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2016 Groundwater Monitoring Report
GENESIS LANDFILL AND RECYCLING FACILITY
PREPARED FOR DIAL-A-DUMP INDUSTRIES PTY LTD

Document Control

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2016 GROUNDWATER MONITORING REPORT

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1 INTRODUCTION

EnvironConsulting Services (ECS) was commissioned by Dial-A-Dump Industries (EC) (DADI) (the client) to provide a Groundwater Monitoring Report for the Genesis Landfill and Recycling Facility (the Site), for the period 1 January to 31 December 2016 (referred to in this report as the Reporting Period).

2 OBJECTIVE

The objective of the Groundwater Monitoring Report (GMR) was to analyse the data extracted from the monitoring undertaken, identify any trends in the data and assess the potential impact of leachate on groundwater resulting from on-site activities. Another objective of preparing the GMR was to assess the effectiveness of the groundwater monitoring network and leachate collection systems for the period 1 January to 31 December 2016, in accordance with the Soil, Water and Leachate Management Plan as detailed in Douglas Partners: Soil, Water and Leachate Management Plan, Light Horse Business centre, Eastern Creek, Prepared for Alexandria Landfill Pty Ltd (December 2011).

3 BACKGROUND INFORMATION

3.1 SITE LOCATION AND DESCRIPTION

Dial-A-Dump (EC) Pty Ltd operates the Genesis landfill facility and Honeycomb Drive, Eastern Creek under Environment Protection Licence (EPL) 13426 issued by the NSW Environment Protection Authority (EPA) under the Protection of the Environment (Operations) Act, 1997. A recycling facility (Genesis Recycling Facility), also operated by Dial-A-Dump (EC) Pty Ltd is located adjacent to the landfill and is regulated under EPL 20121.

The facility is surrounded by a mix of commercial, open space, infrastructure (M4) and industrial developments.

3.2 LANDFILL HISTORY

As described by Environmental Resources Management (ERM) in their report “*Light Horse Business Centre, Volume 1 & 2, Environmental Assessment Report*” (ERM, 2008), the predominant feature is the breccia quarry, formerly known as the Pioneer Quarry, where it is understood that extractive operations started in the 1950s. The quarry reached the end of its economic life and all quarrying activities at the site ceased in September 2006, although the quarry void remained.

Angus Creek, a tributary of Eastern Creek runs to the east and Ropes Creek to the west of the landfill. Minor drainage lines are present in the northern-eastern and south-eastern areas of the site, generally draining to the south and southwest respectively.

3.3 LANDFILL GEOMETRY

The landfill geometry information was reported in the *Leachate Collection System, Concept Design* (ERM, August 2008) as:

The open cut elliptical void is approximately 430 metres (m) x 700 m and up to 150 m in depth. The surface area is approximately 265,000 m² at ground surface and 12,000 m² at the base.

3.3.1 WALLS OF VOID

Benches of approximately 7 to 8 m in width descend down the sides of the void. The upper part of the quarry is excavated through unconsolidated sediments including clays and weathered shales and therefore has lower angled slopes. A spiral access road around 20 m in width around the edge of the void descends to the quarry base. Stormwater drains control run-off on the access road (Consulting Earth Scientists Pty Ltd (CES) “*Water Balance Report, Genesis Landfill and Recycling Facility*” November 2016).

3.3.2 BASE OF VOID

A rectangular level area (-57m above Australian Height Datum (AHD)) forms the base of the former void. A raised area (approximately 8m higher) is present to the east of the rectangular base. The base is fairly flat and drains to a sump from which groundwater ingress and run off is currently pumped. These areas have been entirely covered with landfill material (CES 2016).

3.4 GEOLOGY

According to Ian Grey Groundwater Consulting (IGGC): *Archbold Road, Eastern Creek: Groundwater and Salinity Assessment for Proposed Quarry Rehabilitation Project and Developable Land. May 2007 (IGGC 2007)*, the geology of the site can be described as follows:

Reference to the published 1:100,000 Penrith area geology map (Clarke & Jones, 1991) indicates that site is underlain by strata of the Wianamatta Group. The upper unit is the Bringelly Shale, a formation dominated by claystone and siltstone with thin laminite horizons and minor sandstone and with a thickness of at least 100m. This is underlain by the Minchinbury Sandstone, a 3m to 6m thick quartz-lithic sandstone; followed by the Ashfield Shale, which comprises sandstone-siltstone laminite and sideritic claystone.

The Wianamatta Group is underlain by the Hawkesbury Sandstone, the top of which is expected to occur at below -80mAHD in the area of the site due to the presence of a palaeochannel (Jones and Clarke, 1991), and is therefore likely to be below the base of the former quarry located immediately north-east of the proposed development.

The Minchinbury Diatreme occurs beneath the former quarry. This is considered to be the remnant of an explosive volcanic vent, and forms a steep-sided or vertical inverted conical structure approximately 850m by 300m and pear-shaped in plan. The diatreme comprises volcanic breccia made up of basaltic lapilli (4 to 32mm fragments) and blocks in a fine-grained matrix of tuff and siltstone. Vertically bedded sandstone/siltstone (Bringelly Shale) has been dragged down a ring fault surrounding the diatreme (Jones and Clarke, 1991).

The edge of the diatreme is generally within the former quarry, with the upper benches excavated through weathered or un-weathered shale country rock. However, the diatreme extends beyond the south-western limit of the quarry, forming the low hill in the northern part of the cleared farmland, which comprises the site. Volcanic strata are exposed in the road cuttings in this area.

Alluvial deposits of Quaternary age occur along Ropes Creek, located to the west of the site. Minor alluvium may occur along the course of a tributary stream, which crosses the southern part of the site.

3.5 HYDROGEOLOGY

The hydrogeology of the site and surrounding area is largely controlled by the geology and the former quarry void. The strata of the Wianamatta Shale group are generally of low permeability, and have a limited potential to transmit groundwater flow. The majority of groundwater flow

occurs via fractures and bedding planes, with negligible flow through the rock mass (Edison Environmental & Engineering 2015).

The formation generally forms a layered aquifer system, with discrete aquifers occurring within horizontal fracture zones and with limited inter-connection between zones (IGGC, 2009). The groundwater pressure surface generally follows the topography, with groundwater flowing from recharge areas on high ground to discharge areas (generally creeks, rivers and wetland areas). Groundwater levels generally reflect the level of the nearest discharge zones and in the area of the site would be expected to be around 50 mAHD close to the creek lines. A slight downward hydraulic gradient typically exists between horizontal aquifer zones although this may be reversed in areas of groundwater discharge (IGGC, 2007).

The Minchinbury Diatreme would originally have formed a large, fractured rock mass within the Bringelly Shale. The permeability of the volcanic breccia relative to the surrounding shales and sandstone is not known, however the intrusion originally formed a low hill and the local high point, and would be expected to represent a groundwater recharge area, with groundwater flowing from high levels around the intrusion towards likely discharge areas associated with Ropes Creek to the west and Eastern Creek to the east. IGGC (2009) consider that the intrusion of the diatreme resulted in faulting and increased fracturing of the surrounding strata, and subsequent quarrying activities will have also increased local fracturing as a result of blasting and pressure relief. This is likely to have increased the permeability of the strata immediately surrounding the quarry (IGGC, 2007).

Regional groundwater quality is generally poor, with high salinity levels from connate salts within the formation or alternatively from leaching of accumulated salt from the lower soil profile (McNally, 2009; Old, 1942) and the limited flushing due to low groundwater flow rates. Groundwater quality associated with volcanic bodies such as the diatreme can be highly alkaline and high levels of inorganic nitrogen can also be present, which over time could be the cause for irregular spikes on the level of inorganic nitrogen.

A weathered profile comprising soil and soil-like materials such as mottled clays and weathered shale generally overlies the shale. This reaches depths of 3 m to 12 m in the foot slopes and valley floors but can be very thin or absent beneath hills. A perched shallow groundwater system can occur within this stratum with most groundwater flow-taking place laterally through the upper, more permeable loamy soils.

Alluvial deposits occur around Ropes Creek, and limited alluvial material may occur immediately around the tributary. Such strata are highly variable, but are likely to comprise sands, silts and

clays. Groundwater is likely to be hydraulically connected to the creek. Localised recharge from creek water is likely to result in relatively fresh groundwater, although discharge of more saline groundwater from the shale can occur through the alluvial material.

A groundwater bore search via NSW Natural Resource Atlas website accessed on December 2016 indicated that 18 registered groundwater bores exist within a 5 kilometre (km) radius of the sites' vicinity. The majority of these bores, are registered for the purpose of monitoring, including the closest registered bore, located approximately 780 m east of the site, although there are also two shallow irrigation wells, an aquaculture waste-disposal bore and a shallow domestic bore, it is noted that reticulated water is available and supplied to the site by Sydney Water. As such, it is considered unlikely that groundwater in the vicinity of the site is extracted for potable or domestic use.

Records on the NSW Department of Primary Industries (Water) website accessed on 8th December 2016 indicate that groundwater use in the area is limited, with only three registered bores for abstraction of groundwater for irrigation purposes, all of which are shallow and exploit perched groundwater in residual clays or minor alluvium. There is also an aquaculture waste disposal bore. All other recorded bores in the area are monitoring or test bores. This low level of groundwater exploitation reflects the generally low yields and high salinity obtained from bores drilled into the shale.

4 GROUNDWATER MONITORING PROGRAM

Genesis established a groundwater monitoring program (IGGC 2007) to characterise background water quality prior to landfilling and allow identification of potential impacts on water quality and water table levels once landfilling commenced. The monitoring involve\ collecting groundwater samples from groundwater wells four times per annum, monitoring rounds were undertaken during February 2016, May 2016, August 2016 and November 2016. Samples were tested for a selected list of analytes on three occasions and for a more comprehensive list of analytes annually, during this reporting period the annual monitoring round was conducted in February 2016. The locations of groundwater monitoring wells are presented in Appendix 1.

The groundwater monitoring network comprise seventeen bores of three types:

- Six shallow bores targeting perched groundwater within the upper, weathered shale bedrock aquifer (18m to 21m deep);
- Five intermediate bores targeting the mid-level aquifer zones within the fractured rock (50m to 110m deep); and
- Seven deep bores targeting the aquifer zones close to or slightly below the base of the engineered landfill (115 m to 160 m deep) at -67 m AHD.

The following comments are provided with respect to the groundwater monitoring network:

- Groundwater monitoring wells BH10d and BH12d were reportedly blocked in 2014/2015 and could not be sampled. Replacement groundwater monitoring wells BH25d and BH26d were installed in September 2015;
- BH16s targets the shallow aquifer, no groundwater was encountered in this well during the reporting period.

Additional groundwater wells are to be installed on the facility, as per condition E5 of the Environmental Protection License #13426:

“prior to the waste in the cell reaching the equivalent level of 30mAHD the six Stage 2 (two intermediate and four shallow) groundwater monitoring bores detailed in the report titled “Groundwater Monitoring Plan: Genesis Facility, Eastern Creek” dated March 2012 and prepared by IGGC (“The Report”) and located approximately in accordance with ‘Figure 3: Bore Locations (approximate)’ contained within the Report must be installed.

The bores must be installed and constructed in accordance with the Report and/or any new hydrogeological data”

Furthermore, condition E5.2 states:

“Prior to installation of the groundwater monitoring bores the EPA must be notified so conditions requiring the installation and monitoring of the groundwater bores can be added to the license”.

The Licensee has written to the EPA, however the level required in the licence condition has not been reached and therefore the additional wells have not been installed.

4.1 FIELD TESTING

Field notes and observations are also taken at the time of sampling (ex-situ). The pH, conductivity, dissolved oxygen, redox potential and temperature were measured in the field during purging of the wells using a YSI Professional Plus water Quality Meter calibrated prior to use.

4.2 SAMPLING AND ANALYSIS

Although sampling of groundwater was attempted from all wells, the actual number collected vary on each monitoring event, this is due to monitoring bores being dry at the time of sampling or containing insufficient water for analysis.

As established in the Groundwater Sampling Guidelines (Victoria EPA, 2000), the wells were purged until all the above field indicator parameters have stabilised. Stabilization is considered achieved when three consecutive readings report similar concentrations of field parameters. For wells that are sampled with hand bailers, three well volumes are removed or until they are dry, after this the monitoring bore is allowed to recharge/recover prior to sampling. All samples collected were chilled and sent to a NATA accredited chemical laboratory under chain of custody conditions.

Details of the minimum, mean and maximum results are reported in the tables below:

Monitoring Point BH5s

Groundwater monitoring well on northern site boundary labelled as "BH5s" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	740	832	992
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.053	0.053	0.053
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	66	93	114
Chloride	milligrams per litre	4	4	175	256	382
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.014	0.014	0.014
Electrical conductivity	microsiemens per centimetre	4	4	2796	4344	7310

Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.3	0.4	0.4
Lead	milligrams per litre	1	1	0.003	0.003	0.003
Magnesium	milligrams per litre	4	4	97	103	117
Manganese	milligrams per litre	1	1	0.004	0.004	0.004
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.79	15	23.8
Nitrogen (ammonia)	milligrams per litre	4	4	0.02	0.03	0.07
pH	pH Units	4	4	6.83	7.44	8.39
Phenols	micrograms per litre	1	1	<1.0	<1.0	<1.0
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	2	3	5
Redox potential	millivolts	4	4	-64.8	168	616

Sodium	milligrams per litre	4	4	590	639	664
Standing Water Level	metres below ground level	4	4	10.003	11.077	12.151
Sulfate	milligrams per litre	4	4	285	704	899
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	18	18	18
Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.031	0.031	0.031

Monitoring Point BH8s

Groundwater monitoring well near leachate treatment plant (sth-east area) labelled as "BH8s" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	Milligrams per litre	4	4	434	999	1260
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.077	0.077	0.077
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	99	192	458
Chloride	milligrams per litre	4	4	2720	3673	6150
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	9640	10200	11020
Ethyl benzene	micrograms per litre	1	1	<2.0	<2.0	<2.0
Fluoride	milligrams per litre	1	2	0.2	0.2	0.2

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	159	195	214
Manganese	milligrams per litre	1	1	0.034	0.034	0.034
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.06	5.60	10.6
Nitrogen (ammonia)	milligrams per litre	4	4	0.03	2.53	9.95
pH	pH Units	4	4	6.85	7.28	7.65
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	18	24	39
Redox potential	millivolts	4	4	-39.2	-26.3	-17.6
Sodium	milligrams per litre	4	4	1980	2393	3350
Standing Water Level	metres below ground level	4	4	18.596	18.690	18.784
Sulfate	milligrams per litre	4	4	388	430	475
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	<1	<1	<1

Total petroleum hydrocarbons	micrograms per litre	1	1	<0.5	<0.5	<0.5
Xylene	micrograms per litre	1	1	<2.0	<2.0	<2.0
Zinc	milligrams per litre	1	1	0.013	0.013	0.013

Monitoring Point BH9s

Groundwater monitoring well in western carpark adjacent to weighbridge labelled as "BH9s" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	540	791	1000
Aluminium	milligrams per litre	1	1	0.01	0.01	0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	2.82	2.82	2.82
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Calcium	milligrams per litre	4	4	125	191	244
Chloride	milligrams per litre	4	4	1320	2458	3160
Chromium	milligrams per litre	1	1	0.002	0.002	0.002
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	7400	8833	10100
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.2	0.2	0.2

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	107	185	251
Manganese	milligrams per litre	1	1	0.085	0.085	0.085
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	0.20	0.39
Nitrogen (ammonia)	milligrams per litre	4	4	1.16	2.74	3.83
pH	pH Units	4	4	6.87	7.26	7.81
Phenols	micrograms per litre	1	1	<1.0	<1.0	<1.0
Phosphorus	milligrams per litre	1	1	0.04	0.04	0.04
Potassium	milligrams per litre	4	4	22	26	29
Redox potential	millivolts	4	4	-43.6	-34.4	-21.7
Sodium	milligrams per litre	4	4	792	1406	1810
Standing Water Level	metres below ground level	4	4	9.131	9.836	10.540
Sulfate	milligrams per litre	4	4	<1	36	76
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	4	4	4

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	<0.005	<0.005	<0.005

Monitoring Point BH14s

Groundwater monitoring well in north-west area adjacent to quarry access road labelled as "BH14s" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	Milligrams per litre	4	4	825	897	997
Aluminium	milligrams per litre	1	1	0.01	0.01	0.01
Arsenic	milligrams per litre	1	1	0.012	0.012	0.012
Barium	Milligrams per litre	1	1	2.35	2.35	2.35
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	Milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	19	21	23
Chloride	Milligrams per litre	4	4	366	401	428
Chromium	Milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	1960	2463	2720
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	Milligrams per litre	1	2	0.4	0.4	0.4

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	Milligrams per litre	4	4	17	17.5	18
Manganese	Milligrams per litre	1	1	0.039	0.039	0.039
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	Milligrams per litre	4	4	<0.01	0.03	0.03
Nitrogen (ammonia)	Milligrams per litre	4	4	1.2	1.32	1.44
pH	pH Units	4	4	7.59	7.83	8.04
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	Milligrams per litre	1	1	0.02	0.19	0.36
Potassium	milligrams per litre	4	4	10	10.5	11
Redox potential	millivolts	4	4	-74.5	-21.3	65.9
Sodium	Milligrams per litre	4	4	615	650.25	684
Standing Water	metres below ground level	4	4	17.321	17.564	17.807
Sulfate	Milligrams per litre	4	4	2	6.25	13
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	Milligrams per litre	1	1	2	2	2

Total petroleum hydrocarbons	micrograms per litre	1	1	<0.5	<0.5	<0.5
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	Milligrams per litre	1	1	<0.005	<0.005	<0.005

Monitoring Point BH15s

Groundwater monitoring well on eastern access track labelled as "BH15s" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	1030	1060	1110
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	0.002	0.002	0.002
Barium	milligrams per litre	1	1	0.056	0.056	0.056
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	81	84	88
Chloride	milligrams per litre	4	4	1360	1515	1790
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	5790	5992.5	6150
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.2	0.2	0.2

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	178	186.75	198
Manganese	milligrams per litre	1	1	0.053	0.053	0.053
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.03	0.05	0.1
Nitrogen (ammonia)	milligrams per litre	4	4	0.03	0.06	0.1
pH	pH Units	4	4	6.73	7.33	7.82
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<1.01
Potassium	milligrams per litre	4	4	16	16	16
Redox potential	millivolts	4	4	-42.4	-27.05	-19
Sodium	milligrams per litre	4	4	1060	1122.5	1200
Standing Water Level	metres below ground level	4	4	16.444	16.982	17.520
Sulfate	milligrams per litre	4	4	205	216.75	230
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	<1	<1	<1

Total petroleum hydrocarbons	micrograms per litre	1	1	<0.5	<0.5	<0.5
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.017	0.017	0.017

Monitoring Point 16s

Groundwater monitoring well on south site boundary - adjacent to concrete pad labelled as "BH16s" in Figure 1. Historical data recorded by (IGGC) for this monitoring well indicates that groundwater has been found with insufficient quantities to sample or to record field parameters and the monitoring well has been found dry in 2012, 2013 and the last 2 monitoring events in 2015, this monitoring well has also been found dry during all 4 groundwater monitoring events in 2016.

Monitoring Point BH2i

Groundwater monitoring well in western carpark adjacent to weighbridge labelled as "BH2i" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	490	546.75	623
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	2.82	2.82	2.82
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	100	114.25	125
Chloride	milligrams per litre	4	4	958	1172	1520
Chromium	milligrams per litre	1	1	0.002	0.002	0.002
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	3210	3533.33	3810
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.2	0.2	0.2

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	17	66.50	124
Manganese	milligrams per litre	1	1	0.083	0.083	0.083
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	0.18	0.29
Nitrogen (ammonia)	milligrams per litre	4	4	0.11	1.83	3.53
pH	pH Units	4	4	6.99	7.43	8.24
Phenols	micrograms per litre	1	1	4.3	4.3	4.3
Phosphorus	milligrams per litre	1	1	0.14	0.14	0.14
Potassium	milligrams per litre	4	4	16	18	22
Redox potential	millivolts	4	4	-33.8	-7.67	39.3
Sodium	milligrams per litre	4	4	735	814.75	943
Standing Water Level	metres below ground level	4	4	30.190	34.426	38.662
Sulfate	milligrams per litre	4	4	5	45.67	92
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	2	2	2

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	<0.005	<0.005	<0.005

Monitoring Point BH4i

Groundwater monitoring well on north site boundary labelled as "BH4i" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	446	576	853
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.033	0.033	0.033
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	96	256	362
Chloride	milligrams per litre	4	4	228	3,962	6180
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.017	0.017	0.017
Electrical conductivity	microsiemens per centimetre	4	4	5790	11918	18120
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.2	0.3	0.4

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	102	144	191
Manganese	milligrams per litre	1	1	0.002	0.002	0.002
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	34.78	75.1
Nitrogen (ammonia)	milligrams per litre	4	4	<0.01	6.84	8.26
pH	pH Units	4	4	6.6	7.52	8.19
Phenols	micrograms per litre	1	1	<1.0	<1.0	<1.0
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	2	33	53
Redox potential	millivolts	4	4	-88.8	-57.4	-14.9
Sodium	milligrams per litre	4	4	598	2,500	3790
Standing Water Level	metres below ground level	4	4	39.625	39.738	39.850
Sulfate	milligrams per litre	4	4	<1	771	771
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	31	31	31

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.014	0.014	0.014

Monitoring Point BH7i

Groundwater monitoring well in south-east area adjacent to leachate treatment plant labelled as "BH7i" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	417	454	483
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	0.002	0.002	0.002
Barium	milligrams per litre	1	1	58.3	58.3	58.3
Benzene	micrograms per litre	1	1	1	1	1
Cadmium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Calcium	milligrams per litre	4	4	247	373.25	456
Chloride	milligrams per litre	4	4	4070	5822.5	6580
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.074	0.074	0.074
Electrical conductivity	microsiemens per centimetre	4	4	12200	16615	18350
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.1	0.1	0.1

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	94	142	164
Manganese	milligrams per litre	1	1	0.421	0.421	0.421
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	0.035	0.06
Nitrogen (ammonia)	milligrams per litre	4	4	3.54	7.03	8.57
pH	pH Units	4	4	5.84	6.16	6.31
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	0.02	0.02	0.02
Potassium	milligrams per litre	4	4	23	34.5	39
Redox potential	millivolts	4	4	30.1	54.63	67
Sodium	milligrams per litre	4	4	2080	3077.5	3490
Standing Water Level	metres below ground level	4	4	28.301	28.493	28.685
Sulfate	milligrams per litre	4	4	<1	<1	<1
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	<1	<1	<1

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.04	0.04	0.04

Monitoring Point BH11i

Groundwater monitoring, Groundwater monitoring well in south-west workshop area labelled as "BH11i" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	49	49	49
Aluminium	milligrams per litre	1	1	0.01	0.01	0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.027	0.027	0.027
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	17	17	17
Chloride	milligrams per litre	4	4	30	31	32
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.043	0.043	0.043
Electrical conductivity	microsiemens per cm	4	4	1820	2018	2215
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	1	1	1

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	5	5.5	6
Manganese	milligrams per litre	1	1	0.002	0.002	0.002
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.44	0.48	0.52
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.02	0.02
pH	pH Units	4	4	11.24	11.38	11.52
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	2	2.5	3
Redox potential	millivolts	4	4	-65	-43.3	-21.6
Sodium	milligrams per litre	4	4	16	17	18
Standing Water Level	metres below ground level	4	4	28.280	28.567	29.623
Sulfate	milligrams per litre	4	4	9	9.5	10
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	4	4	4

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.013	0.013	0.013

Monitoring Point BH13i

Groundwater monitoring, Groundwater monitoring well in north-east boundary labelled as "BH13i" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	480	680	1030
Aluminium	milligrams per litre	1	1	0.05	0.05	0.05
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.912	0.912	0.912
Benzene	micrograms per litre	1	1	2	2	2
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	308	355.25	386
Chloride	Milligrams per litre	4	4	1010	1130	1260
Chromium	milligrams per litre	1	1	0.002	0.002	0.002
Copper	milligrams per litre	1	1	0.002	0.002	0.002
Electrical conductivity	microsiemens per centimetre	4	4	5710	6197.5	6900
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.3	3.3	6.3

Lead	milligrams per litre	1	1	0.008	0.008	0.008
Magnesium	milligrams per litre	4	4	<1	<1	<1
Manganese	milligrams per litre	1	1	<0.001	<0.001	<0.001
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.15	0.47	1.02
Nitrogen (ammonia)	milligrams per litre	4	4	3.51	6.67	9.01
pH	pH Units	4	4	11.68	11.94	12.36
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	21	22.25	24
Redox potential	millivolts	4	4	-317.6	-309.625	-294.9
Sodium	milligrams per litre	4	4	615	650.25	673
Standing Water Level	metres below ground level	4	4	19.932	20.594	21.255
Sulfate	milligrams per litre	4	4	5	6.25	8
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	5	5	5

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.006	0.006	0.006

Monitoring Point BH3d

Groundwater monitoring, Groundwater monitoring well on northern boundary labelled as "BH3d" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	434	998.5	1260
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.077	0.077	0.077
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	99	192.25	458
Chloride	milligrams per litre	4	4	2720	3672.5	6150
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	9640	10200	11020
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2

Fluoride	milligrams per litre	1	2	0.2	0.2	0.2
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	159	194.5	214
Manganese	milligrams per litre	1	1	0.034	0.034	0.034
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.06	5.60	10.6
Nitrogen (ammonia)	milligrams per litre	1	4	0.03	2.53	9.95
pH	pH Units	4	4	6.85	23.26	71
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	18	23.75	39
Redox potential	millivolts	4	4	-39.1	-26.3	-17.6
Sodium	milligrams per litre	4	4	1980	2392.5	3350
Standing Water Level	metres below ground level	4	4	19.932	20.594	21.255
Sulfate	milligrams per litre	4	4	<1	429.67	475
Toluene	micrograms per litre	1	1	<2	<2	<2

Total organic carbon	milligrams per litre	1	1	<1	<1	<1
Total petroleum hydrocarbons	micrograms per litre	1	1	<0.5	<0.5	<0.5
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.013	0.013	0.013

Monitoring Point BH6d

Groundwater monitoring, Groundwater monitoring well in south-east area near leachate treatment plant labelled as "BH6d" in Figure 1.

Pollutant	Unit of measure	No. of samples required by	No. of samples you collected and	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	425	771	1240
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.04	0.04	0.04
Benzene	micrograms per litre	1	1	10	10	10
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	87	185	452
Chloride	milligrams per litre	4	4	242	2801	6590
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.007	0.007	0.007
Electrical conductivity	microsiemens per centimetre	4	4	10990	13320	14640
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	0.4	0.4	0.4

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	20	123	202
Manganese	milligrams per litre	1	1	0.003	0.003	0.003
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.04	2.40	9.02
Nitrogen (ammonia)	milligrams per litre	4	4	0.12	5.62	10.7
pH	pH Units	4	4	6.73	6.90	6.99
Phenols	micrograms per litre	1	1	1.7	1.7	1.7
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	2	22	42
Redox potential	millivolts	4	4	-93	-18.2	20.1
Sodium	milligrams per litre	4	4	637	1730	3580
Standing Water Level	metres below ground level	4	4	66.109	72.129	78.148
Sulfate	milligrams per litre	4	4	<1	634	908
Toluene	micrograms per litre	1	1	21	21	21
Total organic carbon	milligrams per litre	1	1	22	22	22

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	12	12	12
Zinc	milligrams per litre	1	1	0.016	0.016	0.016

Monitoring Point BH10d

Groundwater monitoring well near workshop, south-west part of site labelled as "BH10d" in Figure 1. This monitoring well has been consistently found to be blocked and therefore it was replaced in September 2015 by groundwater monitoring well BH 25d.

Monitoring Point BH12d

Groundwater monitoring well north-east premises boundary labelled as "BH12d" in Figure 1. This monitoring well has been found consistently blocked and as such it was replaced by groundwater monitoring well BH26d in September 2015.

Monitoring Point BH17d

Groundwater monitoring well in quarry on western side labelled as "BH17d" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	49	1082.5	2140
Aluminium	milligrams per litre	1	1	0.01	0.01	0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.025	0.025	0.025
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	<1	90.33	227
Chloride	milligrams per litre	4	4	33	165	282
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.045	0.045	0.045
Electrical conductivity	microsiemens per centimetre	4	4	5970	7152.5	8740
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	2	1.1	1.1	1.1

Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	<1	6	6
Manganese	milligrams per litre	1	1	0.002	0.002	0.002
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.02	0.14	0.43
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	18.35	32.9
pH	pH Units	4	4	11.14	11.92	12.24
Phenols	micrograms per litre	1	1	<1	<1	<1
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	3	20	32
Redox potential	millivolts	4	4	-341.2	-302.25	-193.2
Sodium	milligrams per litre	4	4	18	485.75	762
Standing Water Level	metres below ground level	4	4	14.929	16.331	17.732
Sulfate	milligrams per litre	4	4	<1	8.67	11
Toluene	micrograms per litre	1	1	<2	<2	<2
Total organic carbon	milligrams per litre	1	1	4	4	4

Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.011	0.011	0.011

Monitoring Point BH18d

Groundwater monitoring well on south site boundary on concrete pad labelled as "BH18d" in Figure 1.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	49	418.25	679
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	26	26	26
Benzene	micrograms per litre	1	1	1	1	1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	6	106.25	259
Chloride	milligrams per litre	4	4	30	1864.75	3880
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	11590	12822.5	15850
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2

Fluoride	milligrams per litre	1	2	0.2	0.2	0.2
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	2	32.75	109
Manganese	milligrams per litre	1	1	0.021	0.021	0.021
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	0.02	1.22	4.2
Nitrogen (ammonia)	milligrams per litre	4	4	1.4	4.89	7.55
pH	pH Units	4	4	6.01	7.22	7.75
Phenols	micrograms per litre	1	1	<1.0	<1.0	<1.0
Phosphorus	milligrams per litre	1	1	<0.001	<0.001	<0.001
Potassium	milligrams per litre	4	4	2	46.25	106
Redox potential	millivolts	4	4	-38.7	-24.2	-14
Sodium	milligrams per litre	4	4	16	1008.75	2010
Standing Water Level	metres below ground level	4	4	53.951	54.901	55.851
Sulfate	milligrams per litre	4	4	<1	21	37
Toluene	micrograms per litre	1	1	<2	<2	<2

Total organic carbon	milligrams per litre	1	1	<1	<1	<1
Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.012	0.012	0.012

Monitoring Point BH25d

Groundwater monitoring, Groundwater monitoring well in south-west workshop area labelled as "BH25d" in Figure 1. This bore is the replacement of monitoring point "BH10d".

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	296	310.67	326
Aluminium	milligrams per litre	1	1	<0.01	<0.01	<0.01
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	26	26	26
Benzene	micrograms per litre	1	1	1	1	1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	3	4.33	6
Chloride	milligrams per litre	4	4	75	84.67	102
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.045	0.045	0.045
Electrical conductivity	microsiemens per centimetre	4	4	810	3916.67	6980
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2

Fluoride	milligrams per litre	1	2	0.4	0.4	0.4
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	<1	1.5	2
Manganese	milligrams per litre	1	1	0.003	0.003	0.003
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	0.06	0.07
Nitrogen (ammonia)	milligrams per litre	4	4	1.11	1.21	1.34
pH	pH Units	4	4	8.12	8.42	8.77
Phenols	micrograms per litre	1	1	<1.0	<1.0	<1.0
Phosphorus	milligrams per litre	1	1	<0.001	<0.001	<0.001
Potassium	milligrams per litre	4	4	8	8.33	9
Redox potential	millivolts	4	4	-132	-116.97	-101.4
Sodium	milligrams per litre	4	4	187	193.33	204
Standing Water Level	metres below ground level	4	4	23.936	26.110	28.283
Sulfate	milligrams per litre	4	4	17	17.67	18
Toluene	micrograms per litre	1	1	<2	<2	<2

Total organic carbon	milligrams per litre	1	1	<1	<1	<1
Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.010	0.010	0.010

Monitoring Point BH26d

Groundwater monitoring well north-east premises boundary labelled as "BH12d" in Figure 1. This monitoring well is the replacement of monitoring point "BH12".

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	349	578.25	753
Aluminium	milligrams per litre	1	1	0.02	0.02	0.02
Arsenic	milligrams per litre	1	1	0.002	0.002	0.002
Barium	milligrams per litre	1	1	6.8	6.8	6.8
Benzene	micrograms per litre	1	1	10	10	10
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	87	132.25	184
Chloride	milligrams per litre	4	4	1340	2907.5	3610
Chromium	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	<0.001	<0.001	<0.001
Electrical conductivity	microsiemens per centimetre	4	4	9570	10522.5	11050
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2

Fluoride	milligrams per litre	1	2	0.1	0.15	0.2
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	37	63.5	77
Manganese	milligrams per litre	1	1	0.122	0.122	0.122
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	4	4	<0.01	0.07	0.09
Nitrogen (ammonia)	milligrams per litre	4	4	4.18	8.06	10.7
pH	pH Units	4	4	6.86	7.565	8.25
Phenols	micrograms per litre	1	1	1.5	1.5	1.5
Phosphorus	milligrams per litre	1	1	<0.01	<0.01	<0.01
Potassium	milligrams per litre	4	4	36	64.25	78
Redox potential	millivolts	4	4	-53.7	-24.275	16.2
Sodium	milligrams per litre	4	4	1030	1912.5	2340
Standing Water Level	metres below ground level	4	4	64.328	64.392	64.456
Sulfate	milligrams per litre	4	4	<1	9.67	25
Toluene	micrograms per litre	1	1	22	22	22

Total organic carbon	milligrams per litre	1	1	21	21	21
Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Xylene	micrograms per litre	1	1	12	12	12
Zinc	milligrams per litre	1	1	0.009	0.009	0.009

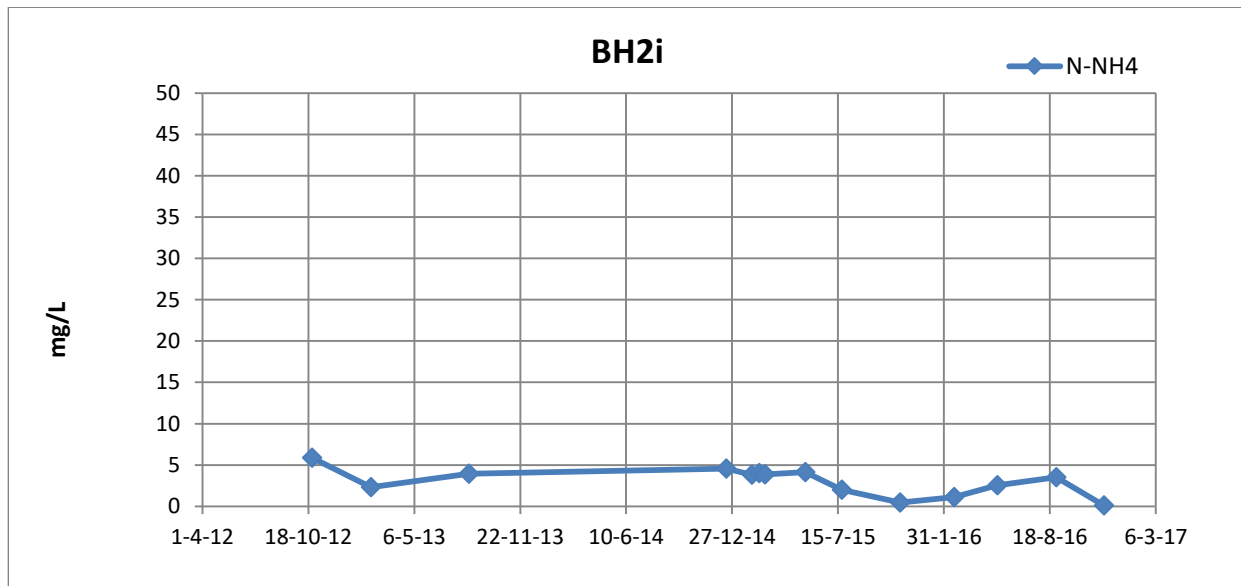
5 GROUNDWATER PERFORMANCE

Assessment of site groundwater quality is undertaken using trend analysis of monitoring data.

Ammonia concentration is the primary leachate indicating parameter and for the purposes of assessment of leachate contamination of groundwater wells on site, will be the initial analyte assessed. Where this analyte does not appear to occur in concentrations above normal levels in groundwater samples, further discussion will not occur (except where deemed necessary).

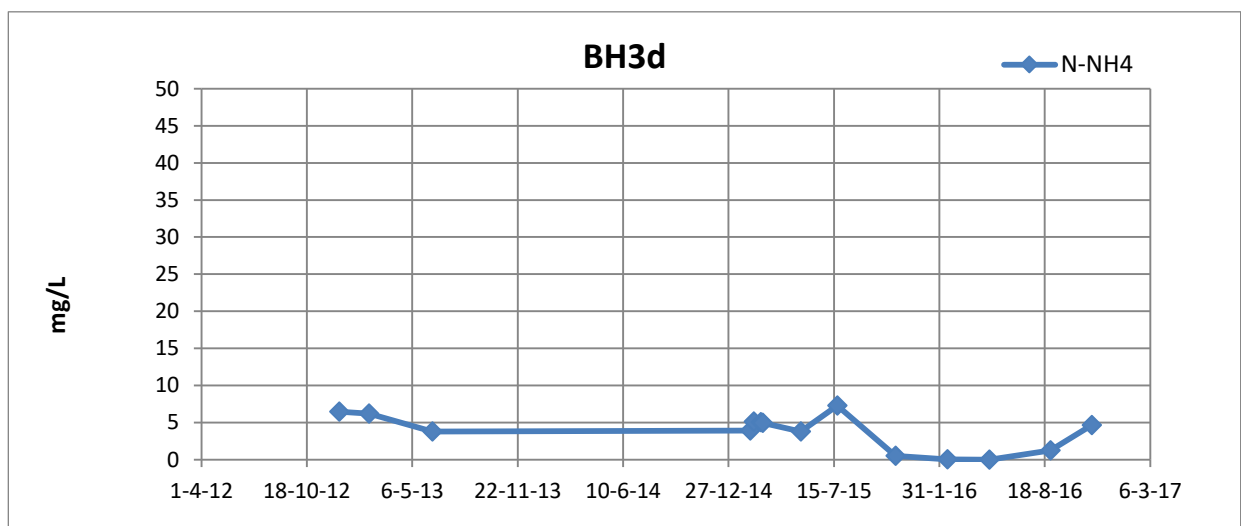
The variation in historical ammonia concentrations in all groundwater wells is shown in the subsections below.

5.1 GROUNDWATER MONITORING WELL – BH2I



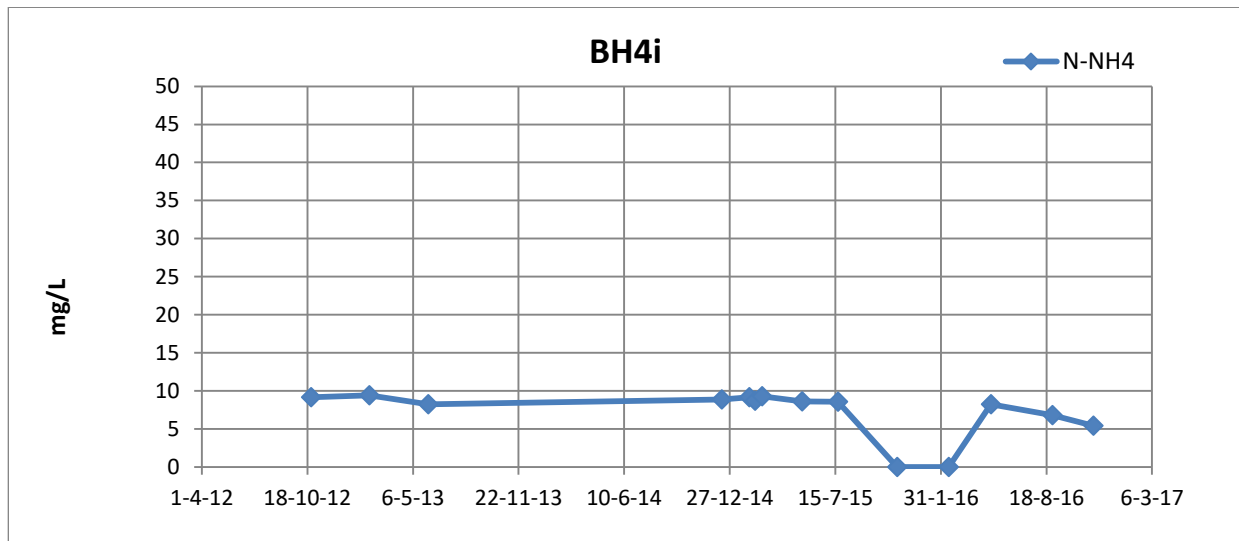
This well monitors the mid-level aquifer zone within the fracture rock at approximately 25.6 mAHD. During this reporting period all four sampling visits to BH2i yielded data. Minor fluctuations of ammonia are shown in the Figure below. Concentrations are low compared with background data and not indicative of any leachate impacting groundwater at this location.

5.2 GROUNDWATER WELL – BH3D



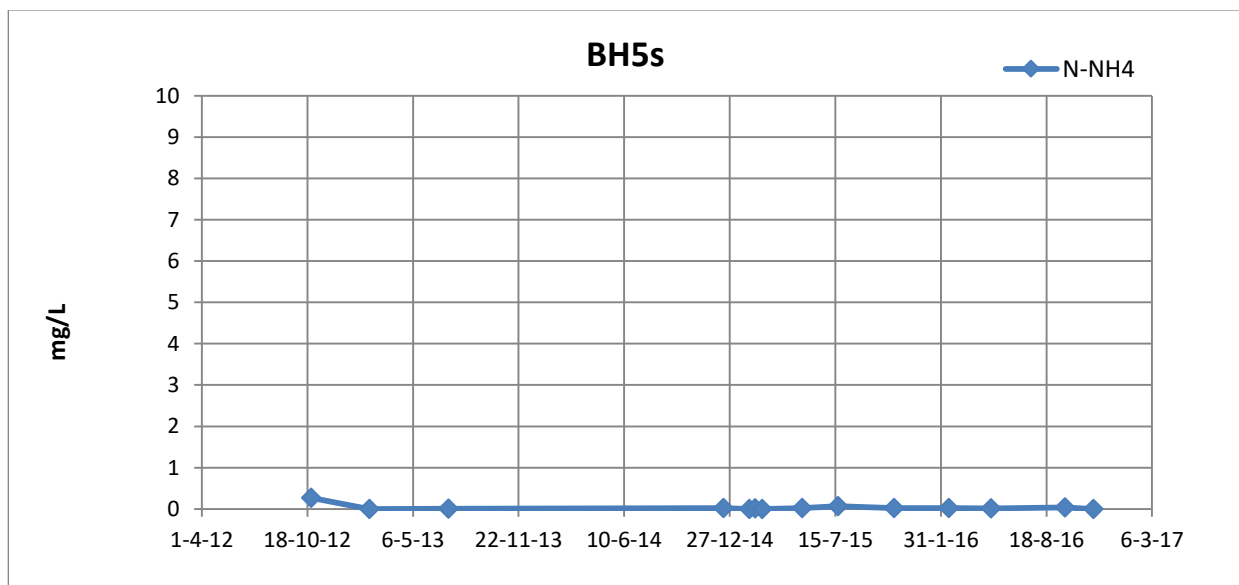
This well monitors the aquifer zone close to or slightly below the landfill base at approximately -55.1 mAHD. Field observations recorded on the water being removed from this groundwater well for analysis are not indicative of any impacts from leachate. No leachate odour or hydrogen sulphide odour has been recorded and colour observations do not suggest the presence of leachate.

5.3 GROUNDWATER WELL – BH4I



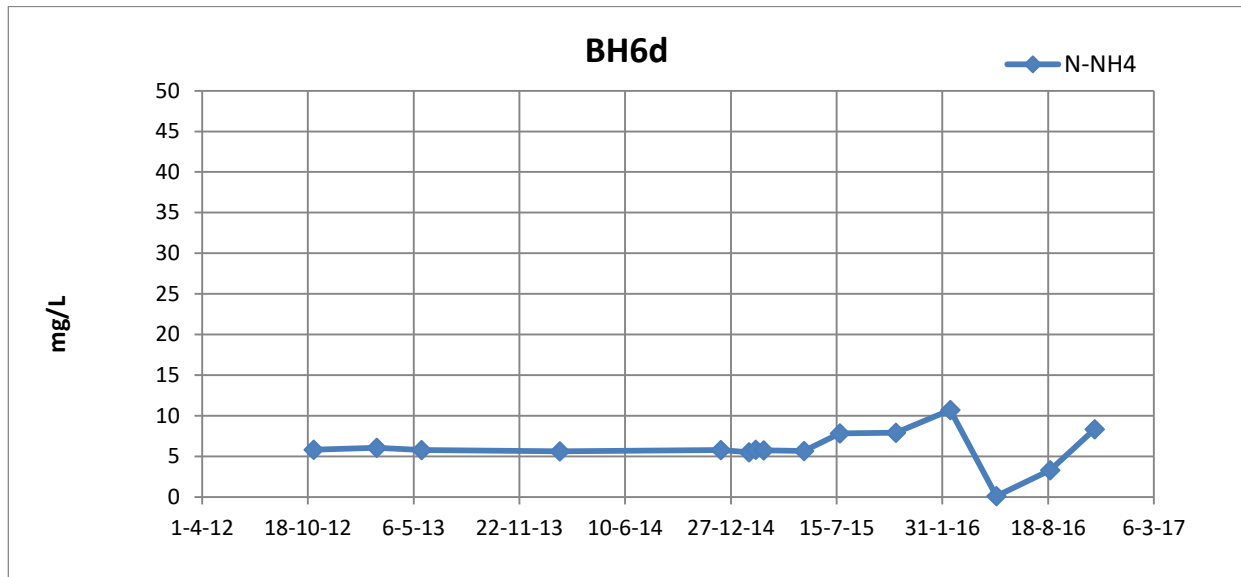
This well monitors the mid-level aquifer zone within the fracture rock at approximately 36.3 mAHD. The concentration of ammonia measured in this well during the 2016 monitoring period is within the range encountered in the aquifer before landfilling activities commenced and indicates that the groundwater in this well is not being impacted by any leachate.

5.4 GROUNDWATER MONITORING WELL – BH 5S



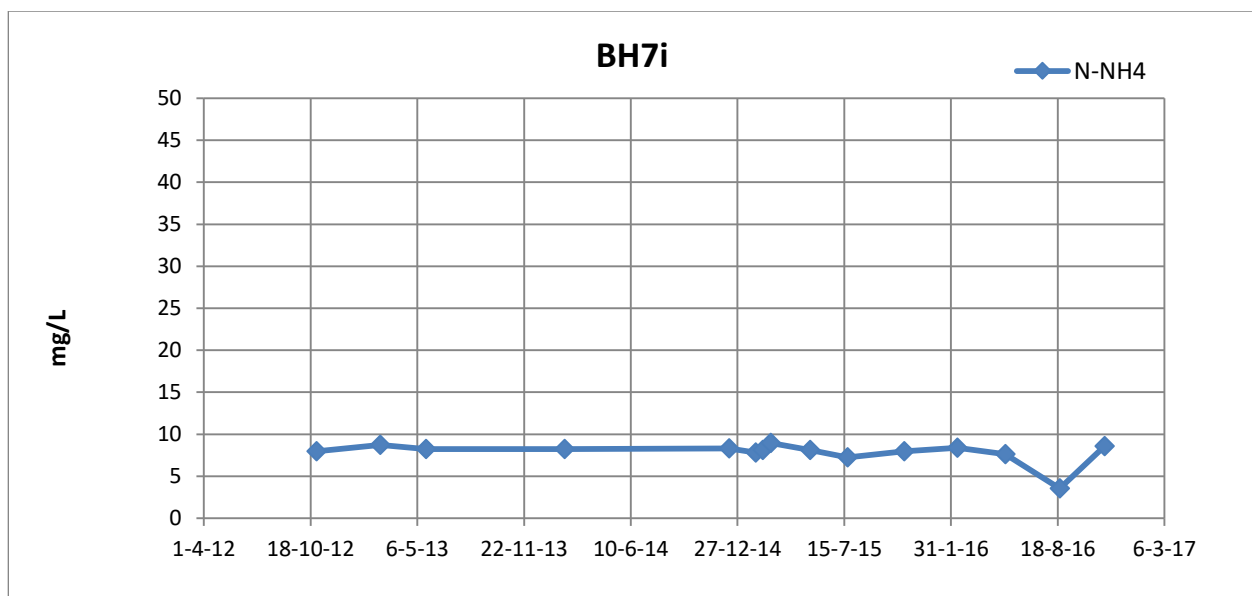
This well monitors the perched groundwater within the upper weathered shale bedrock aquifer at approximately 65.3 mAHD. The concentration of ammonia measured in this well during the 2016 monitoring period is low and has been consistent with fluctuations in ammonia levels in the past, the concentrations of ammonia found at BH5s during the reporting period indicate that the groundwater in this well is not being impacted by leachate.

5.5 GROUNDWATER MONITORING WELL – BH6D



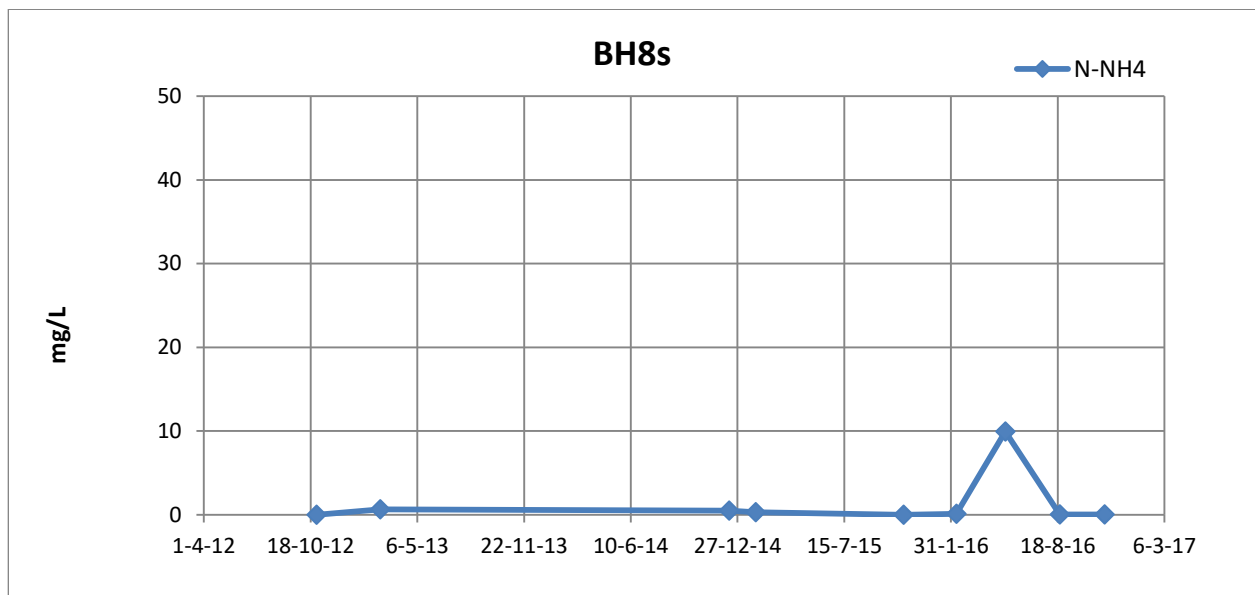
This well monitors the aquifer zone close to or slightly below the landfill base at approximately -57.5 mAHD. Despite fluctuations, ammonia concentrations measured in this well during 2016 are within the range found historically and there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.6 GROUNDWATER MONITORING WELL – BH7I



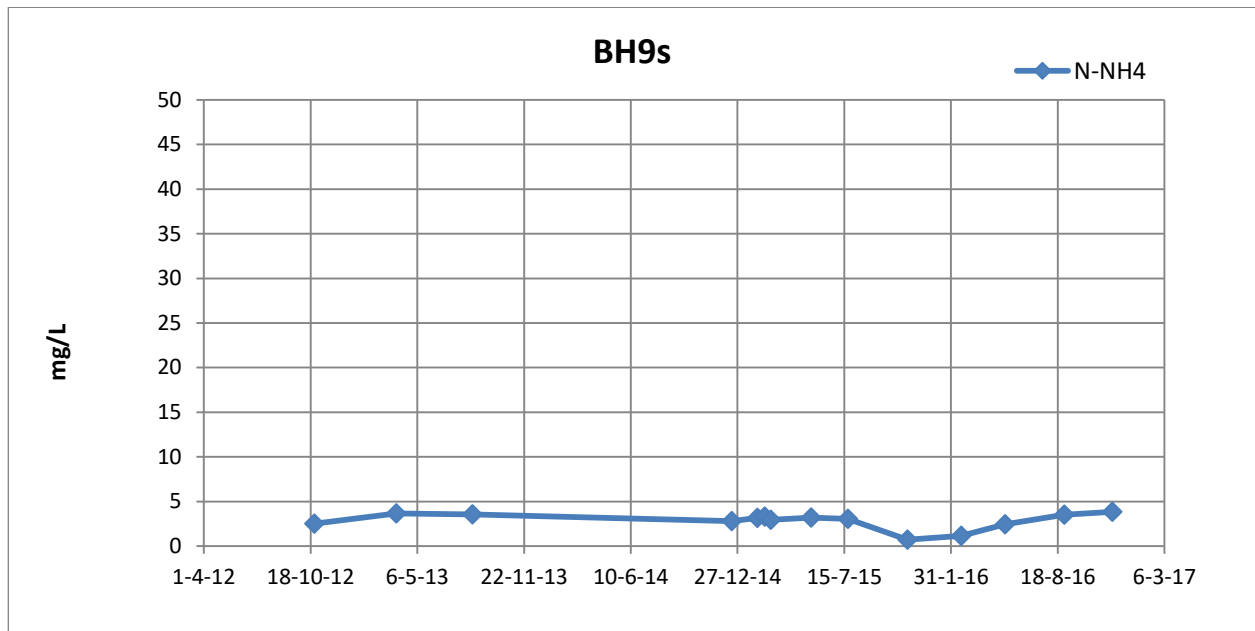
This well monitors the mid-level aquifer zone within the fracture rock at approximately 39.7 mAHD. Ammonia concentrations measured in this well during 2016 are consistent with historical data and there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.7 GROUNDWATER MONITORING WELL – BH8S



This well monitors the perched groundwater within the upper weathered shale bedrock aquifer at approximately 69.8 mAHD. Ammonia concentrations measured in this well during 2016 are within the range found historically and despite a peak value of 10 mg/L during the second quarter monitoring event, subsequent monitoring events have demonstrated that the 10mg/L concentration was not indicative of leachate migration and that the high concentration can be regarded as an anomaly on the data, as such, there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.8 GROUNDWATER MONITORING WELL – BH9S

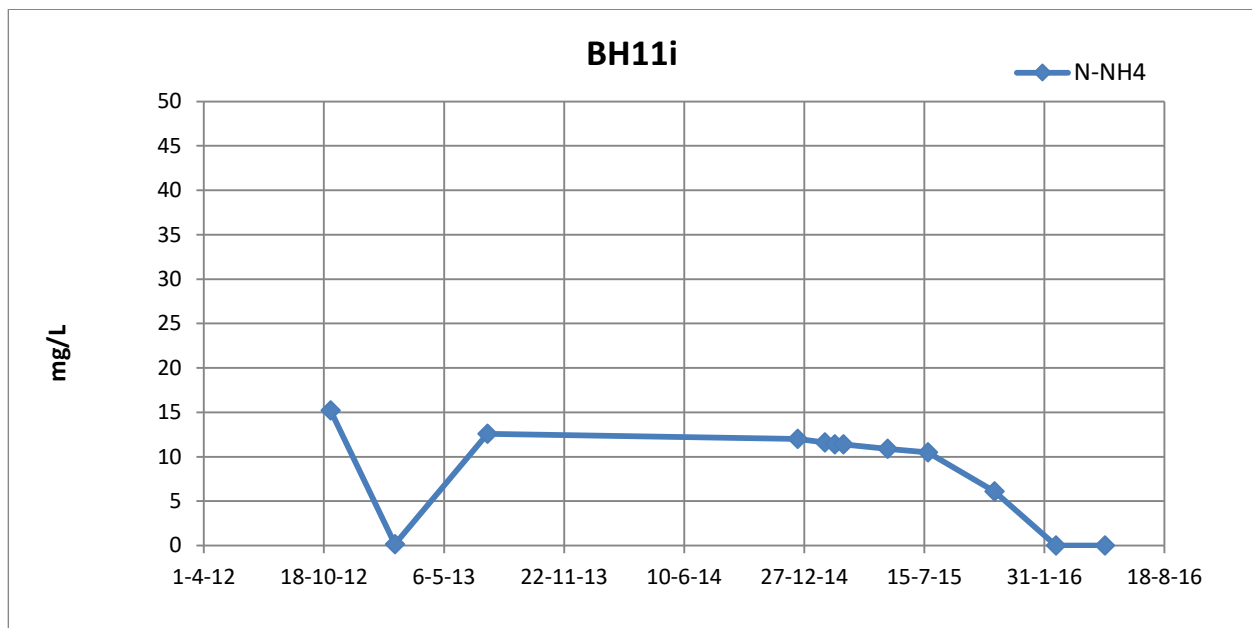


This well monitors the perched groundwater within the upper weathered shale bedrock aquifer at approximately 69.8 mAHD. Ammonia concentrations measured in this well during 2016 have increased from low detections (late 2015) to concentrations within the range found historically and there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.9 GROUNDWATER MONITORING WELL – BH10D

IGGC has reported this monitoring well to be blocked since January 2013. In September 2015 EnvironConsulting Services was engaged to supervise the drilling of a replacement bore for BH10d, the new bore has adopted the “name” BH25d and is reported in section 5.18. Since BH10d has been blocked, there is no data for groundwater chemistry at this location for the reporting period.

5.10 GROUNDWATER MONITORING WELL – BH11I



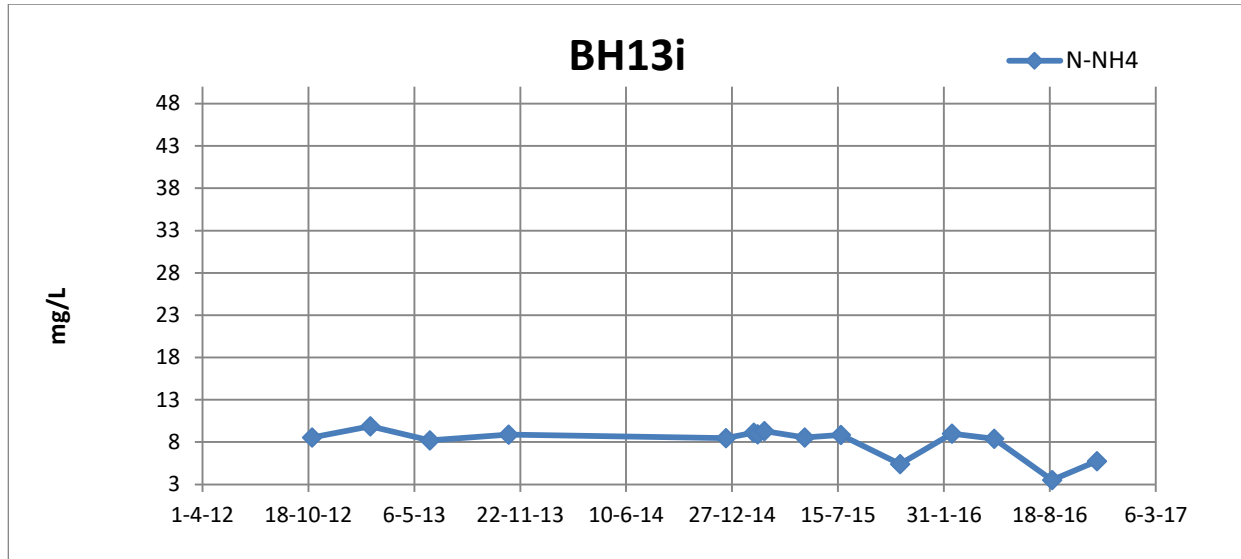
This well monitors the mid-level aquifer zone within the fracture rock at approximately -17.4 mAHD. The concentration of ammonia measured in this well during the 2016 monitoring period has decreased with respect to previous monitoring periods and concentrations remain within the range encountered in the aquifer before landfilling activities commenced. This indicates that the groundwater in this well is not being impacted by leachate. It is important to note that during the August and December 2016 monitoring visits, BH11i was blocked at an approximate depth of 4 metres below ground level and as such it has not been able to be sampled.

Attempts have been made to unblock the well and a final attempt will be made by the end of January 2017. If this attempt is unsuccessful then a new replacement well will be drilled, in close proximity to the existing well.

5.11 GROUNDWATER MONITORING WELL – BH12D

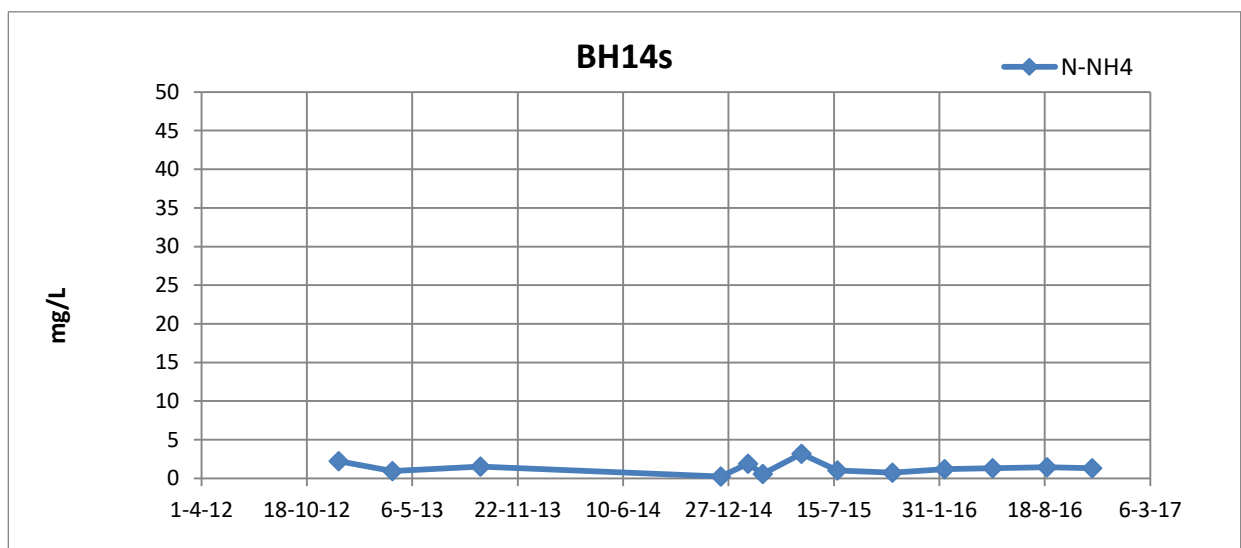
IGGC has historically reported this monitoring well to be blocked since November 2012 and the bore was scheduled for replacement. In September 2015 ECS was engaged to supervise the drilling of the replacement bore, which adopted the “name” BH26D. Since BH12D has been blocked there is no data for groundwater chemistry at this location for the reporting period. Groundwater monitoring data for BH26D is reported in section 5.19.

5.12 GROUNDWATER MONITORING WELL – BH13I



This well monitors the mid-level aquifer zone within the fracture rock at approximately -7.7 mAHD. The concentration of ammonia measured in this well during the 2016 monitoring period is within the range encountered in the aquifer before landfilling activities commenced and indicates that the groundwater in this well is not being impacted by leachate.

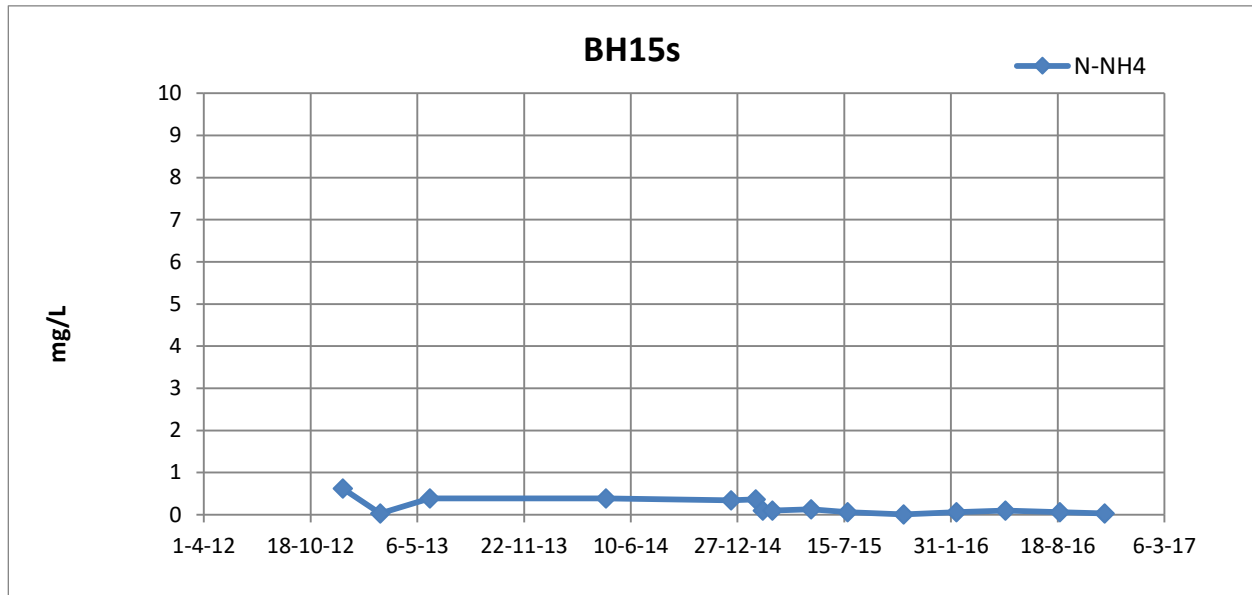
5.13 GROUNDWATER MONITORING WELL – BH14S



This well monitors the perched groundwater within the upper weathered shale bedrock aquifer at approximately 55 mAHD. Ammonia concentrations measured in this well during 2016 are within the range found historically, the concentrations have shown minimal variations during the reporting period with the exception of an increase during 2015 which has shown concentrations

similar to those found in early stages of the project. There does not appear to be any indication that leachate is impacting the groundwater in this well.

5.14 GROUNDWATER MONITORING WELL – BH15S

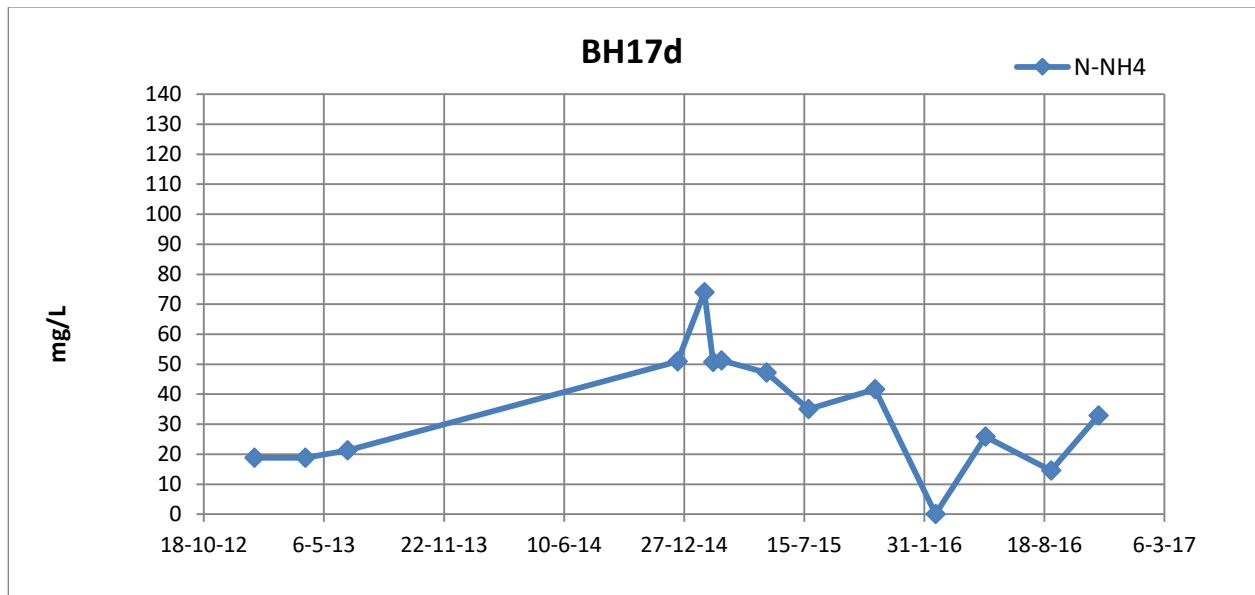


This well monitors the perched groundwater within the upper weathered shale bedrock aquifer at approximately 71 mAHD. Ammonia concentrations measured in this well have consistently decreased since operations commenced, especially from 2014 reporting period and the concentrations are within the range found historically and there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.15 GROUNDWATER MONITORING WELL – BH16S

This monitoring well was reported to be dry and as such there is no data for groundwater chemistry at this location.

5.16 GROUNDWATER MONITORING WELL – BH17D



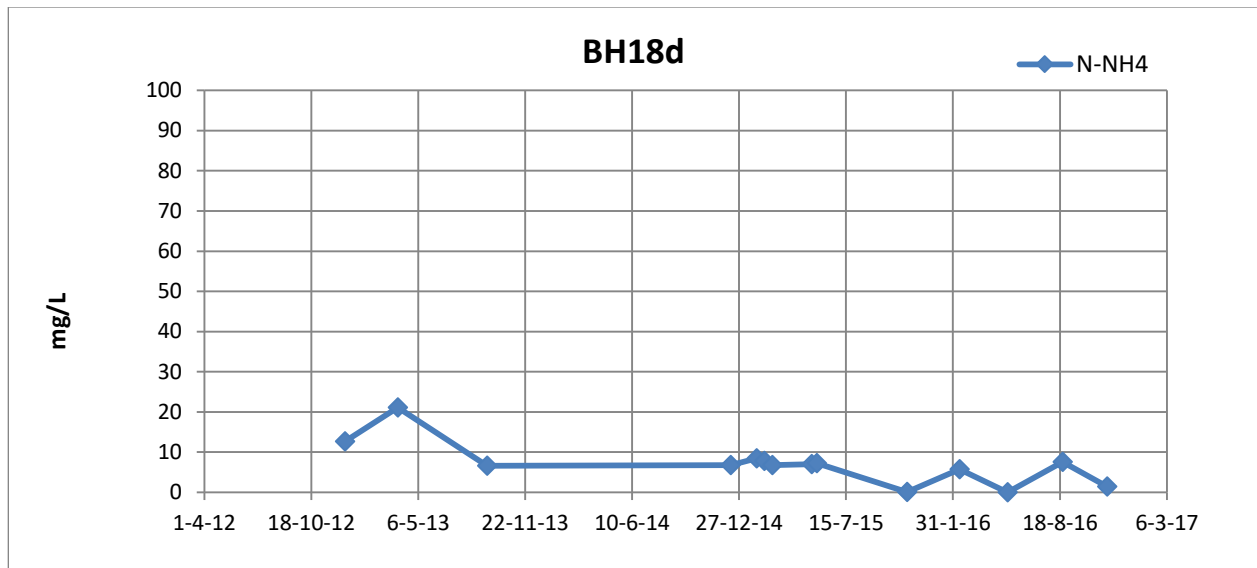
Concentrations of ammonia in groundwater well BH17d display a slight upward trend, however, levels now appear to be stabilizing with background data.

As identified in the report entitled Groundwater Monitoring Plan, Genesis Facility, Eastern Creek. Stage 1 Groundwater Monitoring Network by IGGC February 2013; elevated levels of ammonia are present in the boreholes located at the site groundwater aquifer are “likely to reflect natural hydrochemistry in a confined aquifer of this type: these levels are slightly higher than those typically found in Bringelly Shale groundwater but similar and higher levels are observed in association with igneous formations of similar composition to the Minchinbury Diatreme (PB, 2006), Possibly derived from trapping of volcanic gas within the formation”.

The report also states that “Nitrogen is present in the volcanic diatreme in the form of ammonia with concentrations of 20 mg/L and higher concentrations may occur”.

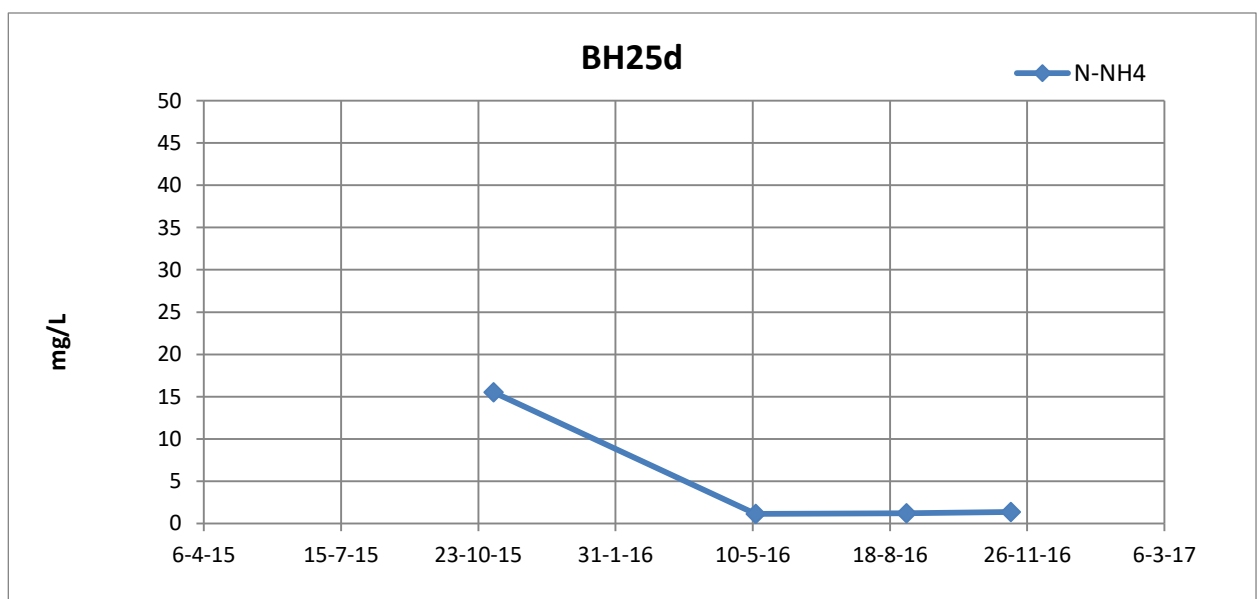
When compared to the ammonia concentrations recorded in the other wells around the site it appears that this analyte is highly variable in nature and that the measured concentrations in BH17d are not indicative of leachate impacting the groundwater in this well. No leachate odour or hydrogen sulphide odour has been recorded and colour observations do not suggest the presence of leachate.

5.17 GROUNDWATER MONITORING WELL – BH18D



This well monitors the aquifer zone close to or slightly below the landfill base at approximately -60 mAHD. Ammonia concentrations measured in this well during 2016 are within the range found historically and there does not appear to be any indication that leachate is impacting the groundwater in this well.

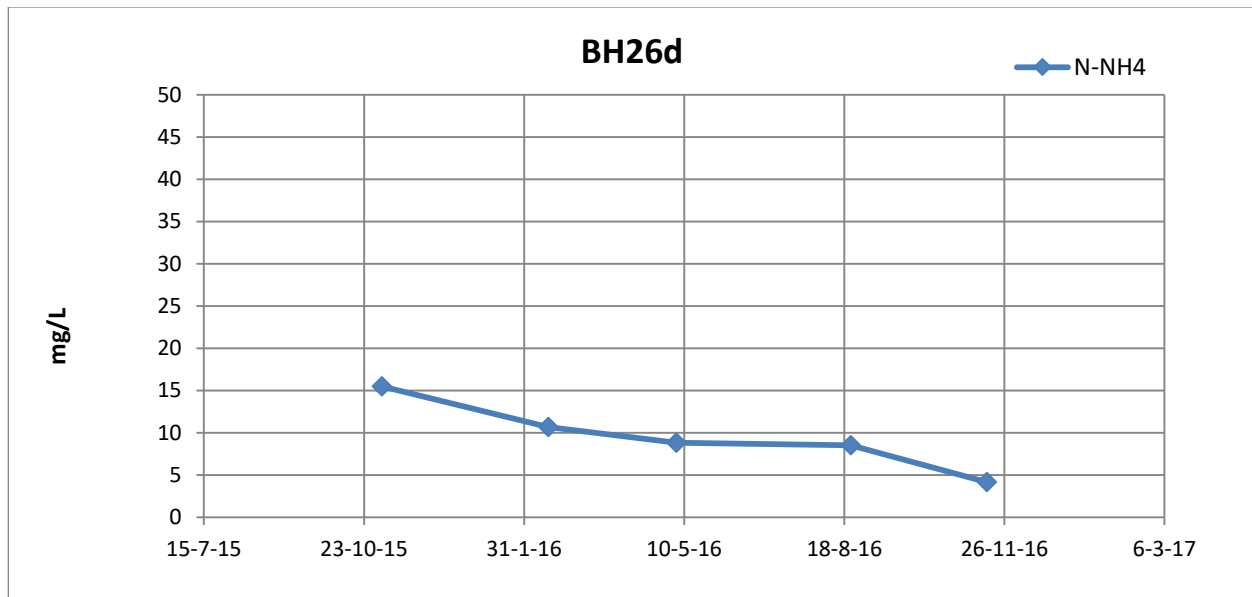
5.18 GROUNDWATER MONITORING WELL - BH 25D



This well monitors the aquifer zone close to or slightly below the landfill base at approximately -60.1 mAHD. Despite the reported concentrations during October 2015 which can be attributed to the hydrogeology of the site as discussed in section 3.5. Ammonia concentrations measured in this

well during 2016 have stabilized, and as such there does not appear to be any indication that leachate is impacting the groundwater in this well.

5.19 GROUNDWATER MONITORING WELL – BH26D



Similarly to BH25d, this well monitors the aquifer zone close to or slightly below the landfill base at approximately -67.2 mAHD in the vicinity of historical groundwater monitoring well BH12d. ammonia concentrations measured in this well during 2016 have shown that this monitoring well is naturally finding its stabilization point, and as such there does not appear to be any indication that leachate is impacting the groundwater in this well.

6 CONCLUSION

The temporal trends of ammonia concentration in each groundwater well demonstrate that the existing leachate collection system is effective, leachate is not impacting on groundwater and the operation of the facility has not had a negative impact on the surrounding groundwater environment.

Based on the monitoring results reported above, ECS considers that there is no need to modify the groundwater monitoring programme at this stage of the project. Furthermore, the existing schedule of chemicals analysed in accordance with Environmental Protection License 13426, is sufficient to detect any potential impact on groundwater in the vicinity of the site.

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