89	3.51	4.88	3.69		

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

35

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW7S	MW 7S	MW 7S	MW7S	MW7S	MW 7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	31/11/11	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	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	
Ground Level (m AHD)															-	-	-	-																			
Depth to Groundwater (m AHD)															-	-	-	-																			
Groundwater depth (m bTOC)			4.57	4.44	4.09	4.32	4.31	4.24	4.58	4.76	4.38	4.54	4.56	4.32	4.23	4.26	4.68	4.84	4.84	4.25	4.64	4.67	4.55	4.06	1.9	4.32	4.7	4.70	4.24	4.47	4.39	4.17	4.54	4.85	4.83	4.68	
Height of Stick up (m)			0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53		
Groundwater Depth (mbgl)			4.04	3.91	3.56	3.79	3.78	3.71	4.05	4.23	3.85	4.01	4.03	3.79	3.7	3.73	4.15	4.31	4.31	3.72	4.11	4.14	4.02	3.53	1.37	3.79	4.17	4.17	3.71	3.94	3.86	3.64	4.01	4.32	4.3	4.15	
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.5	7.6	7.2	7.4	7.8	7	7.9	7.6	7.9	7.7	7.9	7.5	7.4	7.4	7.8	7.8							6.8	8.1	7.1	7.3	7.7	7.0	7.8	6.9	7.0	7.7	7.7	7.6	7.7
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.9	1.01	0.836	0.55	0.604	0.392	0.702	0.584	0.522	<1	0.671	0.467	0.442	0.381	0.518	0.58						317	463	423	579	475	451	580	617	464	723	614	535	544	
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.9	2.99	1.36	2.38	2.33	2.83	1.52	2.57	1.81	1.4	2.07	1.65	2.12	1.77	2.03	1.97	1.97	2.15	1.5	2.3	2.7	3.22	3.24	1.82	3.9	1.95	1.94	3.87	2.82	3.20	2.60	3.15	2.60	3.22	
Dissolved Oxygen (%)			-	-	14.30	-	-	-	-	-	-	-	13.9			-	-	-																			
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Redox Potential (mV)			-	-	-	-	-	10.50	-	-	-	<0.1				-39	-	-																			
Comments			nc	nc	nc	nc	-	-	-	nc	-	-			nc	nc	nc	nc																			
Sodium			-	-	109	-	-	34	-	-	-	44	-	-	-	40	-	-																			
Potassium			-	-	11	-	-	2	-	-	-	4	-	-	-	6	-	-																			
Calcium			-	-	11	-	-	31	-	-	-	56	-	-	-	24	-	-																			
Magnesium			-	-	9	-	-	6	-	-	-	7	-	-	-	5	-	-																			
Chloride			-	-	166	-	-	56	-	-	-	82	-	-	-	48	-	-																			
Alkalinity (as CaCO3)			200	177	204	151	154	85	166	172	147	152	180	132	141	109	153	143	143	143	144	144	159	89	140	133	170	180	150	----	152	91	154	<1	<1	<1	
Bicarbonate			200	177	204	151	154	85	166	172	137	152	180	132	141	109	153	143	143	143	144	144	159	89	140	133	170	180	150	----	152	91	154	172	189	195	
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	11	<1	<1	<1	<1	<1	<1	<1	<1	143	<1	<1	<1	<1	<1	<1	<1	<1	<1	----	<1	<1	<1	172	189	195	
Sulphate (SO4)			-	-	39	-	-	10	-	-	-	14	-	-	-	9	-	-																			
pH (lab)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Total Dissolved Solids (TDS)			538	528	530	362	256	238	418	328	274	334	398	240	238	201	282	312	312	198	330	399	433	248	267	357	434	316	235	----	409	264	382	395	313	283	
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
Iron (filtered)	0.3 (1)		-	-	0.16	-	-	1.22	-	-	-	0.4	-	-	-	0.66	-	-																			
Manganese	1.90		-	-	0.02	-	-	0.01	-	-	-	0.014	-	-	-	0.01	-	-																			
Nitrate (NO3 as N)	0.7 (7)		0.01	0.01	0.02	0.06	<0.01	0.04	<0.01	0.12	<0.01	0.11	<0.01	0.1	<0.01	0.16	<0.10	<0.01	<0.01	<0.01	0.02	<0.01	0.04	0.05	<0.01	0.02	0.10	0.010	----	0.01	0.15	0.01	<0.01	<0.01	<0.01	<0.01	
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.10	0.02	0.02	<0.01	0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	----	0.06	<0.01	<0.01	0.01	<0.01	<0.01		
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.49	1.7	2.56	1.34	1.3	0.16	1.93	2.03	2.25	2.34	2.74	1.2	1.91	0.91	1.33	1.64	1.64	0.68	1.12	0.54	1.16	0.59	0.02	0.8	0.7	1.03	0.38	----	0.34	0.29	0.38	0.29	0.49	0.45	
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.8	2.6	4.5	1.6	2.2	0.4	2	3.3	2.6	2.8	3.5	1.4	2.6	1.5	2	1.8	1.8	1.00	1.6	0.7	1.6	0.8	0.8	1.3	1.2	1.4	0.5	----	1.6	1.3	0.6	0.8	0.9	0.8	
Dissolved Organic Carbon			-	-	9	-	-	6	-	-	-	6	-	-	-	8	-	-																			
Fluoride (Electrode)			-	-	<0.1	-	-	0.1	-	-	-	0.1	-	-	-	<0.1	-	-																			
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.25	0.21	0.5	0.74	0.83	0.57	0.32	0.24	0.58	0.32	0.18	0.19	0.16	0.96	0.67	0.22	0.22	0.33	0.23	0.08	0.52	0.21	0.08	0.16	0.32	0.22	----	1.03	0.55	0.37	0.62	0.49	0.22		

Note:		Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems		35		1. Trigger value is an indicative interim working level only (IIWL). 2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3. 3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW. 4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW. 5. Trigger value for total Nitrogen in lowland rivers in NSW.		6. Trigger value for total Nitrogen in marine ecosystems in NSW. 7. Trigger value for a 95% protection level. 8. Guideline for water quality and aesthetics: primary contact. a. Reference only, not directly applicable to groundwater.	
Focus of this monitoring report		nc = no comment		NA = not available					

Gerroa Waste Disposal Depot

Sample ID	ANZECC, 2000		MW7D	MW 7D	MW 7D	MW7D	MW7D	MW 7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D</
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Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

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1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

T-1 Summary GW (MW-9)

Gerroa Waste Disposal Depot (2010 to 2018)

Sample ID	ANZECC, 2000		MW9	MW 9	MW 9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	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	31/11/11	12/12	10/8/12	21/11/12	18/2/13	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	13/7	
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	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	0.38	0.67	0.83	0.54	0.56	0.66	-0.01	0.49	0.52	0.62	0.5	0.53	0.63	
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	1.94	1.65	1.49	1.78	1.76	1.66	2.33	1.83	1.8	1.70	1.82	1.79		
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	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	0.99	0.7	0.54	0.83	0.81	0.71	1.38	0.88	0.85	0.75	0.87	0.84		
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	5.7								6.4	6.7	6.5	6.3	5.9	
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								9120	7690	4610	9520	31400	9450	
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	1.9	3.69	4.1	2.2	3.3	3.61	1.8	1.92	1.9	4.41	5.40	2.60		
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	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Sodium			-	-	759	-	-	904	-	-	-	-	2330	-	-	190	-	-	-	-	-	-	-	-	-	-	1350	-	-	-	-	-
Potassium			-	-	34	-	-	37	-	-	-	-	101	-	-	13	-	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-
Calcium			-	-	33	-	-	31	-	-	-	-	147	-	-	6	-	-	-	-	-	-	-	-	-	-	69	-	-	-	-	-
Magnesium			-	-	67	-	-	77	-	-	-	-	392	-	-	14	-	-	-	-	-	-	-	-	-	-	165	-	-	-	-	-
Chloride			-	-	912	-	-	1410	-	-	-	-	4620	-	-	275	-	-	-	-	-	-	-	-	-	-	1960	-	-	-	-	-
Alkalinity (as CaCO3)			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86	86	97	39	146	135	142	135	133	84	64	84	90	112	
Bicarbonate			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86	86	97	39	146	135	142	135	133	84	64	84	90	112	
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Sulphate (SO4)			-	-	33	-	-	258	-	-	-	-	679	-	-	37	-	-	-	-	-	-	-	-	-	-	384	-	-	-	-	-
pH (lab)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS)			15600	10900	3270	6560	3900	2920	3660	9530	4000	7670	6540	8220	3320	671	7530	13100	13100	6240	20900	8190	6730	3580	5160	2870	6840	21500	5220	8350	14000	
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (filtered)	0.3 (1)		-	-	4.64	-	-	0.57	-	-	-	0.11	-	-	-	0.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	1.90		-	-	0.015	-	-	0.002	-	-	-	0.005	-	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	<0.01	0.01	0.01	0.13	1.60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.76	0.19	0.05	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	0.24	0.01	<0.01	0.34	0.21	0.01	0.01	0.47	0.07	<0.05	0.03	0.26	1.29	
Total Kjeldahl 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	1.10	0.40	1.00	2.10	2.60	2.40	4.90	2.20	1.40	2.0	1.4	4.0	22.3	
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	0.06	0.05	0.07	0.22	0.20	0.13	0.31	0.16	0.03	0.20	0.09	0.45	0.23	

Note:		Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems		35	1. Trigger value is an indicative interim working level only (IIWL). 2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3. 3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW. 4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW. 5. Trigger value for total Nitrogen in lowland rivers in NSW.	6. Trigger value for total Nitrogen in marine ecosystems in NSW. 7. Trigger value for a 95% protection level. 8. Guideline for water quality and aesthetics: primary contact. a. Reference only, not directly applicable to groundwater.
Focus of this monitoring report		nc = no comment		NA = not available		

T-1 Summary GW (MW-10)

Gerroa Waste Disposal Depot (2010 to 2018)

[illegible]

Note:

Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems

35

Focus of this monitoring report

nc = no comment

NA = not available

1. Trigger value is an indicative interim working level only (IWVL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

T-1 Summary GW (MW-11)

Gerroa Waste Disposal Depot (2010 to 2018)

[illegible]

Note

Exceeds ANZECC (2000) guideline
marine/fresh water ecosystems

35

Focus of this monitoring report

nc = no comment

NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water Location (ML-1)

Gerroa Waste Disposal Depot (2003 to 2018)

Sample ID	ANZECC, 2000		ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	
Field Measurements	Fresh	Marine	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	21/11/07	22/02/08	29/05/08	25/08/08	19/11/08	2008-2016	2016-2018		
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.93	7.85	7.58	7.59	7.15	4.31	7.41	6.42	7.13	7.42	7.2	6.45	6.29	6.27	6.9	7.68	5.82	7.09	6.91	6.49	6.5	7.1	No Access	No access (Cleary Bros. Land) No samples taken		
Temperature			12.75	21.66	22.54	17.36	13.33	19.15	18.89	13.65	16.71	19.18	23.57	11.57	15.92	22.4	22.48	11.93	13.53	23.93	20.87	15.26	15.1	20.5				
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.2	40	13	36.7	13.6	0.4	4.2	4.5	1.941	11.12	36.76	45	9.616	25.73	10.63	10.93	1.388	12.93	1.292	3.591	3.7	9.67				
Eh (ORP) (mV)			-67	nm	nm	nm	nm	nm	nm	-23	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	76			
Salinity (ppt)			0.65	25.53	7.48	23.16	7.93	0.21	2.22	2.4	0.99	6.35	23.27	29.03	5.43	15.73	6.03	6.23	0.7	7.43	0.7	2.37	2.5	nm				
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.8	6.2	3.8	2	0.5	0.8	5.1	7.8	8.97	8.26	2.34	5.83	14.29	6.81	4.67	7.88	8.93	5.69	5.36	5.25	7.9	nm				
Dissolved Oxygen (%)			45	82.4	42.6	24.1	5.7	8.3	55.2	64.9	92.8	92.7	31.5	64.4	149.4	86	54.4	74.2	86.1	70.5	60.2	64.9	79	55				
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	12.7	29.3	28	24.8	22.3	13.8	12.4	10.8	10.7	1.9	12.1	17.5	40.3	3.9	15.6	4	4.7	5.3	25.5	3.9	4.9	nm				
Laboratory Analyses																												
Sodium (ICP)			156	9695	2890	8881	2325	41	733	686	396	218	6700	8600	1200	<1	1600	1500	160	2100	150	1200	520	1300				
Potassium (ICP)			8.3	362	122	374	115	8.8	32	33	22	9.4	240	400	83	2.7	76	80	10	96	9.4	53	25	54				
Calcium (ICP)			34	212	106	207	115	13	44	46	45	98	280	150	83	330	65	81	29	81	33	130	50	73				
Magnesium (ICP)			28	-	318	994	305	9.4	93	97	50	28	830	940	160	0.06	200	220	32	280	26	160	63	160				
Chloride							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Alkalinity (as CaCO3)			235	120	130	119	120	18	75	9.2	74	30	157	100	91	98	53	91	-	120	69	<2	64	90				
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	-	-	-	-				
pH			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7				
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160				
Total Dissolved Solids (TDS)			12692	32132	6716	19936	8866	220	2304	2404	2032	7664	26108	32000	5600	31000	6600	7500	728	7500	840	2400	2100	6400				
Total Suspended Solids (TSS)			-	47	5	11	14	31	6	18	9	22	22	66	21	93	19	22	11	-	-	-	-	-				
Metals (mg/L)																												
Iron (ICP)	0.3 (1)		0.21	0.12	0.18	<0.002	0.28	3.5	0.072	0.29	0.06	0.33	0.03	2.1	2.7	0.14	0.08	0.41	0.39	0.51	2.5	1.5	0.47	0.7				
Manganese (ICP)	1.90		0.15	0.028	0.02	0.02	0.027	0.49	0.007	0.29	<0.01	0.06	0.084	0.03	0.1	0.03	0.05	0.1	0.16	0.037	0.14	0.14	0.08	0.06				
Nutrients (mg/L)																												
Nitrate (NO3 as N)	0.7 (7)		0.03	0.49	0.08	0.19	0.06	0.1	0.04	0.069	<0.04	<0.04	<0.04	0.14	<0.04	0.14	0.16	0.06	0.11	0.07	<0.04	-	-	0.05				
Nitrite (NO2 as N)			<0.02	0.09	<0.02	0.09	<0.02	<0.02	<0.02	0.016	0.015	0.028	0.022	0.011	0.004	0.06	0.012	0.004	0.03	0.031	0.012	-	-	0.01				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.05	0.61	1.4	1.5	2.2	<0.02	0.71	<0.02	0.21	0.45	2.1	0.4	1.3	0.49	0.05	0.69	<0.10	1.3	0.31	1.5	0.22	<1				
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.38	0.92	1.6	1.6	2.9	1.1	0.94	0.62	0.86	0.94	3.1	1.1	2.3	2.7	0.83	1.4	0.57	1.7	1.3	2.2	0.93	0.8				
Total Organic Carbon (TOC)			6	1	1	<1	3	27	18	9	7	3	<1	NR	8	<1	5		8	11	16	10	10	-				
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.02	<0.002	<0.002	0.11	0.05	0.24	0.004	0.023	<0.002	<0.005	0.019	<0.005	0.015	0.013	0.049	0.005	0.39	0.015	<0.05	0.01	<0.005	<0.05				
Biological (CFU/100 ml)																												
Enterococcus	35 (8)	35 (8)	<1	12	400	4 (app)	40	90	90	<1	38	120	36	30 (app)	20 (app)	20 (app)	1500 (app)	72 (app)	<2	20	102	33	2 (app)	18 (app)				
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	<1	4	14 (app)	6 (app)	12 (app)	250	20 (app)	2	72	30	16	12 (app)	20 (app)	<2	1800(app)	12 (app)	<2	128	24	23	10	20				

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

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

Notes:

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value specified at pH = 8.0, for a 95% protection level, is corrected for an average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% Protection level
8. Guideline for water quality and aesthetics: Primary Contact
 - a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water (ML-2)

Gerroa Waste Disposal Depot (2003 to 2018)

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-2	ML-2	ML-2
Field Measurements	Fresh	Marine	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
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.4	8.27	7.75	7.59	7.46	6.72	7.39	6.69	6.74	7.3	7.24	6.45	6.25	5.67
Temperature			13.71	22.37	24.3	16.68	14.71	19.04	20.67	13.71	17.33	21.78	21.25	11.79	15.84	23.31
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		5	41.4	27.4	36.9	23.6	1.3	25.6	6.3	8.986	41.19	47.28	33.07	15.21	47.9
Eh (ORP) (mV)			-40	nm	nm	nm	nm	nm	nm	-431	nm	nm	nm	nm	nm	nm
Salinity (ppt)			2.67	26.24	16.77	23.38	14.25	0.66	15.58	3.42	5.05	26.42	30.81	20.68	8.9	31.24
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.5	5.4	3.5	2	0.4	1.5	4.2	6.5	7.6	6.09	3.26	9.5	15.46	6.15
Dissolved Oxygen (%)			44.2	72.7	45.4	23.1	4.1	15.9	51.5	62	81.6	80.8	44.1	100	164.8	86.3
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	17.9	40	42.4	26.6	26.3	15.7	18.3	12.1	9.8	4.6	2.1	3.7	44.7	6.8
Laboratory Analyses																
Sodium (ICP)			742	9217	5760	9283	4430	177	4720	1007	1295	8304	8800	6300	1500	<1
Potassium (ICP)			28	345	224	388	181	14	287	48	65	349	330	280	150	0.71
Calcium (ICP)			59	212	181	203	153	20	293	55	66	217	360	120	100	-
Magnesium (ICP)			95	-	765	106	536	26	820	136	162	1015	1100	660	250	0.021
Chloride			-	-	-	-	-	-	-	-	-	-	-	-	-	350
Alkalinity (as CaCO3)			306	125	130	13	135	25	118	11.5	106	109	124	90	120	111
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-	-	-	-	0.021
pH			6.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS)			3392	32400	20008	21828	16284	672	15624	3612	5540	27196	36608	22000	9000	34000
Total Suspended Solids (TSS)			-	58	28	11	23	27	25	12	21	66	23	50	48	94
Metals (mg/L)																
Iron (ICP)	0.3 (1)		0.42	0.092	0.48	<0.002	0.21	3.2	0.016	0.1	0.06	0.21	0.01	0.1	2.4	<0.04
Manganese (ICP)	1.90		0.12	0.022	0.026	0.02	0.025	0.45	0.025	0.28	0.01	0.03	0.033	0.02	<0.1	0.03
Nutrients (mg/L)																
Nitrate (NO3 as N)	0.7 (7)		0.06	<0.02	0.03	0.28	<0.02	0.03	0.06	0.076	0.08	<0.04	<0.04	0.13	<0.04	350
Nitrite (NO2 as N)			<0.02	<0.02	<0.02	0.07	<0.02	<0.02	0.02	0.014	0.059	0.018	0.009	0.011	0.013	8500
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	2.3	0.08	1.4	0.95	3.3	0.2	2.1	0.05	3.5	0.32	0.6	0.22	3.8	0.2
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	2.4	0.08	1.4	1.3	4.1	2	2.1	0.73	4.3	0.73	0.73	0.58	5.2	0.71
Total Organic Carbon (TOC)			5	1	<1	<1	1	26	13	9	7	<1	NR	5	<1	
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.008	<0.002	0.14	0.12	2.8	0.25	0.004	0.021	<0.002	0.007	0.055	0.076	0.014	0.021
Biological (CFU/100 ml)																
Enterococcus	35 (8)	35 (8)	7	<1	500(app)	10 (app)	24 (app)	100	50	<1	47	120	48	690	8 (app)	32 (app)
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	15	<1	72	8 (app)	24 (app)	200	60	2	32	80	50	1000	48	6 (app)

Exceeds ANZECC (2000) guidelines

0.054**Focus of this monitoring report**

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection, corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water (ML-2)

Gerroa Waste Disposal Depot (2003 to 2018)

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-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Field Measurements	Fresh	Marine	27/02/07	23/05/07	22/08/07	21/11/07	22/02/08	29/05/08	25/08/08	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
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.13	7.62	6.19	7.27	6.85	6.02	6.7	7.23	7	6.8	6.3	6.7	7.1	6.8	6.7	5.7	6.8	7.2	6.8
Temperature			23.13	14.46	13.97	25.39	22.11	15.44	14.1	21	-	-	-	-	-	-	-	-	-		
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		17.5	36.12	2.171	26.73	35.684	14.356	8.5	41.6	20	33	38	24	21.2	28.9	10.4	1.37	20.1	20	1.41
Eh (ORP) (mV)			nm	nm	nm	nm	nm	nm	nm	120	-	-	-	-	-	-	-	-	-		
Salinity (ppt)			10.33	22.85	1.12	16.36	23.99	10.4	6.1	nm	-	-	-	-	-	-	-	-	-		
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.64	4.52	7.8	9.81	5.56	6.14	93	nm	8.1	7.2	7.5	6.6	5.2	7	9.92	3.64	5.36	8.2	6.05
Dissolved Oxygen (%)			54.6	44.3	76.2	131.2	73.2	75.8	9.5	32	-	-	89	-	-	-	-	39.10	-		
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	9.7	4.9	6.1	16.2	3.8	4.2	5.7	nm	-	-	-	-	-	-	-	-	-		
Laboratory Analyses																					
Sodium (ICP)			3000	5600	320	4200	6500	5600	1300	7200	3800	-	8000	-	-	-	-	40	-		189
Potassium (ICP)			120	260	17	180	270	230	55	290	160	-	390	-	-	-	-	4	-		10
Calcium (ICP)			95	150	32	140	170	270	70	200	170	-	320	-	-	-	-	7	-		32
Magnesium (ICP)			320	800	47	530	790	680	140	890	480	-	1000	-	-	-	-	6	-		29
Chloride			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Alkalinity (as CaCO3)			63	120	-	110	110	<2	71	120	25	110	120	110	117	109	64	16	123	114	50
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
pH			-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-		
Redox Potential (mV)			-	-	-	-	-	-	-	180	-11.4	-	88	-	-	-	-	-	-		73.5
Total Dissolved Solids (TDS)			11000	27000	1050	16000	23000	9600	5000	28000	13000	23000	29000	20000	14200	23500	12000	116	17900	13200	846
Total Suspended Solids (TSS)			16	66	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Metals (mg/L)																					
Iron (ICP)	0.3 (1)		0.07	0.28	0.7	0.45	0.26	1.5	0.57	0.34	0.52	-	<0.01	-	-	-	-	1.19	-		0.89
Manganese (ICP)	1.90		0.05	0.11	0.15	0.03	0.038	0.04	0.06	0.03	0.13	-	<0.01	-	-	-	-	0.057	-		0.12
Nutrients (mg/L)																					
Nitrate (NO3 as N)	0.7 (7)		0.34	0.08	0.08	0.1	0.02	-	-	0.02	0.69	0.1	0.1	0.11	0.05	0.16	0.1	0.05	0.13	0.15	0.08
Nitrite (NO2 as N)			0.012	0.017	0.04	0.057	0.025	-	-	0.01	0.2	0.02	0.02	0.04	0.02	0.08	0.01	<0.01	0.16	0.06	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.12	0.96	0.24	1.1	0.88	3.7	0.44	<1	1.9	0.56	0.41	1.5	1.9	<0.10	<0.10	0.08	0.87	2.39	1.69
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.85	1.4	1	2	1	4.3	0.98	0.7	1.9	0.81	0.41	1.9	4.9	1.1	1.4	1.6	2	3.2	2
Total Organic Carbon (TOC)			3		8	11	3	5	7	-	-	-	-	-	-	-	-	-	-		
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	<0.005	0.016	0.54	0.15	0.06	0.01	<0.005	0.08	0.01	0.01	0.009	1.1	0.1	<0.01	0.02	0.1	<0.01	0.04	0.1
Biological (CFU/100 ml)																					
Enterococcus	35 (8)	35 (8)	1600 (app)	18 (app)	<2	24	80	35	16 (app)	24 (app)	130	-	-	-	-	-	-	~1300	-		~18
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	1600 (app)	36 (app)	<2	140	110	17	18	38	120	-	9	-	-	-	-	~6600	-		~17

Exceeds ANZECC (2000) guidelines 0.054

Focus of this monitoring report

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection, corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water (ML-2)

Gerroa Waste Disposal Depot (2003 to 2018)

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-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Field Measurements	Fresh	Marine	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	6/5/14	18/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	7	7.2	7	7.3	7.4	6.5	7	7.2	6.9	7.1	7	7	6.5	6.6	7.5	7.1	6.5
Temperature									-	-	-	-								
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		6.73	19	15.7	20	46.9	19.6	5.13	6.88	13.6	40	38200	21000	36600	553	4280	7790	9400	25400
Eh (ORP) (mV)									-	-	-	-		149						
Salinity (ppt)									-	-	-	-								
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	6.68	6.25	5.66	3.2	6.03	5.39	4.61	4.97	11.1	5.22	6.66	6.2	5.8	4.1	4.46	9.11	4.93	5.4
Dissolved Oxygen (%)						33.2			-	-	-	-		67.3						
Turbidity (NTU)	6-50 (a)	0.5-10 (a)							-	-	-	-								
Laboratory Analyses																				
Sodium (ICP)						7180			-	1200	-	-		5400				1420		
Potassium (ICP)						272			-	52	-	-		246				55		
Calcium (ICP)						255			-	79	-	-		241				66		
Magnesium (ICP)						701			-	140	-	-		614				158		
Chloride									-	-	-	-								
Alkalinity (as CaCO3)			66	128		121	128	117	43	160	127	115	124	92	111	17	68	103	131	102
Sulphate (SO4)									-	-	-	-								
pH									-	-	-	-								
Redox Potential (mV)						<0.1			-	58	-	-						-17		
Total Dissolved Solids (TDS)			6730	13700	11800	18100	34600	12900	2950	4260	9920	28800	32600	18600	24400	423	2060	4840	6240	17200
Total Suspended Solids (TSS)									-	-	-	-								
Metals (mg/L)																				
Iron (ICP)	0.3 (1)					<0.50			-	1.45	-	-		0.36				1.64		
Manganese (ICP)	1.90					0.031			-	0.052	-	-		0.025				0.023		
Nutrients (mg/L)																				
Nitrate (NO3 as N)	0.7 (7)		0.12	0.07	0.24	0.18	<0.01	0.23	0.02	0.15	0.06	0.01	0.03	0.15	<0.01	0.05	0.02	0.13	0.05	0.02
Nitrite (NO2 as N)			0.02	0.09	0.06	0.02	<0.01	<0.01	0.02	0.02	0.06	0.05	0.02	0.04	0.04	<0.01	0.02	0.02	0.05	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	1.03	1.7	1.8	1.09	<0.10	<0.10	0.75	3.19	1	0.44	0.33	0.68	0.36	0.09	0.8	1.5	1.76	0.81
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.6	2.4	2.9	1.3	0.2	1	2	3.6	2.2	1	<0.5	1.2	0.9	1.4	1.2	1.9	3	1.6
Total Organic Carbon (TOC)									-	-	-	-								
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.03	0.06	0.05	<0.01	<0.01	0.13	0.09	0.04	0.01	0.12	0.6	0.05	0.09	0.21	0.16	0.1	0.05	0.03
Biological (CFU/100 ml)																				
Enterococcus	35 (8)	35 (8)				4			-	20	-	-		160				590		
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)				2			-	24	-	-		290				640		

Exceeds ANZECC (2000) guidelines

0.054

Focus of this monitoring report

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection,corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water quality and aesthetics; primary contact
- a. Reference only, not dirtectly applicable to groundwater

Table SW-1: Summary Analytical Results for Surface Water (ML-2)

Gerroa Waste Disposal Depot (2003 to 2018)

Sample ID	ANZECC, 2000		ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Field Measurements	Fresh	Marine	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	29/11/17	8/2/18	24/5/18
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	6.8	7.1	7.2	7.1	6.7	7.3	7.2	7.1
Temperature											
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		43200	5240	47300	30100	15300	29100	30800	41800	47200
Eh (ORP) (mV)				1.0				132			
Salinity (ppt)											
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.82	5.66	4.73	4.87	6.38	4.90	3.21	3.25	3.25
Dissolved Oxygen (%)											
Turbidity (NTU)	6-50 (a)	0.5-10 (a)									
Laboratory Analyses											
Sodium (ICP)				922				4750			
Potassium (ICP)				35				180			
Calcium (ICP)				63				246			
Magnesium (ICP)				104				525			
Chloride				----				----			
Alkalinity (as CaCO ₃)			118	110	109	139	136	120	<1	<1	<1
Sulphate (SO ₄)			118	----	109	139	136	----	153	145	121
pH			<1		<1	<1	<1		153	145	121
Redox Potential (mV)											
Total Dissolved Solids (TDS)			33200	3070	33100	19400	9970	18800	21200	15800	27200
Total Suspended Solids (TSS)											
Metals (mg/L)											
Iron (ICP)	0.3 (1)			1.07				0.88			
Manganese (ICP)	1.90			0.042				0.028			
Nutrients (mg/L)											
Nitrate (NO ₃ as N)	0.7 (7)		0.13	0.16	0.06	<0.01	0.02	0.31	0.01	<0.01	0.06
Nitrite (NO ₂ as N)			<0.01	0.02	<0.01	<0.01	0.04	0.04	0.04	<0.01	0.01
Ammonia (NH ₃ as N)	1.88 (2)	2.84 (2)	0.11	1.16	0.16	0.78	1.21	0.32	0.16	<0.05	<0.10
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.5	1.9	<0.5	1.0	2.3	0.5	0.8	<0.5	<0.5
Total Organic Carbon (TOC)				----				----			
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.06	0.04	<0.05	0.09	0.04	<0.05	<0.05	<0.05	<0.05
Biological (CFU/100 ml)											
Enterococcus	35 (8)	35 (8)		28				44			
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)		18				~94			

Exceeds ANZECC (2000) guidelines

0.054

Focus of this monitoring report

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection, corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water Location (ML-3)

Gerroa Waste Disposal Depot (2003 to 2018)

Sample ID	ANZECC, 2000		ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3
Field Measurements	Fresh	Marine	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04	2004-2014	2015-2016	2016-2018
pH (field)	6.5-8.0 (a)	8-8.4 (a)	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; 2	No access (Cleary Bros. Land) - no samples taken 31/05/2013; 30/08/2013; 27/11/2013 an	No access (Cleary Bros. Land) - no samples taken
Temperature			20.5	21.34	13.03	13.16	18.75			
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		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)	4.6	4.5	2.2	0.8	1.2			
Dissolved Oxygen (%)			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)			-	-	-	-	-			
Potassium (ICP)			-	-	-	-	-			
Calcium (ICP)			-	-	-	-	-			
Magnesium (ICP)			-	-	-	-	-			
Chloride			-	-	-	-	-			
Alkalinity (as CaCO3)			-	-	-	-	-			
Sulphate (SO4)			-	-	-	-	-			
pH			-	-	-	-	-			
Redox Potential (mV)			-	-	-	-	-			
Total Dissolved Solids (TDS)			-	-	-	-	-			
Total Suspended Solids (TSS)			-	-	-	-	-			
Metals (mg/L)										
Iron (ICP)	0.3 (1)		-	-	-	-	-			
Manganese (ICP)	1.90		-	-	-	-	-			
Nutrients (mg/L)										
Nitrate (NO3 as N)	0.7 (7)		-	-	-	-	-			
Nitrite (NO2 as N)			-	-	-	-	-			
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.08	0.04	0.08	0.07	0.03			
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	-	-	-	-	-			
Total Organic Carbon (TOC)			-	-	-	-	-			
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	-	-	-	-	-			
Biological (CFU/100 ml)										
Enterococcus	35 (8)	35 (8)	10	390	72	60	140			
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	16	32 (app)	50	18 (app)	220			

Exceeds ANZECC (2000) guidelines

0.054

Notes:

Focus of this monitoring report

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value specified at pH = 8.0, 95% protection level, corrected pH = 7.3.
3. Trigger value for oxides of Nitrogen (NO_x) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NO_x) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% Protection level
8. Guideline for water quality and aesthetics: Primary Contact
- a. Reference only, not directly applicable to groundwater.

Gerroa Waste Disposal Depot (2003 to 2018)

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH = 8, 95% protection, corrected at pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
 - a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water Locations (ML-5; 2003 to 2018)

Gerroa Waste Disposal Depot (2003 to 2018)

Sample ID	ANZECC, 2000		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	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5
Field Measurements	Fresh	Marine	10/7/03	22/10/03	2/2/04	13/5/04	13/7/04	26/10/04	19/11/08	18/2/09	19/5/09	27/8/09	27/11/09	26/2/10	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
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.26	7.97	7.54	7.51	7.51	6.6	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
Temperature			13.6	22.51	23.47	16.41	14.26	19.03	20.2	-	-	-	-	-	-	-	-	-									-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		3	40.3	19.7	36.1	14.6	0.7	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
Eh (ORP) (mV)			-63	nm	nm	nm	nm	nm	88	-	-	-	-	-	-	-	-	-									-	-
Salinity (ppt)			1.58	25.7	11.7	22.78	8.48	0.34	nm	-	-	-	-	-	-	-	-	-									-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.3	5.9	3	1.6	0.5	1	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
Dissolved Oxygen (%)			41.8	79	37	18.2	4.8	11.3	67	-	-	62	-	-	-	-	54.00	-					33.7				-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	15.4	33.3	26.8	26.1	32.3	14.1	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
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
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
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
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	1.9	1.2	4.1	1.4	4.2	0.2	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
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
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
Biological (CFU/100 ml)																												
Enterococcus	35 (8)	35 (8)	2	4	600	36 (app)	40	80	116 (app)	180	-	-	-	-	-	-	-1200	-		-8				12			-	-16
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	<1	16	44	12 (app)	12 (app)	160	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

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection, corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water Locations (ML-5; 2003 to 2018)

Gerroa Waste Disposal Depot (2003 to 2018)

Sample ID	ANZECC, 2000		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	ML-5	
Field Measurements	Fresh	Marine	27/11/13	7/2/14	6/5/14	18/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	29/11/17	8/2/18	24/5/18
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.2		6.5	6.7	6.4	6.1	6.9	7.3	7.1	6.8	6.6	6.9	7.0	7.0	7.0	6.7	7.1	7.0	6.8
Temperature			-	-																	
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		4.26		26800	12900	26800	357	1210	2380	1820	9900	36600	1220	47100	14400	10600	17300	14900	40200	44400
Eh (ORP) (mV)			-	-	208																
Salinity (ppt)			-	-																	
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	6.65		5.55	6.2	5.6	5.3	5.2	7.34	3.83	5.1	3.43	4.87	3.43	5.48	5.15	5.37	3.09	2.66	2.92
Dissolved Oxygen (%)			-	-	63.3																
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-																	
Laboratory Analyses																					
Sodium (ICP)			-	-		2980				379				162				2580			
Potassium (ICP)			-	-		138				19				10				108			
Calcium (ICP)			-	-		154				42				33				155			
Magnesium (ICP)			-	-		363				49				24				318			
Chloride			-	-																	
Alkalinity (as CaCO3)			112		138	105	157	15	60	134	134	102	118		106	121	159		195	168	118
Sulphate (SO4)			-	-																	
pH			-	-									6.6		7.0	7.0	7.0		7.1	7.0	6.8
Redox Potential (mV)			-	-						95				38.0				118			
Total Dissolved Solids (TDS)			2510		21400	8160	18500	281	538	1370	1270	6860	24000		25800	8900	6540		8840	20600	31300
Total Suspended Solids (TSS)			-	-																	
Metals (mg/L)																					
Iron (ICP)	0.3 (1)		-	-		0.6				2.09				1.15				0.32			
Manganese (ICP)	1.90		-	-		0.04				0.032				0.052				0.034			
Nutrients (mg/L)																					
Nitrate (NO3 as N)	0.7 (7)		0.05	0.02	0.01	0.15	0.03	0.05	0.04	0.22	0.06	<0.01	0.14	0.21	0.04	0.02	<0.01	0.35	0.08	0.01	0.11
Nitrite (NO2 as N)			0.02	0.15	0.1	0.04	0.24	<0.01	0.01	0.02	0.02	0.02	0.01	<0.01	<0.01	<0.01	0.05	0.05	0.17	0.03	0.03
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.52	2.6	1.73	0.68	3.5	0.07	0.83	2.39	1.65	1.24	0.20	1.63	0.27	1.20	2.82	0.85	1.68	1.26	<0.10
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.6	2.7	2	1.2	4.3	1.6	1.7	2.6	2.7	2.5	0.5	2.4	1.4	1.9	4.2	1.1	2.4	1.9	<0.5
Total Organic Carbon (TOC)			-	-										----				----			
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.01	0.03	0.22	0.05	0.09	0.2	0.11	0.06	0.03	0.03	0.10	0.04	0.06	0.07	0.06	<0.02	0.08	<0.05	0.05
Biological (CFU/100 ml)																					
Enterococcus	35 (8)	35 (8)	-	-		130				240				18				-8			
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	-	-		220				1100				21				-6			

Exceeds ANZECC (2000) guidelines **0.054****Focus of this monitoring report**

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

1. Trigger value is an indicative interim working level only (IWL).
2. Ammonia trigger value at pH =8, 95% protection, corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.

6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% protection level.
8. Guideline for water quality and aesthetics: primary contact.
- a. Reference only, not directly applicable to groundwater.

Table 6: Groundwater and Surface Water Monitoring - 2016 to 2018

Analytes	Groundwater Wells & Blue Angle Creek									Detection Limit	Method Reference
	31/05/16	12/08/16	10/11/16	20/02/17	18/05/17	17/08/17	30/11/17	8/02/18	24/05/18		
Physical Properties											
pH	X	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	X	0.01 mS/cm	Conductivity meter and probe
Dissolved Oxygen	X	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	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	X	0.01 mg/L	FIA
Total Phosphorus	X	X	X	X	X	X	X	X	X	2 µg/L	FIA
Nitrate-nitrogen	X	X	X	X	X	X	X	X	X	10 µg/L	FIA
Nitrite-nitrogen	X	X	X	X	X	X	X	X	X	1 µg/L	FIA
Total Kjeldhal Nitrogen	X	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				X				0.5 mg/L	Titrated with mercuric nitrate using diphenol-carbazonel/xylene cyanol FF indicator
Fluoride		X				X				0.1 mg/L	APHA4500-FC
Magnesium		X				X				0.02 mg/L	USEPA 6010 A
Sulphate										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	X	0.5 mg/L	APHA2340C
Potassium		X				X				0.05 mg/L	USEPA 6010 A
Organic Contaminants											
Dissolved Organic Carbon		X				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				X				1cfu/100 ml	WMM 009 (~AS 4276.7 - 1995)
Enterococcus MF		X				X				1cfu/100 ml	WMM 013 (~AS 4276.9 - 1995)

Appendix A

CERTIFICATE OF ANALYSIS

Work Order : **EW1602035**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill Quarterly**
Order number : **87895**
C-O-C number : **----**
Sampler : **Craig Wilson**
Site : **----**
Quote number : **----**
No. of samples received : **17**
No. of samples analysed : **17**

Page : 1 of 6
Laboratory : Environmental Division NSW South Coast
Contact : Glenn Davies
Address : 1/19 Ralph Black Dr, North Wollongong 2500
4/13 Geary Pl, North Nowra 2541
Australia
Telephone : 02 42253125
Date Samples Received : 31-May-2016 15:10
Date Analysis Commenced : 31-May-2016
Issue Date : 07-Jun-2016 15:05

NATA Accredited Laboratory 825
 Accredited for compliance with
 ISO/IEC 17025.



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Kristy Boje	Laboratory Supervisor	Laboratory - Wollongong



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.

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK055G: LOR riased for Ammonia for various samples due to sample matrix
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW1D	MW1S	MW3	MW4	MW5
Client sampling date / time					31-May-2016 11:40	31-May-2016 11:30	31-May-2016 11:10	31-May-2016 11:55	31-May-2016 10:55
Compound	CAS Number	LOR	Unit		EW1602035-001	EW1602035-002	EW1602035-003	EW1602035-004	EW1602035-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.3	----	7.0	6.6	7.1
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		652	----	701	685	430
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		378	----	446	426	270
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		287	----	238	348	186
Total Alkalinity as CaCO3	----	1	mg/L		287	----	238	348	186
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		2.08	----	4.31	0.74	6.93
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	0.02	<0.01	0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.16	----	0.04	0.11	1.40
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.16	----	0.06	0.11	1.41
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.6	----	5.9	2.7	12.8
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		2.8	----	6.0	2.8	14.2
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.39	----	0.95	2.42	2.24
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.00	----	1.38	2.12	1.39
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		7.81	----	4.28	4.52	4.02



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW6D	MW6S	MW7D	MW7S	MW9
Client sampling date / time					31-May-2016 10:25	31-May-2016 10:15	31-May-2016 10:40	31-May-2016 10:35	31-May-2016 12:25
Compound	CAS Number	LOR	Unit		EW1602035-006	EW1602035-007	EW1602035-008	EW1602035-009	EW1602035-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.9	----	7.4	7.7	5.9
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		788	----	471	475	31400
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		496	----	290	316	21500
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		347	----	203	180	64
Total Alkalinity as CaCO3	----	1	mg/L		347	----	203	180	64
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		4.55	----	1.00	1.03	<0.05
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.08	----	0.13	0.10	0.76
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.08	----	0.13	0.10	0.76
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.9	----	1.3	1.4	2.0
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		5.0	----	1.4	1.5	2.8
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		3.95	----	1.62	0.22	0.20
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		1.52	----	2.91	1.95	4.41
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		5.06	----	4.83	4.70	1.70



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW10	MW11	ML-1	ML-2	ML-3
Client sampling date / time					31-May-2016 12:10	31-May-2016 12:50	31-May-2016 12:55	31-May-2016 13:15	31-May-2016 13:00
Compound	CAS Number	LOR	Unit		EW1602035-011	EW1602035-012	EW1602035-013	EW1602035-014	EW1602035-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		4.8	4.9	----	6.9	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		33700	22600	----	43200	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		22000	13900	----	33200	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	----	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		2	5	----	118	----
Total Alkalinity as CaCO ₃	----	1	mg/L		2	5	----	118	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.05	<0.05	----	0.11	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.31	0.03	----	0.13	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.31	0.03	----	0.13	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.9	2.5	----	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		3.2	2.5	----	0.6	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.26	0.16	----	0.06	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.24	2.97	----	4.82	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.08	2.13	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					31-May-2016 12:45	31-May-2016 12:35	----	----	----
Compound	CAS Number	LOR	Unit		EW1602035-016	EW1602035-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	6.6	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	36600	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	24000	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		----	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		----	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		----	118	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		----	118	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	0.20	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.14	----	----	----
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.15	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	0.5	----	----	----
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	0.6	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.10	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	3.43	----	----	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		----	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1603052**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill Annual**
Order number : **87895**
C-O-C number : **----**
Sampler : **Craig Wilson**
Site : **----**
Quote number : **----**
No. of samples received : **18**
No. of samples analysed : **18**

Page : 1 of 10
Laboratory : Environmental Division NSW South Coast
Contact : Glenn Davies
Address : 1/19 Ralph Black Dr, North Wollongong 2500
4/13 Geary Pl, North Nowra 2541
Australia
Telephone : 02 42253125
Date Samples Received : 12-Aug-2016 15:39
Date Analysis Commenced : 12-Aug-2016
Issue Date : 18-Aug-2016 16:18

NATA Accredited Laboratory 825
 Accredited for compliance with
 ISO/IEC 17025.



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Kristy Boje	Laboratory Supervisor	Laboratory - Wollongong
Sarah Axisa	Microbiologist	Sydney Microbiology, Smithfield, NSW



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.

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- ED041G: LOR raised for Sulfate on sample 5 due to sample matrix.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW006 is ALS's internal code and is equivalent to AS4276.7.



Analytical Results

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

Client sample ID

				MW1D	MW1S	MW3	MW4	MW5
Client sampling date / time				12-Aug-2016 11:45	12-Aug-2016 11:40	12-Aug-2016 11:30	12-Aug-2016 12:00	12-Aug-2016 11:10
Compound	CAS Number	LOR	Unit	EW1603052-001	EW1603052-002	EW1603052-003	EW1603052-004	EW1603052-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.2	----	7.2	6.3	7.3
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	735	----	840	392	350
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	408	----	440	208	190
EA075FD: Field Redox Potential								
Redox Potential	----	0.1	mV	-90.0	----	-35.0	23.0	-144
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	298	----	253	162	166
Total Alkalinity as CaCO3	----	1	mg/L	298	----	253	162	166
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	10	----	13	19	<10
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	66	----	126	24	16
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	81	----	73	59	42
Magnesium	7439-95-4	1	mg/L	22	----	11	5	6
Sodium	7440-23-5	1	mg/L	31	----	89	13	15
Potassium	7440-09-7	1	mg/L	13	----	2	4	3
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.010	----	0.110	0.013	0.006
Iron	7439-89-6	0.05	mg/L	0.07	----	0.32	<0.05	0.12
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW1D	MW1S	MW3	MW4	MW5
Client sampling date / time					12-Aug-2016 11:45	12-Aug-2016 11:40	12-Aug-2016 11:30	12-Aug-2016 12:00	12-Aug-2016 11:10
Compound	CAS Number	LOR	Unit		EW1603052-001	EW1603052-002	EW1603052-003	EW1603052-004	EW1603052-005
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.1	----	0.2	<0.1	0.1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.66	----	0.56	0.16	2.34
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.03	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		2.04	----	0.08	0.60	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		2.07	----	0.08	0.60	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.4	----	2.9	0.8	3.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.02	----	0.90	1.74	0.31
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		8.02	----	8.88	4.31	3.77
Total Cations	----	0.01	meq/L		7.53	----	8.47	4.02	3.32
Ionic Balance	----	0.01	%		----	----	----	----	3.93
Ionic Balance	----	0.01	%		3.14	----	2.36	3.40	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		9	----	11	4	8
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		1.98	----	2.46	2.23	1.42
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.08	----	3.54	3.86	3.40
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	----	----	----	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW6D	MW6S	MW7D	MW7S	MW9
Client sampling date / time					12-Aug-2016 10:15	12-Aug-2016 10:05	12-Aug-2016 10:30	12-Aug-2016 10:40	12-Aug-2016 12:40
Compound	CAS Number	LOR	Unit		EW1603052-006	EW1603052-007	EW1603052-008	EW1603052-009	EW1603052-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.1	----	7.2	7.0	6.5
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		723	----	440	451	9450
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		468	----	218	235	5220
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		-8.0	----	16.0	-17.0	14.0
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		24	----	6	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		344	----	205	150	84
Total Alkalinity as CaCO3	----	1	mg/L		368	----	214	150	84
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		38	----	8	13	415
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19	----	14	49	3120
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		130	----	71	48	78
Magnesium	7439-95-4	1	mg/L		10	----	6	7	177
Sodium	7440-23-5	1	mg/L		11	----	8	32	1780
Potassium	7440-09-7	1	mg/L		4	----	4	3	66
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		----	----	----	----	----
Magnesium	7439-95-4	1	mg/L		----	----	----	----	----
Sodium	7440-23-5	1	mg/L		----	----	----	----	----
Potassium	7440-09-7	1	mg/L		----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.050	----	0.045	0.010	0.004
Iron	7439-89-6	0.05	mg/L		<0.05	----	0.06	0.17	0.25
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		----	----	----	----	----
Iron	7439-89-6	0.05	mg/L		----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW6D	MW6S	MW7D	MW7S	MW9
Client sampling date / time					12-Aug-2016 10:15	12-Aug-2016 10:05	12-Aug-2016 10:30	12-Aug-2016 10:40	12-Aug-2016 12:40
Compound	CAS Number	LOR	Unit		EW1603052-006	EW1603052-007	EW1603052-008	EW1603052-009	EW1603052-010
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		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		0.14	----	0.70	0.38	0.03
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		3.06	----	0.10	<0.01	0.19
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		3.07	----	0.10	<0.01	0.19
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.2	----	0.9	0.5	1.4
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.60	----	0.93	0.22	0.09
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		8.68	----	4.84	4.65	98.3
Total Cations	----	0.01	meq/L		7.89	----	4.49	4.44	97.6
Ionic Balance	----	0.01	%		----	----	----	----	----
Ionic Balance	----	0.01	%		4.72	----	3.72	2.29	0.40
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		7	----	5	4	24
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.00	----	2.05	1.94	5.40
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		4.64	----	4.40	4.24	1.82
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	----	----	----	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW10	MW11	ML-1	ML-2	ML-3
Client sampling date / time					12-Aug-2016 12:25	12-Aug-2016 13:10	12-Aug-2016 13:40	12-Aug-2016 13:25	12-Aug-2016 13:45
Compound	CAS Number	LOR	Unit		EW1603052-011	EW1603052-012	EW1603052-013	EW1603052-014	EW1603052-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.2	5.6	----	6.8	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		10200	9000	----	5240	----
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		6220	6060	----	3070	----
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		172	65.0	----	1.0	----
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		6	27	----	110	----
Total Alkalinity as CaCO3	----	1	mg/L		6	27	----	110	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		439	373	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3420	2980	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		78	84	----	----	----
Magnesium	7439-95-4	1	mg/L		209	202	----	----	----
Sodium	7440-23-5	1	mg/L		1860	1610	----	----	----
Potassium	7440-09-7	1	mg/L		61	43	----	----	----
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		----	----	----	63	----
Magnesium	7439-95-4	1	mg/L		----	----	----	104	----
Sodium	7440-23-5	1	mg/L		----	----	----	922	----
Potassium	7440-09-7	1	mg/L		----	----	----	35	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.009	0.023	----	----	----
Iron	7439-89-6	0.05	mg/L		0.25	3.09	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		----	----	----	0.042	----
Iron	7439-89-6	0.05	mg/L		----	----	----	1.07	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW10	MW11	ML-1	ML-2	ML-3
Client sampling date / time					12-Aug-2016 12:25	12-Aug-2016 13:10	12-Aug-2016 13:40	12-Aug-2016 13:25	12-Aug-2016 13:45
Compound	CAS Number	LOR	Unit		EW1603052-011	EW1603052-012	EW1603052-013	EW1603052-014	EW1603052-015
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	0.1	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	0.02	----	1.16	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	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		0.10	0.02	----	0.16	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.10	0.02	----	0.18	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.6	6.6	----	1.9	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.17	0.42	----	0.04	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		106	92.4	----	----	----
Total Cations	----	0.01	meq/L		104	91.9	----	----	----
Ionic Balance	----	0.01	%		----	----	----	----	----
Ionic Balance	----	0.01	%		1.05	0.24	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		15	58	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		5.00	2.02	----	5.66	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.18	2.25	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	----	----	18	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	----	----	28	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	BLANK	----	----
Client sampling date / time					12-Aug-2016 13:50	12-Aug-2016 12:50	12-Aug-2016 11:15	----	----
Compound	CAS Number	LOR	Unit		EW1603052-016	EW1603052-017	EW1603052-018	-----	-----
				Result	Result	Result	Result	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	6.9	----	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1220	----	----	----	----
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L	----	627	----	----	----	----
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV	----	38.0	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	107	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	107	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	----	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	----	----	----	----	----
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	----	33	----	----	----	----
Magnesium	7439-95-4	1	mg/L	----	24	----	----	----	----
Sodium	7440-23-5	1	mg/L	----	162	----	----	----	----
Potassium	7440-09-7	1	mg/L	----	10	----	----	----	----
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	----	0.052	----	----	----	----
Iron	7439-89-6	0.05	mg/L	----	1.15	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	BLANK	----	----
Client sampling date / time					12-Aug-2016 13:50	12-Aug-2016 12:50	12-Aug-2016 11:15	----	----
Compound	CAS Number	LOR	Unit		EW1603052-016	EW1603052-017	EW1603052-018	-----	-----
					Result	Result	Result	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	1.63	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.21	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.21	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	2.4	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.04	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	----	----	----	----
Total Cations	----	0.01	meq/L		----	----	----	----	----
Ionic Balance	----	0.01	%		----	----	----	----	----
Ionic Balance	----	0.01	%		----	----	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	4.87	----	----	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		----	----	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	18	----	----	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	21	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1604243**
Client : **KIAMA COUNCIL**
Contact : **MS JULIE MILEVSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0557**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Glenn Davies**
Site : **Gerroa Landfill**
Quote number : **----**
No. of samples received : **17**
No. of samples analysed : **17**

Page : **1 of 6**
Laboratory : **Environmental Division NSW South Coast**
Contact : **Glenn Davies**
Address : **1/19 Ralph Black Dr, North Wollongong 2500**
4/13 Geary Pl, North Nowra 2541
Australia

Telephone : **02 42253125**
Date Samples Received : **10-Nov-2016 14:15**
Date Analysis Commenced : **10-Nov-2016**
Issue Date : **23-Nov-2016 18:56**



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

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



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.

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK061G:/EK067G: LOR raised for TKN and Total P on sample No 14 due to sample matrix.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					10-Nov-2016 11:10	10-Nov-2016 11:05	10-Nov-2016 10:50	10-Nov-2016 09:35	10-Nov-2016 09:48
Compound	CAS Number	LOR	Unit		EW1604243-001	EW1604243-002	EW1604243-003	EW1604243-004	EW1604243-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.4	----	7.6	7.1	7.7
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		992	----	795	561	264
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		476	----	464	342	136
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		309	----	217	227	96
Total Alkalinity as CaCO ₃	----	1	mg/L		309	----	217	227	96
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		12.5	----	1.30	0.11	0.17
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.02	----	<0.01	<0.01	0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.02	----	0.09	0.03	0.10
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	----	0.09	0.03	0.11
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		15.8	----	3.4	1.6	2.8
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		15.8	----	3.5	1.6	2.9
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.59	----	0.52	2.43	0.35
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.40	----	3.01	3.68	3.49
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.56	----	4.04	4.58	3.81



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					10-Nov-2016 10:30	10-Nov-2016 10:35	10-Nov-2016 10:00	10-Nov-2016 10:10	10-Nov-2016 11:45
Compound	CAS Number	LOR	Unit		EW1604243-006	EW1604243-007	EW1604243-008	EW1604243-009	EW1604243-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.3	----	7.3	7.8	6.2
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		840	----	481	580	13400
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		466	----	306	----	8350
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	<1	----	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	<1	----	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		334	----	209	----	90
Total Alkalinity as CaCO ₃	----	1	mg/L		334	----	209	----	90
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		3.10	----	0.13	----	0.26
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.06	----	<0.01	----	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.04	----	0.56	----	0.05
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.10	----	0.56	----	0.05
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.3	----	0.7	----	4.0
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.4	----	1.3	----	4.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		12.1	----	3.34	----	0.45
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.09	----	3.81	3.87	2.60
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		4.86	----	4.03	4.47	1.79



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					10-Nov-2016 11:40	10-Nov-2016 12:00	[10-Nov-2016]	10-Nov-2016 12:30	[10-Nov-2016]
Compound	CAS Number	LOR	Unit		EW1604243-011	EW1604243-012	EW1604243-013	EW1604243-014	EW1604243-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.1	5.8	----	7.1	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		12200	6890	----	47300	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		8160	4280	----	33100	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	----	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		<1	28	----	109	----
Total Alkalinity as CaCO ₃	----	1	mg/L		<1	28	----	109	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.15	0.11	----	0.16	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.02	<0.01	----	0.06	----
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.02	<0.01	----	0.06	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.6	5.3	----	<0.5	----
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		2.6	5.3	----	<0.5	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.17	0.40	----	<0.05	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.89	2.23	----	4.73	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		1.80	1.83	----	4.80	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					[10-Nov-2016]	10-Nov-2016 12:05	----	----	----
Compound	CAS Number	LOR	Unit		EW1604243-016	EW1604243-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	7.0	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	47100	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	25800	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		----	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		----	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		----	106	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		----	106	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	0.27	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.04	----	----	----
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.04	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	1.4	----	----	----
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	1.4	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.06	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	3.43	----	----	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		----	4.83	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1700715**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Glenn Davies, Robert DaLio**
Site : **Gerroa Landfill**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **17**
No. of samples analysed : **17**

Page : **1 of 6**
Laboratory : **Environmental Division NSW South Coast**
Contact : **Glenn Davies**
Address : **1/19 Ralph Black Dr, North Wollongong 2500**
4/13 Geary Pl, North Nowra 2541
Australia

Telephone : **02 42253125**
Date Samples Received : **20-Feb-2017 15:30**
Date Analysis Commenced : **20-Feb-2017**
Issue Date : **27-Feb-2017 16:28**



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Dian Dao		Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong



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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK059G-EK058G: LOR raised for NOx- Nitrate on sample 12 due to sample matrix.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					20-Feb-2017 08:45	20-Feb-2017 08:50	20-Feb-2017 08:30	20-Feb-2017 07:35	20-Feb-2017 07:55
Compound	CAS Number	LOR	Unit		EW1700715-001	EW1700715-002	EW1700715-003	EW1700715-004	EW1700715-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.2	----	7.1	6.6	6.9
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		844	----	755	580	236
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		440	----	432	317	197
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		302	----	254	237	109
Total Alkalinity as CaCO3	----	1	mg/L		302	----	254	237	109
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		6.65	----	0.43	0.05	0.15
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.03	----	0.02	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.53	----	0.05	0.03	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.56	----	0.07	0.03	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		8.7	----	3.2	1.0	18.0
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		9.3	----	3.3	1.0	18.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.42	----	0.69	1.82	1.59
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.97	----	1.86	1.34	1.63
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.46	----	3.90	4.45	3.66



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					20-Feb-2017 08:00	20-Feb-2017 08:05	20-Feb-2017 08:20	20-Feb-2017 08:15	20-Feb-2017 09:05
Compound	CAS Number	LOR	Unit		EW1700715-006	EW1700715-007	EW1700715-008	EW1700715-009	EW1700715-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.8	----	7.2	6.9	6.2
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		841	----	452	617	21000
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		493	----	285	409	14000
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		352	----	195	152	112
Total Alkalinity as CaCO3	----	1	mg/L		352	----	195	152	112
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		2.96	----	0.99	0.34	1.29
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	0.06	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.06	----	<0.01	0.15	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.06	----	<0.01	0.21	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.2	----	1.2	1.6	4.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.3	----	1.2	1.8	4.1
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		4.88	----	1.83	1.03	0.23
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		1.82	----	1.42	2.82	3.27
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		4.83	----	4.55	4.39	1.69



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					20-Feb-2017 09:25	20-Feb-2017 09:20	[20-Feb-2017]	20-Feb-2017 09:50	[20-Feb-2017]
Compound	CAS Number	LOR	Unit		EW1700715-011	EW1700715-012	EW1700715-013	EW1700715-014	EW1700715-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.2	5.6	----	7.2	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		14600	11000	----	30100	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		10600	7040	----	19400	----
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		<1	23	----	139	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	23	----	139	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.17	0.11	----	0.78	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.10	----	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.10	----	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		9.0	6.1	----	1.0	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		9.0	6.1	----	1.0	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.82	0.47	----	0.09	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.32	2.62	----	4.87	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.10	2.02	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					[20-Feb-2017]	20-Feb-2017 09:10	----	----	----
Compound	CAS Number	LOR	Unit		EW1700715-016	EW1700715-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	7.0	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	14400	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	8900	----	----	----
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		----	121	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		----	121	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	1.20	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.02	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.02	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	1.9	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	1.9	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.07	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	5.48	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1702211**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Duncan McIntosh, Robert DaLio**
Site : **GERROA LANDFILL**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **17**
No. of samples analysed : **17**

Page : 1 of 6
Laboratory : Environmental Division NSW South Coast
Contact : Glenn Davies
Address : 1/19 Ralph Black Dr, North Wollongong 2500
4/13 Geary Pl, North Nowra 2541
Australia NSW
Telephone : 02 42253125
Date Samples Received : 18-May-2017 16:30
Date Analysis Commenced : 18-May-2017
Issue Date : 23-May-2017 17:07



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

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



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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- It has been noted that Nitrite is greater than NOx for sample 17, however this difference is within the limits of experimental variation.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]
Compound	CAS Number	LOR	Unit		EW1702211-001	EW1702211-002	EW1702211-003	EW1702211-004	EW1702211-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.4	6.4	7.3	6.8	7.8
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		834	691	733	523	276
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		460	561	412	308	168
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		302	139	201	224	99
Total Alkalinity as CaCO3	----	1	mg/L		302	139	201	224	99
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		11.0	0.31	0.18	0.12	0.04
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.03	<0.01	0.05	0.12	0.09
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.03	<0.01	0.05	0.12	0.09
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		13.9	5.5	1.2	1.2	1.9
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		13.9	5.5	1.2	1.3	2.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.30	0.50	0.20	0.94	0.16
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.20	2.29	2.41	3.45	2.87
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.99	3.11	3.47	3.09	3.34



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]
Compound	CAS Number	LOR	Unit		EW1702211-006	EW1702211-007	EW1702211-008	EW1702211-009	EW1702211-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.0	6.6	7.4	7.0	6.5
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		940	644	515	464	10600
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		514	343	285	264	6910
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		366	80	209	91	156
Total Alkalinity as CaCO3	----	1	mg/L		366	80	209	91	156
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		5.76	0.06	0.98	0.29	0.19
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.04	0.02	0.02	0.01	0.02
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	0.02	0.02	0.01	0.02
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		7.4	4.2	1.6	1.3	22.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		7.4	4.2	1.6	1.3	22.3
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		4.89	0.42	1.37	0.55	1.78
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.98	3.21	3.30	3.20	3.40
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		4.56	4.33	4.34	4.17	1.67



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]	[18-May-2017]
Compound	CAS Number	LOR	Unit		EW1702211-011	EW1702211-012	EW1702211-013	EW1702211-014	EW1702211-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.8	6.2	----	7.1	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		4210	3030	----	15300	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2640	2020	----	9970	----
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		24	62	----	136	----
Total Alkalinity as CaCO3	----	1	mg/L		24	62	----	136	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.18	0.04	----	1.21	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	0.04	----
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	----	0.06	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		10.4	15.7	----	2.3	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		10.4	15.7	----	2.4	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.70	1.18	----	0.04	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		5.30	4.43	----	6.38	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.05	2.10	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					[18-May-2017]	[18-May-2017]	----	----	----
Compound	CAS Number	LOR	Unit		EW1702211-016	EW1702211-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	7.0	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	10600	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	6540	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		----	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		----	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		----	159	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		----	159	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	2.82	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	0.05	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.04	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	4.2	----	----	----
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	4.2	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.06	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	5.15	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1703508**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill Annual**
Order number : **87895**
C-O-C number : **----**
Sampler : **Robert DaLio**
Site : **GERROA LANDFILL**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **18**
No. of samples analysed : **18**

Page : 1 of 10
Laboratory : Environmental Division NSW South Coast
Contact : Glenn Davies
Address : 1/19 Ralph Black Dr, North Wollongong 2500
4/13 Geary Pl, North Nowra 2541
Australia NSW
Telephone : 02 42253125
Date Samples Received : 17-Aug-2017 15:00
Date Analysis Commenced : 17-Aug-2017
Issue Date : 28-Aug-2017 12:27



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW
Vyoma Tailor	Microbiologist	Sydney Microbiology, Smithfield, NSW



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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- EK055G: LOR raised for NOx-Nitrate on sample 12 due to sample matrix.
- EK067G: LOR raised for Total P on sample No 14 & 17 due to sample matrix.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.
- Membrane filtration results for MW006 are reported as an estimate (~) due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW006 is ALS's internal code and is equivalent to AS4276.7.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					17-Aug-2017 10:22	17-Aug-2017 10:20	17-Aug-2017 10:00	17-Aug-2017 08:25	17-Aug-2017 09:45
Compound	CAS Number	LOR	Unit		EW1703508-001	EW1703508-002	EW1703508-003	EW1703508-004	EW1703508-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.4	----	7.4	6.8	7.9
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		862	----	625	675	328
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		400	----	355	364	174
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		-115	----	-134	-81.1	-20.6
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		286	----	208	310	127
Total Alkalinity as CaCO3	----	1	mg/L		286	----	208	310	127
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		13	----	1	8	6
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		63	----	52	14	17
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		62	----	50	105	44
Magnesium	7439-95-4	1	mg/L		20	----	7	7	4
Sodium	7440-23-5	1	mg/L		48	----	65	13	12
Potassium	7440-09-7	1	mg/L		17	----	2	5	2
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.013	----	0.092	0.252	0.004
Iron	7439-89-6	0.05	mg/L		0.05	----	5.03	0.97	0.07
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.2	----	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		8.22	----	0.19	0.13	0.03
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.03	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		1.09	----	0.01	0.12	<0.01



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					17-Aug-2017 10:22	17-Aug-2017 10:20	17-Aug-2017 10:00	17-Aug-2017 08:25	17-Aug-2017 09:45
Compound	CAS Number	LOR	Unit		EW1703508-001	EW1703508-002	EW1703508-003	EW1703508-004	EW1703508-005
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.12	----	0.01	0.12	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		9.0	----	1.3	0.9	1.0
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		10.1	----	1.3	1.0	1.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.24	----	0.28	1.17	0.10
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		7.76	----	5.64	6.76	3.14
Total Cations	----	0.01	meq/L		7.26	----	5.95	6.51	3.10
Ionic Balance	----	0.01	%		3.32	----	2.64	1.86	0.70
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		12	----	21	9	8
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.90	----	1.80	3.20	2.57
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.46	----	3.98	4.55	3.81



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					17-Aug-2017 08:55	17-Aug-2017 08:50	17-Aug-2017 09:15	17-Aug-2017 09:30	17-Aug-2017 10:55
Compound	CAS Number	LOR	Unit		EW1703508-006	EW1703508-007	EW1703508-008	EW1703508-009	EW1703508-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.9	----	7.2	7.7	6.3
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1360	----	512	723	17200
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		554	----	248	382	10900
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		-133	----	-104	-62.2	17.5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		517	----	224	154	98
Total Alkalinity as CaCO ₃	----	1	mg/L		517	----	224	154	98
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		29	----	7	15	731
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		73	----	16	121	5070
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		140	----	75	54	161
Magnesium	7439-95-4	1	mg/L		16	----	8	6	396
Sodium	7440-23-5	1	mg/L		53	----	10	72	2740
Potassium	7440-09-7	1	mg/L		24	----	4	4	87
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.143	----	0.059	0.011	0.017
Iron	7439-89-6	0.05	mg/L		0.64	----	<0.05	<0.05	0.67
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		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		19.6	----	0.65	0.38	0.15
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.01	----	0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.24	----	0.20	<0.01	0.06



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					17-Aug-2017 08:55	17-Aug-2017 08:50	17-Aug-2017 09:15	17-Aug-2017 09:30	17-Aug-2017 10:55
Compound	CAS Number	LOR	Unit		EW1703508-006	EW1703508-007	EW1703508-008	EW1703508-009	EW1703508-010
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.25	----	0.21	<0.01	0.06
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		21.5	----	0.8	0.6	1.9
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		21.8	----	1.0	0.6	2.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		3.51	----	1.99	0.37	0.13
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		13.0	----	5.07	6.80	160
Total Cations	----	0.01	meq/L		11.2	----	4.94	6.42	162
Ionic Balance	----	0.01	%		7.31	----	1.34	2.87	0.57
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		20	----	6	7	34
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.12	----	2.46	2.60	3.46
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		4.92	----	4.69	4.54	1.79



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					17-Aug-2017 11:15	17-Aug-2017 11:40	17-Aug-2017 00:00	17-Aug-2017 12:00	17-Aug-2017 00:00
Compound	CAS Number	LOR	Unit		EW1703508-011	EW1703508-012	EW1703508-013	EW1703508-014	EW1703508-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.2	5.2	----	6.7	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		16900	13800	----	29100	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		10700	8500	----	18800	----
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		150	144	----	132	----
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		7	11	----	120	----
Total Alkalinity as CaCO3	----	1	mg/L		7	11	----	120	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		736	445	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		4980	4160	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		127	110	----	----	----
Magnesium	7439-95-4	1	mg/L		363	316	----	----	----
Sodium	7440-23-5	1	mg/L		2700	2280	----	----	----
Potassium	7440-09-7	1	mg/L		86	64	----	----	----
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		----	----	----	246	----
Magnesium	7439-95-4	1	mg/L		----	----	----	525	----
Sodium	7440-23-5	1	mg/L		----	----	----	4750	----
Potassium	7440-09-7	1	mg/L		----	----	----	180	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.015	0.031	----	----	----
Iron	7439-89-6	0.05	mg/L		0.90	1.78	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		----	----	----	0.028	----
Iron	7439-89-6	0.05	mg/L		----	----	----	0.88	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					17-Aug-2017 11:15	17-Aug-2017 11:40	17-Aug-2017 00:00	17-Aug-2017 12:00	17-Aug-2017 00:00
Compound	CAS Number	LOR	Unit		EW1703508-011	EW1703508-012	EW1703508-013	EW1703508-014	EW1703508-015
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.2	0.2	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.12	0.12	----	0.32	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	0.04	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.16	<0.05	----	0.31	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.16	<0.05	----	0.35	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		7.4	6.2	----	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		7.6	6.2	----	0.8	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.59	0.35	----	<0.05	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		156	127	----	----	----
Total Cations	----	0.01	meq/L		156	132	----	----	----
Ionic Balance	----	0.01	%		0.03	2.11	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	NO ACCESS	----	NO ACCESS
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		23	135	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		5.54	4.45	----	4.90	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.15	2.24	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	----	----	~94	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	----	----	44	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	BLANK	----	----
Client sampling date / time					17-Aug-2017 00:00	17-Aug-2017 11:35	17-Aug-2017 12:05	----	----
Compound	CAS Number	LOR	Unit		EW1703508-016	EW1703508-017	EW1703508-018	-----	-----
					Result	Result	Result	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	6.7	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	17300	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	10600	----	----	----
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		----	118	----	----	----
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		----	131	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		----	131	----	----	----
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		----	155	----	----	----
Magnesium	7439-95-4	1	mg/L		----	318	----	----	----
Sodium	7440-23-5	1	mg/L		----	2580	----	----	----
Potassium	7440-09-7	1	mg/L		----	108	----	----	----
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		----	0.034	----	----	----
Iron	7439-89-6	0.05	mg/L		----	0.32	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	0.85	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	0.05	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	BLANK	----	----
Client sampling date / time					17-Aug-2017 00:00	17-Aug-2017 11:35	17-Aug-2017 12:05	----	----
Compound	CAS Number	LOR	Unit		EW1703508-016	EW1703508-017	EW1703508-018	-----	-----
				Result	Result	Result		----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.35	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.40	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	1.1	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	1.5	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	<0.02	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		NO ACCESS	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	5.37	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		----	~8	----	----	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		----	~6	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1704934**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Duncan McIntosh**
Site : **GERROA LANDFILL**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **17**
No. of samples analysed : **14**

Page : **1 of 5**
Laboratory : **Environmental Division NSW South Coast**
Contact : **Glenn Davies**
Address : **1/19 Ralph Black Dr, North Wollongong 2500**
4/13 Geary Pl, North Nowra 2541
Australia NSW
Telephone : **02 42253125**
Date Samples Received : **28-Nov-2017 13:39**
Date Analysis Commenced : **30-Nov-2017**
Issue Date : **07-Dec-2017 14:08**



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Kristy Boje	Laboratory Supervisor	Laboratory - Wollongong, NSW



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.

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK067G: LOR raised for Total P on sample 14 due to sample matrix.
- EK057G: It has been noted that Nitrite is greater than NOx for sample 8 and 9, however this difference is within the limits of experimental variation.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field data supplied by ALS Wollongong.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00
Compound	CAS Number	LOR	Unit		EW1704934-001	EW1704934-002	EW1704934-003	EW1704934-004	EW1704934-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.4	----	7.3	7.0	7.8
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		884	----	425	738	292
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		466	----	292	422	180
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		333	----	216	380	133
Total Alkalinity as CaCO3	----	1	mg/L		333	----	216	380	133
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		9.24	----	0.24	0.15	0.12
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.06	----	0.03	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.73	----	0.02	0.01	0.06
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.79	----	0.05	0.01	0.06
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		9.7	----	1.1	0.8	2.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		10.5	----	1.2	0.8	2.4
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.26	----	0.27	1.60	0.27
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	Dry	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.10	----	2.88	3.72	3.64
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.90	----	4.36	4.63	4.14



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00
Compound	CAS Number	LOR	Unit		EW1704934-006	EW1704934-007	EW1704934-008	EW1704934-009	EW1704934-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.1	----	7.4	7.7	6.3
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		863	----	465	614	24900
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		522	----	318	395	18100
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		340	----	218	172	90
Total Alkalinity as CaCO3	----	1	mg/L		340	----	218	172	90
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		3.71	----	0.49	0.29	0.43
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.02	----	0.02	0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.02	----	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.5	----	0.9	0.8	13.7
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.5	----	0.9	0.8	13.7
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		4.88	----	2.72	0.62	1.21
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	Dry	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.05	----	3.11	3.15	2.65
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		5.24	----	5.00	4.85	2.00



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-2	ML-5	----
Client sampling date / time					29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	29-Nov-2017 00:00	----
Compound	CAS Number	LOR	Unit		EW1704934-011	EW1704934-012	EW1704934-014	EW1704934-017	-----
					Result	Result	Result	Result	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		5.0	5.3	7.3	7.1	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		28300	11700	30800	14900	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		19700	6190	21200	8840	----
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		3	20	153	195	----
Total Alkalinity as CaCO3	----	1	mg/L		3	20	153	195	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.10	0.12	0.16	1.68	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.04	0.17	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.04	<0.01	0.01	0.08	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	<0.01	0.05	0.25	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		8.8	17.4	0.8	2.4	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		8.8	17.4	0.8	2.6	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.65	1.52	<0.05	0.08	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.25	3.60	3.21	3.09	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.36	2.32	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1800513**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Duncan McIntosh**
Site : **GERROA LANDFILL**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **17**
No. of samples analysed : **17**

Page : **1 of 6**
Laboratory : **Environmental Division NSW South Coast**
Contact : **Glenn Davies**
Address : **1/19 Ralph Black Dr, North Wollongong 2500**
4/13 Geary Pl, North Nowra 2541
Australia NSW

Telephone : **02 42253125**
Date Samples Received : **08-Feb-2018 16:30**
Date Analysis Commenced : **08-Feb-2018**
Issue Date : **19-Feb-2018 12:08**



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

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- General Comments
- Analytical Results

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Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Kristy Boje	Laboratory Supervisor	Laboratory - Wollongong, NSW



General Comments

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

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

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

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EA015 TDS, results has been confirmed for samples 12, 14, 17 by re-analysis.
- EK055G: LOR raised for Ammonia on sample 14 due to sample matrix.
- EK061G:/EK067G:/EK062G LOR raised for TKN, Total P and TN on sample No 14 & 17 due to sample matrix.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Field data supplied by ALS Wollongong.
- Field tests completed on day of sampling/receipt.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					08-Feb-2018 11:40	08-Feb-2018 11:45	08-Feb-2018 11:20	08-Feb-2018 09:50	08-Feb-2018 11:00
Compound	CAS Number	LOR	Unit		EW1800513-001	EW1800513-002	EW1800513-003	EW1800513-004	EW1800513-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.2	----	7.2	6.3	7.7
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1040	----	394	774	310
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		542	----	267	442	241
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		371	----	188	399	135
Total Alkalinity as CaCO3	----	1	mg/L		371	----	188	399	135
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		13.1	----	0.27	0.10	0.14
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.03	----	0.05	0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.03	----	0.05	0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		13.2	----	1.1	0.8	0.8
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		13.2	----	1.2	0.8	0.8
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.26	----	0.34	1.29	0.13
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.12	----	2.27	2.79	2.50
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.90	----	4.38	4.62	4.14



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					08-Feb-2018 10:10	08-Feb-2018 10:05	08-Feb-2018 10:30	08-Feb-2018 10:50	08-Feb-2018 12:30
Compound	CAS Number	LOR	Unit		EW1800513-006	EW1800513-007	EW1800513-008	EW1800513-009	EW1800513-010
				Result	Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.2	----	6.5	7.6	6.4
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		904	----	503	535	37400
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		577	----	319	313	24600
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		388	----	227	189	81
Total Alkalinity as CaCO ₃	----	1	mg/L		388	----	227	189	81
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		3.85	----	0.89	0.49	0.54
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.03	----	0.02	<0.01	0.81
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.03	----	0.02	<0.01	0.81
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.5	----	1.3	0.9	11.8
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.5	----	1.3	0.9	12.6
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		3.69	----	2.05	0.49	0.94
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.87	----	2.75	2.60	0.52
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		5.20	----	4.97	4.83	1.93



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					08-Feb-2018 12:50	08-Feb-2018 12:20	08-Feb-2018 12:20	08-Feb-2018 13:30	08-Feb-2018 13:30
Compound	CAS Number	LOR	Unit		EW1800513-011	EW1800513-012	EW1800513-013	EW1800513-014	EW1800513-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		4.8	4.6	----	7.2	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		39200	33100	----	41800	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		23700	23900	----	15800	----
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		2	<1	----	145	----
Total Alkalinity as CaCO3	----	1	mg/L		2	<1	----	145	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.10	0.27	----	<0.05	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.40	<0.01	----	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.40	<0.01	----	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		5.0	9.4	----	<0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		5.4	9.4	----	<0.5	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.37	0.64	----	<0.05	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	Not collected	----	Not collected
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.76	3.47	----	3.25	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.32	2.37	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					08-Feb-2018 13:30	08-Feb-2018 12:40	----	----	----
Compound	CAS Number	LOR	Unit		EW1800513-016	EW1800513-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	7.0	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	40200	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	20600	----	----	----
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		----	168	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		----	168	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	1.26	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	0.03	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.04	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	1.9	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	1.9	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	<0.05	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		Not collected	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	2.66	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EW1802122**
Client : **KIAMA COUNCIL**
Contact : **MR PAUL CZULOWSKI**
Address : **11 MANNING STREET**
KIAMA NSW, AUSTRALIA 2533

Telephone : **+61 02 4232 0444**
Project : **Gerroa Landfill**
Order number : **87895**
C-O-C number : **----**
Sampler : **Duncan McIntosh**
Site : **GERROA LANDFILL**
Quote number : **WO/026/15 - Gerroa Landfill**
No. of samples received : **17**
No. of samples analysed : **17**

Page : **1 of 6**
Laboratory : **Environmental Division NSW South Coast**
Contact : **Glenn Davies**
Address : **1/19 Ralph Black Dr, North Wollongong 2500**
4/13 Geary Pl, North Nowra 2541
Australia NSW
Telephone : **02 42253125**
Date Samples Received : **24-May-2018 13:09**
Date Analysis Commenced : **24-May-2018**
Issue Date : **31-May-2018 15:06**



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

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



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.

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK061G/EK067G:: LOR raised for TKN and Total P on sample No 14 & 18 due to sample matrix.
- EK055G:LOR raised for Ammonia analysis on samples EW1802122-14 and 17 due to sample matrix.
- EK059G:LOR raised for NOX analysis on sample EW1802122-12 due to sample matrix.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field data supplied by ALS Wollongong.
- Field tests completed on day of sampling/receipt.
- Sampling completed by ALS Wollongong.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					24-May-2018 11:45	24-May-2018 11:55	24-May-2018 11:30	24-May-2018 09:45	24-May-2018 11:10
Compound	CAS Number	LOR	Unit		EW1802122-001	EW1802122-002	EW1802122-003	EW1802122-004	EW1802122-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.3	----	7.3	7.0	7.8
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1380	----	391	834	392
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		671	----	195	416	220
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		358	----	172	432	180
Total Alkalinity as CaCO3	----	1	mg/L		358	----	172	432	180
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		15.8	----	0.30	0.06	0.08
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.02	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.02	----	0.03	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	----	0.03	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		16.4	----	0.9	0.6	0.5
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		16.4	----	0.9	0.6	0.5
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.28	----	0.21	1.07	0.09
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		2.74	----	3.53	5.10	3.10
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		3.83	----	4.28	4.82	4.06



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time					24-May-2018 10:10	24-May-2018 10:00	24-May-2018 10:30	24-May-2018 10:45	24-May-2018 12:35
Compound	CAS Number	LOR	Unit		EW1802122-006	EW1802122-007	EW1802122-008	EW1802122-009	EW1802122-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.1	----	7.3	7.7	6.1
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		952	----	527	544	33100
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		526	----	296	283	22700
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		400	----	238	195	50
Total Alkalinity as CaCO3	----	1	mg/L		400	----	238	195	50
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		4.99	----	0.89	0.45	0.27
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.02	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.16	----	0.01	<0.01	0.75
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.18	----	0.01	<0.01	0.75
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		6.4	----	1.3	0.8	5.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		6.6	----	1.3	0.8	6.0
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		3.32	----	1.43	0.22	0.41
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		3.69	----	3.72	3.22	4.54
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		5.08	----	4.84	4.68	1.64



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					24-May-2018 12:25	24-May-2018 12:15	24-May-2018 12:15	24-May-2018 13:10	24-May-2018 00:00
Compound	CAS Number	LOR	Unit		EW1802122-011	EW1802122-012	EW1802122-013	EW1802122-014	EW1802122-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		4.7	5.4	----	7.1	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		39700	27200	----	47200	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		27600	16200	----	27200	----
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		<1	36	----	121	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	36	----	121	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	2.23	----	<0.10	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.24	<0.10	----	0.06	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.24	<0.10	----	0.07	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		5.2	11.4	----	<0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		5.4	11.4	----	<0.5	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.39	0.60	----	<0.05	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	Not sampled	----	Not sampled
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.35	3.41	----	3.25	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		2.00	2.07	----	----	----



Analytical Results


Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	ML-4	ML-5	----	----	----
Client sampling date / time					24-May-2018 00:00	24-May-2018 12:45	----	----	----
Compound	CAS Number	LOR	Unit		EW1802122-016	EW1802122-017	-----	-----	-----
				Result	Result		----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	6.8	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	44400	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	31300	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		----	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		----	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		----	118	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		----	118	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	<0.10	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	0.03	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.11	----	----	----
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.14	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	<0.5	----	----	----
EK062G: Total Nitrogen as N (TKN + NO_x) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	<0.5	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.05	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		Not sampled	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	2.92	----	----	----

Appendix B

Monthly Rainfall (millimetres)

KIAMA (BOMBO HEADLAND)

Station Number: 068242 · State: NSW · Opened: 2001 · Status: Open · Latitude: 34.65°S · Longitude: 150.86°E · Elevation: 16 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001												11.2	
2002	99.6	288.2	125.4	62.8	52.4	28.0	18.2	12.0	9.6	7.2			
2003								41.0					
2007												87.0	
2008	55.0			102.0	12.6	127.8	86.0	46.2	69.2	88.4	12.6	99.4	
2009	11.6	87.4	48.6	66.4	0.0	75.8	53.0	2.8	21.0	187.8	56.0	106.2	716.6
2010	69.0	201.0	90.4	54.2	83.6	71.2	111.2	67.4	121.0	132.2	51.0	83.8	1136.0
2011	87.6	59.0	297.8	78.6	100.2	93.0	187.4	87.4	52.8	112.6	144.2	50.8	1351.4
2012	61.0	289.0	213.2	109.6	11.4	86.0	64.8	8.0	19.8	91.6	35.2	53.8	1043.4
2013	170.8	153.2	74.2	183.6	121.8	220.2	69.6	17.8	89.0	12.8	137.2	85.2	1335.4
2014	26.2	42.0	306.2	103.8	10.8	34.2	7.8	154.4	52.4	86.8	47.4	159.8	1031.8
2015	208.0	98.4	53.0	247.6	44.2	69.8	48.0	269.4	82.8	46.6	57.2	105.6	1330.6
2016	124.6	25.6	86.6	32.6	9.2	328.4	91.6	91.4	56.4	30.6	25.8	50.8	953.6
2017	18.8	158.8	309.6	76.0	49.4	54.0	1.4	35.2	0.4		116.8	46.4	
2018	69.0	111.6	43.0	15.6	16.6	172.0	3.2						

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown



Monthly Rainfall (millimetres)

KIAMA (BOMBO HEADLAND)

Station Number: 068242 · State: NSW · Opened: 2001 · Status: Open · Latitude: 34.65°S · Longitude: 150.86°E · Elevation: 16 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lowest	11.6	25.6	43.0	15.6	0.0	28.0	1.4	2.8	0.4	7.2	12.6	11.2	716.6
Highest	208.0	289.0	309.6	247.6	121.8	328.4	187.4	269.4	121.0	187.8	144.2	159.8	1351.4

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

<http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml>.

Product code: IDCJAC0001 reference: 40338519 Created on Tue 21 Aug 2018 17:12:25 PM EST



Appendix C

Appendix C

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 (2.82 mg/L on 18 May 2017)

Legend:

Appendix D



DOC17/218276

The General Manager
Kiama Municipal Council
Via e-mail at: council@kiama.nsw.gov.au

Attention: Ms Julie Milevski

07 September 2017

Dear Mr Forsyth

**Gerroa Waste Disposal & Recycling Facility
Ground and Surface Water Monitoring Results**

I refer to the email from Ms Julie Milevski of Kiama Municipal Council (Council) to the Environment Protection Authority (EPA) dated 7 April 2017 providing ground and surface water monitoring results for the Gerroa Waste Disposal & Recycling Facility located at 349 Crooked River Road, Gerroa (the Premises). I apologise for the delay in responding to this matter.

The results have been reviewed and the EPA is seeking further information as below.

MW1D

On 10 November 2016 and 20 February 2017, ammonia levels at this monitoring point were 12.5mg/L and 6.65mg/L respectively. These are the highest recorded results since 2011 results.

MW3

On 31 May 2016 and 10 November 2016, ammonia levels at this monitoring point were 4.31mg/L and 1.30mg/L respectively. It is noted that on 16 February 2016, ammonia was detected as 20.9mg/L however, Council's consultant indicated that this result was an anomaly. Aside from this result, and 7.78mg/L being detected on 18 February 2013, all other results have been below 1.00mg/L.

The EPA is seeking further explanation as to the cause of the suspected elevated ammonia results and whether any remediation action is required. Please provide the requested response in writing to Unit Head Waste Compliance, PO Box 513, WOLLONGONG, NSW, 2520 or by email to waste.operations@epa.nsw.gov.au or by Fax at (02) 4224 4110. The submission must be made by **5pm on 29 September 2017**.

If you have any questions about this matter, please contact Greg Frost on (02) 4224 4113.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Matthew Corradin'.

MATTHEW CORRADIN
Unit Head Waste Compliance
Environment Protection Authority

Client: Kiama Municipal Council

**Project: Second Interim Groundwater Report
Gerroa Waste Disposal Depot**

**Prepared for: Tony Hardy
Kiama Municipal Council
P.O. Box 75, Kiama, NSW, 2533.**

**Report: 14 May 2018
Reference: E2W-025 Gerroa R002 (V1)**

Authorised by: Earth2Water Pty Ltd

Dino Parisotto - Director
BAppSc Geology (Hons); MAppSc (Groundwater)
SCPA Certified Practitioner- Site Assessment and Management

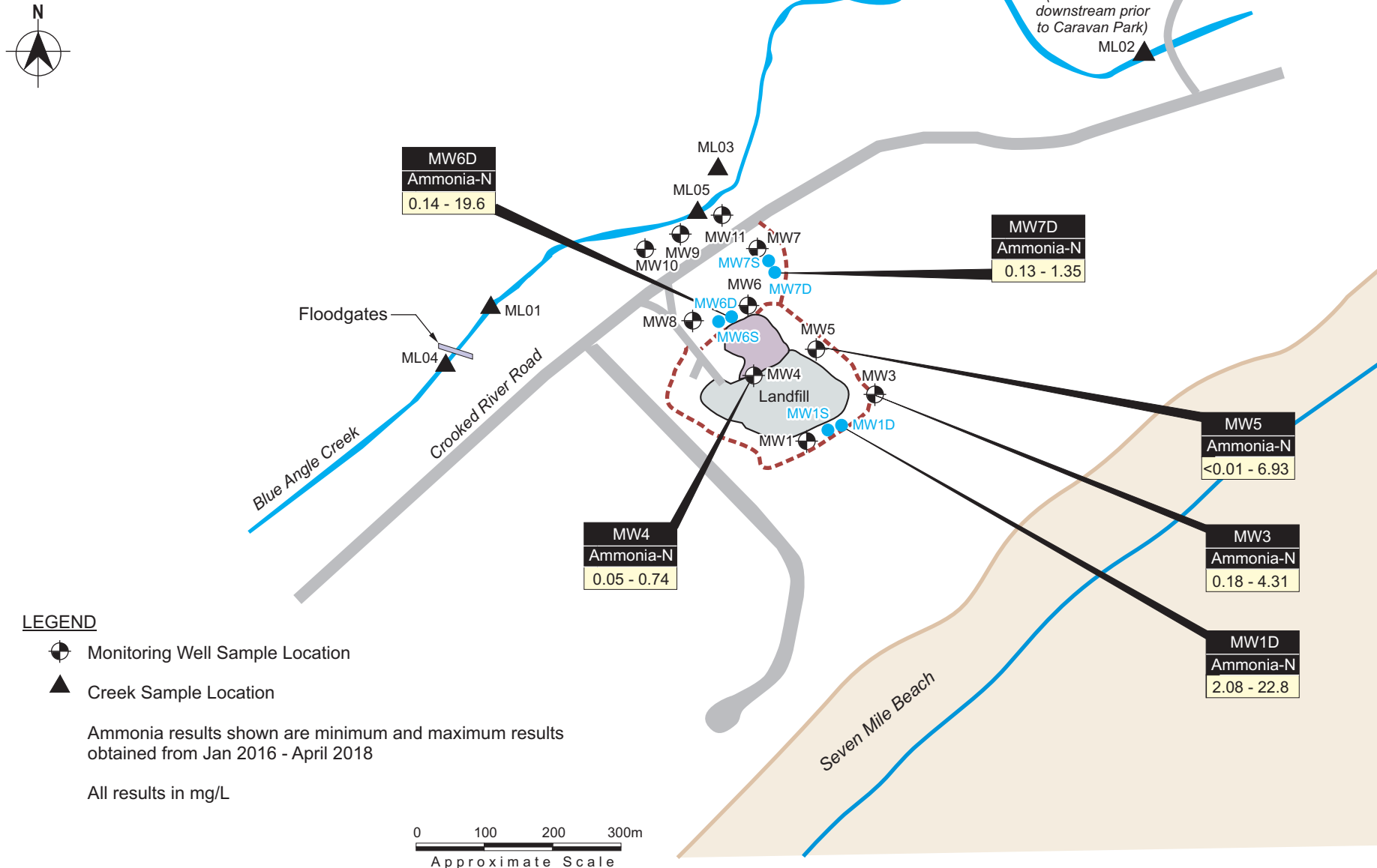


**Ph: (02) 4234 0829 Mobile: 0422 334102
175 Fern Street, Gerringong, NSW, 2534**

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Source: Base Plan, URS Australia Pty Ltd

GROUNDWATER AMMONIA RESULTS (mg/L) 2016-2018

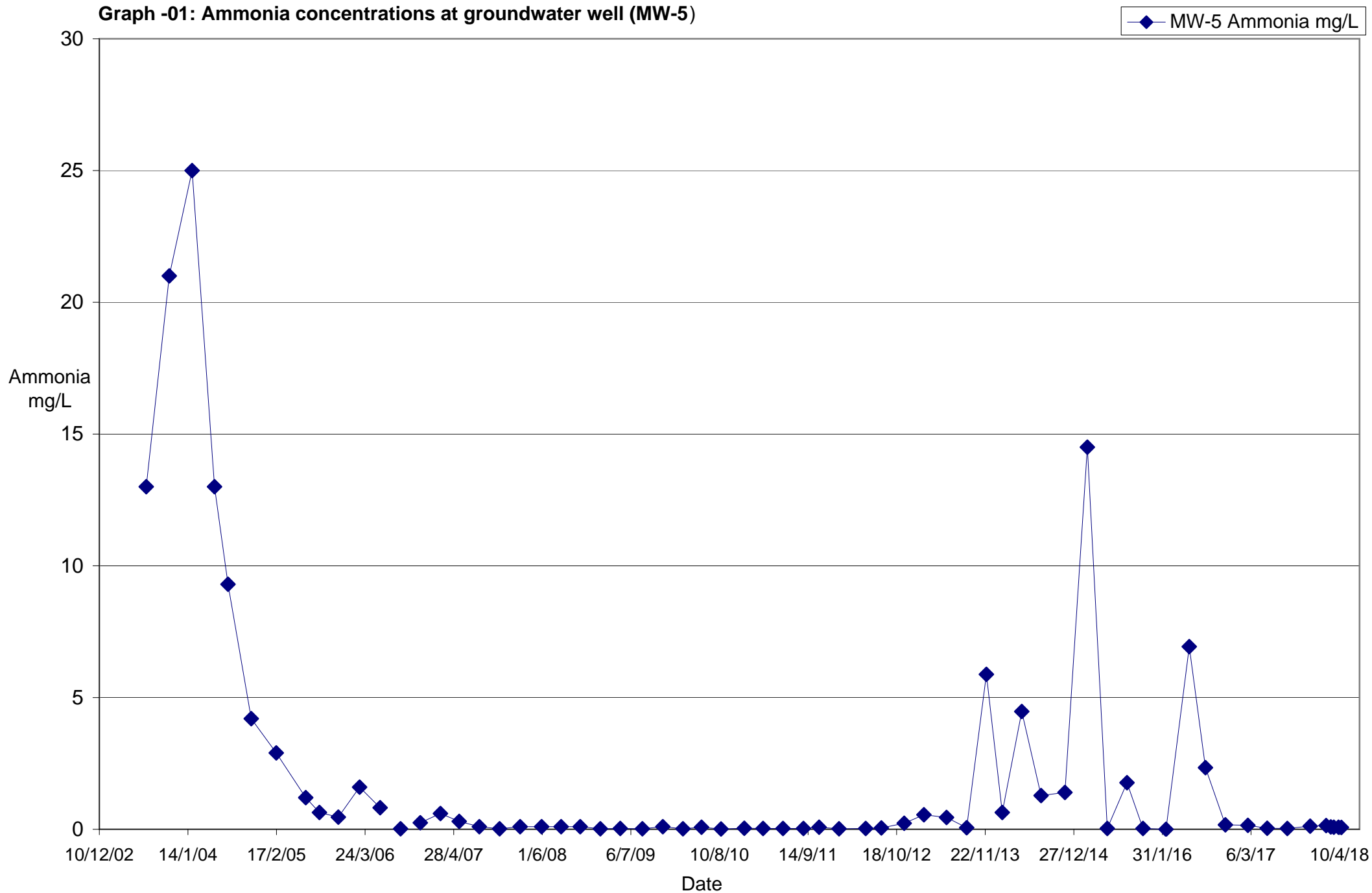
GERROA INTERIM REPORT

Date: April 2018

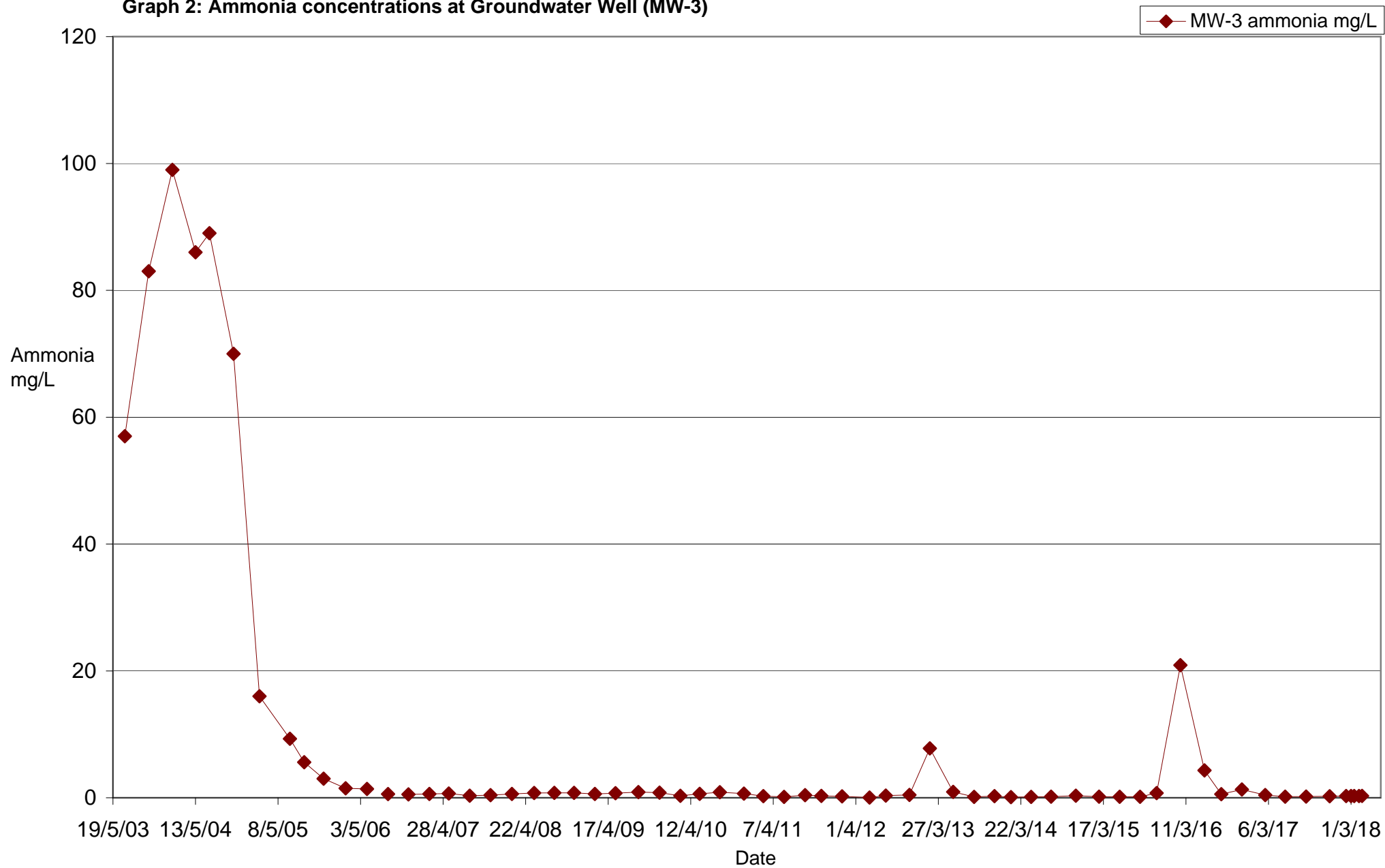
Reference: E2W_025_58.cdr

Figure 1

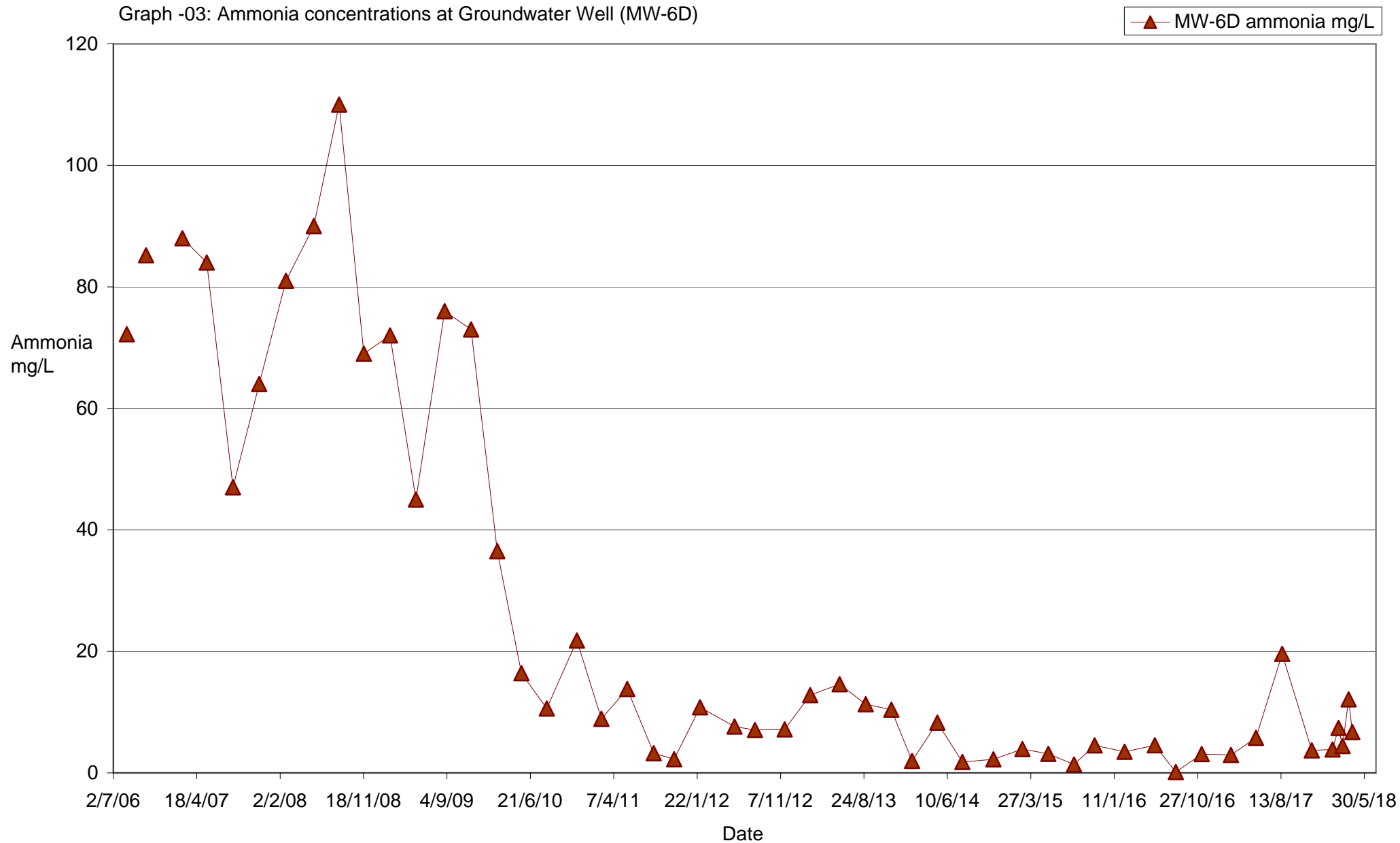
Graph -01: Ammonia concentrations at groundwater well (MW-5)



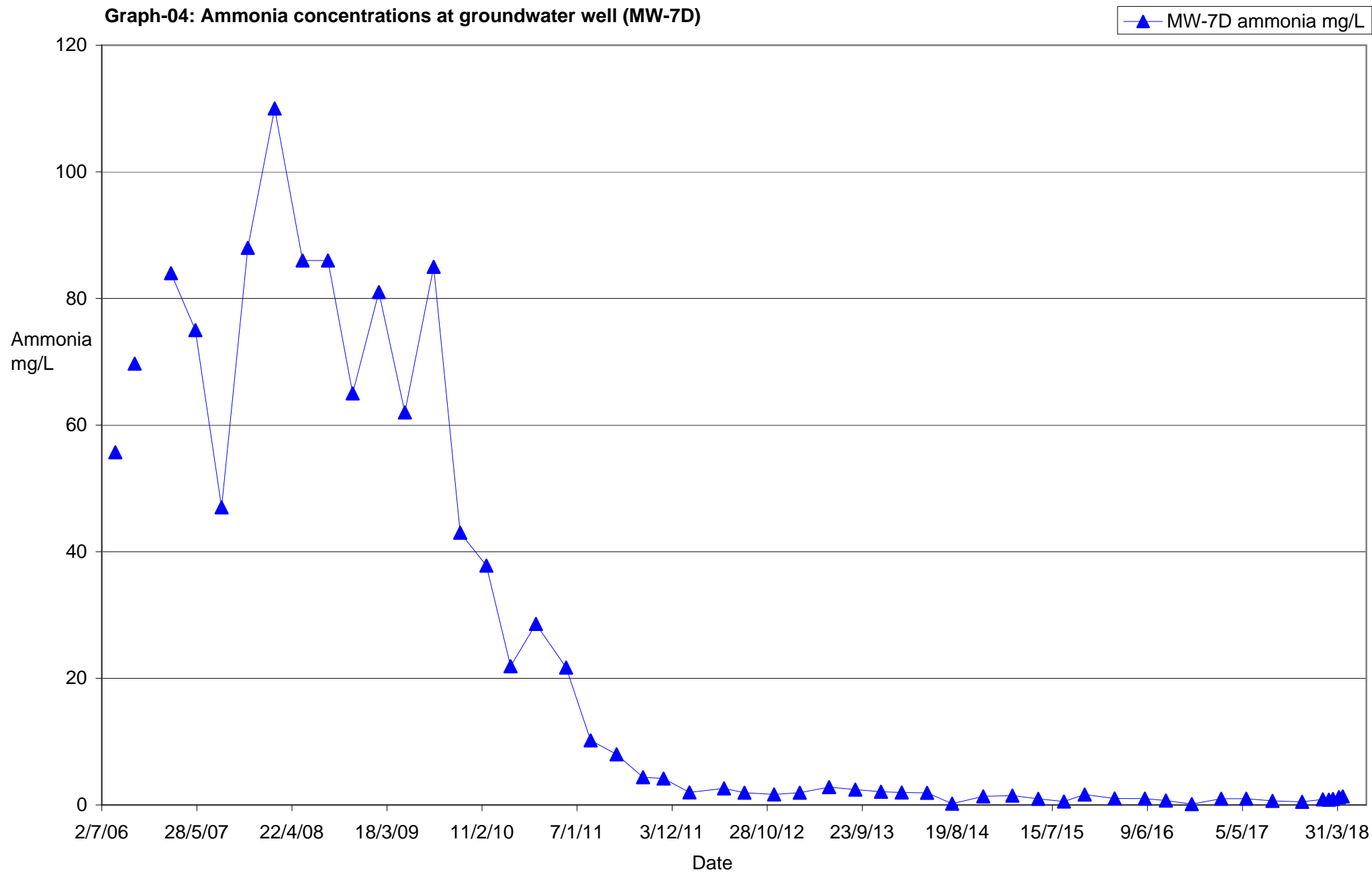
Graph 2: Ammonia concentrations at Groundwater Well (MW-3)



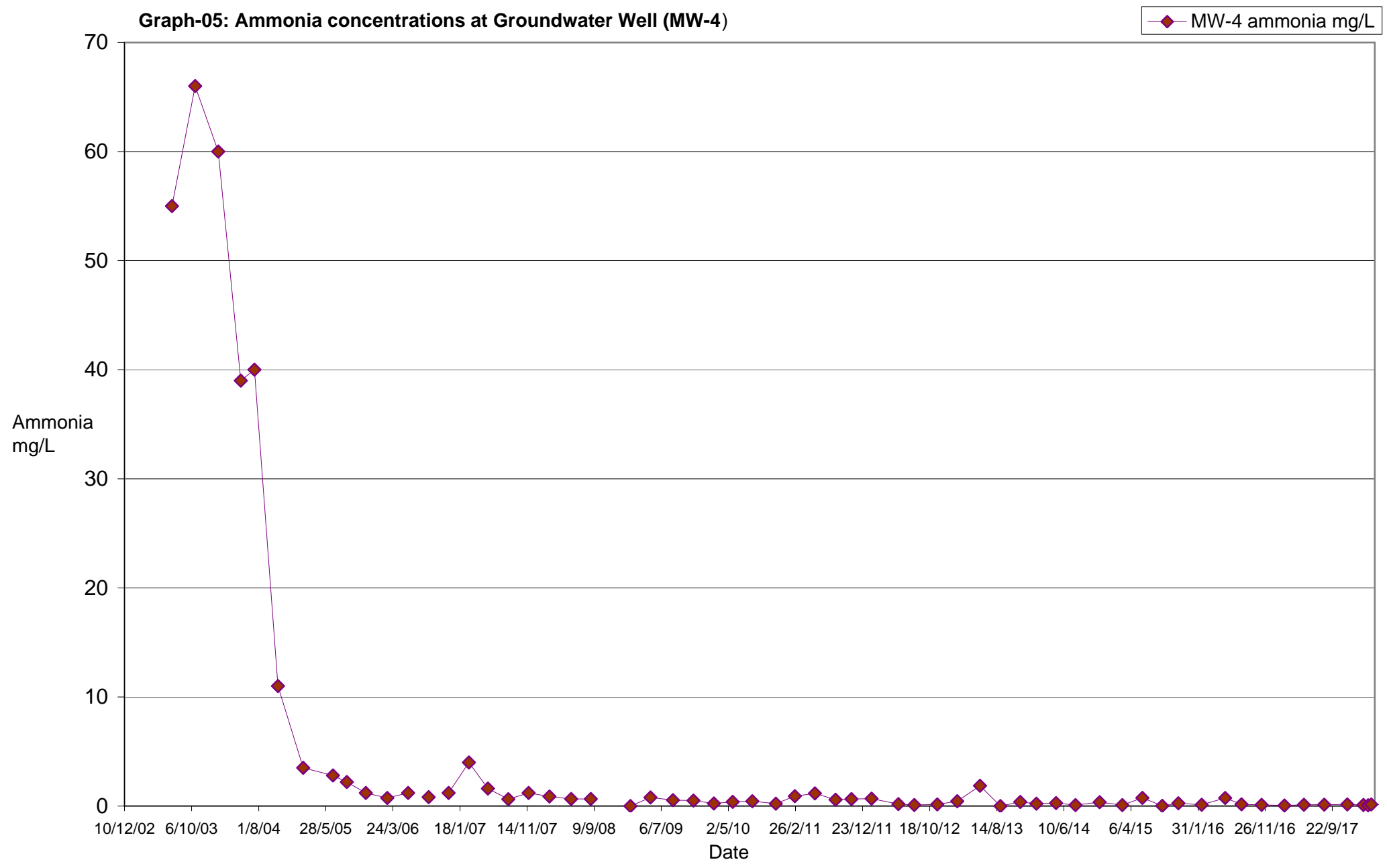
Graph -03: Ammonia concentrations at Groundwater Well (MW-6D)



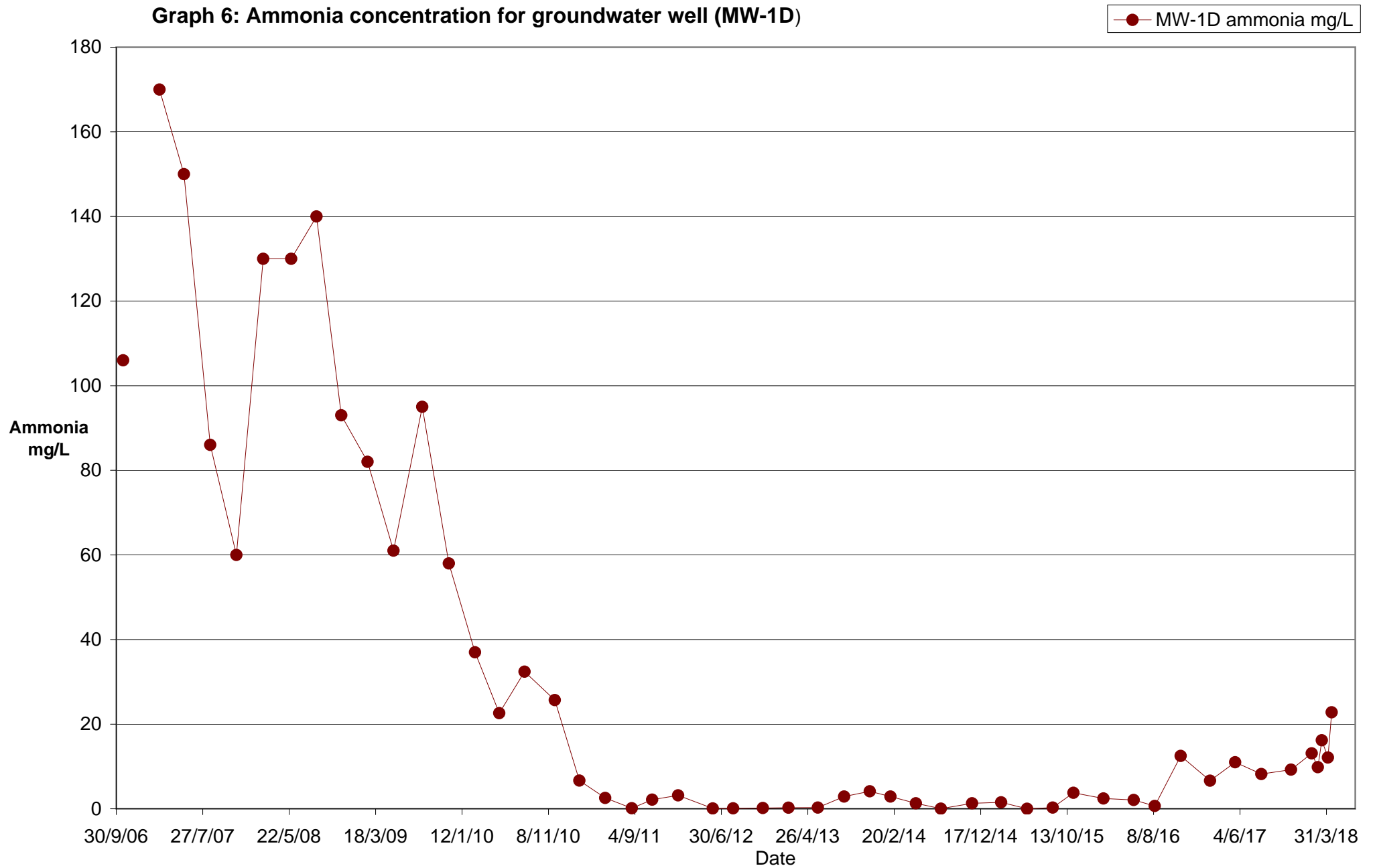
Graph-04: Ammonia concentrations at groundwater well (MW-7D)



Graph-05: Ammonia concentrations at Groundwater Well (MW-4)



Graph 6: Ammonia concentration for groundwater well (MW-1D)



Appendix E

Limitations

Earth2Water Pty Ltd has prepared this report for the use of Kiama 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.

This report was prepared in August 2018 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 some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report, and our previous 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 recommendations and or conclusions offered.

LAST PAGE OF REPORT



***Thank you for the opportunity to work with
Kiama Council.***

*Your feedback is appreciated at Earth2Water
(dino@earth2water.com.au)*

