Whytes Gully Landfill Annual Report 2017-2018

Environmental Protection Licence 5862

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Prepared for

Wollongong City Council

26 July 2018

wollongong
city of innovation

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1 Introduction

1.1 Background

Wollongong City Council (Council) owns and operates the Wollongong Waste and Resource Recovery Park (the Site), which is located on Reddals Road, Kembla Grange NSW. The Site is situated at the foothills of the Illawarra Escarpment south west of the Wollongong central business district on approximately 50 hectares. The Site is formally identified as Lots 50, 52 and 53 of Deposited Plan (DP) 1022266 and Lot 2 of DP 240557. The Site location is shown on **Figure 1** of **Appendix A** and a Site plan provided on **Figure 2** of **Appendix A**.

Council holds an Environmental Protection Licence (EPL) issued by the NSW Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act 1997* (POEO Act). The Licence Number is 5862 and authorises the scheduled activity of waste disposal (application to land) at the Site with no limit on the scale of the activity.

A *Landfill Environmental Management Plan* (LEMP) was prepared in 2014 (Golder 2014) on behalf of Council to ensure that environmental compliance is maintained throughout Site operations. The management measures provided in the LEMP were developed in consideration of the *NSW Environmental Guidelines: Solid Waste Landfills (*EPA, 1996*)* and also addressed the monitoring and reporting requirements of EPL 5862. The NSW *Environmental Guidelines: Solid Waste Landfills* (EPA 1996) were replaced with the *Environmental Guidelines: Solid Waste Landfills, Second edition* (EPA, 2016). As such Council are updating the Site LEMP to ensure compliance with current legislative requirements.

1.2 Objectives

The objectives of this Annual Report are to provide the EPA with the following:

- A summary of compliance monitoring data gathered during the reporting period of the 29th of May 2017 to the 28th of May 2018.
- Interpretation of monitoring data to assess the environmental performance of the Site considerate of the conditions of the EPL.

1.3 Scope

1.3.1 Fieldwork

To meet the objectives of the Annual Report the following scope of works was undertaken during the reporting period in accordance with the requirement of EPL 5862:

- Surface gas monitoring at areas where intermediate or final cover has been placed;
- Subsurface gas monitoring of twelve (12) landfill gas monitoring wells;
- Gas accumulation monitoring within all buildings within 250m of deposited waste;
- Water monitoring at three (3) stormwater monitoring points;
- Groundwater monitoring at thirteen (13) monitoring wells;
- Tracking of waste tyres received at the Site; and
- Monitoring of trade wastewater at one (1) sampling point located at the pre-treatment discharge.

1.3.2 Reporting

Section 6 (R1) of EPL 5862 states that Annual Return and an Annual Report must be prepared by the licence holder. In accordance with Section 6 (R1.8) of the EPL this Annual Report provides an assessment of environmental performance relevant to the licence conditions including:

- Tabulated results of all monitoring data required to be collected by this licence;
- A graphical presentation of data from at least the last three years in order to show variability and/or trends;
- An analysis and interpretation of all monitoring data;

- An analysis of and response to any complaints received;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or incidents and of remedial action taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility.

This report has been prepared in accordance with the reporting conditions provided in Section 6 of the EPL and in consideration of the *Environmental Guidelines: Solid Waste Landfills, Second edition* (EPA, 2016) and *Requirements for publishing pollution monitoring data* (EPA, 2013). The Annual Return pro forma for the 2017/2018 reporting period was provided to the NSW EPA via their online lodgement platform E-Connect.

1.4 Site History and Configuration

1.4.1 Site History

Whytes Gully was developed in the early 1980's as the principal landfill site for Wollongong's domestic and commercial waste streams. Initially, the 'western gully' section was landfilled. The western gully is unlined by modern standards and was used for waste deposition from 1982 to 1993. Initially coal wash refuse was used to provide daily cover, and later steel furnace slag was introduced around 1988 due to its stability in wet weather, as well as Council's inability to source local clean fill in sufficient quantities. The leachate collection network from the western gully passes through a series of rock drains at the centre of each lift. The rock drains connect with a riser and the leachate flows from riser to riser, and eventually to the leachate collection well at the base of the western gully. The western gully section of the landfill has been capped with clay with a thickness between 1m and 4m.

Development of the 'eastern gully' section received consent in approximately 1992, following extensive public consultation. The eastern gully section is lined with a single layer of HDPE smooth liner, over a subsoil drainage layer of 5mm gravel and a corrugated groundwater drainage system. The eastern gully was excavated to rock and was developed in two stages, beginning with the first stage 80 to 100m above the slope from the current toe of the landfill embankment. The leachate is drained from the first stage of the eastern gully via a 300mm corrugated drainage pipe at the base and a 300mm thick sand layer above the liner.

The second stage of the eastern gully is situated in front and above the first stage, with extended leachate drains and HDPE liner. From 2014 to 2016, the eastern gully underwent extensive surface reshaping works in order to reduce rainwater infiltration, increase surface water diversion, to ensure consistent cover depths and to prepare the surface for the new landfill cell base liner.

Construction of Stage 3 of the landfill commenced during August 2013, with the first cell, Cell 1A, completed in 2014 which is situated below the eastern gully. Placement of waste commenced in Cell 1A around March 2015. Council has since constructed Cell 1B in 2015 and commenced filling. Cell 2 is currently being constructed.

Leachate is collected from all landfilled areas at the site and treated in a 3 stage process. The leachate is initially collected in a primary holding pond that utilises biological process and aeration primarily to strip the leachate of ammonia. The leachate is then pumped to a smaller, shallower pond with a larger surface area to increase the speed of this process on a batch by batch basis. From the smaller pond the leachate is then pumped to a sequential batch reactor that in conjunction with a filtration system eliminates the residual contaminants in the leachate to a standard that is suitable for acceptance by sewer under the sites Trade Wastewater Agreement with Sydney Water.

The location of each cell and significant Site features such as leachate ponds and shown on **Figure 2** of **Appendix A**).

2 Site Setting

2.1 Topography and Drainage

The Site is situated on a south west facing slope, which is dominated by a roughly east-west directional ridgeline along the northern boundary. The landfill deposition areas are located within two historical gullies, the western gully landfill and the eastern gully landfill. The eastern gully landfill is the current location of waste deposition with the western gully was historically filled until approximately 1993.

The topography of the Site is subject to variability due to the nature of landfilling, however, in general the Site is characterised by moderate to steep slopes. An elevation profile created utilising Nearmap for an aerial image captured on 19th of January 2018 shows that the lowest elevations of the Site are located in the south western portion with an approximate relative level (RL) of 15 m Australian Height Datum (AHD), and the highest elevations are located in the north eastern portion with an approximate RL of 100 m AHD. Approximate contours are shown on **Figure 4** of **Appendix A**.

2.2 Soil and Geology

The *1:100,000 geological map 'Wollongong-Port Hacking'* (Department of Primary Industries, 1985) shows that the Site is on the boundary of two major geological formations. The southern portion of the site is underlain by fluvial sands, silts and clays associated with Dapto Creek, with sandstone of the Budgong formation underlying alluvial soils. The Budgong Sandstone formation typically comprises of red, brown and grey lithic sandstone. The northern portion of the site is underlain by interbedded lithic sandstone, coal, carbonaceous claystone, siltstone and claystone of the Pheasants Nest Formation. It is inferred that the Pheasants Nest formation would mainly be encountered on the ridgelines in the higher elevations of the Site.

A geotechnical investigation completed by Golder Associates (Golder 2012) summarised the Site geology into the following areas:

- **Pheasants Nest Formation**: the Pheasants Nest Formation was noted on the upper slopes across the northern portion the site. The material encountered was generally weathered sandstone that grades into fresh sandstone at depths typically less than 10 m below ground level (bgl). The residual soil is generally less than 2 m thick. Siltstone was encountered in zones throughout the sandstone at depths greater than about 15 m (based on the Maunsell 1992 investigation). Siltstone was not encountered in the Golder 2012 investigation.
- **Budgong Sandstone Formation**: the Budgong Sandstone Formation was located across the southern portion of the site. The sandstone generally had a weathering profile that extended to depths up to 15 m bgl. Zones of weathered siltstone had a maximum thickness of approximately 3m and were located intermittently throughout this formation.
- **Alluvial Soils**: alluvial soils consisted of colluvial / alluvial soil material (silty clay and silt with some sands and sub angular gravels and cobbles) and was located across the middle and south west portion of the site. Zones of alluvial soil had a maximum thickness of approximately 11m. This geological unit was inferred to be underlain by Budgong Sandstone.
- **Capping Layer and Landfill**: landfill and a capping layer are located across the completed areas of landfilling. The capping material consists of generally low to medium plasticity sandy clay and is typically has a thickness less than 1.5m. Landfill waste is located beneath the capping layer consisting predominantly of domestic waste including paper, plastic, wood, rubble and other materials. The depth to the base of the general waste fill was not well defined, however, a review of historical topographic data suggests that the thickness of the fill could be up to 52m within the eastern gully landfill. The landfilled areas were inferred to be underlain by the Pheasants Nest Formation.

2.3 Climate

Climate data for the Site has been taken from the Albion Park (Wollongong Airport) Bureau of Meteorology (BOM) Weather Station (ID 068241). The weather station is located approximately 10 km south of the Site and is considered an accurate representation of the conditions experienced at the landfill during the reporting period. **Table 2-1** summaries the key climatic data from the Albion Park weather station.

Table 2-1 Climatic Data – Albion Park Weather Station

	2017						2018					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)	42.2	1.4	24.8	0.0	24.0	116.4	49.8	56.0	116.6	46.6	18.2	12.8
Mean max temperature (°C)	18.3	18.5	18.9	22.6	23.6	23.4	27.4	28.1	26.7	25.9	25.2	21.2
Mean min temperature (°C)	7.1	5.1	6.7	7.7	11.9	13.1	17.2	17.0	16.3	15.5	13.6	8.1
Mean 9am wind speed (km/h)	12	12	20	22	13	11	12	13	12	10	10	12
Mean 3pm wind speed (km/h)	14	20	24	27	22	23	20	22	22	19	17	20
Mean 9am relative humidity (%)	78	64	53	40	66	66	69	68	70	76	68	68
Mean 3pm relative humidity (%)	61	42	44	41	61	59	68	61	61	62	62	54

Long-term averages for the Albion Park weather station are shown in **Table 2-2** and have been included for comparative purposes.

Table 2-2 Long Term Averages – Albion Park Weather Station

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)[1]	94.5	51.4	55.3	42.7	64.5	83.1	67.0	72.9	140.5	122.3	73.8	55.8
Mean max temperature (°C)[1]	18.1	17.6	18.8	21.4	23.1	24.0	25.6	27.0	26.3	25.3	23.1	20.6
Mean min temperature (°C)[1]	7.2	6.3	6.5	8.5	10.8	13.4	15.3	16.9	17.1	15.6	12.2	8.8
Mean 9am wind speed (km/h) [2]	13.6	14.4	15.0	15.3	14.4	12.9	12.7	11.6	9.8	8.1	10.7	12.4
Mean 3pm wind speed (km/h)[2]	17.6	18.1	21.8	22.6	20.9	20.9	21.5	21.6	20.0	18.9	17.7	17.1
Mean 9am relative humidity (%)[2]	73	68	61	57	58	67	66	68	74	76	68	69
Mean 3pm relative humidity (%)[2]	57	54	49	53	58	63	61	63	67	64	61	58

[1] Data recorded from 1999 – 2018

[2] Data recorded from 1999 - 2010

The climate data shows relatively dry weather during the current reporting period compared to the long term averages. Winter months were particularly dry as was the start of spring with no rainfall recorded in the month of September.

Average maximum and minimum temperatures were generally slightly higher than long term averages. Mean wind speeds were slightly increased but overall in-line with the long-term trends. Humidity results were in general accordance with long-term trends.

3 Field Investigations

3.1 Fieldwork Methodology

The subsections below describe the frequency of monitoring, monitoring method, monitoring locations and analytes for surface gas, subsurface gas, gas accumulation, stormwater and groundwater. The fieldwork methodologies implemented during the reporting period were developed in consideration of the guidance provided in the NSW EPA *Environmental Guidelines: Solid waste landfills (second edition)* (EPA 2016).

3.1.1 Surface Gas

Surface gas monitoring was completed during the reporting period to assess for potential surface gas emissions of methane emitting from the current and existing landfill areas at the site. Surface gas migration monitoring should demonstrate that the cover material and extraction system is controlling the emission of landfill gas.

The fieldwork methodology for surface gas monitoring is summarised below in **Table 3-1**. The location of each surface gas monitoring location is shown on **Figure 3** of **Appendix A**.

Table 3-1 Surface Gas Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Surface gas monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Methane was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Surface gas monitoring was achieved by testing the atmosphere 5 centimetres above the ground surface in areas with intermediate or final cover where wastes have been placed. The monitoring was completed on calm days (winds below 10km/hr) and on transects with an approximate spacings of 25m.
Monitoring Locations	Surface gas monitoring for methane was undertaken at the following locations: ▪ The current active landfill cell: transects 2, 3, 5, 7 and 10 ▪ The former landfill cell to the north west of the current cell: transects A, C, D, E, F, G, H, and I ▪ Reddalls Road and Farmborough Road fence lines.

3.1.2 Subsurface Gas

Subsurface gas monitoring was completed during the reporting period to detect the potential presence of methane around the perimeter of the landfill cell to assess the potential for offsite migration of methane onto surrounding properties.

The fieldwork methodology for subsurface gas monitoring is summarised below in **Table 3-2**. The location of each subsurface gas monitoring location is shown on **Figure 4** of **Appendix A**.

Table 3-2 Subsurface Gas Monitoring Methodology

Activity	Description
Frequency	Subsurface gas monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Subsurface gas monitoring was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Subsurface gas monitoring was achieved by testing the methane concentration in twelve landfill gas monitoring wells (listed below) that are situated around the northern, eastern and southern perimeters of the landfill. The contents of each well was sampled and analysed prior to potential dilution by air.
Monitoring Locations	Subsurface gas monitoring for methane was undertaken at twelve landfill gas monitoring wells, Point 21 (LFG MW1) to Point 32 (LFG MW12), in accordance with Section 5 (M2.3).

3.1.3 Gas Accumulation

Gas accumulation monitoring was completed periodically during the reporting period to demonstrate that gas is not accumulating at dangerous levels in enclosed spaces on or near the landfill.

The fieldwork methodology for gas accumulation monitoring is summarised below in **Table 3-3**. The location of each gas accumulation monitoring location is shown on **Figure 4** of **Appendix A**.

Table 3-3 Gas Accumulation Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Gas accumulation monitoring for methane was completed monthly during the reporting period in accordance with Section 5 (M2.2) of EPL 5862.
Monitoring Method	Methane was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Gas accumulation monitoring was undertaken in all accessible buildings and other enclosed structures within 250m of deposited waste or leachate storage. Some buildings and structures within 250m were not assessed as they were inaccessible and/or the owner did not permit authority to access the building.
Monitoring Locations	Gas accumulation monitoring was undertaken at the following locations during the reporting period: ▪ Weighbridge ▪ Glengarry Cottage (administrative building)

3.1.4 Stormwater

Stormwater monitoring was completed periodically during the reporting period to detect excess sediment loads in stormwater leaving the site and/or potential cross-contamination of stormwater with landfill leachate.

The fieldwork methodology for stormwater monitoring is summarised below in **Table 3-4**. The location of each stormwater monitoring location is shown on **Figure 4** of **Appendix A**.

Table 3-4 Stormwater Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Stormwater sampling was completed annually in accordance with Section 5 (M2.3) of EPL 5862. Sampling was also meant to occur during an overflow event, however, no overflow events occurred during the reporting period. The annual stormwater sampling event took place on the 19th of February 2018.
Monitoring Method	Stormwater monitoring was completed by a third party contractor, ALS Environmental. Grab samples of water were collected using a scoop at the nominated sampling points (summarised below). The instrument used to measure water quality parameters was calibrated prior to each monitoring event.
Monitoring Locations	Stormwater samples were collected from the following monitoring points in accordance with Section 2 (P1.2) of EPL 5862: ▪ 1 (outlet at Reddalls Road) ▪ 33 (downstream monitoring point) ▪ 34 (upstream monitoring point).
Analytes	In accordance with Section 5 (M2.3) of EPL 5862 each stormwater sample was analysed for: ▪ Alkalinity ▪ Calcium ▪ conductivity ▪ filterable iron ▪ magnesium ▪ pH ▪ sodium ▪ temperature ▪ total phenolics ▪ Ammonia ▪ Chloride ▪ dissolved oxygen ▪ fluoride ▪ nitrate ▪ potassium ▪ sulfate ▪ total organic carbon ▪ total suspended solids

3.1.5 Groundwater

Groundwater monitoring was completed periodically during the reporting period to determine if groundwater was impacted by interactions with leachate.

The fieldwork methodology for groundwater monitoring is summarised below in **Table 3-5**. The location of each groundwater monitoring location is shown on **Figure 4** of **Appendix A**.

Table 3-5 Groundwater Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Groundwater monitoring was completed on a quarterly basis during the reporting period with sampling undertaken on ▪ August 2017 ▪ September 2017 (resample from August sampling event) ▪ November 2017 ▪ February 2018 ▪ May 2018
Monitoring Method	Groundwater was sampled by a third party contractor, ALS Environmental, using bailer technique. A pre-calibrated water quality meter used to measure groundwater quality parameters during monitor well purging. The collected groundwater samples were submitted to ALS Environmental for analysis of contaminants and parameters of interest (summarised below). Ground water levels were recorded before purging.
Monitoring Locations	Groundwater bores monitored during the reporting period included EPL monitoring points: 5 (GABH02), 9 (GMW102), 10 (GM103), 11 (GM104), 12 (GM105), 13 (GM106), 14 (GMW108S), 15 (GMW108D), 16 (GMW109S), 17 (GMW110), 18 (GMW111), 19 (GMW109D) and 20 (BH6)
Analytes	In accordance with Section 5 (M2.3) of EPL 5862 groundwater monitoring points 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20 were analysed for: <u>Annually</u> ▪ Metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt, copper, lead, manganese, mercury, zinc) ▪ Benzene, toluene, ethylbenzene, xylene (BTEX) ▪ Fluoride ▪ Nitrate and nitrite ▪ Organochlorine pesticides (OCP) ▪ Organophosphate pesticides (OPP) ▪ Polycyclic aromatic hydrocarbons (PAH) ▪ Total petroleum hydrocarbons (TPH) ▪ Total phenolics <u>Quarterly</u> ▪ Alkalinity ▪ Calcium, magnesium, potassium, sodium, chloride, sulfate ▪ pH and conductivity ▪ Standing water level ▪ Total dissolved solids (TDS) ▪ Total organic carbon (TOC) ▪ Nitrogen (ammonia) <u>Additional Analysis</u> The Annual Report for the 2016/2017 reporting period noted an upward trend in heavy metal concentrations in groundwater monitoring points 11 and 16 (WCC 2017), particularly barium, chromium, cobalt and lead. In response to the apparent trend, the monitoring frequency of heavy metals in points 11 and 16 was increased from annually to quarterly during the 2017/2018 reporting period to assess the trend more closely. Following elevated concentrations during the August groundwater monitoring event aluminium, barium, cadmium, calcium, chromium, cobalt, copper, lead, manganese, nickel and zinc were tested for total and dissolved concentrations during the September 2017 monitoring event to distinguish between contaminant concentrations in sediments and water.

3.1.6 Trade Wastewater

Monitoring of trade waste was completed periodically during the reporting period to assess waste water discharge and confirm that water quality parameters were within the acceptable criteria. Discharge of trade waste to sewer is undertaken in accordance with the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water 2017).

The fieldwork methodology for trade wastewater monitoring is summarised below in **Table 3-6**. The trade waste monitoring location is shown on **Figure 4** of **Appendix A**.

Table 3-6 Trade Wastewater Monitoring Methodology

Activity	Description
Frequency	Trade wastewater sampling was undertaken on the 11th of August 2017 and every 22 days thereafter. If trade wastewater was not discharged on the scheduled day, then the sample was taken on the next day that trade wastewater was discharged.
Monitoring Method	Trade wastewater was sampled by a third party contractor, ALS Environmental. Composite samples were collected over a 24 hour period using a Composite Auto-sampler, and pre and post monitoring samples were collected as grab samples. Composite samples were obtained over one full production day by combining equal volumes taken at 30 minute intervals. The volumes collected were at least 5,000 millilitres over the full day. The reading of the flowmeter was obtained at the commencement and conclusion of each sampling day. Discrete samples were collected and tested for pH and temperature at the start and finish of each sample day. The probe used to measure water quality parameters was calibrated prior to each monitoring event and the trade wastewater samples collected were submitted to ALS Environmental for analysis of parameters of interest (summarised below).
Monitoring Locations	In accordance with the *Consent* (Sydney Water, 2017) monitoring of trade wastewater was undertaken at a sampling point located at the pre-treatment discharge, excluding domestic sewage and prior to the point of connection to the Sewer. The specific monitoring location was on Site leachate treatment plant which is shown on **Figure 4** of **Appendix A**.
Analytes	Composite samples were submitted to ALS Environmental for analysis of the following: ▪ Electrical conductivity; ▪ Ammonia (as Nitrogen); ▪ Biochemical oxygen demand; ▪ Suspended solids; and ▪ Total dissolved solids. Discrete samples were tested on site for pH, electrical conductivity and temperature using a calibrated water quality meter. Additionally, the volume of wastewater discharged was obtained from the reading of the total flow on the flow metering system.

3.1.7 Waste Tyres

Waste tyres are received at the Site from public drop off and from Council's On Call Household Cleanup service. All tyres received at the Site are temporarily stored in a steel bin and subsequently removed for off-site recycling by a tyre recycling contractor (Tyrecycle Pty Ltd). Waste tyres are not disposed of or buried at the Site.

Council display a NSW EPA Fixed QR2id Plate on the inbound weighbridge to enable inbound vehicles disposing waste tyres to exchange information regarding their load to the EPA under Clause 76 of the Waste Regulation. Any vehicles that fail to scan the QR2id plate at the entry to the landfill are reported by Council to the Waste Operations division of the EPA on a monthly basis (no later than 7 days following the end of each month).

Council follow a procedure (Procedure – Reporting un scanned inbound waste tyres to EPA, TRIM No. Z16/175510) developed to manage waste tyres in a manner that satisfies their obligations under the POEO (Waste) Regulation 2014. The procedure was prepared in consideration of the *Asbestos and Waste Tyre Guidelines* (EPA 2015).

4 Data Quality Objectives

The NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, which is endorsed by the NSW EPA under s105 of the *Contaminated Land Management Act 1997*, requires that Data Quality Objectives (DQOs) are to be adopted for all assessment and remediation programs. The DQO process as adopted by the NSW EPA is described within US EPA (2000) *Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations*.

4.1 Data Quality Objectives

The DQO process has been used to establish a systematic planning approach to setting the type, quantity and quality of data required for making decisions based on the environmental condition of the Site. The DQO process involves the following seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

Activity	Description
Step 1: State the Problem	An Annual Report is required as a condition of EPL 5862 to assess the environmental performance of the Site during the 2017/2018 reporting period. The Annual Report will determine the type, concentrations, and extent of potential contamination / parameters in the matrices sampled including landfill gas (surface and subsurface), leachate, surface water and groundwater.
Step 2: Identify the decision / goal of the study	The NSW EPA requires an Annual Report to confirm if the environmental performance of the Site meets the licence conditions and regulatory obligations of EPL 5862.
Step 3: Identify the information inputs	The primary inputs to the decisions described above are: ▪ Assessment of landfill gas, leachate, surface water and groundwater in accordance with direction of Section 5 (Monitoring and Recording Conditions) of EPL 5862. ▪ Assessment of management procedures for waste tyres. ▪ Laboratory analysis of samples for the contaminants and parameters of interest defined in Section 5 of EPL 5862. ▪ Assessment of analytical results against applicable performance criteria and Section 3 (Limit Conditions) of EPL 5862. ▪ Review of complaints recorded during the reporting period that relate to odour originating from the Site. ▪ Aesthetic observations material encountered during sampling. Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs) outlined below.
Step 4: Define the boundaries of the study	The study site is located at Reddals Road, Kembla Grange NSW. The lateral extent of the study is the site boundaries, as shown on **Figure 2** of **Appendix A**. The vertical extent of the study extends into the landfill gas and groundwater monitoring wells installed during previous investigations. The temporal boundaries of the study are from the 29th of May 2017 to the 28th of May 2018 (i.e. the reporting period).
Step 5: Develop the analytical approach	The decision rules for the Annual Report include: ▪ The sampling points, contaminants and parameters of interest, frequency of sampling and sampling method will meet the requirements EPL 5862. ▪ Samples requiring laboratory analysis will be analysed at National Association of Testing Authorities (NATA) accredited laboratory. ▪ Laboratory QA/QC results will indicate reliability and representativeness of the data set. ▪ Laboratory Limits of Reporting (LORs) will be below the applicable guideline criteria for the analysed contaminants and parameters of interest, where possible. ▪ Applicable guideline criteria will be sourced from EPL 5862 and other NSW EPA endorsed guidelines (as necessary). If the concentration of a contaminant or parameter of interest is outside of the acceptable limit additional works may be required to assess the potential risk.

Activity	Description
Step 6: Specify performance or acceptance criteria	To ensure the results obtained are accurate and reliable, sampling and analysis was undertaken in accordance with the guidance provided in EPL 5862. DQIs are used to assess the reliability of field procedures and analytical results. In particular, the DQIs within NSW EPA (2017) are used to document and quantify compliance. DQIs are described below, and are presented in **Table 4-2**, below: ▪ Completeness – A measure of the amount of useable data (expressed as %) from a data collection activity. ▪ Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event. ▪ Representativeness – The confidence (expressed qualitatively) that data are representative of each media present on the site. ▪ Precision – A quantitative measure of the variability (or reproducibility) of data. ▪ Accuracy (bias) – A quantitative measure of the closeness of reported data to the true value.
Step 7: Develop the Plan for Obtaining Data	Sampling and Analysis has been undertaken in compliance with EPL 5862 by qualified technical staff with analysis completed by a NATA accredited Laboratory. Results are discussed within this report.

4.2 Data Quality Indicators

The following DQIs referenced in Step 6 in **Table 4-1**, have been adopted in accordance with the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*. The DQIs outlined in **Table 4-2** assist with decisions regarding the contamination status of the site, including the quality of the laboratory data obtained.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	Each sampling event	All samples
Suitably qualified and experience sampler	Each sampling event	All samples
Appropriate lab methods and limits of reporting (LORs)	Each sampling event	All samples
Chain of custodies (COCs) completed appropriately	Each sampling event	All samples
Compliance with all sample holding times	All samples	All samples
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All samples
Experienced sampler	All samples	All samples
Climatic conditions (temperature, rain, wind etc) recorded and influence on samples quantified (if required)	All samples	All samples
Consistent analytical methods, laboratories and units	All samples	All samples
Representativeness		
Sampling technique appropriate for each media and analytes (appropriate collection, handling and storage)	All samples	All Samples

Samples homogenous	All samples	All Samples
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts detected and assessed
Samples extracted and analysed within holding times	All samples	All samples
Precision		
Laboratory duplicates	1 per 20 samples	<20% RPD Result > 20 × LOR <50% RPD Result 10-20 × LOR No Limit RPD Result <10 × LOR
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	<LOR

5 Performance Criteria

Environmental monitoring data gathered during the reporting period was screened against the applicable criteria for each sample type / matrix as summarised below.

5.1 Surface Gas

The results of surface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold level for further investigation and potential action was detection of methane at any point of the landfill above 500 parts per million (ppm).

5.2 Subsurface Gas

The results of subsurface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold levels for further investigation and corrective action were detection of methane at concentrations above 1% (volume/volume) and carbon dioxide at concentrations of 1.5% (v/v) above established natural background levels.

5.3 Gas Accumulation

The results of gas accumulation monitoring within enclosed buildings and structures were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold level for further investigation and corrective action was detection of methane at concentrations above 1% (v/v).

5.4 Water

5.4.1 Stormwater

In accordance with Section 3 (L1.2) of EPL 5862 the performance criteria for stormwater was no discharge of contaminated stormwater to waters under dry weather conditions (less than 10mm of rainfall within a 24hr period) or a storm event/s of less than 1:10 year, 24 hour recurrence interval (less than 297.4 mm of rainfall within a 24 hour time period).

The contaminants and parameters applicable to stormwater samples are provided in Section 5 (M2.3)

In addition, and in accordance with Section 3 (L2) of EPL 5862, the performance criteria for the stormwater monitoring and discharge point at Reddalls Road, known as Monitoring Point 1, include:

- pH: a 100 percentile concentration limit of 6.5 to 8.5
- Total Suspended Solids: a 100 percentile concentration limit of 50 mg/L

Samples were also screened against the guidelines summarised below in **Section 5.4.3**

5.4.2 Leachate Discharge

In accordance with Section 3 (L1.3) of EPL 5862 the limit for leachate was no discharge of leachate to waters under dry weather conditions (less than 10mm of rainfall within a 24hr period) or a storm event/s of less than the 1:25 Average Return Interval (ARI), 24 hour recurrence interval (less than 371.5 mm of rainfall within a 24 hour time period). The performance criteria adopted for leachate discharges was based on records regarding the timing and nature of leachate discharges during the reporting period.

5.4.3 Groundwater

The selected performance criteria for groundwater samples were based on the recommendations of the *Environmental Guidelines* (EPA 2016) and in consideration of the land use, site setting and the plausible interactions between potential contaminants and human and environmental receptors. A conceptual site model is provided in **Section 8.9** that further discusses these interactions.

The Environmental Guidelines (EPA 2016) screening groundwater analytical results against the *National Environment Protection (Assessment of Site Contamination) Measure* (National Environment Protection Council, 2013), specifically:

> Schedule B1, Table 1C Groundwater Investigation Levels, which summarises trigger values from:
  - *Australian Water Quality Guidelines* (ANZECC 2000):

The results were screened against the criteria for 80%, 90% and 95% species protection trigger levels, which refers to the percentage of species expected to be protected. A brief overview of each protection level is provided below:

- The 80% protection level trigger values apply to ecosystems that are highly disturbed with limited conservation value;
- The 90% protection level trigger values apply to ecosystems that are moderately disturbed with low conservation value; and
- The 95% protection level trigger values apply to ecosystems that are slightly to moderately disturbed with a moderate conservation value.

Each protection trigger level was applied to groundwater data gathered during the reporting period, however, given the high level of disturbance at the site and the predominantly industrial surrounding land use the 90% levels are considered most appropriate to adopt as a performance criteria.

- *Australian Drinking Water Guidelines* (National Health and Medical Research Council and the Natural Resource Management Ministerial Council, 2011, updated 2014) (ADWG).

Surface water and groundwater are not utilised for human consumption at the Site, however, it is plausible that groundwater is used for agricultural (irrigation and stock watering). As such the ADWG have been adopted.

> Schedule B1, Table 1A (4) Health Screening Levels groundwater for petroleum hydrocarbons.

5.4.4 Trade Wastewater

Trade wastewater analytical results were screened against the criteria provided in the *Consent* (Sydney Water, 2017). The *Consent* provides criteria for a variety of parameters for the long term average daily mass (LTADM) and the maximum daily mass (MDM).

In addition to analytical performance criteria the *Consent* provides limits for aesthetic properties of trade wastewater including temperature, colour, pH, fibrous materials, gross solids and flammability, and limits to the rate of discharge of wastewater to sewer.

5.5 Waste - Tyres

Section 3 (L3.2) of EPL 5862 states that the licensee must not dispose of any tyres on the premises which:

> Have a diameter of less than 1.2 metres;

> Are delivered at the premises in a load containing more than 5 whole tyres; and

> Became waste in the Sydney Metropolitan Area.

Section 3 (L3.3) states that tyres stockpiled on the premises must:

> Not exceed fifty tonnes of tyre at one time;

> Be located in a clearly defined area away from the tipping face;

> Be managed to control vermin; and

> Be managed to prevent any tyres from catching fire.

5.6 Odour

In accordance with Section 3 (L4) of EPL 5862 offensive odour must not emit beyond the boundary of the premises. The performance criteria adopted for potential offensive odour emissions was occurrences (if any) of complaints from members of the public relating to odour.

6 Results

Monitoring results gathered during the reporting period are provided in the data tables in **Appendix B** and are summarised in the relevant subsections below. Laboratory certificates of analysis and quality reports have not been appended to this report due to the large number of files, however, they can be provided upon request.

A list of ALS Environmental Work Order numbers applicable to environmental monitoring and analysis completed during the reporting period are summarised below in **Table 6-1**.

Table 6-1 Laboratory Work Order Numbers

Sample Media	Work Order Number	
Groundwater	EW1802085	EW1800650
	EW1703553	EW1800652
	EW1704003	EW1802296
	EW1704789	
Stormwater	EW1703487	EW1801054
	EW1800651	EW1800935
Trade Wastewater	EW1702528	EW1704412
	EW1702795	EW1704913
	EW1703130	EW1705356
	EW1703409	EW1705429
	EW1703660	EW1800340
	EW1703690	EW1800726
	EW1704251	EW1801099

6.2 Gas

6.2.1 Surface Gas

The highest reported concentration of methane was 144 ppm measured at transact 10 during the October 2017 monitoring event, below the threshold level for further investigation and corrective action of 500 ppm.

Surface gas monitoring results from the reporting period are summarised in **Tables 1A** to **1F** of **Appendix B**.

6.2.2 Subsurface Gas

The highest reported concentration of methane was 0.0067% (v/v), measured in monitoring point 27 (LFGMW7) during the May 2018 monitoring event, below the threshold level for further investigation and corrective action of 1% (v/v).

Monitoring points 31 (LFGMW11) and 32 (LFGMW12) were inaccessible during the April monitoring event.

Subsurface gas monitoring results from the reporting period are summarised in **Table 2** of **Appendix B**.

6.2.3 Gas Accumulation

The highest reported concentration of methane was 0.00044 % (v/v), measured within the weighbridge during the April 2018 monitoring event, below the threshold level for further investigation and corrective action of 1 % (v/v).

Gas accumulation monitoring results from the reporting period are summarised in **Table 3** of **Appendix B**.

6.3 Stormwater

Controlled releases of uncontaminated stormwater occurred on ten (10) occasions during the reporting period with standing water level, turbidity and pH measured and validated prior to each release.

pH and turbidity were measured using a water quality meter prior to each release and samples of stormwater were collected and submitted for laboratory analysis of TSS on four occasions to validate the accuracy of field turbidity measurements. Prior to each release pH was measured between 6.5 to 8.5 and TSS was below 50 mg/L.

Stormwater monitoring results from the annual sampling event are summarised in **Table 4** of **Appendix B** with the pertinent findings provided below:

- Ammonia was reported at a concentration of 1.82 mg/L in the stormwater sample collected from Point 33, above the ANZECC 90% protection trigger level of 1.43 mg/L. Ammonia was reported below the performance criteria in all other samples.
- The highest reported concentration of TSS was 76 mg/L in the stormwater sample collected from Point 33. The TSS concentration of Point 1 was 16 mg/L, below the EPL limit specific to Point 1 of 50 mg/L.
- A pH of 9.7 was reported in the stormwater sample collected from Point 1, outside of the acceptable pH range from the EPL of 6.5 to 8.5.

6.4 Leachate

No uncontrolled off site discharges of leachate occurred during the reporting period under dry or wet weather.

6.5 Groundwater

6.5.1 Groundwater Levels

Groundwater levels measured at the site during the reporting period are summarised in **Table 5A** of **Appendix B** and ranged from 1.65m below ground level (bgl) in groundwater monitoring Point 20 (BH6) to 11.7m bgl in groundwater monitoring point 12 (GMW105).

6.5.2 Laboratory Results

Groundwater data tables are provided in **Tables 5A** to **5F** of **Appendix B** with the pertinent findings summarised below:

- Benzene, toluene, ethylbenzene and xylenes (BTEX) and TPH were not detected above the laboratory limits of reporting (LORs) in any groundwater sample collected during the reporting period (refer to **Table 5B** of **Appendix B)**.
- PAH was not detected above the laboratory LORs in any sample, however, it is noted that the adopted criteria for anthracene and benzo(a)pyrene were below the laboratory limit of reporting (refer to **Table 5A** of **Appendix B)**. Therefore the results of anthracene and benzo(a)pyrene cannot be screened against the criteria, which is further discussed in **Section 9.2**.
- A summary of heavy metals results is provided below and tabulated in **Table 5C** of **Appendix B**:
  - Aluminium (total) concentrations ranged from 0.21mg/L in monitoring point 19 to 229 mg/L in point 11, with all samples containing aluminium above the ANZECC 90% protection trigger level of 0.08 mg/L. The dissolved concentration of aluminium in point 11 was 0.44 mg/L and in point 16 was 0.42 mg/L, also above the ANZECC 90% trigger level.
  - Arsenic, barium and mercury were below reported at concentrations below the adopted performance criteria for all samples.
  - Cadmium (total) concentrations ranged from below the laboratory limit of reporting (multiple samples) to 0.0006 mg/L in monitoring point 11. The concentration recorded for point 11 is above the ANZECC 90% protection trigger level of 0.0004 mg/L but below the ADWG criteria of 0.002 mg/L. Dissolved cadmium was below the laboratory LOR in point 11.
  - Chromium (hexavalent) was not detected above the laboratory limit of reporting in all groundwater samples collected during the reporting period, however, it is noted that the adopted criteria is below the laboratory limit of reporting. Therefore the results cannot be screened against the performance criteria, which is further discussed in **Section 9.2**.
  - Copper (total) concentrations ranged from 0.002 mg/L (multiple samples) to 0.32 mg/L (point 11) with all results above the ANZECC 90% protection trigger level of 0.0018 mg/L but below the ADWG criteria of 2 mg/L. Dissolved copper was below the laboratory LOR for point 11 and 0.003 mg/L, above the ANZECC 90% protection trigger level but below the ADWG criteria.

- Lead (total) concentrations ranged from below the laboratory limit of reporting (point 15) to 0.32 mg/L (point 11) with all results above the ANZECC 90% protection trigger level of 0.0018 mg/L but below the ADWG criteria of 2 mg/L. Dissolved lead was below the laboratory LOR for point 11 and point 16.
- Manganese (total) concentrations ranged from 0.021 (point 15) to 7.15 mg/L (point 11) with seven samples above the ANZECC 90% protection trigger level of 2.5 mg/L and nine samples above the ADWG criteria of 0.5 mg/L. Dissolved manganese was 0.415 mg/L in point 11 and 3.19 mg/L in point 16, above the ANZECC 90% protection trigger level.
- Nickel (total) concentrations ranged from 0.028 (point 16) to 0.88 mg/L (point 11) with seven samples above the ANZECC 90% protection trigger level of 0.013 mg/L. Dissolved nickel was 0.002 mg/L in point 11 and 0.009 mg/L in point 16, below the criteria.
- Zinc (total) concentrations ranged from 0.01 mg/L (multiple samples) to 0.61 mg/L (point 11) with fifteen samples above the ANZECC 90% protection trigger level of 0.015 mg/L. Dissolved zinc was below the laboratory LOR in point 11 and 0.022 in point 16, above the ANZECC 90% trigger level.
- Specific trigger values were not provided in the adopted performance criteria for calcium, cobalt, magnesium and potassium.

> A summary of inorganics is provided below and tabulated in **Table 5D** of **Appendix B**:

- Ammonia concentrations ranged from below the laboratory limit of reporting (multiple samples) to 0.82 mg/L in point 16, with all samples below the adopted performance criteria.
- Fluoride concentrations ranged from 0.1 mg/L (point 16) to 0.9 mg/L in point 20, with all samples below the adopted performance criteria.
- Nitrate concentrations ranged from 0.01 mg/L (point 14) to 0.52 mg/L in point 17, with all samples below the adopted performance criteria.
- Specific trigger values were not provided in the adopted performance criteria for alkalinity, chloride, nitrite, sodium, TDS, TOC and sulfate.

> A summary organochlorine pesticides is provided below and tabulated in **Table 5E** of **Appendix B**:

- OCP contaminants aldrin and dieldrin, chlordane, dichlorodiphenyltrichloroethane (DDT), endrin, lindane and heptachlor were not detected above the laboratory limit of reporting in any sample, however, it is noted that the adopted criteria were below the laboratory limit of reporting. Therefore the results cannot be screened against the criteria, which is further discussed in **Section 9.2**.

> A summary organophosphorus pesticides is provided below and tabulated in **Table 5E** of **Appendix B**:

- OPP contaminants azinophos methyl, chlorpyrifos, diazinon, dimethoate, malathion, methyl parathion and parathion were not detected above the laboratory limit of reporting in any sample, however, it is noted that the adopted criteria were below the laboratory limit of reporting. Therefore the results cannot be screened against the criteria, which is further discussed in **Section 9.2**.
- Bromophos-ethyl, carbophenothion, chlorfenvinphos, dichlorvos, ethion, fenthion, fethyl parathion, monocrotophos, fenamiphos and pirimphos-ethyl were not detected above the laboratory limit of reporting and were therefore below the adopted performance criteria.

> Electrical conductivity ranged from 354 µS/cm (point 9) to 5,730 µS/cm (point 5) (refer to **Table 5F** of **Appendix B)**.

> pH ranged from 5.8 (point 12) to 7.5 (point 11) (refer to **Table 5F** of **Appendix B)**.

> Total organic carbon ranged from 8 mg/L (point 5) to 9 mg/L (point 20) (refer to **Table 5F** of **Appendix B)**.

6.6 Trade Wastewater

A summary of trade wastewater monitoring is provided below and tabulated in **Table 6** of **Appendix B**:

Trade wastewater monitoring was undertaken 18 times during the reporting period. The results of monitoring showed that on each occasion volume discharge, total dissolved solids, suspended solids, ammonia as N, biochemical oxygen demand and temperature were within the acceptable criteria provided in the *Consent* (Sydney Water, 2017).

pH was measured at the commencement and completion of each monitoring event and a non-conformance with the Sydney Water criteria was recorded on the 17th of August 2017. A pH of 6.5 was recorded at commencement and completion of monitoring, which is outside of the acceptable criteria of 7 to 10.

6.7 Waste Tyres

Section 3 (L3.2) of the EPL provides limitations on the size and number of waste tyres that can be disposed at the premises. Council do not dispose of waste tyres on Site but instead receives and temporarily stores them until they are collected by an external contractor, Tyrecycle Pty Ltd, for recycling. As such the license condition L3.2 do not apply to the site operations during the reporting period.

Section 3 (L3.3) of the EPL states a number of requirements relating to tyre stockpiles at the Site. Stockpiles of types on Site during the reporting period were compliant with L3.3, specifically:

- Tyre stockpiles did not exceed fifty tonnes at one time. The tyre storage bin at the site has a capacity of 150 tyres, which when full equates to significantly less than fifty tonnes. Council's Operations team regularly scheduled outbound loads of waste tyres to ensure that the capacity of the bin is not exceeded;
- The tyre stockpile was clearly defined and situated approximately 450m from the tipping face during the reporting period; and
- The tyre stockpile was scheduled for frequent removal mitigating the potential for vermin impact and fire risk.

6.8 Odour

A total of nine complaints were received by Council from members of the public during the reporting period relating to offensive odour detected at an offsite location. An Environmental Incident Form was completed for each complaint with the pertinent information summarised below in **Table 6-2**. The complaints received during the EPL reporting period were used to assess the Sites environmental performance for odour.

Table 6-2 Complaints Summary

Date of Complaint	Nature of Complaint	Additional Information
14/06/2017	Offensive odour	Offensive odour reported to EPA on 14 June 2017. EPA forwarded the complaint to Wollongong City Council - waste services via email on 27 June 2017. Exceptional circumstances were not undertaken at the time of the complaint. The deodoriser was present on site and accessible for workers.
19/08/2017	Offensive odour	An after-hours call was received by EPA (Ref 147636). A strong offensive odour was reported from near Whytes gully tip, with the odour first noted around 5pm. Reviewed weather station data and waste works diary to identify issues that may be responsible. No unusual operational activities occurred around the incident date and time. The team working at the tip face were reminded to follow operational procedures and to cover waste in accordance with the EPL.
13/01/2018	Offensive odour	A complaint of offensive odour was received by the EPA from an individual located at the Farmborough Heights area at around 12:30pm. The weather was hot (30°C) with previous days up to 40°C+. Winds were gusting 50km/hr from the west-north-west. No unusual operational activities occurred at Site around the complaint date and time. The Site Waste Coordinator visited Highview Drive (Farmborough Heights) and could not detect an offensive odour.
16/01/2018	Offensive odour	Three complaints of offensive odour were received by the EPA from the Farmborough Heights area. The individual who reported the odour advised the odour was ongoing and offensive. No unusual operational activities occurred at Site around the complaint date and time. The Site Waste Coordinator visited Highview Drive (Farmborough Heights) and could not detect an offensive odour. The individual who reported the odour was contacted by phone by Council to confirm the nature of the complaint.
17/01/2018	Offensive odour	A complaint of offensive odour was received by the EPA from an individual located at the Farmborough Heights with the reported odour described like a "horse stable smell". The weather was warm (21°C) with previous days up to 40°C+. Winds were gusting 48km/hr from the south-south-east. No unusual operational activities occurred at Site around the complaint date and time. The Site Waste Coordinator visited Highview Drive (Farmborough Heights) and could not detect an offensive odour.

Date of Complaint	Nature of Complaint	Additional Information
5/03/2018	Offensive odour	An offensive odour was reported to the EPA at 8:00am from an individual located at Farmborough Heights. The odour was noted for a period of 1.5hr on two consecutive mornings on the 5th and 6th and was described by the individual as faint. The individual also noted that the odour is usually smelled early in the morning following rainfall events and suspects it is associated with removal of daily cover. There was a slight breeze from the south-west at the time of the complaint. No unusual operational activities occurred at the time of the complaint. The deodoriser was in place and utilised prior to lifting lids in the morning.
20/03/2018	Offensive odour	An individual from Farmborough Heights reported a strong offensive odour. The wind at the time of the complaint was up to 41km/hr from the south-east.
20/04/2018	Offensive odour	An offensive odour was reported to the EPA at from an individual from Farmborough Heights at 1:00pm. The individual reported the presence of a strong odour from within their house that they believed was originating from the Site. The weather conditions at the time of the complaint was mild with only slight winds from the south-east. No unusual operational activities occurred at Site around the complaint date and time. The team working at the tip face were reminded to follow operational procedures and to cover waste in accordance with the EPL.

7 Quality Assurance / Quality Control

A detailed overview of the QA/QC program including internal laboratory QA/QC is included in **Appendix C**. A summary of the results of the QA/QC performance are included in the following sections.

7.1 Laboratory QA/QC

The selected analytical laboratory, ALS Environmental, undertake internal QA/QC procedures which include the analysis of method blanks, internal duplicate samples, laboratory control samples, matrix spikes and surrogate recovery. Additionally, laboratory QA/QC measures include receipt, logging, storage, preservation, holding time and analysis of samples within the method specified.

A review of the laboratory QA/QC procedures indicates that laboratory QA/QC procedures were within specified ranges for all samples with the exception of three duplicates, four laboratory control samples and four matrix spikes. In addition, five matrix spike recoveries were unable to be determined as the background level was greater than or equal to the four times the spike level.

Samples were received and stored appropriately and all samples were analysed within the specified holding time.

7.2 Data Useability

The data validation process of laboratory QA/QC data indicates that the reported analytical results are representative of the conditions at the sample locations and that the analytical data can be relied upon for the purpose of the Annual Report for EPL 5862.

8 Discussion

The data and information gathered during the reporting period is discussed below in consideration of the performance criteria. In addition and in accordance with Section 6 (R1.8) of EPL 5862, historical laboratory results have been tabulated and presented in graphical format that compares data from at least three years (where available).

Trend graphs are provided in **Appendix D** and summarised below in the sections below, however, trend graphs and a discussion has not been provided for OCP, OPP, PAH, BTEXN or Phenolics as these contaminants have historically never been reported above the laboratory limit of reporting.

8.1 Surface Gas

Surface gas monitoring completed during the reporting period did not identify surface methane concentrations that exceeded the threshold level. As such non-conformances of the EPL did not occur during the reporting period with respect to surface gas emissions.

8.2 Subsurface Gas

Subsurface gas monitoring completed during the reporting period did not identify subsurface methane at concentrations that exceeded the threshold level. As such non-conformances of the EPL did not occur during the reporting period with respect to subsurface gas.

8.3 Gas Accumulation

Gas accumulation monitoring completed during the reporting period did not identify methane at concentrations that exceeded the threshold level. As such non-conformances of the EPL did not occur during the reporting period with respect to gas accumulation.

8.4 Stormwater

No uncontrolled releases of contaminated stormwater occurred during the reporting period under dry weather or storm events. As such non-conformances of the EPL did not occur with respect to releases of stormwater.

A pH of 9.7 was measured at Point 1 at the time of sample collection during the annual monitoring event, which is outside of the acceptable range of 6.5 to 8.5 provided in EPL 5862. The pH at Points 33 and 34 were 7.5 and 7.6, respectively, substantially below that measured at Point 1 and within the neutral range. The elevated pH at Point 1 correlates with high concentrations of alkalinity (carbonate as calcium carbonate), chloride, sodium and sulfate when compared with that of Points 33 and 34.

An elevated concentration of ammonia was reported in the sample collected from Point 33, exceeding the ANZECC 90% protection limit. Points 1 and 34 were significantly lower with concentrations marginally above the laboratory LOR. Point 33 is located in an adjoining property to the south and the sample was collected from a surface water body approximately 150 m south west of the Site boundary. The elevated ammonia concentration at this location may indicate potential interaction with leachate originating at the Site through groundwater discharging into the surface water body or from a release of leachate from storage ponds.

Reddalls Road is a public road that is frequently utilised by vehicles associated with local heavy industry. The road passes between the Site boundary and Points 1 and 33 and it is inferred that surface water runoff from Reddalls Road would flow to each monitoring point. It is also noted that monitoring Points 1 and 33 were stagnant at the time of sampling and that releases of stormwater and leachate did not occur during the reporting period. These factors are further discussed in the recommendations in **Section 9.2**.

8.4.1 Trend Analysis

A series of graphs showing trends in stormwater contaminant and parameter levels are provided in **Sheets 1A** to **1E** of **Appendix D** and are discussed below.

The pH of Point 1 increased sharply from last reporting period from 7.7 to 9.7 as shown on **Sheet 1D**. The pH at Point 1 has historically ranged from 7.1 to 8.0 in the previous three years with the measurement of 9.7 the highest pH recorded at this location. The pH of Point 33 and 34 remained relatively stable.

TSS at Point 33 showed an upward trend from the previous year but remained within the typical range during the previous three years.

The remainder of contaminants and parameters did not deviate significantly from the concentrations reported during the previous three years.

8.5 Groundwater

8.5.1 Groundwater Levels

Interpretation of groundwater levels across the Site from the reporting period indicate that the inferred groundwater flow direction is from the north east to the south west, which is consistent with the local topography and is shown on **Figure 4** of **Appendix A**. Groundwater is situated at the greatest depths in the higher elevations of the Site toward the north eastern corner and is shallowest in the south eastern boundary in close proximity to the nearest surface water body, Dapto Creek.

It is noted that groundwater monitoring points 9, 12 and 13 were dry during the February 2018 monitoring event. These wells are located in the higher elevations of the site along the northern and western boundary. Climatic data from the Albion Park weather station summarised in **Table 2-1** indicates that 49.8mm of rain fell in December and 56.0mm in January, down from the long-term averages of 67.0mm and 72.9mm, respectively.

Consequently the wells that were dry during the February monitoring event were unable to be sampled and analysed for the 'yearly' contaminants listed in table M2.3 of the EPL.

8.5.1.1 Trend Analysis

A series of graphs showing groundwater level trends are provided in **Sheet 2** of **Appendix D** and discussed below.

Groundwater levels have remained relatively stable over the previous three years with the exception of EPA monitoring points 5, 9, 12 and 13.

The groundwater depth recorded in monitoring point 5 during the May 2017 monitoring event was 10.65 meters below ground level (mbgl), significantly deeper than historical groundwater depths recorded (typically around 5 mbgl). Monitoring point 5 is situated in the lower lying portion of the Site toward the western boundary. The groundwater levels remained stable during the 2017/2018 reporting period and the unusual groundwater depth of 10.65 mgbl recorded in 2017 is considered an anomaly or a reporting error by ALS Environmental, with subsequent depths returning normal values.

The groundwater depth in monitoring point 9 has historically fluctuated between 1.95 to 11.68 mbgl but had never been recorded as dry. Monitoring point 9 is situated at a relatively high elevation and is located along the northern boundary of the Site. The well was recorded as dry during the February 2018 monitoring event and may be a consequence of dry weather conditions prior to the sampling event.

The groundwater depth in monitoring point 12 has historically remained relatively stable fluctuating between 10 to 12 mbgl, but had never been recorded as dry. Monitoring point 12 is situated at a relatively high elevation and is located along the eastern boundary of the Site. The well was recorded as dry during the February 2018 monitoring event and may be a consequence of dry weather conditions prior to the sampling event.

Monitoring point 13 was recorded as dry during the reporting period which is consistent with historical records. Monitoring point 12 is situated at a relatively high elevation and is located along the eastern boundary of the Site.

8.5.2 Laboratory Results

Groundwater analysis completed during the reporting period showed that the majority of contaminants and parameters of interest specified in EPL 5862 were below the laboratory LORs or the performance criteria, including BTEX, TPH, PAH, ammonia, fluoride and nitrate.

Performance criteria are not provided for alkalinity, chloride, nitrite, sodium, TDS, TOC and sulfate however the results were generally comparable with historical data and are not considered unusual or concerning in the context of the Site and surrounding land use. EPA monitoring points 5, 17, 18 and 20 are located in the lower elevations of the Site toward the western and southern western boundary and generally had the highest concentrations. EPA monitoring points 9, 10, 12 and 13 generally contained the lowest levels of the parameters, with the wells located in the higher elevations toward the northern and eastern boundary. This indicates that wells situated down gradient of buried waste have the relatively higher concentrations.

Numerous heavy metal concentrations were reported above the adopted performance criteria during the reporting period including aluminium, cadmium, copper, lead, manganese, nickel and zinc. The

concentrations reported were for total metals in accordance with the EPL requirement, however, it is important to note that the adopted screening criteria recommended by the *Environmental Guidelines* (EPA 2016) are intended for application to concentrations of dissolved metals. As such the exceedances are not necessarily indicative of environmental concern with the contaminant concentrations most likely attributed to the presence of sediment in unfiltered samples. Monitoring Points 11 and 16 typically had the highest concentrations of total metals and samples from both locations were analysed for both total and dissolved metals on during the September monitoring event. The results show that that dissolved heavy metal concentrations were significantly lower than total metals, with exceedances of the adopted criteria generally limited to aluminium, copper, manganese and zinc in Point 16.

8.5.2.1 Trend Analysis

A trend graph and discussion has not been provided for OCP, OPP, PAH, BTEXN or Phenolics as these contaminants have never been reported above the laboratory limit of reporting.

A series of graphs showing trends in groundwater contaminant and parameter levels for annual monitoring are provided in **Sheet 3A** to **3I** of and graphs for quarterly monitoring are provided in **Sheets 3A** to **3I** of **Appendix D**, and are discussed below.

The trend graphs from the annual groundwater monitoring event shows that contaminant and parameter concentrations have remained steady and relatively consistent with the three years prior, with a general decline in contaminant concentrations. It is noted that several monitoring wells were dry during the annual monitoring event and therefore trend analysis was unable to be completed for the entire well network.

8.6 Trade Wastewater

Trade wastewater was discharged into the sewer network in accordance with the Consent (Sydney Water 2017) with only one non-conformance recorded during the reporting period. A pH of 6.5 was measured at the commencement and completion of monitoring during the event on the 17th of August 2017.

The pH of 6.5 was attributed to damage to the leachate line during construction of a new leachate pond with the civil earthworks contractor, Ertech, striking the leachate line. Process and Operations Engineers from INNACO indicated that the low pH was most likely a consequence of damaged to the leachate line.

pH measurements during the monitoring events prior to and after the 17th of August monitoring event were between 7.7 and 10 (within the acceptable criteria), indicating that the non-conformance of pH was an isolated occurrence and the repairs to the leachate line effectively mitigated the issue.

8.7 Waste Tyres

Waste tyres received at the site are managed in accordance with a procedure that satisfies Councils obligations under the POEO (Waste) Regulation 2014. Tyres are temporarily stored at the site before being collected by a third party contractor for recycling.

Non-conformances of the EPL did not occur during the reporting period with respect to waste tyres.

8.8 Odour

Section 3 (L4) of EPL 5862 states that offensive odour must not emit beyond the boundary of the premises. A total of nine complaints relating to odour were received from members of the public during the reporting period. In each instance the individual making the complaint believed the subject odour was originating from the Site.

The nearest sensitive receptor to the Site is a residential dwelling located approximately 150m north of the current active tip face and the suburb of Farmborough Heights (predominantly low density residential) is located approximately 500m north east.

Given the relative close proximity of sensitive receptors (residences) to the Site, and based on a review of the odour complaints received during the reporting period, it appears that odours thought to originate at the Site occur predominantly when the wind is from the south, following rainfall and on hot days.

The controls for mitigating release of odour, including application of daily cover and the use of a deodoriser, were utilised at the time of each complaint. Additionally, the Site Waste Coordinator visited the location of the complaint on numerous occasions to validate the complaint, however was unable to detect an offensive odour on any occasion.

8.9 Conceptual Site Model

Generally, a conceptual site model (CSM) provides an assessment of the fate and transport of contaminants of potential concern (CoPC) relative to site specific subsurface conditions with regard to their potential risk to human health and the environment. The CSM takes into account site-specific factors including:

- Source(s) of contamination;
- Identification of CoPC associated with past (and present) source(s);
- Vertical, lateral and temporal distribution of CoPC;
- Site specific lithologic information including soil type(s), depth to groundwater, effective porosity, and groundwater flow velocity; and
- Actual or potential receptors considering both current and future land use both for the site and adjacent properties, and any sensitive ecological receptors.

Based on the results discussed in this report a CSM has been developed and is outlined below in **Table 8-1**. Additional details are included in the sections that follow as necessary.

Table 8-1 Conceptual Site Model

CSM Element	Description
Contaminant Sources	Known contaminant sources at the site include: ▪ Historical site use as a landfill since the early 1980's for deposition of domestic and commercial waste streams. ▪ Leachate resulting from degradation of buried waste and interaction with groundwater.
Site Current and Future Use	The site is an operational landfill that receives waste from the Wollongong City Council local government area. It is anticipated that the landfill will remain operational and continue to receive waste for the foreseeable future with a projected lifespan of at least 40 years based on current landfilling rates.
Site Geology	A geotechnical investigation (Golder 2012) indicates that the site is situated on two geological units. The Pheasants Nest Formation was noted on the upper slopes across the northern portion the site. The material encountered was generally weathered sandstone that grades into fresh sandstone at depths typically less than 10 m below ground level. The Budgong Sandstone Formation was located across the southern portion of the site. The sandstone generally had a weathering profile that extended to depths up to 15 m bgl. In addition to the natural geology the historical and current landfill cells have been covered with a capping layer typically comprising low to medium plasticity sandy clay with a thickness less than 1.5m. Underlying the landfill cap is predominantly domestic waste including paper, plastic, wood, rubble and other materials.
CoPCs	The CoPC listed in EPL 5862 include heavy metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt, copper, lead, manganese, mercury, zinc), polycyclic aromatic hydrocarbon, total petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylenes, naphthalene, organochlorine pesticides, organophosphate pesticides and phenolics. In addition to CoPC the EPL identifies potentially hazardous landfill gasses including methane and carbon dioxide.
Extent of Impacts	The extent of potential contamination would primarily be located immediately below and down gradient of the tip face. Monitoring undertaken during the reporting period indicates that contaminants above the adopted criteria are limited to heavy metals aluminium, cadmium, copper, lead, manganese and zinc. Other CoPC were reported below the laboratory limit of reporting or the adopted criteria, however, it is noted that several contaminants including PAHs, OCPs and OPPs were unable to be screened against the adopted criteria as the laboratory LORs was reported higher than the criteria. Methane was detected during the reporting period atop the current and previous tip face (surface gas), subsurface and within enclosed structures, however, the concentrations were below the threshold level for further investigation and corrective action.
Potential Human Receptors	Potential human receptors include: ▪ Employees working at the tip face in earthworks plant and machinery;

	▪ Employees working within enclosed structures including the weighbridge and office; ▪ Trespassers who illegally access the site; ▪ Contractors constructing the new landfill cell; ▪ Contractors undertaking scheduled environmental monitoring (surface water, groundwater and landfill gas); and ▪ Individuals working or living near the site.
Potential Ecological Receptors	Potential ecological receptors include: ▪ Dapto Creek which is the nearest offsite down gradient surface water body and the downstream surface water bodies including Mullet Creek and Lake Illawarra; ▪ Groundwater under the site being impacted as a result of the vertical migration of contaminants from leachate and buried waste; and ▪ Flora and fauna on the site interacting with contaminants in the soils including birds scavenging from the tip face.
Potential Contaminant Pathways	Potential contaminant pathways include: ▪ Dermal contact with contaminated materials including soil, waste and hazardous building materials; ▪ Dermal contact with contaminated media including surface water, groundwater and leachate; ▪ Inhalation of hazardous landfill gases emanating from buried waste and leachate; ▪ Inhalation of volatile contaminants and/or asbestos fibres; ▪ Ingestion of contaminant impacted materials including soil, waste and hazardous building materials; ▪ Potential contaminant uptake by vegetation; and ▪ Potential ingestion of contaminant impacted fresh produce (fruit and vegetables) grown down gradient of the site.

8.9.2 Data Gaps and Uncertainties

The assessment of potential contamination at the site was based on a site inspection and review of available historical reports and information. As such, the lateral and vertical extent of potential contamination in soil is unknown.

9 Conclusions and Recommendations

9.1 Conclusions

The following can be concluded based on the monitoring undertaken during the reporting period:

- Council implemented an environmental monitoring program during the 2017/2018 reporting period that satisfied the conditions and requirements of EPL 5862 and the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water, 2017).
- Water contained in stormwater and leachate ponds at the Site were managed such that uncontrolled releases of contaminated water did not occur during the reporting period.
- Monitoring results show that surface and subsurface hazardous ground gases were not present at concentrations that exceed the adopted performance criteria.
- Stormwater samples collected from surface water bodies down gradient of the site generally showed contaminant and parameter concentrations below the performance criteria. pH and ammonia were outside of the acceptable limits at Point 1 and 33, respectively. The results of future sampling events should be monitored closely to confirm the concentrations as discussed below in **Section 9.2**.
- Heavy metals were detected above the performance criteria in groundwater at numerous monitoring wells, however, samples were submitted for analysis of total metals and therefore the elevated concentrations may be due to the presence of sediments. Future monitoring events should also assess dissolved concentrations of heavy metals to determine if elevated metals are attributed to sediment or if they exist in dissolved phase, as discussed below in **Section 9.2**.
- Management and handling of waste tyres at the Site was undertaken in a manner that was compliant with the EPL conditions.
- Complaints from the public relating to offensive odours originating from the Site were received during the reporting period. Each complaint was investigated by Council to confirm the nature of the complaint and to identify suitable corrective actions. Recommendations designed to improve odour at the site are provided below in **Section 9.2**.

9.2 Recommendations

Based on the conclusions of this report the following actions are recommended:

- Contaminant detections at stormwater sampling Points 1 and 33 could be the result of interference from runoff originating at Reddalls Road as opposed to the Site. Furthermore the surface water bodies were stagnant at the time of sampling and releases of stormwater and leachate did not occur during the reporting period. It is suggested that the sample collection point for Point 1 be relocated upstream to a point between Reddalls Road and the Site boundary (if possible) to eliminate the risk of cross contamination. Given that an elevated concentration of ammonia was reported in Point 33 and a pH of 9.7 was measured at Point 1, the results should be monitored closely during future monitoring events to confirm if the unusual results were anomalous or indicative of potential leachate interaction with stormwater bodies.
- The laboratory limit of reporting was above the adopted screening criteria for several contaminants including PAHs, OCPs and OPPs. Future analysis of these contaminants should be undertaken at an ultra-trace level to ensure the limit of reporting is below the applicable criteria.
- Consideration should be given to completing the annual groundwater sampling earlier during the reporting period to allow a greater opportunity to collect samples. The annual event was scheduled for February 2018 and monitoring wells 9, 12 and 13 were dry. These wells are located in the higher elevations of the site along the northern and western boundary and provide important data showing groundwater contaminant concentrations up-gradient of the tip face. Conducting the annual sampling event earlier during the reporting period will allow alternate opportunities for sampling in the event of dry wells being encountered.
- Consideration should be given to the replacement or removal of EPA groundwater monitoring well 13. The well has been recorded as consistently dry since 2012 with only two records of groundwater interception during monitoring.

> Historically water samples have been submitted for laboratory analysis of total heavy metals in accordance with EPL 5862. Water samples should also be analysed for dissolved metals (ie filtered) to determine if elevated metals are attributed to sediment or if they exist in dissolved phase.

10 References

ANZECC (2000), Australian Water Quality Guidelines, 2000

Australian Standards (1999), AS 4482.2-1999 Guide to the Sampling and Investigation of Potentially Contaminated Soil - Volatile Substances, 1999

Golder Associates (2012), Geotechnical Investigation, Whytes Gully Landfill, 2012

Golder Associates (2014), Landfill Environmental Management Plan, Whytes Gully Landfill, 2014

NEPC (2013), National Environment Protection (Assessment of Site Contamination) Measure, 2013

NHMRC (2014), Australian Drinking Water Guidelines, 2014)

NSW EPA (1996), NSW Environmental Guidelines: Solid Waste Landfills, 1996

NSW EPA (2013), Requirements for publishing pollution monitoring data, 2013

NSW EPA (2015), Asbestos and Waste Tyre Guidelines, 2015

NSW EPA (2016), Environmental Guidelines: Solid Waste Landfills (Second Edition), 2016

NSW EPA (2017), Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017

NSW DPI (1985), 1:100,000 geological map Wollongong-Port Hacking, 1985

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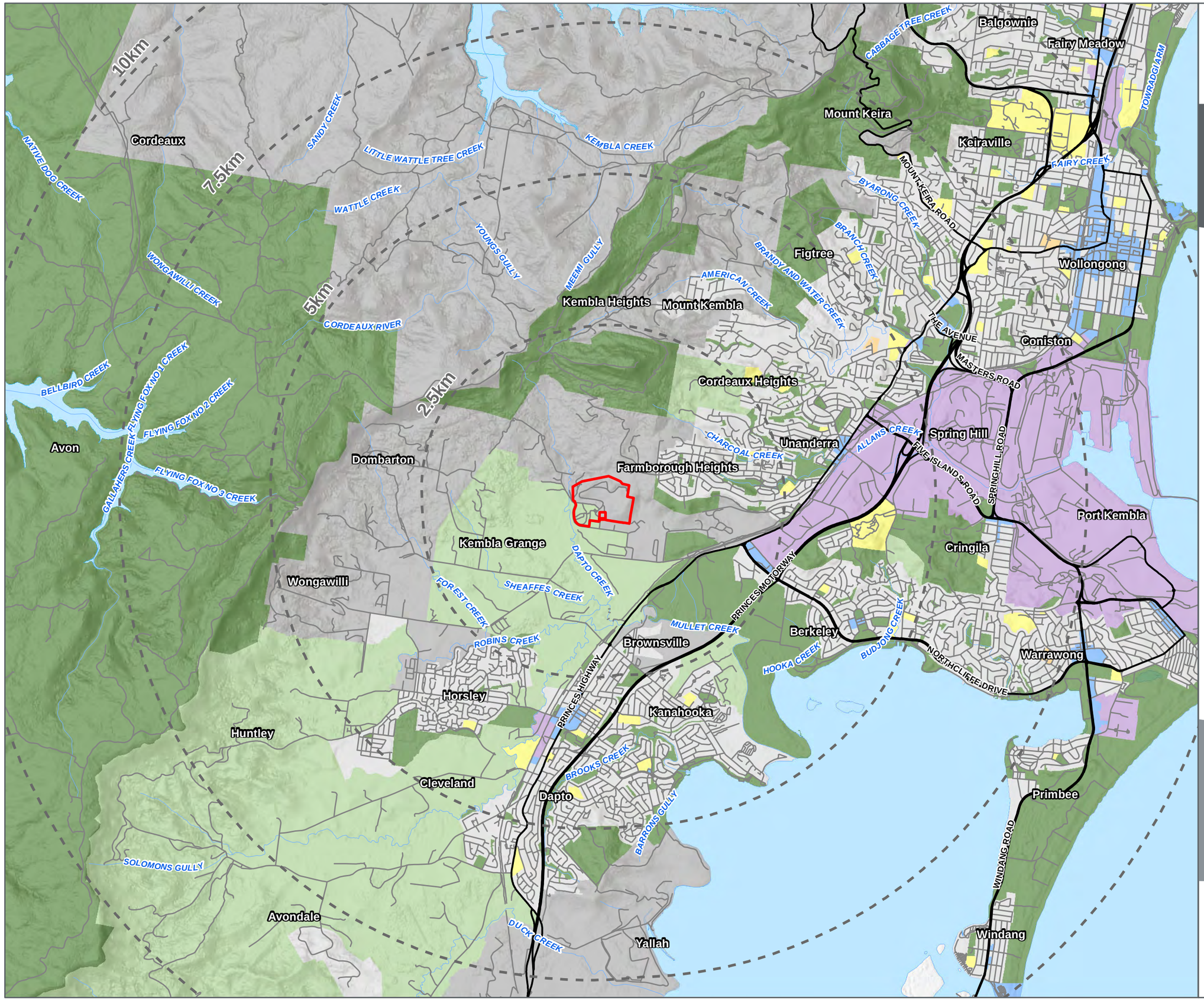
US EPA (2000), Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations, 2000

APPENDIX A

FIGURES

Location Plan

WHYTES GULLY WASTE DISPOSAL DEPOT



Legend

- Site Boundary
- Distance Buffer
- Major Watercourse (LPI)

Land Use (ABS, 2016)

- Other
- Commercial
- Education
- Hospital/Medical
- Industrial
- Parkland
- Primary Production
- Residential
- Water

FIGURE 1

1:60,000 Scale at A3

km
0 0.5 1 1.5 2

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2018-06-15 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82018196-GS-006-LocationPlan.mxd 01

Site Plan

WHYTES GULLY WASTE DISPOSAL DEPOT

Haul road
Borrow pit
Small vehicle transfer station
Alternate leachate pond
Secondary leachate pond
Primary leachate pond
Settling pond 1
Settling pond 2
Surface water polishing pond
Leachate treatment plant
MRF Building and amenities
Weighbridge
Landfill gas management area
Revolve Centre & Recycling Area
Glengarry Cottage
FARMBOROUGH ROAD
DAPTO CREEK
REDDALLS ROAD

Legend

- Site Boundary
- Watercourse (LPI)
- Cadastre (DFSI-SS, 2017)
- Eastern Gully Landfill
- Western Gully Landfill
- New Landfill (Under Construction)

FIGURE 2

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2018-06-15 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82018196-GS-001-SitePlan.mxd 02
Aerial imagery supplied by nearmap (January, 2018)

ID	Latitude	Longitude
1	-34.461282	150.798123
2	-34.461707	150.801046
3	-34.461173	150.798302
4	-34.461495	150.801312
5	-34.461167	150.797993
6	-34.460442	150.802531
7	-34.460744	150.799456
8	-34.460662	150.800985
9	-34.460543	150.79948
10	-34.460406	150.801562
11	-34.460363	150.79919
12	-34.460305	150.801931
13	-34.459877	150.799587
14	-34.460263	150.802198
15	-34.459746	150.799557
16	-34.46015	150.802252
17	-34.459633	150.799504
18	-34.460049	150.802359
19	-34.459466	150.800126
20	-34.459508	150.802163
21	-34.459317	150.800473
22	-34.459198	150.80202
23	-34.45887	150.800838
24	-34.459055	150.802454
25	-34.458568	150.801338
26	-34.458847	150.802561
27	-34.458401	150.801948
28	-34.458776	150.80268
29	-34.463136	150.802109
30	-34.462029	150.801591
31	-34.463059	150.802341
32	-34.461703	150.801685
33	-34.462976	150.802555
34	-34.461435	150.801757
35	-34.46328	150.803183
36	-34.46102	150.80182
37	-34.463113	150.803519
38	-34.460763	150.802258
39	-34.463006	150.803882
40	-34.460828	150.80296
41	-34.463095	150.804387
42	-34.46081	150.803324
43	-34.462768	150.804721
44	-34.460816	150.803691
45	-34.46244	150.805036
46	-34.460834	150.804042
47	-34.461257	150.804917
48	-34.460364	150.8034

Surface Gas Monitoring Locations

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Surface Gas Monitoring Transect
- Cadastre (DFSI-SS, 2017)

FIGURE 3

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2018-06-15 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82018196-GS-002-SurfaceGas.mxd 01
Aerial imagery supplied by nearmap (January, 2018)

EPL ID	Latitude	Longitude
1	-34.465788	150.798241
2	-34.461495	150.798117
5	-34.462361	150.798127
9	-34.458563	150.800373
10 / 28	-34.460495	150.805903
11	-34.461171	150.796442
12 / 25	-34.462304	150.805465
13 / 24	-34.463246	150.804627
14	-34.463322	150.799269
15	-34.463408	150.799345
16	-34.465054	150.796328
17	-34.463322	150.79609
18	-34.462247	150.79629
19	-34.465092	150.796432
20	-34.465292	150.798669
21	-34.463294	150.801753
22	-34.463579	150.802467
23	-34.463598	150.80419
26	-34.461599	150.806093
27	-34.460933	150.805969
29	-34.460077	150.805912
30	-34.459686	150.805817
31	-34.459629	150.805265
32	-34.459544	150.804713
33	-34.466937	150.796376
34	-34.460624	150.795442
Glengarry Cottage	-34.465023	150.801355
Leachate Treatment Plant	-34.463926	150.798743
SWERF	-34.463935	150.801647
Weighbridge	-34.46375	150.799164

Groundwater, Surface Water and Subsurface Gas Monitoring Locations

WHYTES GULLY WASTE DISPOSAL DEPOT

Legend

- Site Boundary
- Dual Well (Groundwater and Gas)
- Gas Accumulation Monitoring Point
- Groundwater Monitoring Well
- Stormwater Monitoring Point
- Subsurface Gas Monitoring Well
- Trade Wastewater Monitoring Point
- Inferred Groundwater Flow Direction
- 5m Contours (LPI LiDAR, 2013)
- Cadastre (DFSI-SS, 2017)

FIGURE 4

1:5,000 Scale at A3

m
0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2018-07-19 | Project: 8201819601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82018196-GS-004-Groundwater-SubsurfaceGas.mxd 03
Aerial imagery supplied by nearmap (January, 2018)

APPENDIX B

DATA SUMMARY TABLES

Transect	Point	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
1	1	ppm	500	-	-	-	-	-	-	-	-	-	-	2.8	-
	2			-	-	-	-	-	-	-	-	-	-	-	-
	3			-	-	-	-	-	-	-	-	-	-	-	-
	4			-	-	-	-	-	-	-	-	-	-	-	-
	5			-	-	-	-	-	-	-	-	-	-	-	-
2	1			-	-	-	-	-	-	1.9	-	2.9	3	3.4	5.3
	2			-	-	-	-	-	-	2.8	-	2.7	5.1	-	6.4
	3			-	-	-	-	-	-	2.4	-	2.6	6	-	6.4
	4			-	-	-	-	-	-	-	-	-	6.4	-	-
	5			-	-	-	-	-	-	-	-	-	1.5	3.8	-
3	1			1.6	-	NA	3	1.5	1.3	3.1	2	4.7	5.4	6.1	5.6
	2			1.4	-	-	4.5	1.3	1.3	1.3	2.5	8.3	9.2	4.9	6.4
	3			2	-	-	3.8	5.8	1.5	4.3	2.7	11.3	3.6	4.6	6
	4			3.2	-	-	3.8	4.4	1.7	2.1	7.6	4.1	3.7	4.7	6.5
	5			3	-	-	-	-	-	-	-	4.7	4.5		-
	6			-	-	-	-	-	-	-	-	-	-	-	-
	7			-	-	-	-	-	-	-	-	-	-	-	-
	8			-	-	-	-	-	-	-	-	-	-	-	-
	9			-	-	-	-	-	-	-	-	-	-	-	-
5	1			2.6	3.5	3	3.8	9.4	1.6	3.4	3.5	34.3	3.8	7.5	12.9
	2			1.9	8	4	5.3	6.6	1.8	2.8	2.4	26.2	2.5	4.8	9.3
	3			22.3	15.9	3	22.8	6.1	1.5	2.6	2.6	16.8	3.6	5.6	11.5
	4			34.7	15.2	3	43.1	82.1	1.8	4.6	5.8	16.5	6.5	4.8	28.2
	5			10.4	15	2.4	12.9	19.1	-	1.9	2.8	16.9	11	4.9	9.6
	6			7.7	8.4	8	-	-	-	1.8	-	-	6.4	-	-
	7			2.9	50.1	12	-	-	-	-	-	-	-	-	-
	8			4.5	16.1	4	-	-	-	-	-	-	-	-	-
	9			13.7	21.5	5.8	-	-	-	-	-	-	-	-	-
	10			8.3	23.9	4.6	-	-	-	-	-	-	-	-	-
	11			2	-	11.1	-	-	-	-	-	-	-	-	-
	12			-	-	3	-	-	-	-	-	-	-	-	-
	13			-	-	-	-	-	-	-	-	-	-	-	-

The threshold levels for further investigation and corrective action were adopted from the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016)

Notes:
ppm: parts per million
"-" denotes not accessible

Transect	Point	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
6	1	ppm	500	-	3.3	3.8	18	-	-	-	-	-	-	-	-
	2			-	5.7	6.2	14	-	-	-	-	-	-	-	-
	3			-	-	4.9	14	-	-	-	-	-	-	-	-
	4			-	-	10.2	11.8	-	-	-	-	-	-	-	-
	5			-	-	8	15.1	-	-	-	-	-	-	-	-
	6			-	-	83	17.8	-	-	-	-	-	-	-	-
	7			-	-	22.3	14.8	-	-	-	-	-	-	-	-
	8			-	-	25.8	-	-	-	-	-	-	-	-	-
	9			-	-	49	-	-	-	-	-	-	-	-	-
	10			-	-	75	-	-	-	-	-	-	-	-	-
	11			-	-	33	-	-	-	-	-	-	-	-	-
7	1			2.4	4	-	11.8	11.9	13.1	4.3	2.1	6.5	2.1	10	6.4
	2			2.3	3.4	-	11.8	3.1	19.9	3.3	1.6	7	2.5	8.6	5.9
	3			3.4	2.8	-	5.6	3.8	16.8	4.4	1.9	11.6	1.9	11.2	4.5
	4			4	2.8	-	11.3	15.7	15.9	4.5	2.1	59.9	1.7	6.2	5.2
	5			3.3	12.2	-	17.1	5.7	9.3	4.6	2.3	8.2	2.3	6.5	35.6
	6			5.4	8.2	-	4.4	6.8	12.3	4.6	5.6	6.4	2.6	-	-
	7			12.3	6.5	-	13.9	12	13.8	-	-	-	-	-	-
	8			5.6	3.9	-	6.4	12.2	5.3	-	-	-	-	-	-
	9			2.1	-	-	2.2	11.4	5.2	-	-	-	-	-	-
	10			1.8	-	-	2.8	19.1	4.4	-	-	-	-	-	-
	11			3.6	-	-	3.6	6.5	16.8	-	-	-	-	-	-
	12			7.6	-	-	5.3	1.9	8.4	-	-	-	-	-	-
	13			4.8	-	-	3.8	-	9	-	-	-	-	-	-
8	1			-	-	-	-	-	8.9	8.9	-	-	-	-	-
	2			-	-	-	-	-	3.5	3.5	-	-	-	-	-
	3			-	-	-	-	-	2.4	2.4	-	-	-	-	-
	4			-	-	-	-	-	2.4	2.4	-	-	-	-	-
	5			-	-	-	-	-	3	3	-	-	-	-	-
	6			-	-	-	-	-	2.8	2.8	-	-	-	-	-
	7			-	-	-	-	-	-	-	-	-	-	-	-
	8			-	-	-	-	-	-	-	-	-	-	-	-

The threshold levels for further investigation and corrective action were adopted from the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016)

Notes:
ppm: parts per million
"-" denotes not accessible

Transect	Point	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
10	1	ppm	500	30.1	0.7	4.4	1.9	6.1	6.1	5.8	5.7	5.2	2.2	9	6.7
	2			18.63	1.2	3.6	1.9	144	6.2	4	2.8	7.2	5.8	45	13.2
	3			15.6	1.2	10.8	1.9	20.8	3.4	6	2.4	29.9	1.3	50	10.2
	4			7.5	6.4	8.3	28.5	10.9	2.8	6	2	6.6	2.2	19	25.7
	5			20.1	4.1	18.3	12.6	39.9	3	3.2	21.6	11	4	31.1	13.3
	6			28.1	6	17.1	5.3	42.4	7.8	10	20.1	15.5	18.1	15	32.5
	7			30.4	10	10.1	23.3	14.9	10.3	6.7	6.9	41.1	10.4	24	17.8
	8			25.1	10.8	5.6	10.2	36.6	13.7	1..2	7.6	64.2	12.1	100	16.3
	9			10.1	10.6	9.2	-	20	13.9	14.4	11.8	11.2	19.4	10.2	-
	10			20.5	4.7	-	-	-	17.2	3.1	-	39.2	11.6	-	-
	11			-	5.1	-	-	-	30.2	50.1	-	19.9	1.7	-	-
	12			-	-	-	-	-	-	6.4	-	-	13.1	-	-
	13			-	-	-	-	-	-	3.4	-	-	20.2	-	-
	14			-	-	-	-	-	-	18.9	-	-	19.8	-	-
	15			-	-	-	-	-	-	12.1	-	-	11.4	-	-
A	1			9.4	1.4	2.2	1.7	2.3	1.8	1.5	1.7	1.7	2	1.3	3.1
	2			9.1	1.7	2.4	1.6	2.2	2.1	1.5	2.3	1.8	2.1	1.9	3.6
	3			9.4	1.8	2.2	1.7	2	2.2	1.5	2.2	1.8	2.1	1.7	4.2
	4			9.9	1.9	2	1.7	-	1.8	1.6	2.1	1.8	-	1	4
	5			-	2	2	1.7	-	-	-	2		-	1	3.8
	6			-	-	1.6	-	-	-	-	1.8		-	-	-
	7			-	-	-	-	-	-	-	-	-	-	-	-
	8			-	-	-	-	-	-	-	-	-	-	-	-
B	1			-	-	-	-	1.7	-	-	-	-	-	-	-
	2			-	-	-	-	1.6	-	-	-	-	-	-	-
	3			-	-	-	-	2.3	-	-	-	-	-	-	-
	4			-	-	-	-	2.6	-	-	-	-	-	-	-
	5			-	-	-	-	2.5	-	-	-	-	-	-	-
	6			-	-	-	-	4.5	-	-	-	-	-	-	-
	7			-	-	-	-	2.6	-	-	-	-	-	-	-
	8			-	-	-	-	2.6	-	-	-	-	-	-	-
C	1			-	2.2	2.6	-	-	1.8	3.2	2.3	1.8	1.6	1.1	4.2
	2			-	2.2	2.8	-	-	1.7	2.3	2.6	1.8	1.9	1.2	4.3
	3			-	2.2	3	-	-	1.6	2.7	2.3	1.8	1.5	1.4	3.6
	4			-	2.2	2.8	-	-	1.7	1.9	3.1	1.9	1.8	1.6	3.9
	5			-	2.1	2.5	-	-	1.5	1.6	2.7	1.9	2	4.8	9.9
	6			-	2.2	2.1	-	-	1.9	1.5	2.4	2.1	1.9	2.1	2.7
	7			-	2.3	1.9	-	-	1.9	1.6	3.6	3.1	2	1.6	5.6
	8			-	2.2	2	-	-	1.6	1.5	3.8	2	2.3	1.8	27.2
	9			-	2.3	-	-	-	-	1.6	8.2	50.3	2.8	1.7	19.1
	10			-	4.8	-	-	-	-	1.6	5.3	3.5	2.3	1.6	9.1
	11			-	-	-	-	-	-	-	-	1.8	-	-	9.5
	12			-	-	-	-	-	-	-	-	1.8	-	-	-

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Notes:
ppm: parts per million
"-" denotes not accessible

Transect	Point	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
D	1	ppm	500	9.9	0.5	2.1	1.5	2.2	-		2.7	1.6	1.4	2.2	1.3
	2			7.6	0.6	2.3	1.5	0.8	-	1.6	2.6	1.6	1.3	2	1.3
	3			10.1	0.6	2.3	1.5	1.2	1.5	2.2	3.8	1.7	1.4	2.1	1.4
	4			12.4	0.4	2.3	1.4	0.7	1.6	1.8	4	1.5	1.5	2.4	1.3
	5			11.9	0.3	1.6	1.6	1.1	1.2	1.5	4	2.4	1.7	3.8	1.3
	6			20	-	1.7	1.6	-	1.2	1.8	-	-	-	-	1.4
	7			23.8	-	-	1.5	-	1	-	-	-	-	-	-
	8			38.8	-	-	1.6	-	1.3	-	-	-	-	-	-
	9			-	-	-	1.7	-	-	-	-	-	-	-	-
E	1			34.3	1.8	2.6	2.2	2	2	1.8	2.2	2.3	1.8	2.1	2.2
	2			29.1	2.6	2.6	2.2	2.3	2	1.8	8.5	1.6	2.1	2.1	1.8
	3			22.3	3	2.4	1.9	1.5	1.8	1.5	2.1	1.9	1.8	2.2	1.5
	4			21.1	1.6	2.3	1.9	1.4	1.5	1.6	1.8	1.7	1.6	1.9	1.4
	5			12.1	0.9	1.8	1.9	2.3	1.6	1.6	3.2	1.7	3	2.8	1.6
	6			16.8	0.9	1.5	1.8	3.8	7.2	1.7	2.9	2	1.8	2.5	1.5
	7			10.6	0.7	2	1.8	1.4	1.6	1.7	2.3	1.8	1.9	2	1.2
F	1			12.9	2.6	2.5	2.1	3	2.4	1.8	3.8	1.8	2.1	2.1	2
	2			16.1	2.7	2.4	1.5	3.1	1.9	1.8	2.8	2	2.4	2	2
	3			15	2.4	2.1	1.5	3	2	2.2	1.9	1.9	1.6	1.9	2
	4			19.8	2.4	2.4	1.4	2	2.1	1.8	1.5	1.7	1.7	1.8	2.2
	5			25.5	2.3	2.5	1.4	1.2	2.1	1.8	2.8	2.3	2	1.8	2.2
	6			34.1	1.8	2.2	1.4	1.8	2.1	1.9	2.5	4.3	2.1	2.1	2.5
	7			33.9	2	2	1.4	1.4	2	1.7	1.9	1.7	2.7	2.5	1.8
	8			42.1	1.6	2.2	1.5	0.9	2.1	1.8	2.7	12.4	2.7	2.1	2.4
	9			-	-	-	-	1.5	-	-	-	-	-	-	-
G	1			11.9	3	2.1	1.7	2.5	2	1.8	2.3	1.4	2	1.6	3.3
	2			19	2.6	2.4	1.8	2.6	2	2.2	2.1	1.4	2.1	1.6	2.8
	3			20.5	2.9	2.3	1.7	2.6	2.1	2	2	1.3	2.2	1.7	3.1
	4			26.4	2.1	2.1	1.5	3.2	1.9	1.8	1.6	1.7	2.9	1.8	2.6
	5			29.1	2.3	2.2	1.5	2.5	1.7	1.8	2.6	1.8	2.4	1.9	2.1
	6			28.6	2	2.2	1.8	1.6	1.7	1.8	2.2	1.7	2.7	2	2.3
	7			25.9	2	1.9	1.8	1.7	1.9	1.9	2.8	1.6	2.5	25	2.2
	8			-	-	-	-	-	-	-	-	-	-	-	-
	9			-	-	-	-	-	-	-	-	-	-	-	-
	10			-	-	-	-	-	-	-	-	-	-	-	-

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Notes:
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"-" denotes not accessible

Transect	Point	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
H	1	ppm	500	14.9	2.4	3	1.7	2.3	2.1	1.1	3	1.5	2	1.9	8.9
	2			4.5	2.4	2.3	1.8	2.3	1.9	1.6	2.6	1.5	1.9	2	1.8
	3			14.3	2.4	2.6	1.8	2	1.7	1.7	2.8	1.4	1.5	5.1	1.4
	4			15.3	2.5	1.9	1.8	2.2	3.6	1.8	2.8	5.7	1.7	1.6	6
	5			13.1	2.5	2.1	1.8	2	1.8	1.6	2.8	2.5	2.1	1.6	4.2
	6			14.6	2.4	2.2	1.8	2.3	8.9	1.7	2.2	1.6	2	1.4	2.9
	7			-	2.6	2.6	-	-	-	-	-	-	-	-	-
	8			-	2.4	2.6	-	-	-	-	-	-	-	-	-
I	1			8.1	2.5	2.4	1.9	1	1.4	1.9	3.1	2.2	1.3	4.5	2.6
	2			11.4	3.4	1.9	1.8	1.4	1.3	1.9	3.7	2	1.2	2.2	1.9
	3			8.4	1.6	2	1.7	1.3	1.6	1.8	4.3	1.9	1.3	2.2	1.3
	4			8.6	1.9	2.3	1.7	0.9	1.5	1.8	3.1	1.9	1	2.3	1.6
	5			8.1	1.8	2.4	1.7	1.3	1.3	1.8	2.7	1.8	4.5	2.3	1.9
	6			7.6	1.9	2.8	1.6	1.6	1.4	1.7	3.3	1.7	5.5	2.4	4
	7			-	2.2	-	-	-	-	-	-	-	-	-	-
	8			-	2.5	-	-	-	-	-	-	-	-	-	-
J	1			-	-	-	-	2.2	-	-	-	-	-	-	-
	2			-	-	-	-	4.9	-	-	-	-	-	-	-
	3			-	-	-	-	2	-	-	-	-	-	-	-
	4			-	-	-	-	13.5	1.7	1.7	-	-	-	-	-
	5			-	-	-	-	-	1.5	-	-	-	-	-	-
	6			-	-	-	-	-	2.9	-	-	-	-	-	-
K	1			-	-	-	-	16	1.6	-	-	-	-	-	-
	2			-	-	-	-	100	-	-	-	-	-	-	-
	3			-	-	-	-	67.9	-	-	-	-	-	-	-
	4			-	-	-	-	2.7	-	-	-	-	-	-	-
	5			-	-	-	-	1.8	-	-	-	-	-	-	-
	6			-	-	-	-	1.7	-	-	-	-	-	-	-
M	1			-	-	-	-	-	5.6	-	-	-	-	-	-
	2			-	-	-	-	-	35.9	-	-	-	-	-	-
	3			-	-	-	-	-	2	-	-	-	-	-	-
	4			-	-	-	-	-	2	-	-	-	-	-	-
	5			-	-	-	-	-	1.8	-	-	-	-	-	-
	6			-	-	-	-	-	1.8	-	-	-	-	-	-

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Notes:
ppm: parts per million
"-" denotes not accessible

Transact	Unit	Level for Investigation and Corrective Action	Date										
			5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018
EPA point 21	% v/v	1	0.0002	0.0001	0.0002	0.0002	0.0002	0.0004	0.0005	0.0001	0.0002	0.0006	0.0003
EPA point 22			0.0004	0.0001	0.0002	0.0002	0.0003	0.0001	0.0002	0.0002	0.0002	0.0006	0.0002
EPA point 23			0.0007	0.0001	0.0002	0.0001	0.0002	0	0.0002	0.0001	0.0001	0.0004	0
EPA point 24			0.0008	0.0001	0.0002	0.0002	0.0004	0.0001	0.0003	0.0002	0.0003	0.0003	0.0001
EPA point 25			0.0004	0.0002	0.0004	0.0002	0.0003	0.0003	0.0002	0.0001	0.0005	0.0006	0.0005
EPA point 26			0.0009	0.0002	0.0004	0.0002	0.0006	0.0003	0.0007	0.0006	0.0004	0.0006	0.0003
EPA point 27			0.0014	0.0006	0.0015	0.0004	0.0005	0.002	0.0006	0.0014	0.0007	0.0006	0.001
EPA point 28			0.0018	0.0005	0.0011	0.0007	0.0006	0.0004	0.0007	0.0015	0.0008	0.0002	0.0005
EPA point 29			0.0023	0.0006	0.0006	0.0003	0.0006	0.0003	0.001	0.0027	0.0003	0.0012	0.0005
EPA point 30			0.001	0.0016	0.0066	0.0005	0.0004	0.0003	0.0012	0.0001	0.0007	0.0011	0.0003
EPA point 31			0.0018	0.0003	0.0004	0.0003	0.0007	0.0009	0.0006	0.0001	0.0003	0.0009	-
EPA point 32			0.0005	0.0004	0.0004	0.0003	0.0009	0.0007	0.0005	0.0002	0.001	0.0005	-

The threshold levels for further investigation and corrective action were adopted from the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016)

Notes:
% v/v: percentage as volume/volume
"-" denotes no access

Building / Structure	Location	Unit	Level for Investigation and Corrective Action	Date											
				5/06/2017	26/07/2017	8/08/2017	7/09/2017	9/10/2017	1/11/2017	11/12/2017	10/01/2018	14/02/2018	9/03/2018	11/04/2018	2/05/2018
SWERF	1	% (v/v)	1	-	-	-	-	-	0.00011	0.00017	-	-	-	-	-
	2			-	-	-	-	-	0.0001	0.00017	-	-	-	-	-
Weighbridge Office	1			0.00017	0.0001	0.00022	0.00014	0.00018	0.00011	0.0003	0.00016	0.00017	0.00016	0.00044	0.00024
Glengarry Cottage	Manager Office			0.00017	0.00012	0.00021	0.00015	0.00018	0.0001	0.00018	0.00014	0.00015	0.00013	0.00017	0.00022
	Front Office			0.00018	0.00011	0.00023	0.00016	0.00025	0.00013	0.00017	0.00014	0.00016	0.00012	0.00018	0.00023
	Meeting Room			0.00017	0.00013	0.00023	0.00015	0.00026	0.00011	0.0002	0.00018	0.00016	0.00011	0.00016	0.00021
	Operations Room			0.00015	0.00011	0.00022	0.00015	0.0003	0.00012	0.0002	0.00017	0.00016	0.00013	0.00018	0.0002
	Kitchen			0.00016	0.00012	0.00021	0.00015	0.00026	0.00009	0.00018	0.00018	0.00016	0.00016	0.00018	0.00022
	Hallway			0.00014	0.00013	0.00024	0.00016	0.00028	0.00011	0.00018	0.00019	0.00016	0.00013	0.00016	0.00023
	Store			0.00017	0.00011	0.00022	0.00015	0.00026	0.00009	0.00018	0.00017	0.00016	0.00013	0.00017	0.0002
	Gardens			0.00018	0.0001	0.00023	0.00015	0.00018	0.0002	0.0002	0.00018	0.00015	0.00015	0.00015	0.00021

The threshold levels for further investigation and corrective action were adopted from the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016)

Notes:
v/v % denotes volume/volume as percentage
-' denotes no access

				EC	PAH	Metals				Inorganics																Field Parameters		
				Electrical Conductivity 1:5 soil:water	Phenolics Total	Calcium	Iron (Filtered)	Magnesium	Potassium	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Nitrate & Nitrite (as N)	Sodium	TDS	TOC	TSS	Turbidity	Sulfate as SO4 - Turbidimetric (Filtered)	Dissolved Oxygen	pH (Field)	Temperature (Field)
				µS/cm	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	pH Units	oC
LOR				1	50	1	0.05	1	1	1	1	1	1	0.01	1	0.1	0.01	0.01	0.01	1	1	1	5	0.1	1	0.01	0.1	0.1
ADWG 2015 Health																**1.5**												
ANZECC 2000 Freshwater (80%)														**2.3**			**12**											
ANZECC 2000 Fresh Water (90%)														**1.43**			**8.7**											
ANZECC 2000 Fresh Water (95%)														**0.9**			**7.2**											
EPL 5862 (Point 1 only)																							**50**				**6.5 - 8.5**	
Site	**Location Code**	**Sample Date**	**Field ID**																									
Whytes Gully Stormwater	Point 1	19/02/2018	Point 1	1110	<50	13	<0.05	24	18	93	123	<1	216	0.01	223	0.5	<0.01	<0.01	<0.01	168	-	12	16	-	41	9.6	**9.7**	25.8
	Point 33	19/02/2018	Point 33	686	<50	44	0.52	21	8	270	<1	<1	270	**1.82**	54	0.2	<0.01	<0.01	<0.01	57	-	27	**76**	-	<1	2.82	7.5	22.5
	Point 34	19/02/2018	Point 34	768	<50	64	0.11	25	4	287	<1	<1	287	0.18	69	0.2	<0.01	<0.01	<0.01	47	-	5	23	-	4	3.45	7.6	23.9
Statistical Summary																												
Maximum Concentration				1110	<50	64	0.52	25	18	287	123	<1	287	1.82	223	0.5	<0.01	<0.01	<0.01	168	1140	27	942	50.9	41	9.6	9.8	25.8

	Depth
	m
LOR	0.01

Site	Location Code	Sample Date	Field ID	
Whytes Gully Groundwater	Point 20	22/08/2017	BH6 (Point 20)	1.65
		20/11/2017	BH6 (Point 20)	1.77
		19/02/2018	BH6	1.8
		22/05/2018	BH6 (Point 20)	1.77
	Point 5	22/08/2017	GABH02 (Point 5)	5.26
		20/11/2017	GABH02 (Point 5)	5.6
		19/02/2018	GABH02	5.5
		23/05/2018	GABH02 (Point 5)	5.56
	Point 9	22/08/2017	GMW102 (Point 9)	12.3
		20/11/2017	GMW102 (Point 9)	8.18
	Point 10	22/08/2017	GMW103 (Point 10)	7.7
		20/11/2017	GMW103 (Point 10)	7.69
		19/02/2018	GMW103	7.95
		22/05/2018	GMW103 (Point 10)	7.75
	Point 11	22/08/2017	GMW104 (Point 11)	7.52
		20/11/2017	GMW104 (Point 11)	7.45
		19/02/2018	GMW104	8.65
		22/05/2018	GMW104 (Point 11)	7.9
	Point 12	22/08/2017	GMW105 (Point 12)	10.8
		20/11/2017	GMW105 (Point 12)	11.7
	Point 15	22/08/2017	GMW108D (Point 15)	2.42
		20/11/2017	GMW108D (Point 15)	2.6
		19/02/2018	GMW108D	2.58
		22/05/2018	GMW108D (Point 15)	2.46
		5/06/2018	GMW108D (Point 15)	2.87
	Point 14	22/08/2017	GMW108S (Point 14)	2.91
		20/11/2017	GMW108S (Point 14)	2.98
		19/02/2018	GMW108S	3.09
		22/05/2018	GMW108S (Point 14)	2.96
	Point 19	22/08/2017	GMW109D (Point 19)	3.13
		20/11/2017	GMW109D (Point 19)	3.07
		19/02/2018	GMW109D	3.47
		22/05/2018	GMW109D (Point 19)	3.3
	Point 16	22/08/2017	GMW109S (Point 16)	3.35
		20/11/2017	GMW109S (Point 16)	2.88
		19/02/2018	GMW109S	3.93
		22/05/2018	GMW109S (Point 16)	3.59
	Point 17	22/08/2017	GMW110 (Point 17)	4.23
		20/11/2017	GMW110 (Point 17)	4.43
		19/02/2018	GMW110	4.46
		22/05/2018	GMW110 (Point 17)	4.35
	Point 18	22/08/2017	GMW111 (Point 18)	6.28
		20/11/2017	GMW111 (Point 18)	6.62
		19/02/2018	GMW111	6.62
		22/05/2018	GMW111 (Point 18)	6.55

Statistical Summary

Maximum Concentration	12.3
Average Concentration	5.1
Standard Deviation	2.7

Whytes Gully Landfill
Groundwater
Table 5B - BTEX, TRH, CRC Care TRH Fractions, PAH

				BTEX						TRH					CRC Care TRH Fractions							PAH																					
				Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less NAPHTHALENE	BaP TEQ (zero)	Benzo(b+j)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Phenolics Total	Pyrene
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR				1	2	2	2	2	2	1	20	50	100	50	50	20	100	100	100	100	20	100	0.5	1	1	1	1	1	0.5	1	1	1	1	1	1	1	0.5	1	50	1
ADWG 2015 Health				**1**	**800**	**300**			**600**																			**0.01**													
ANZECC 2000 Freshwater (80%)				**2000**				**640**																												**85**				
ANZECC 2000 Fresh Water (90%)				**1300**				**470**																												**37**				
ANZECC 2000 Fresh Water (95%)				**950**				**350**																		**0.4**										**16**				
Site	**Location Code**	**Sample Date**	**Field ID**																																							
Whytes Gully Landfill - Groundwater	Point 20	19/02/2018	BH6 (Point 20)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 5	19/02/2018	GABH02 (Point 5)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 10	19/02/2018	GMW103 (Point 10)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 11	19/02/2018	GMW104 (Point 11)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 15	19/02/2018	GMW108D (Point 15)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 14	19/02/2018	GMW108S (Point 14)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 19	19/02/2018	GMW109D (Point 19)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 16	19/02/2018	GMW109S (Point 16)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 17	19/02/2018	GMW110 (Point 17)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
	Point 18	19/02/2018	GMW111 (Point 18)	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1
Statistical Summary																																										
Maximum Concentration				<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<100	<100	<100	<100	<20	<100	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<50	<1

				Metals												
				Aluminium (total)	Aluminium (dissolved)	Arsenic	Barium (total)	Barium (dissolved)	Cadmium (total)	Cadmium (dissolved)	Calcium (Filtered)	Chromium (hexavalent)	Chromium (III+VI) (total)	Chromium (III+VI) (dissolved)	Cobalt (total)	Cobalt (dissolved)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR				0.01	0.001	0.001	0.001	0.001	0.0001	0.0001	1	0.01	0.001	0.001	0.001	0.001
ADWG 2015 Health						**0.01**	**2**	**2**	**0.002**	**0.002**		**0.05**				
ANZECC 2000 Freshwater (80%)				**0.15**	**0.15**				**0.0008**	**0.0008**		**0.04**				
ANZECC 2000 Fresh Water (90%)				**0.08**	**0.08**				**0.0004**	**0.0004**		**0.006**				
ANZECC 2000 Fresh Water (95%)				**0.055**	**0.055**				**0.0002**	**0.0002**		**0.001**				
Site	**Location Code**	**Sample Date**	**Field ID**													
Whytes Gully Landfill	Point 20	22/08/2017	BH6 (Point 20)	-	-	-	-	-	-	-	113	-	-	-	-	-
		20/11/2017	BH6 (Point 20)	-	-	-	-	-	-	-	98	-	-	-	-	-
		19/02/2018	BH6 (Point 20)	**1.12**	-	0.003	0.068	-	<0.0001	-	-	**<0.01**	0.002	-	0.015	-
		19/02/2018	BH6 (Point 20)	-	-	-	-	-	-	-	116	-	-	-	-	-
		22/05/2018	BH6 (Point 20)	-	-	-	-	-	-	-	121	-	-	-	-	-
	Point 5	22/08/2017	GABH02 (Point 5)	-	-	-	-	-	-	-	292	-	-	-	-	-
		20/11/2017	GABH02 (Point 5)	-	-	-	-	-	-	-	232	-	-	-	-	-
		19/02/2018	GABH02 (Point 5)	**4.09**	-	<0.001	0.015	-	<0.0001	-	-	**<0.01**	0.004	-	<0.001	-
		19/02/2018	GABH02 (Point 5)	-	-	-	-	-	-	-	324	-	-	-	-	-
		23/05/2018	GABH02 (Point 5)	-	-	-	-	-	-	-	304	-	-	-	-	-
	Point 9	22/08/2017	GMW102 (Point 9)	-	-	-	-	-	-	-	102	-	-	-	-	-
		20/11/2017	GMW102 (Point 9)	-	-	-	-	-	-	-	26	-	-	-	-	-
	Point 10	22/08/2017	GMW103 (Point 10)	-	-	-	-	-	-	-	197	-	-	-	-	-
		20/11/2017	GMW103 (Point 10)	-	-	-	-	-	-	-	162	-	-	-	-	-
		19/02/2018	GMW103 (Point 10)	**5.62**	-	<0.001	0.041	-	<0.0001	-	-	**<0.01**	0.009	-	0.01	-
		19/02/2018	GMW103 (Point 10)	-	-	-	-	-	-	-	173	-	-	-	-	-
		22/05/2018	GMW103 (Point 10)	-	-	-	-	-	-	-	190	-	-	-	-	-
	Point 11	22/08/2017	GMW104 (Point 11)	**35.5**	-	-	0.055	-	<0.0001	-	54	-	0.021	-	0.026	-
		20/09/2017	GMW104 (Point 11)	**229**	**0.44**	-	0.202	0.014	**0.0006**	<0.0001	-	-	0.103	<0.001	0.138	0.001
		20/11/2017	GMW104 (Point 11)	**7.7**	-	-	0.036	-	<0.0001	-	50	-	0.005	-	0.006	-
		19/02/2018	GMW104 (Point 11)	**12.5**	-	<0.001	0.044	-	<0.0001	-	-	**<0.01**	0.009	-	0.007	-
		19/02/2018	GMW104 (Point 11)	-	-	-	-	-	-	-	58	-	-	-	-	-
		22/05/2018	GMW104 (Point 11)	**7.49**	-	-	0.037	-	<0.0001	-	62	-	0.005	-	0.004	-
	Point 12	22/08/2017	GMW105 (Point 12)	-	-	-	-	-	-	-	8	-	-	-	-	-
		20/11/2017	GMW105 (Point 12)	-	-	-	-	-	-	-	7	-	-	-	-	-
	Point 15	22/08/2017	GMW108D (Point 15)	-	-	-	-	-	-	-	118	-	-	-	-	-
		20/11/2017	GMW108D (Point 15)	-	-	-	-	-	-	-	48	-	-	-	-	-
		19/02/2018	GMW108D (Point 15)	**0.39**	-	<0.001	0.022	-	<0.0001	-	-	**<0.01**	0.001	-	<0.001	-
		19/02/2018	GMW108D (Point 15)	-	-	-	-	-	-	-	119	-	-	-	-	-
		22/05/2018	GMW108D (Point 15)	-	-	-	-	-	-	-	46	-	-	-	-	-
	Point 14	22/08/2017	GMW108S (Point 14)	-	-	-	-	-	-	-	134	-	-	-	-	-
		20/11/2017	GMW108S (Point 14)	-	-	-	-	-	-	-	20	-	-	-	-	-
		19/02/2018	GMW108S (Point 14)	**19.9**	-	0.002	0.231	-	<0.0001	-	-	**<0.01**	0.017	-	0.012	-
		19/02/2018	GMW108S (Point 14)	-	-	-	-	-	-	-	126	-	-	-	-	-
		22/05/2018	GMW108S (Point 14)	-	-	-	-	-	-	-	94	-	-	-	-	-
	Point 19	22/08/2017	GMW109D (Point 19)	-	-	-	-	-	-	-	90	-	-	-	-	-
		20/11/2017	GMW109D (Point 19)	-	-	-	-	-	-	-	76	-	-	-	-	-
		19/02/2018	GMW109D (Point 19)	**0.21**	-	<0.001	0.139	-	<0.0001	-	-	**<0.01**	<0.001	-	<0.001	-
		19/02/2018	GMW109D (Point 19)	-	-	-	-	-	-	-	84	-	-	-	-	-
		22/05/2018	GMW109D (Point 19)	-	-	-	-	-	-	-	89	-	-	-	-	-
	Point 16	22/08/2017	GMW109S (Point 16)	**14.8**	-	-	0.344	-	**0.0007**	-	70	-	0.022	-	0.058	-
		20/09/2017	GMW109S (Point 16)	**13.6**	**0.42**	-	0.361	0.156	**0.0004**	<0.0001	-	-	0.018	<0.001	0.046	0.027
		20/11/2017	GMW109S (Point 16)	**3.23**	-	-	0.16	-	<0.0001	-	56	-	0.004	-	0.034	-
		19/02/2018	GMW109S (Point 16)	**6.02**	-	0.004	0.268	-	**0.0002**	-	-	**<0.01**	0.008	-	0.03	-
		19/02/2018	GMW109S (Point 16)	-	-	-	-	-	-	-	68	-	-	-	-	-
		22/05/2018	GMW109S (Point 16)	**4.76**	-	-	0.226	-	<0.0001	-	66	-	0.006	-	0.033	-
	Point 17	22/08/2017	GMW110 (Point 17)	-	-	-	-	-	-	-	195	-	-	-	-	-
		20/11/2017	GMW110 (Point 17)	-	-	-	-	-	-	-	172	-	-	-	-	-
		19/02/2018	GMW110 (Point 17)	**3.43**	-	<0.001	0.015	-	<0.0001	-	-	**<0.01**	0.003	-	0.003	-
		19/02/2018	GMW110 (Point 17)	-	-	-	-	-	-	-	216	-	-	-	-	-
		22/05/2018	GMW110 (Point 17)	-	-	-	-	-	-	-	207	-	-	-	-	-
	Point 18	22/08/2017	GMW111 (Point 18)	-	-	-	-	-	-	-	123	-	-	-	-	-
		20/11/2017	GMW111 (Point 18)	-	-	-	-	-	-	-	113	-	-	-	-	-
		19/02/2018	GMW111 (Point 18)	**4.19**	-	<0.001	0.034	-	<0.0001	-	-	**<0.01**	0.002	-	0.004	-
		19/02/2018	GMW111 (Point 18)	-	-	-	-	-	-	-	121	-	-	-	-	-
		22/05/2018	GMW111 (Point 18)	-	-	-	-	-	-	-	126	-	-	-	-	-
Statistical Summary																
Maximum Concentration				229	0.44	0.004	0.361	0.156	0.0007	<0.0001	324	<0.01	0.103	<0.001	0.138	0.027
Average Concentration				21		0.0016	0.13		0.00018		120	0.01	0.013		0.024	
Standard Deviation				53		0.0011	0.12		0.00019		76	0	0.023		0.033	

				Metals												
				Copper (total)	Copper (dissolved)	Lead (total)	Lead (dissolved)	Magnesium (Filtered)	Manganese (total)	Manganese (dissolved)	Mercury	Nickel (total)	Nickel (dissolved)	Potassium (Filtered)	Zinc (total)	Zinc (dissolved)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR				0.001	0.001	0.001	0.001	1	0.001	0.001	0.0001	0.001	0.001	1	0.005	0.005
ADWG 2015 Health				**2**	**2**	**0.01**	**0.01**		**0.5**	**0.5**	**0.001**	**0.02**	**0.02**			
ANZECC 2000 Freshwater (80%)				**0.0025**	**0.0025**	**0.0094**	**0.0094**		**3.6**	**3.6**	**0.0054**	**0.017**	**0.017**		**0.031**	**0.031**
ANZECC 2000 Fresh Water (90%)				**0.0018**	**0.0018**	**0.0056**	**0.0056**		**2.5**	**2.5**	**0.0019**	**0.013**	**0.013**		**0.015**	**0.015**
ANZECC 2000 Fresh Water (95%)				**0.0014**	**0.0014**	**0.0034**	**0.0034**		**1.9**	**1.9**	**0.0006**	**0.011**	**0.011**		**0.008**	**0.008**
Site	**Location Code**	**Sample Date**	**Field ID**													
Whytes Gully Landfill	Point 20	22/08/2017	BH6 (Point 20)	-	-	-	-	118	-	-	-	-	-	<1	-	-
		20/11/2017	BH6 (Point 20)	-	-	-	-	115	-	-	-	-	-	<1	-	-
		19/02/2018	BH6 (Point 20)	**0.003**	**-**	**0.009**	**-**	-	**2.83**	**-**	<0.0001	-	-	-	**0.01**	**-**
		19/02/2018	BH6 (Point 20)	-	-	-	-	120	-	-	-	-	-	<1	-	-
		22/05/2018	BH6 (Point 20)	-	-	-	-	130	-	-	-	-	-	<1	-	-
	Point 5	22/08/2017	GABH02 (Point 5)	-	-	-	-	192	-	-	-	-	-	2	-	-
		20/11/2017	GABH02 (Point 5)	-	-	-	-	155	-	-	-	-	-	2	-	-
		19/02/2018	GABH02 (Point 5)	**0.008**	**-**	**0.004**	**-**	-	0.07	-	<0.0001	-	-	-	**0.027**	**-**
		19/02/2018	GABH02 (Point 5)	-	-	-	-	190	-	-	-	-	-	2	-	-
		23/05/2018	GABH02 (Point 5)	-	-	-	-	196	-	-	-	-	-	3	-	-
	Point 9	22/08/2017	GMW102 (Point 9)	-	-	-	-	31	-	-	-	-	-	<1	-	-
		20/11/2017	GMW102 (Point 9)	-	-	-	-	10	-	-	-	-	-	<1	-	-
	Point 10	22/08/2017	GMW103 (Point 10)	-	-	-	-	66	-	-	-	-	-	<1	-	-
		20/11/2017	GMW103 (Point 10)	-	-	-	-	61	-	-	-	-	-	<1	-	-
		19/02/2018	GMW103 (Point 10)	**0.016**	**-**	**0.014**	**-**	-	0.452	-	<0.0001	-	-	-	**0.035**	**-**
		19/02/2018	GMW103 (Point 10)	-	-	-	-	58	-	-	-	-	-	<1	-	-
		22/05/2018	GMW103 (Point 10)	-	-	-	-	65	-	-	-	-	-	<1	-	-
	Point 11	22/08/2017	GMW104 (Point 11)	**0.05**	**-**	**0.019**	**-**	31	**1.6**	**-**	-	-	-	<1	**0.104**	**-**
		20/09/2017	GMW104 (Point 11)	**0.32**	<0.001	**0.088**	<0.001	-	**7.15**	0.415	-	**0.088**	0.002	-	**0.61**	**<0.005**
		20/11/2017	GMW104 (Point 11)	**0.014**	**-**	**0.004**	**-**	34	0.374	-	-	-	-	<1	**0.027**	**-**
		19/02/2018	GMW104 (Point 11)	**0.016**	**-**	**0.008**	**-**	-	0.47	-	<0.0001	-	-	-	**0.045**	**-**
		19/02/2018	GMW104 (Point 11)	-	-	-	-	36	-	-	-	-	-	<1	-	-
		22/05/2018	GMW104 (Point 11)	**0.011**	**-**	**0.004**	**-**	42	0.381	-	-	-	-	<1	**0.025**	**-**
	Point 12	22/08/2017	GMW105 (Point 12)	-	-	-	-	4	-	-	-	-	-	<1	-	-
		20/11/2017	GMW105 (Point 12)	-	-	-	-	4	-	-	-	-	-	<1	-	-
	Point 15	22/08/2017	GMW108D (Point 15)	-	-	-	-	79	-	-	-	-	-	1	-	-
		20/11/2017	GMW108D (Point 15)	-	-	-	-	32	-	-	-	-	-	10	-	-
		19/02/2018	GMW108D (Point 15)	**0.002**	**-**	<0.001	-	-	0.021	-	<0.0001	-	-	-	**0.01**	**-**
		19/02/2018	GMW108D (Point 15)	-	-	-	-	78	-	-	-	-	-	1	-	-
		22/05/2018	GMW108D (Point 15)	-	-	-	-	14	-	-	-	-	-	12	-	-
	Point 14	22/08/2017	GMW108S (Point 14)	-	-	-	-	97	-	-	-	-	-	2	-	-
		20/11/2017	GMW108S (Point 14)	-	-	-	-	10	-	-	-	-	-	4	-	-
		19/02/2018	GMW108S (Point 14)	**0.042**	**-**	**0.014**	**-**	-	0.385	**-**	<0.0001	-	-	-	**0.056**	**-**
		19/02/2018	GMW108S (Point 14)	-	-	-	-	94	-	-	-	-	-	1	-	-
		22/05/2018	GMW108S (Point 14)	-	-	-	-	67	-	-	-	-	-	2	-	-
	Point 19	22/08/2017	GMW109D (Point 19)	-	-	-	-	48	-	-	-	-	-	1	-	-
		20/11/2017	GMW109D (Point 19)	-	-	-	-	45	-	-	-	-	-	1	-	-
		19/02/2018	GMW109D (Point 19)	**0.002**	**-**	0.001	-	-	**0.832**	**-**	<0.0001	-	-	-	**0.014**	**-**
		19/02/2018	GMW109D (Point 19)	-	-	-	-	45	-	-	-	-	-	1	-	-
		22/05/2018	GMW109D (Point 19)	-	-	-	-	48	-	-	-	-	-	1	-	-
	Point 16	22/08/2017	GMW109S (Point 16)	**0.067**	**-**	**0.036**	**-**	44	**3.14**	**-**	-	-	-	1	**0.163**	**-**
		20/09/2017	GMW109S (Point 16)	**0.056**	**0.003**	**0.022**	<0.001	-	**3.58**	**3.19**	-	**0.028**	0.009	-	**0.125**	**0.022**
		20/11/2017	GMW109S (Point 16)	**0.015**	**-**	**0.005**	**-**	41	**3.62**	**-**	-	-	-	2	**0.039**	**-**
		19/02/2018	GMW109S (Point 16)	**0.025**	**-**	**0.012**	**-**	-	**3.97**	**-**	<0.0001	-	-	-	**0.165**	**-**
		19/02/2018	GMW109S (Point 16)	-	-	-	-	38	-	-	-	-	-	2	-	-
		22/05/2018	GMW109S (Point 16)	**0.013**	**-**	**0.008**	**-**	41	**3.54**	**-**	-	-	-	2	**0.055**	**-**
	Point 17	22/08/2017	GMW110 (Point 17)	-	-	-	-	153	-	-	-	-	-	1	-	-
		20/11/2017	GMW110 (Point 17)	-	-	-	-	147	-	-	-	-	-	1	-	-
		19/02/2018	GMW110 (Point 17)	**0.005**	**-**	0.002	-	-	0.151	-	<0.0001	-	-	-	**0.018**	**-**
		19/02/2018	GMW110 (Point 17)	-	-	-	-	177	-	-	-	-	-	2	-	-
		22/05/2018	GMW110 (Point 17)	-	-	-	-	159	-	-	-	-	-	1	-	-
	Point 18	22/08/2017	GMW111 (Point 18)	-	-	-	-	97	-	-	-	-	-	1	-	-
		20/11/2017	GMW111 (Point 18)	-	-	-	-	103	-	-	-	-	-	1	-	-
		19/02/2018	GMW111 (Point 18)	**0.008**	**-**	**0.004**	**-**	-	0.303	-	<0.0001	-	-	-	**0.022**	**-**
		19/02/2018	GMW111 (Point 18)	-	-	-	-	98	-	-	-	-	-	<1	-	-
		22/05/2018	GMW111 (Point 18)	-	-	-	-	104	-	-	-	-	-	1	-	-
Statistical Summary																
Maximum Concentration				0.32	0.003	0.088	<0.001	196	7.15	3.19	<0.0001	0.088	0.009	12	0.61	0.022
Average Concentration				0.037		0.014		80	1.8		0.0001			1.8	0.086	
Standard Deviation				0.073		0.02		55	2		0			2.1	0.14	

				Inorganics														
				Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Nitrate & Nitrite (as N)	Sodium (Filtered)	TDS	TOC	Sulfate as SO4 - Turbidimetric (Filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR				1	1	1	1	0.01	1	0.1	0.01	0.01	0.01	1	10	1	1
ADWG 2015 Health										**1.5**							
ANZECC 2000 Freshwater (80%)								**2.3**			**12**						
ANZECC 2000 Fresh Water (90%)								**1.43**			**8.7**						
ANZECC 2000 Fresh Water (95%)								**0.9**			**7.2**						
Site	**Location Code**	**Sample Date**	**Field ID**														
Whytes Gully Landfill	Point 20	22/08/2017	BH6 (Point 20)	701	<1	<1	701	0.25	1030	-	-	-	-	747	2810	11	213
		20/11/2017	BH6 (Point 20)	658	<1	<1	658	0.28	1000	-	-	-	-	845	2600	9	251
		19/02/2018	BH6 (Point 20)	-	-	-	-	-	-	0.9	0.04	<0.01	0.04	-	-	-	-
		19/02/2018	BH6 (Point 20)	785	<1	<1	785	0.25	1150	-	-	-	-	866	2930	-	275
		22/05/2018	BH6 (Point 20)	799	<1	<1	799	0.24	1200	-	-	-	-	792	2960	9	281
	Point 5	22/08/2017	GABH02 (Point 5)	1120	<1	<1	1120	<0.01	1080	-	-	-	-	615	2960	6	147
		20/11/2017	GABH02 (Point 5)	1100	<1	<1	1100	0.03	1040	-	-	-	-	543	3030	8	164
		19/02/2018	GABH02 (Point 5)	-	-	-	-	-	-	0.5	0.02	<0.01	0.02	-	-	-	-
		19/02/2018	GABH02 (Point 5)	1160	<1	<1	1160	0.03	1170	-	-	-	-	696	3400	6	176
		23/05/2018	GABH02 (Point 5)	1210	<1	<1	1210	0.04	1140	-	-	-	-	619	3490	-	177
	Point 9	22/08/2017	GMW102 (Point 9)	358	<1	<1	358	0.08	44	-	-	-	-	40	670	3	30
		20/11/2017	GMW102 (Point 9)	113	<1	<1	113	0.02	26	-	-	-	-	28	342	2	12
	Point 10	22/08/2017	GMW103 (Point 10)	180	<1	<1	180	0.03	389	-	-	-	-	173	1380	1	122
		20/11/2017	GMW103 (Point 10)	300	<1	<1	300	0.04	414	-	-	-	-	180	1280	1	134
		19/02/2018	GMW103 (Point 10)	-	-	-	-	-	-	0.4	0.1	<0.01	0.1	-	-	-	-
		19/02/2018	GMW103 (Point 10)	450	<1	<1	450	0.08	454	-	-	-	-	177	1240	3	137
		22/05/2018	GMW103 (Point 10)	438	<1	<1	438	0.03	455	-	-	-	-	172	1400	2	151
	Point 11	22/08/2017	GMW104 (Point 11)	349	<1	<1	349	0.02	78	-	-	-	-	140	578	2	46
		20/11/2017	GMW104 (Point 11)	476	<1	<1	476	0.03	114	-	-	-	-	183	718	2	72
		19/02/2018	GMW104 (Point 11)	-	-	-	-	-	-	0.7	0.02	<0.01	0.02	-	-	-	-
		19/02/2018	GMW104 (Point 11)	504	<1	<1	504	0.03	131	-	-	-	-	177	720	2	70
		22/05/2018	GMW104 (Point 11)	500	<1	<1	500	0.04	122	-	-	-	-	180	766	2	76
	Point 12	22/08/2017	GMW105 (Point 12)	34	<1	<1	34	0.02	50	-	-	-	-	36	217	2	14
		20/11/2017	GMW105 (Point 12)	34	<1	<1	34	0.1	39	-	-	-	-	41	217	6	14
	Point 15	22/08/2017	GMW108D (Point 15)	495	<1	<1	495	0.02	600	-	-	-	-	401	1720	3	162
		20/11/2017	GMW108D (Point 15)	255	<1	<1	255	0.14	244	-	-	-	-	178	780	12	76
		19/02/2018	GMW108D (Point 15)	-	-	-	-	-	-	0.6	0.17	<0.01	0.17	-	-	-	-
		19/02/2018	GMW108D (Point 15)	514	<1	<1	514	0.02	663	-	-	-	-	439	1660	2	177
		22/05/2018	GMW108D (Point 15)	223	<1	<1	223	0.11	49	-	-	-	-	40	348	16	18
		5/06/2018	GMW108D (Point 15)	505	<1	<1	505	0.06	706	-	-	-	-	431	1590	2	199
	Point 14	22/08/2017	GMW108S (Point 14)	498	<1	<1	498	0.08	584	-	-	-	-	372	1810	4	162
		20/11/2017	GMW108S (Point 14)	144	<1	<1	144	0.04	42	-	-	-	-	61	382	13	25
		19/02/2018	GMW108S (Point 14)	-	-	-	-	-	-	0.5	0.01	<0.01	0.01	-	-	-	-
		19/02/2018	GMW108S (Point 14)	534	<1	<1	534	0.07	679	-	-	-	-	439	1730	8	191
		22/05/2018	GMW108S (Point 14)	434	<1	<1	434	0.1	496	-	-	-	-	298	1280	8	142
	Point 19	22/08/2017	GMW109D (Point 19)	209	<1	<1	209	0.08	416	-	-	-	-	188	868	<1	23
		20/11/2017	GMW109D (Point 19)	215	<1	<1	215	0.08	413	-	-	-	-	206	929	<1	23
		19/02/2018	GMW109D (Point 19)	-	-	-	-	-	-	0.4	0.11	<0.01	0.11	-	-	-	-
		19/02/2018	GMW109D (Point 19)	243	<1	<1	243	0.02	461	-	-	-	-	198	1080	<1	25
		22/05/2018	GMW109D (Point 19)	242	<1	<1	242	0.05	480	-	-	-	-	185	1000	<1	26
	Point 16	22/08/2017	GMW109S (Point 16)	215	<1	<1	215	0.38	282	-	-	-	-	153	912	7	84
		20/11/2017	GMW109S (Point 16)	238	<1	<1	238	0.39	272	-	-	-	-	162	721	7	95
		19/02/2018	GMW109S (Point 16)	-	-	-	-	-	-	0.1	0.03	<0.01	0.03	-	-	-	-
		19/02/2018	GMW109S (Point 16)	304	<1	<1	304	0.82	268	-	-	-	-	162	810	10	74
		22/05/2018	GMW109S (Point 16)	266	<1	<1	266	0.81	288	-	-	-	-	142	757	6	95
	Point 17	22/08/2017	GMW110 (Point 17)	579	<1	<1	579	<0.01	853	-	-	-	-	460	2120	2	282
		20/11/2017	GMW110 (Point 17)	564	<1	<1	564	0.02	822	-	-	-	-	505	2680	2	308
		19/02/2018	GMW110 (Point 17)	-	-	-	-	-	-	0.4	0.52	<0.01	0.52	-	-	-	-
		19/02/2018	GMW110 (Point 17)	628	<1	<1	628	0.02	939	-	-	-	-	511	2470	3	317
		22/05/2018	GMW110 (Point 17)	624	<1	<1	624	0.01	988	-	-	-	-	460	2690	2	338
	Point 18	22/08/2017	GMW111 (Point 18)	527	<1	<1	527	<0.01	671	-	-	-	-	422	1750	<1	196
		20/11/2017	GMW111 (Point 18)	557	<1	<1	557	0.02	672	-	-	-	-	504	2090	2	257
		19/02/2018	GMW111 (Point 18)	-	-	-	-	-	-	0.4	0.02	<0.01	0.02	-	-	-	-
		19/02/2018	GMW111 (Point 18)	575	<1	<1	575	0.05	714	-	-	-	-	477	1810	2	205
		22/05/2018	GMW111 (Point 18)	558	<1	<1	558	0.02	739	-	-	-	-	433	1750	1	205
Statistical Summary																	
Maximum Concentration				1210	<1	<1	1210	0.82	1200	0.9	0.52	<0.01	0.52	866	3490	16	338
Average Concentration				476	<1	<1	476	0.11	544	0.5	0.1	<0.01	0.1	335	1543	5	139
Standard Deviation				283	0	0	283	0.18	368	0.2	0.16	0	0.16	234	934	4	94

				Organochlorine Pesticides																								
				4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ADWG 2015 Health							**0.3**		**2**					**9**									**10**	**0.3**			
ANZECC 2000 Freshwater (80%)									**0.27**					**0.04**						**0.06**			**1**	**0.7**			
ANZECC 2000 Fresh Water (90%)									**0.14**					**0.02**						**0.04**			**0.4**	**0.25**			
ANZECC 2000 Fresh Water (95%)									**0.08**					**0.01**						**0.02**			**0.2**	**0.09**			
Site	**Location Code**	**Sample Date**	**Field ID**																									
Whytes Gully Landfill	Point 20	19/02/2018	BH6 (Point 20)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 5	19/02/2018	GABH02 (Point 5)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 10	19/02/2018	GMW103 (Point 10)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 11	19/02/2018	GMW104 (Point 11)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 15	19/02/2018	GMW108D (Point 15)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 14	19/02/2018	GMW108S (Point 14)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 19	19/02/2018	GMW109D (Point 19)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 16	19/02/2018	GMW109S (Point 16)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 17	19/02/2018	GMW110 (Point 17)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Point 18	19/02/2018	GMW111 (Point 18)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Statistical Summary																												
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Average Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

				Organophosphorous Pesticides															Pesticides			
				Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	0.5	0.5	0.5	2	0.5
ADWG 2015 Health				**30**	**10**	**0.5**	**2**	**10**		**4**	**5**	**7**	**4**	**7**	**70**	**0.7**	**2**			**0.5**	**20**	**0.5**
ANZECC 2000 Freshwater (80%)				**0.11**				**1.2**		**2**		**0.3**			**1.1**						**0.04**	
ANZECC 2000 Fresh Water (90%)				**0.05**				**0.11**		**0.2**		**0.2**			**0.2**						**0.01**	
ANZECC 2000 Fresh Water (95%)				**0.02**				**0.01**		**0.01**		**0.15**			**0.05**						**0.004**	
Site	**Location Code**	**Sample Date**	**Field ID**																			
Whytes Gully Landfill	Point 20	19/02/2018	BH6 (Point 20)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 5	19/02/2018	GABH02 (Point 5)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 10	19/02/2018	GMW103 (Point 10)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 11	19/02/2018	GMW104 (Point 11)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 15	19/02/2018	GMW108D (Point 15)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 14	19/02/2018	GMW108S (Point 14)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 19	19/02/2018	GMW109D (Point 19)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 16	19/02/2018	GMW109S (Point 16)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 17	19/02/2018	GMW110 (Point 17)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
	Point 18	19/02/2018	GMW111 (Point 18)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
Statistical Summary																						
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
Average Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<0.5	<0.5	<0.5	<2	<0.5
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

				EC	TOC	pH
				Electrical Conductivity 1:5 soil:water	Nonpurgeable Organic Carbon	pH (Field)
				µS/cm	mg/L	pH Units
LOR				1	1	0.1
Site	**Location Code**	**Sample Date**	**Field ID**			
Whytes Gully Landfill	Point 20	22/08/2017	BH6 (Point 20)	4780	-	7
		20/11/2017	BH6 (Point 20)	5050	-	6.8
		19/02/2018	BH6 (Point 20)	5190	9	6.8
		22/05/2018	BH6 (Point 20)	5050	-	6.9
	Point 5	22/08/2017	GABH02 (Point 5)	5420	-	6.6
		20/11/2017	GABH02 (Point 5)	5500	-	6.8
		19/02/2018	GABH02 (Point 5)	5730	-	6.8
		23/05/2018	GABH02 (Point 5)	5330	8	6.5
	Point 9	22/08/2017	GMW102 (Point 9)	788	-	7.1
		20/11/2017	GMW102 (Point 9)	354	-	6.8
	Point 10	22/08/2017	GMW103 (Point 10)	2130	-	7
		20/11/2017	GMW103 (Point 10)	2200	-	7.2
		19/02/2018	GMW103 (Point 10)	2290	-	7.1
		22/05/2018	GMW103 (Point 10)	2250	-	7
	Point 11	22/08/2017	GMW104 (Point 11)	1060	-	7.3
		20/11/2017	GMW104 (Point 11)	1340	-	7.3
		19/02/2018	GMW104 (Point 11)	1410	-	7.5
		22/05/2018	GMW104 (Point 11)	1340	-	7.2
	Point 12	22/08/2017	GMW105 (Point 12)	276	-	5.8
		20/11/2017	GMW105 (Point 12)	278	-	5.8
	Point 15	22/08/2017	GMW108D (Point 15)	2960	-	7
		20/11/2017	GMW108D (Point 15)	1340	-	7.3
		19/02/2018	GMW108D (Point 15)	3230	-	7.2
		22/05/2018	GMW108D (Point 15)	568	-	7.3
		5/06/2018	GMW108D (Point 15)	3120	-	6.8
	Point 14	22/08/2017	GMW108S (Point 14)	2910	-	6.8
		20/11/2017	GMW108S (Point 14)	479	-	7.1
		19/02/2018	GMW108S (Point 14)	3370	-	7
		22/05/2018	GMW108S (Point 14)	2320	-	6.8
	Point 19	22/08/2017	GMW109D (Point 19)	1750	-	7
		20/11/2017	GMW109D (Point 19)	1800	-	7
		19/02/2018	GMW109D (Point 19)	1830	-	7.1
		22/05/2018	GMW109D (Point 19)	1830	-	6.9
	Point 16	22/08/2017	GMW109S (Point 16)	1420	-	6.2
		20/11/2017	GMW109S (Point 16)	1430	-	6.2
		19/02/2018	GMW109S (Point 16)	1490	-	6.5
		22/05/2018	GMW109S (Point 16)	1460	-	6.4
	Point 17	22/08/2017	GMW110 (Point 17)	4180	-	6.8
		20/11/2017	GMW110 (Point 17)	4230	-	6.7
		19/02/2018	GMW110 (Point 17)	4460	-	6.9
		22/05/2018	GMW110 (Point 17)	4370	-	6.7
	Point 18	22/08/2017	GMW111 (Point 18)	3400	-	7.4
		20/11/2017	GMW111 (Point 18)	3550	-	6.8
		19/02/2018	GMW111 (Point 18)	3560	-	7
		22/05/2018	GMW111 (Point 18)	3390	-	7

Statistical Summary

Maximum Concentration	5730	9	7.5
Average Concentration	2716		6.9
Standard Deviation	1635		0.37

Parameter	Unit	Trade Waste Agreement Criteria	Date																	
			7/06/2017	26/06/2017	17/07/2017	8/08/2017	31/08/2017	21/09/2017	13/10/2017	2/11/2017	2/11/2017	27/11/2017	22/12/2017	12/01/2018	29/01/2018	23/02/2018	16/03/2018	10/04/2018	3/05/2018	29/05/2018
Meter Reading (start)	Litres	-	243487	246497	247389	252294	253202	253855	254858	255710	255710	258630	263220	264149	266100	267416	272079	275982	277867	280810
Meter Reading (finish)	Litres	-	243949	246529	247467	252306	253242	253905	254892	255837	255837	258829	263242	264251	266164	267483	272210	276030	277919	280873
Volume Dishcharged	KL	605	462	32	78	12	41	50	34	127	127	199	23	102	100	67	131	48	52	63
Discrete Start pH (start) composite	pH Unit	7 to 10	8.2	10	6.5	7.7	8.2	8	8	8.3	8.3	7.1	8.2	8.1	7.9	8	7.9	8.4	8.2	8.5
Total Dissolved Solids composite	mg/L	10000	4170	4300	4980	5400	5640	7150	7670	8450	8450	6360	6560	6360	6360	7340	5490	5180	6120	6160
Total Dissolved Solids MDM	kg/day	2500	1926.5	137.6	388.4	64.8	231.2	357.5	260.8	1073.2	1073.2	1265.6	150.9	648.7	636.0	491.8	719.2	248.6	318.2	388.1
Suspended Solids composite	mg/L	600	36	36	68	56	77	124	62	44	44	132	162	256	68	76	79	22	28	34
Suspended Solids MDM	kg/day	150	16.6	1.2	5.3	0.7	3.2	6.2	2.1	5.6	5.6	26.3	3.7	26.1	6.8	5.1	10.3	1.1	1.5	2.1
Ammonia as N composite	mg/L	100	46	37.8	26.3	73.5	64.1	17	7	0.1	0.1	0.1	0.1	0.1	0.9	0.1	0.1	0.1	0.1	0.6
Ammonia as N MDM	kg/day	36	21.3	1.2	2.1	0.9	2.6	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
pH Finish composite	pH Unit	7 to 10	8.5	10	6.5	8.8	8.2	7.6	8	8.1	8.1	7.3	8	7.9	8.4	8	8	8.4	8.2	8.6
Biochemical Oxygen Demand	mg/L	-	63	19	41	54	86	161	72	6430	13	7	7	2	14	12	6	12	15	27
Biochemical Oxygen Demand MDM	kg/day	80	29.1	0.6	3.2	0.6	3.5	8.1	2.4	816.6	1.7	1.4	0.2	0.2	1.4	0.8	0.8	0.6	0.8	1.7
Temperature	˚C	<38	16	13	8	11	14	17	20	20	20	26	26	24	31	24	26	23	16	17
Electrical Conductivity @ 25C	µS/cm		6420	6620	7670	8310	8670	11000	11800	13000	13000	9780	10100	9780	9790	11300	8440	7970	9420	9480

Notes:
KL: Kilolitres
mg/L: milograms per litre
kg/day: kilograms per day
µS/cm: microsiemens per centimeter
MDM: maximum daily mass

APPENDIX C

QUALITY ASSURANCE AND QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate;
- Equipment decontamination to prevent cross contamination;
- The completion of a field form for each monitoring point;
- Use of appropriate measures (i.e. gloves) to prevent cross contamination;
- Appropriate sample identification;
- Correct sample preservation;
- Sample transport with Chain of Custody (CoC) documentation; and
- Laboratory analysis in accordance with NATA accredited methods.

Table C-1 details the QA/QC procedures and sample collection details undertaken during monitoring and sample collection. **Table C-2** summarises the number of QA/QC samples collected during this investigation. CoC, Sample Receipt Notifications (SRNs), laboratory certificates and Interpretive QA/QC Reports can be provided upon request. These documents are typically appended to the report but due to the quantity of documents they have been omitted.

Table C1: Field QAQC Method Validation

Requirement	Yes/No	Comments
Equipment calibration	Yes	Each field instrument was calibrated prior to use. Calibration certificates can be provided by ALS Environmental upon request.
Equipment decontamination	Yes	Decontamination of sampling equipment (interface probe) was undertaken by washing with phosphate free detergent (Decon 90) followed by a rinse with potable water.
Sampling and monitoring documentation	Yes	Water sampling and gas monitoring was documented by ALS Environmental during each sampling event. Copies of sampling and monitoring documentation can be provided upon request.
Sample collection	Yes	Samples were collected using laboratory provided sampling containers and a clean pair of gloves was used for each new sampling point to limit the potential for cross-contamination.
Sample identification	Yes	All samples were marked with a unique identifier including the sampling point and date.
Sample preservation	Yes	Following collection water samples were placed in an esky that contained bricks. Samples were kept chilled from sample collection until laboratory receipt.
COC documentation	Yes	A COC form was completed by ALS Environmental detailing the sample identification, collection date, sampler and laboratory analysis required. COC forms and SRN can be provided upon request. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	ALS Environmental are a NATA accredited laboratory for the required analysis, which was completed in accordance with NATA accredited methods.

Laboratory QC and QCI Report Summary

The laboratory selected to undertake laboratory testing, ALS Environmental, is NATA accredited for the analysis required. ALS Environmental undertook internal QA/QC measures to demonstrate the suitability of the data. The laboratory is required to undertake and report internal laboratory Quality Control procedures for all chemical analysis undertaken, including:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples;
- Method blank at the rate of one method blank analysis per 20 samples;
- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples; and

> Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the internal laboratory QA/QC requirements is provided within the QC and QCI reports provided by ALS Environmental, which can be provided upon request and are discussed below.

The QC and QCI reports received from ALS Environmental highlight outliers of QA/QC standards including holding time breaches and internal QC results. Review of the QC and QCI documentation provided by ALS Environmental indicates that several outliers existed which are summarised below in **Table C-2**.

Table C-2: Laboratory QA/QC Outlier Summary

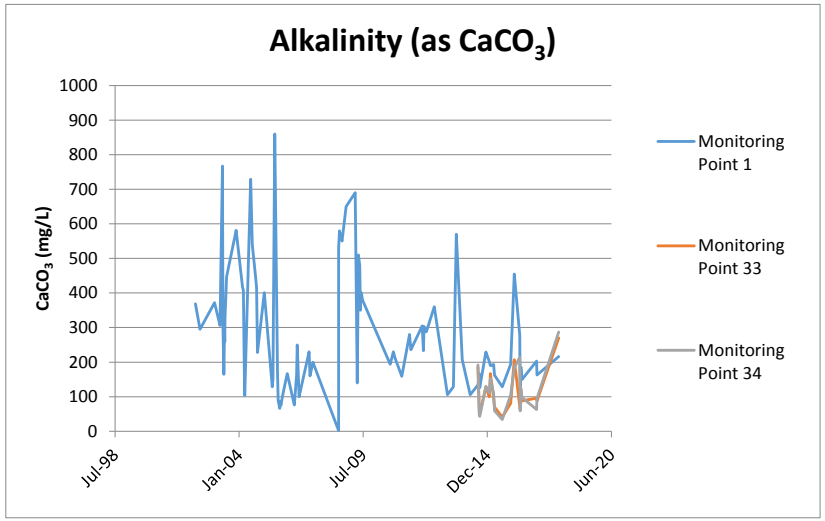
QA/QC Measure	QC Sample ID	Lab Report	Analyte
Duplicates	QC 0 Regular 12	EW1800650_1_QCI	PAH/Phenols (GC/MS – SIM)
	QC 0 Regular 10	EW1800650_1_QCI	Pesticides by GCMS
	QC 0 Regular 14	EW1800650_1_QCI	TRH – Semivolotile Fraction
Laboratory control samples	QC 2 Regular 28	EW1703553_1_QCI	Alkalinity by PC Titrator
	QC 2 Regular 26	EW1704789_1_QCI	
	QC1 Regular 16	EW1800651_1_QCI	
	QC1 Regular 14	EW1800652_1_QCI	
Matrix spikes	QC0 Regular 8	EW1800651_1_QCI	Dissolved Metals by ICP-MS – Suite A
	QC 0 Regular 12	EW1800650_1_QCI	PAH/Phenols (GC/MS – SIM)
	QC 0 Regular 10	EW1800650_1_QCI	Pesticides by GCMS
	QC 0 Regular 14	EW1800650_1_QCI	TRH – Semivolotile Fraction
Matrix Spike (MS) Recoveries	ES1720845-002	EW1703553_1_QCI	Sulfate as SO4, Chloride
	ES1721000-006	EW1703553_1_QCI	Ammonia as N
	ES1729130-004	EW1704789_1_QCI	Sulfate as SO4
	EW1800651-001	EW1800651_1_QCI	Sulfate as SO4
	EW1800651-001	EW1800652_1_QCI	Sulfate as SO4

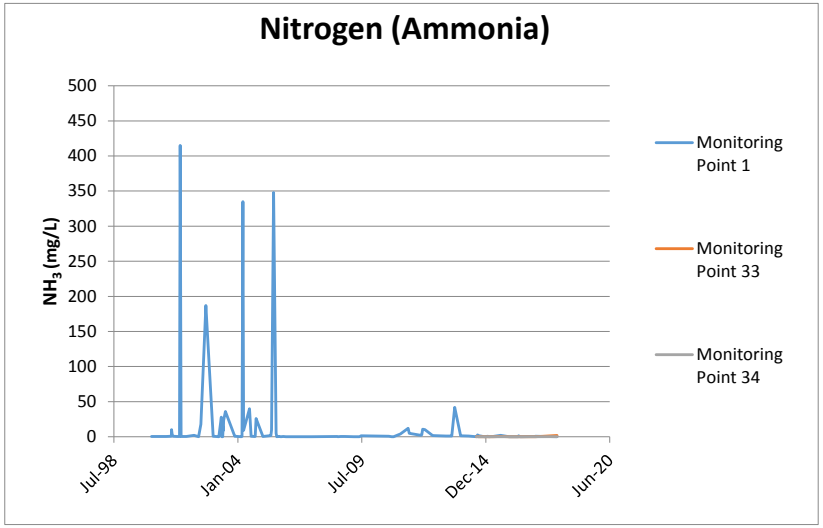
Cardno concludes that the data reported by ALS Environmental as presented in this Annual Report is suitable for interpretative to assess the environmental performance and compliance with EPL 5862.

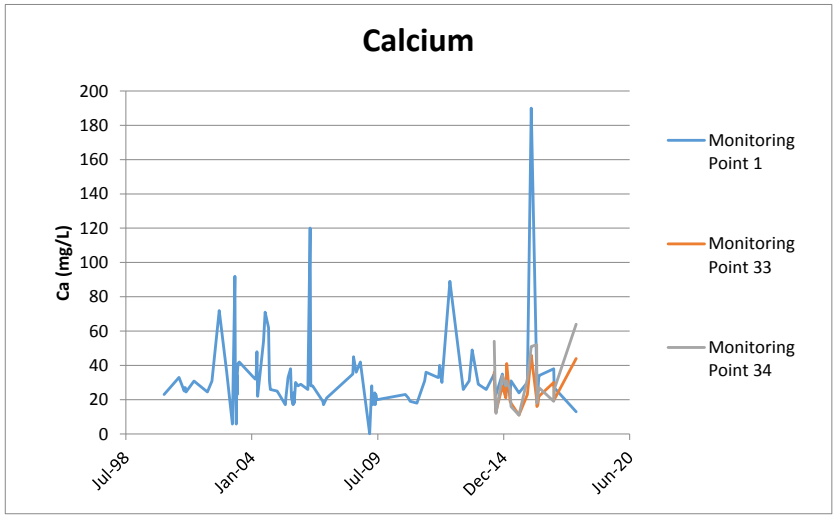
APPENDIX D

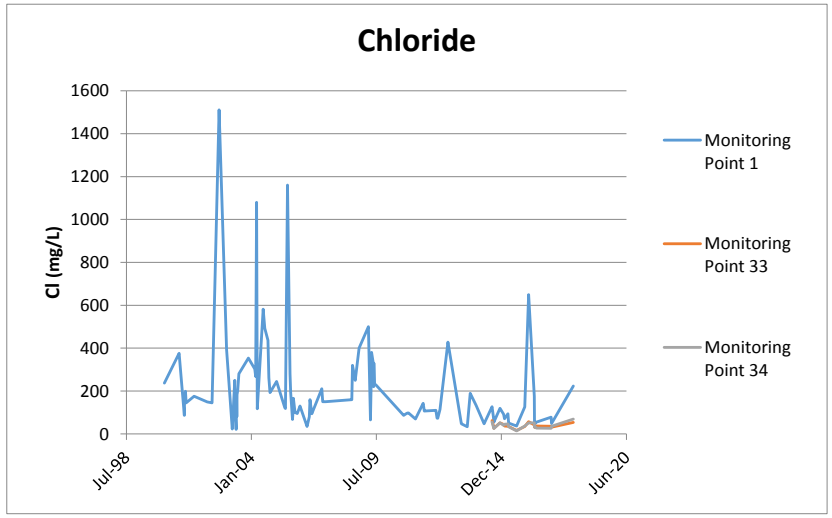
TREND GRAPHS

Sheet 1A

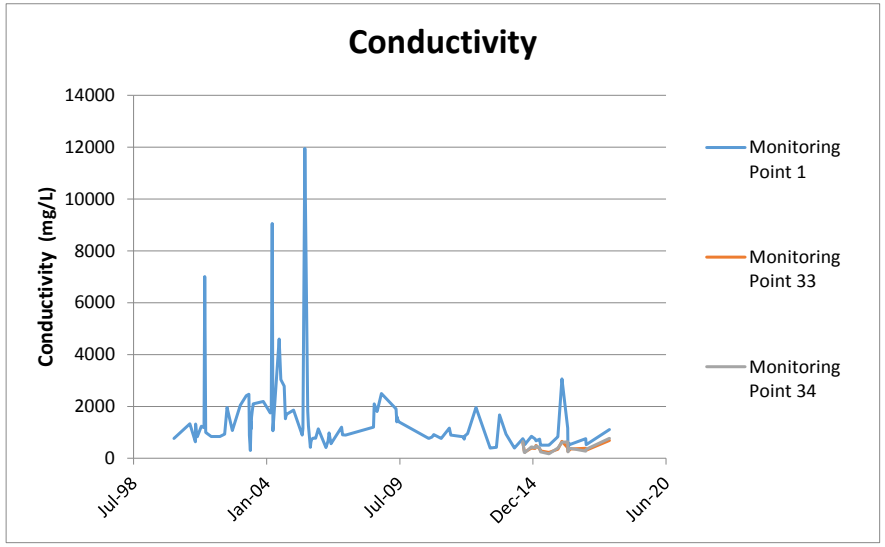

Alkalinity (as $CaCO_3$)
$CaCO_3$ (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

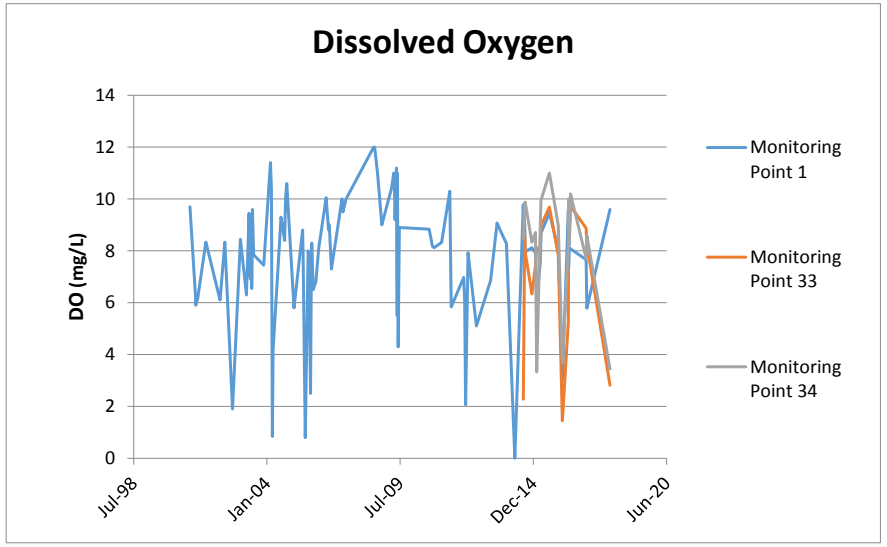

Nitrogen (Ammonia)
NH_3 (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

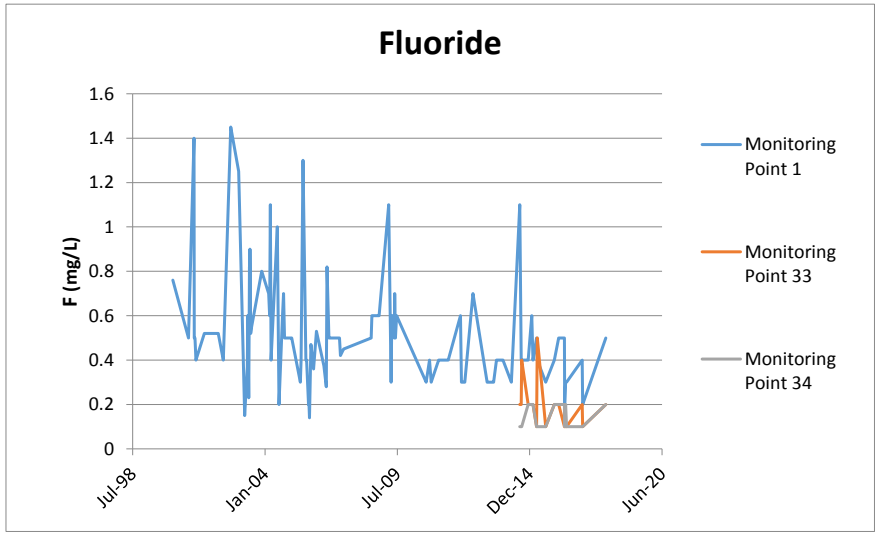

Calcium
Ca (mg/L)
200
180
160
140
120
100
80
60
40
20
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

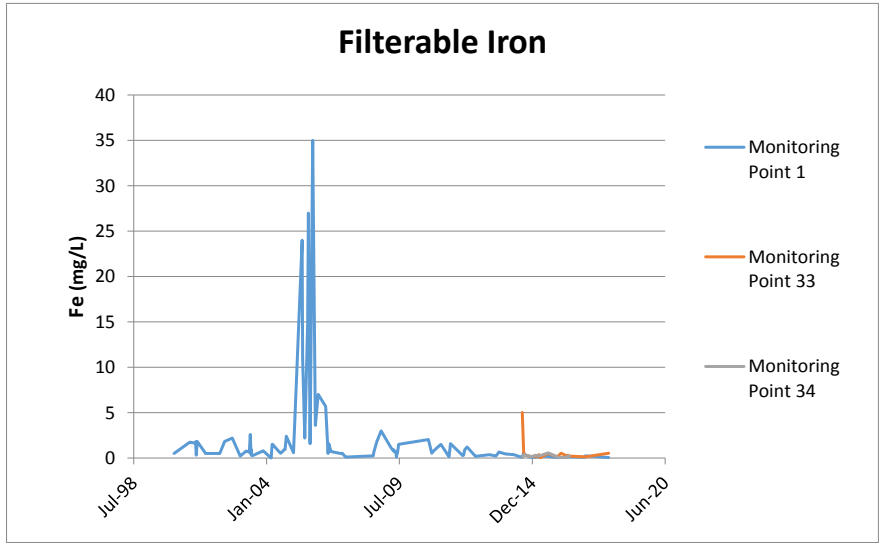

Chloride
Cl (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

Sheet 1B

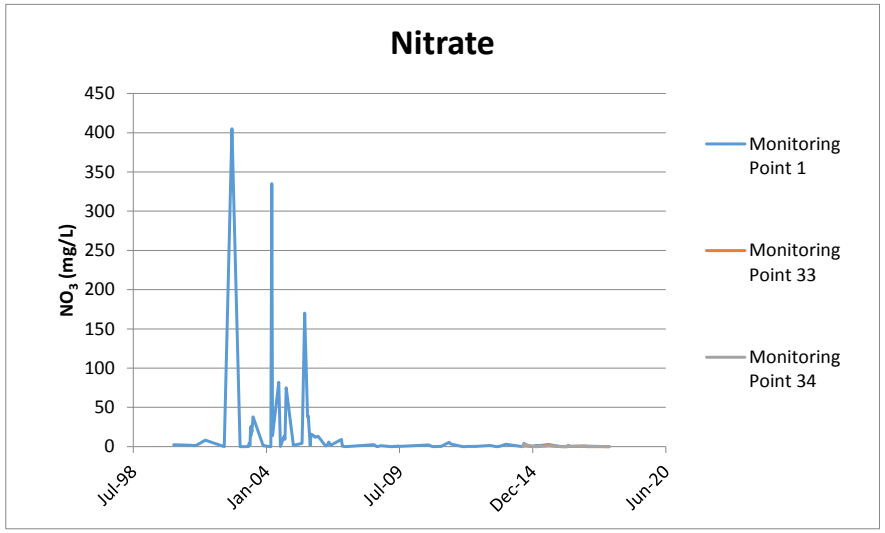

Conductivity
Conductivity (mg/L)
14000
12000
10000
8000
6000
4000
2000
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

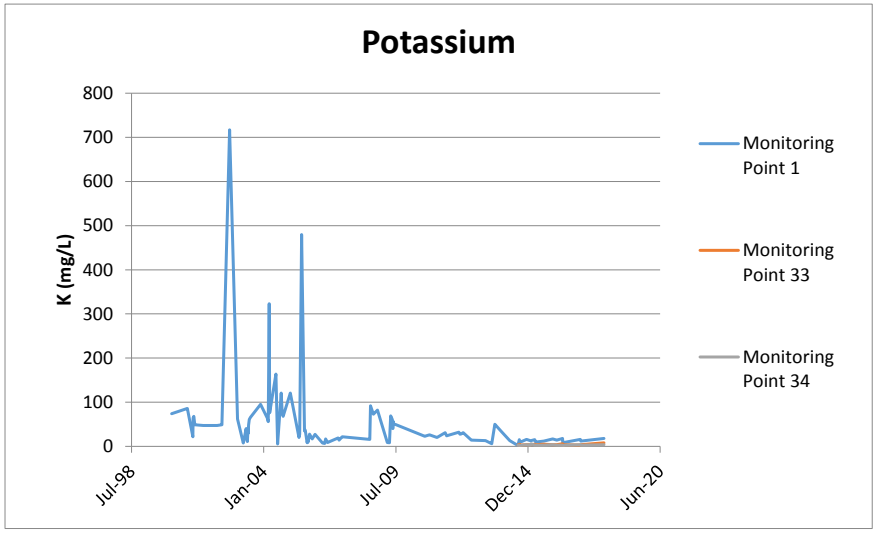

Dissolved Oxygen
DO (mg/L)
14
12
10
8
6
4
2
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

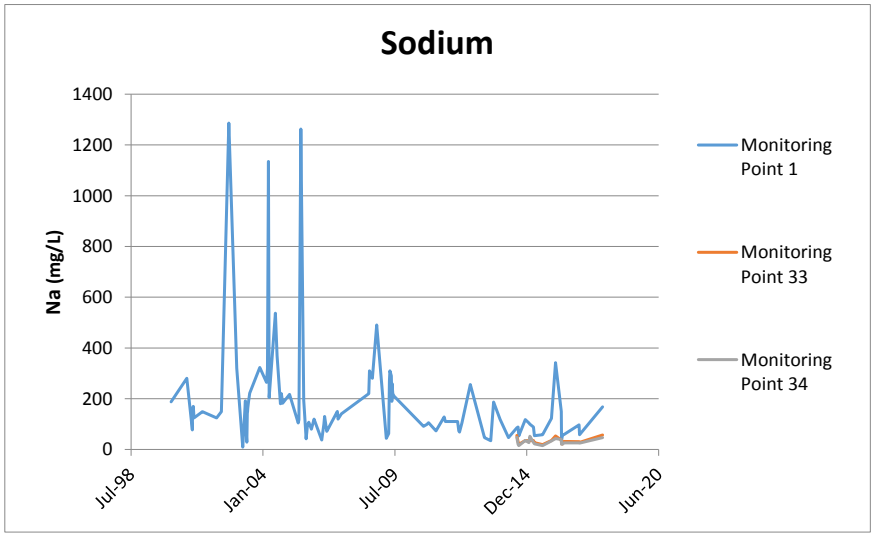

Fluoride
F (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

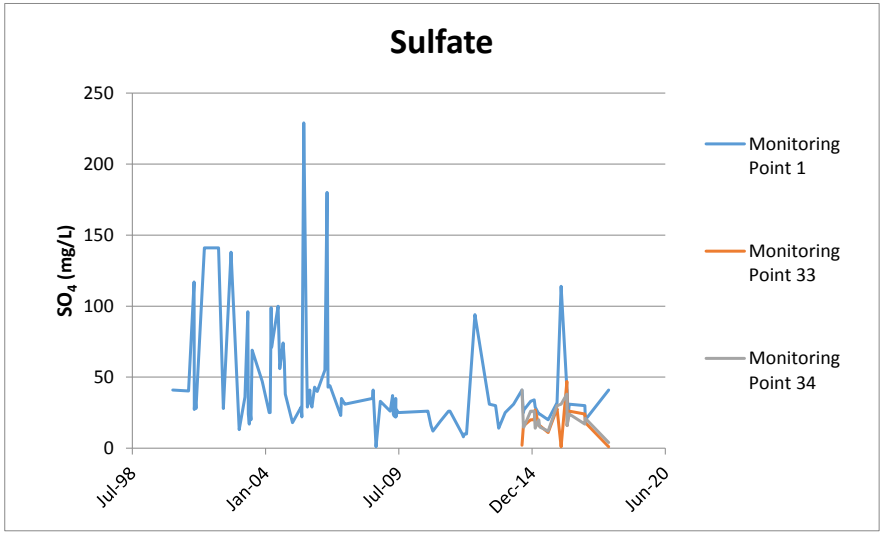

Filterable Iron
Fe (mg/L)
40
35
30
25
20
15
10
5
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

Sheet 1C

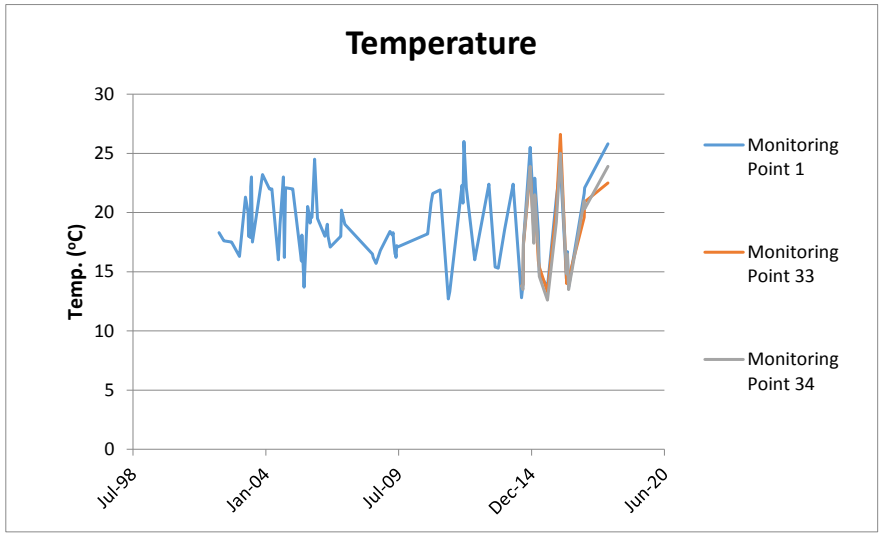

Nitrate
NO3 (mg/L)
450
400
350
300
250
200
150
100
50
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

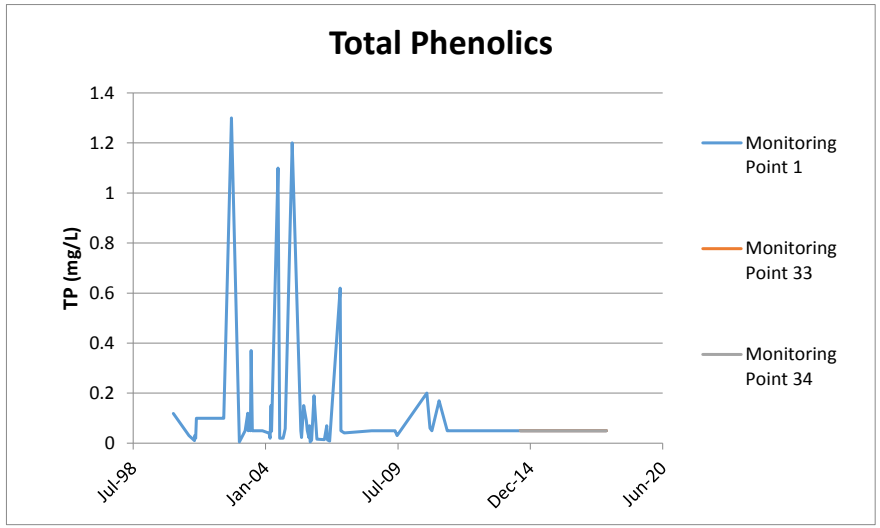

Potassium
K (mg/L)
800
700
600
500
400
300
200
100
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

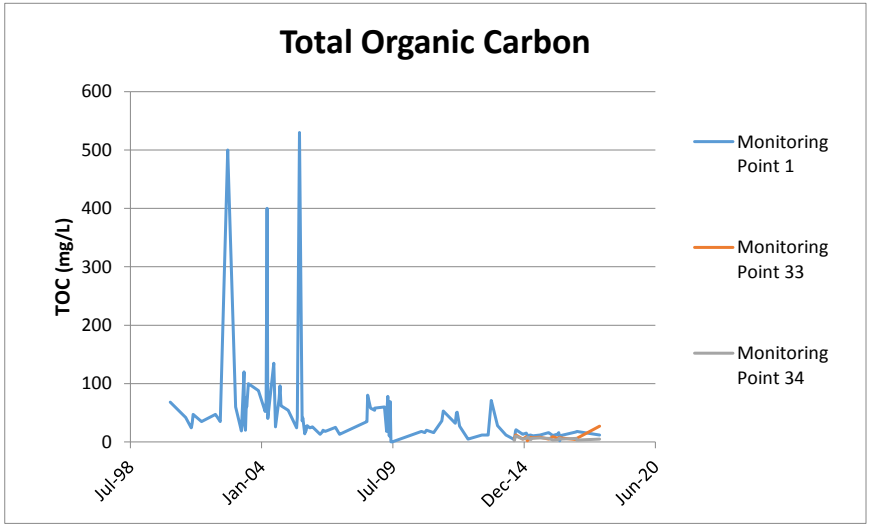

Sodium
Na (mg/L)
1400
1200
1000
800
600
400
200
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

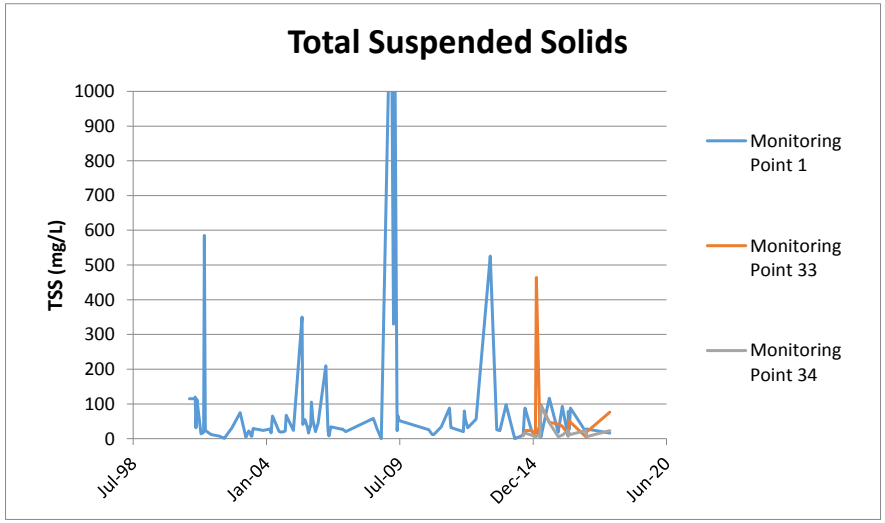

Sulfate
SO4 (mg/L)
250
200
150
100
50
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

Sheet 1D

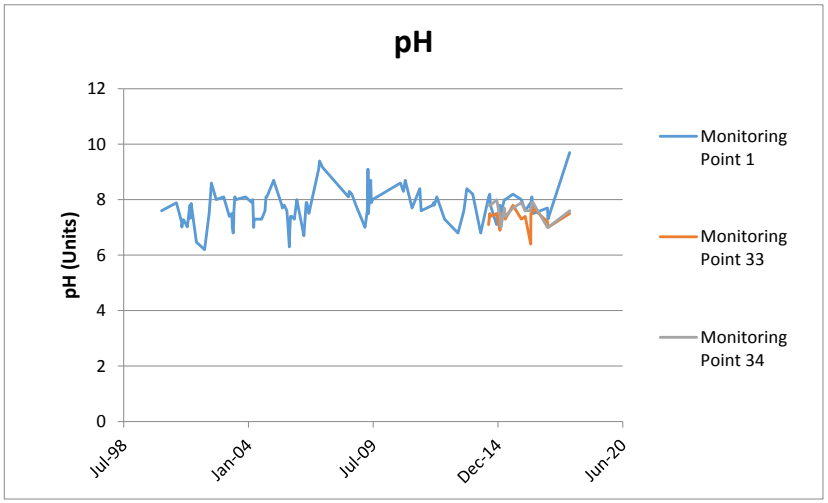

Temperature
Temp. (°C)
30
25
20
15
10
5
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

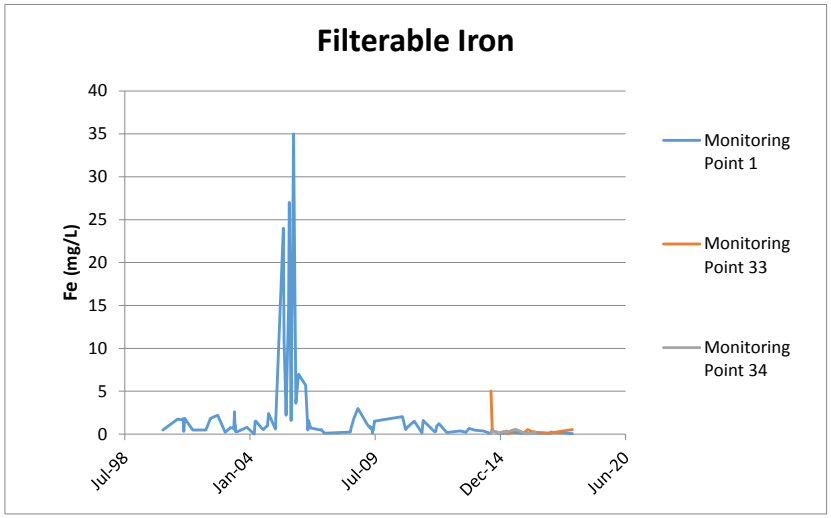

Total Phenolics
TP (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

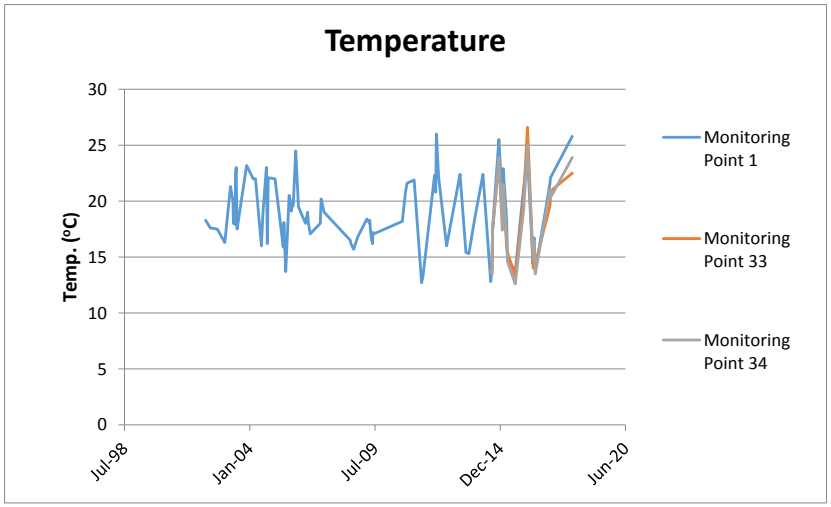

Total Organic Carbon
TOC (mg/L)
600
500
400
300
200
100
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34


Total Suspended Solids
TSS (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

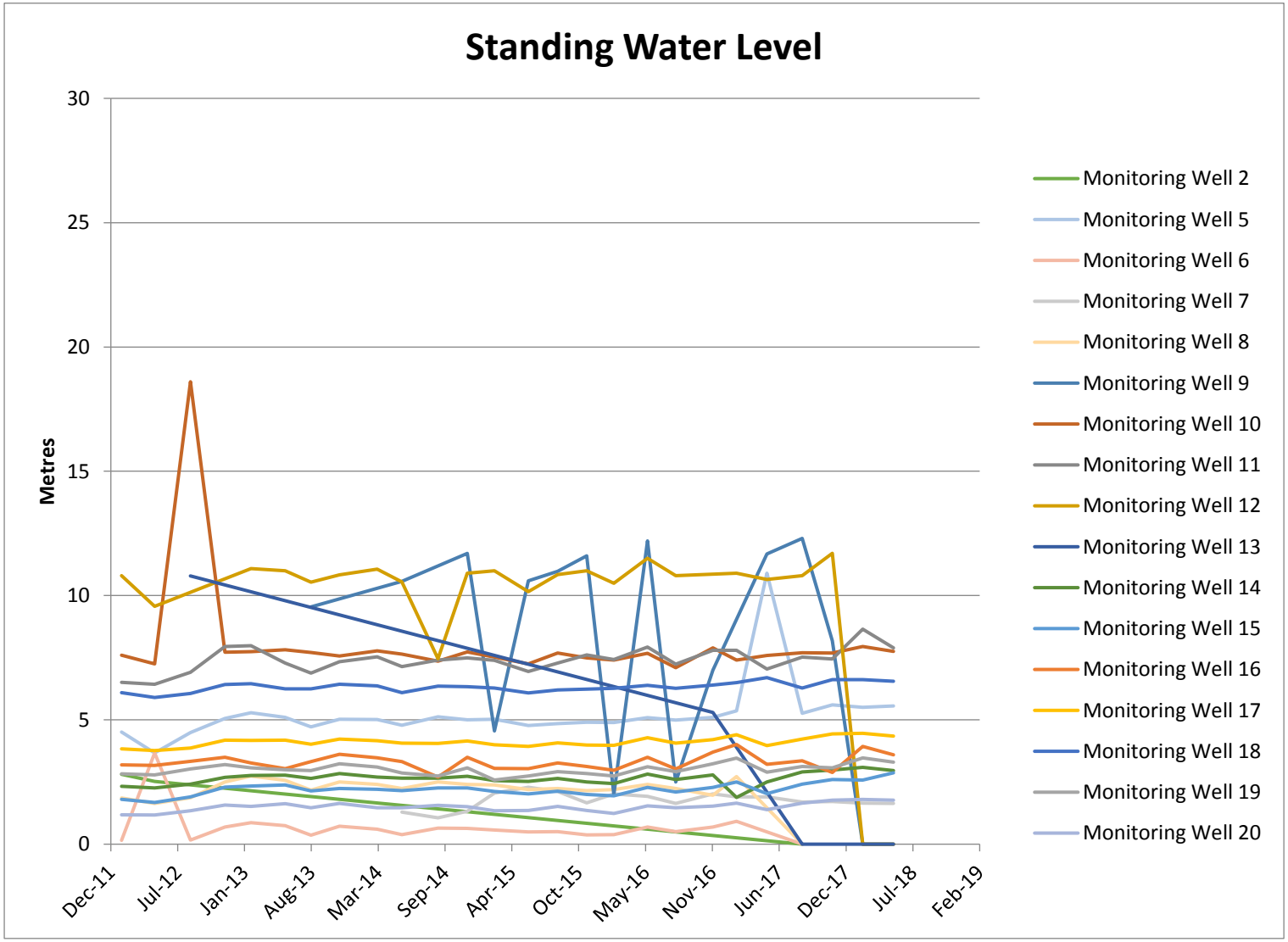
Sheet 1E


pH
pH (Units)
12
10
8
6
4
2
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

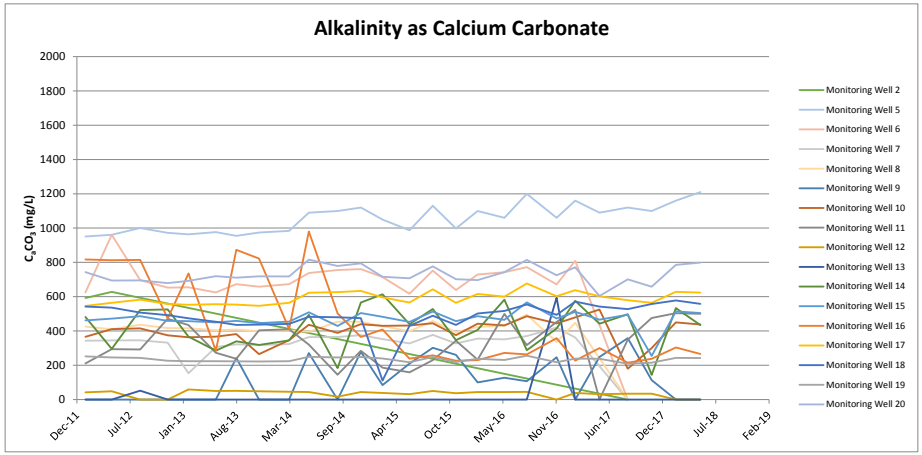

Filterable Iron
Fe (mg/L)
40
35
30
25
20
15
10
5
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

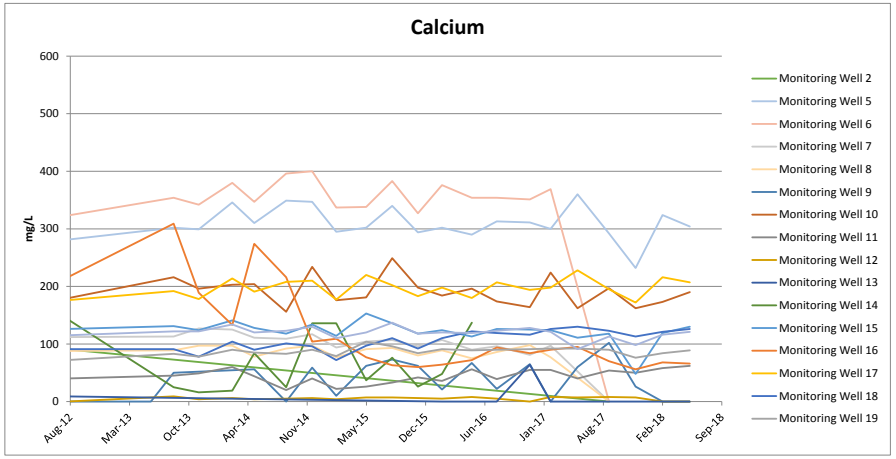

Temperature
Temp. (ºC)
30
25
20
15
10
5
0
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Monitoring Point 1
Monitoring Point 33
Monitoring Point 34

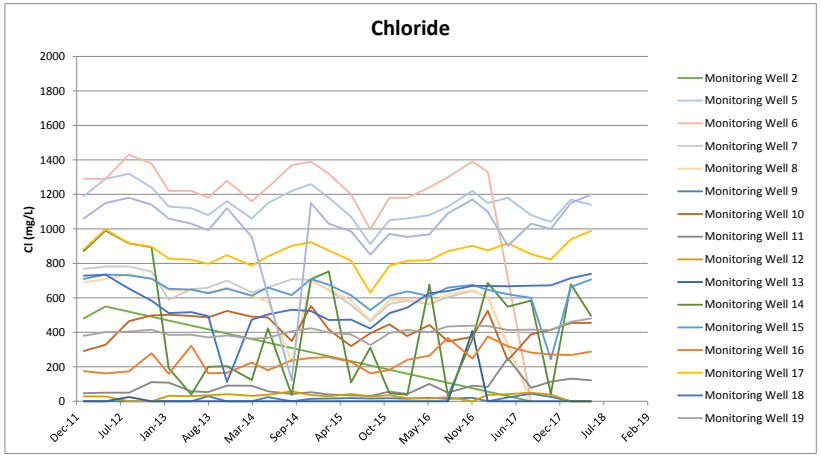
Sheet 2

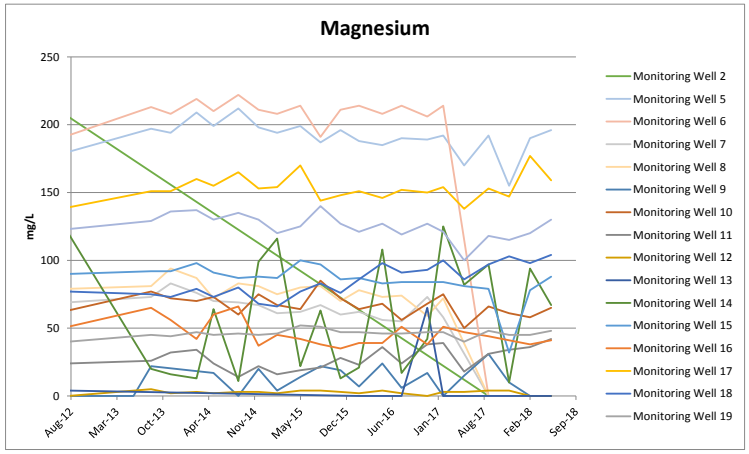

Standing Water Level
Metres
30
25
20
15
10
5
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

Sheet 3A

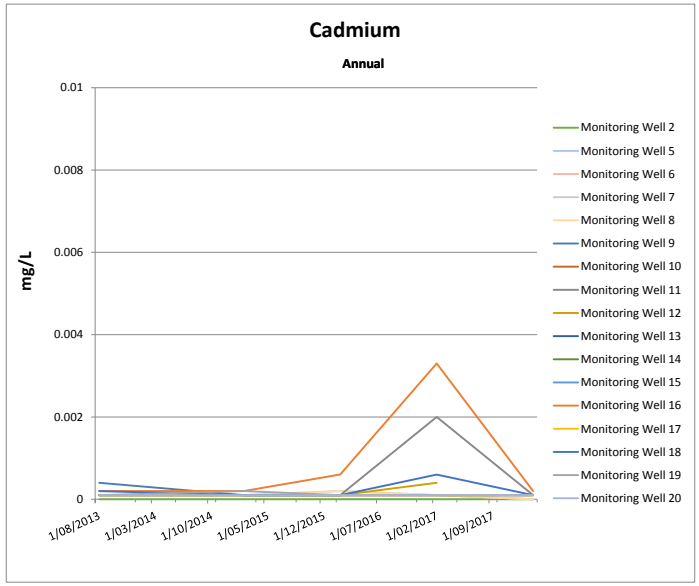

Alkalinity as Calcium Carbonate
C_aCO_3 (mg/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

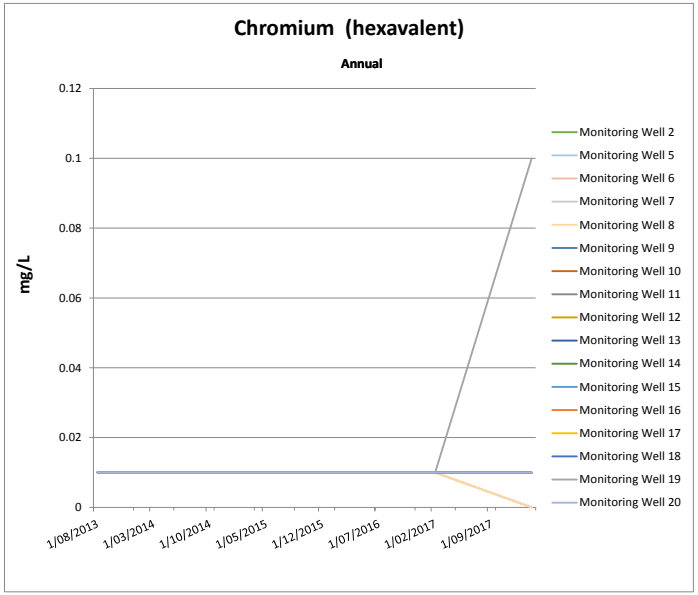

Calcium
mg/L
600
500
400
300
200
100
0
Aug-12
Mar-13
Oct-13
Apr-14
Nov-14
May-15
Dec-15
Jun-16
Jan-17
Aug-17
Feb-18
Sep-18
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19

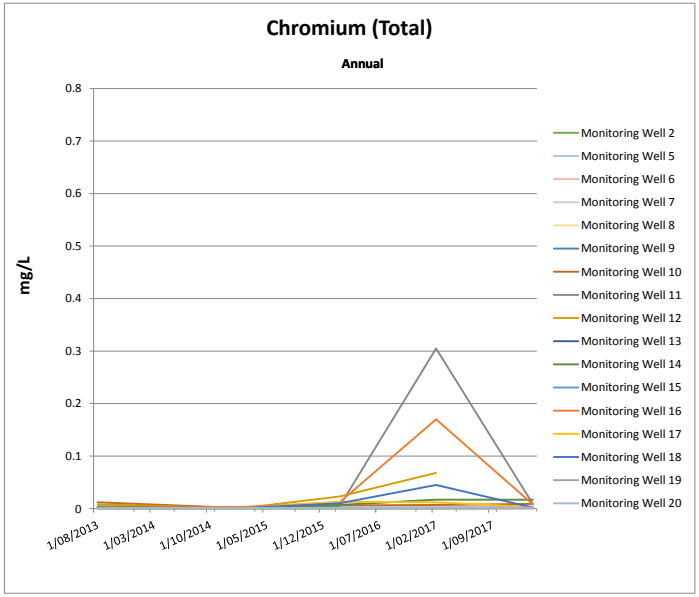

Chloride
Cl (mg/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19

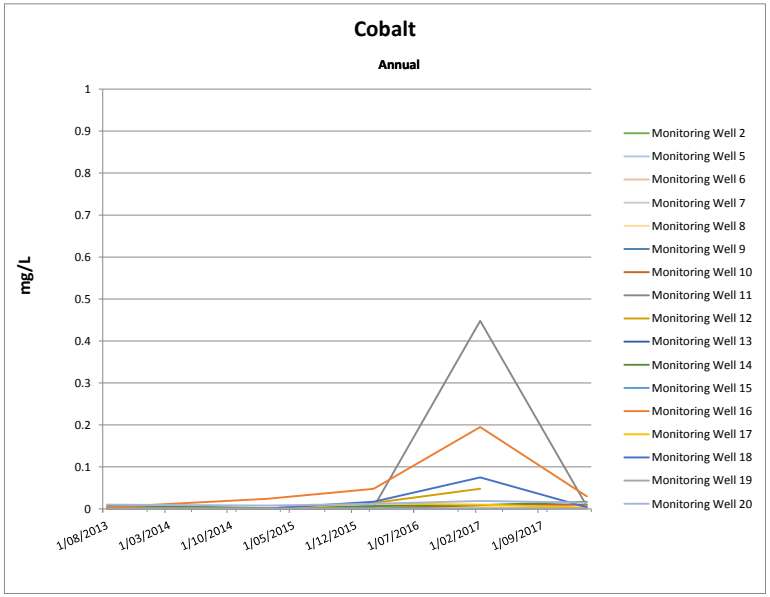

Magnesium
mg/L
250
200
150
100
50
0
Aug-12
Mar-13
Oct-13
Apr-14
Nov-14
May-15
Dec-15
Jun-16
Jan-17
Aug-17
Feb-18
Sep-18
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19

Sheet 3B

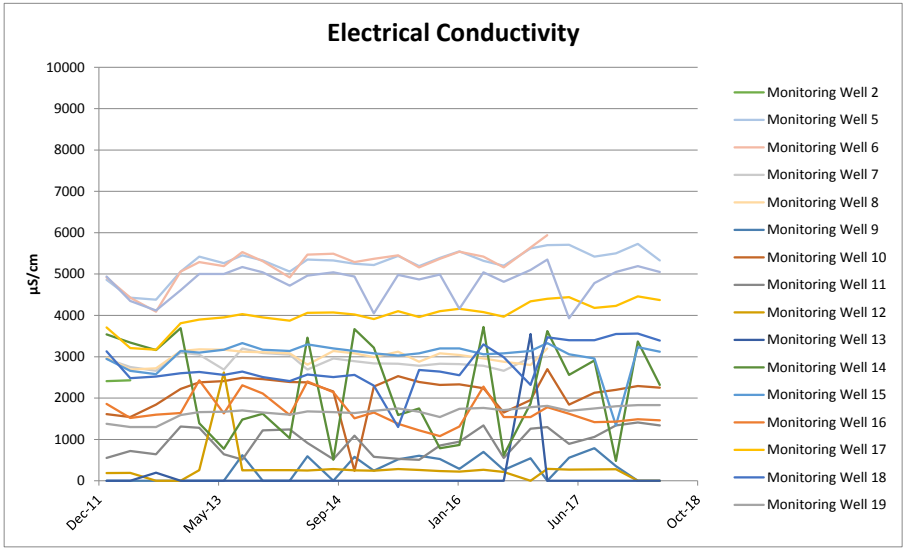

Cadmium
Annual
mg/L
0.01
0.008
0.006
0.004
0.002
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

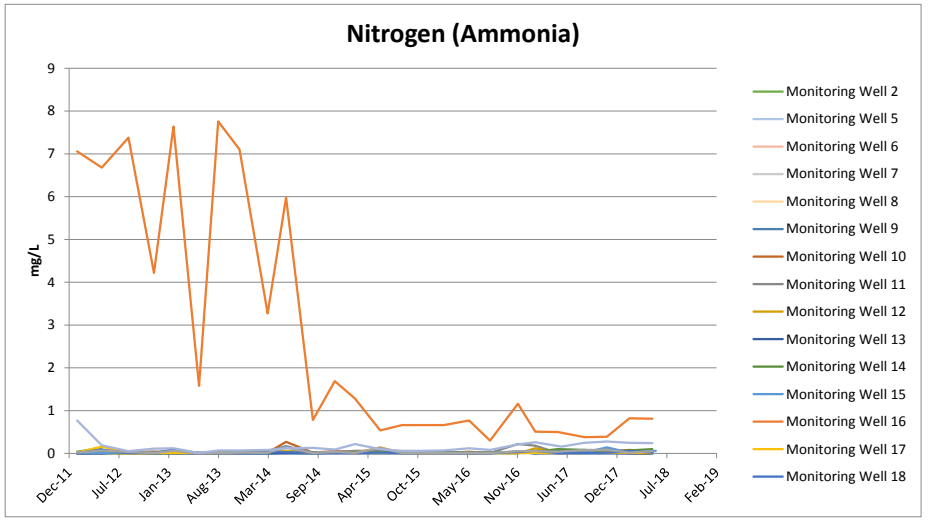

Chromium (hexavalent)
Annual
mg/L
0.12
0.1
0.08
0.06
0.04
0.02
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

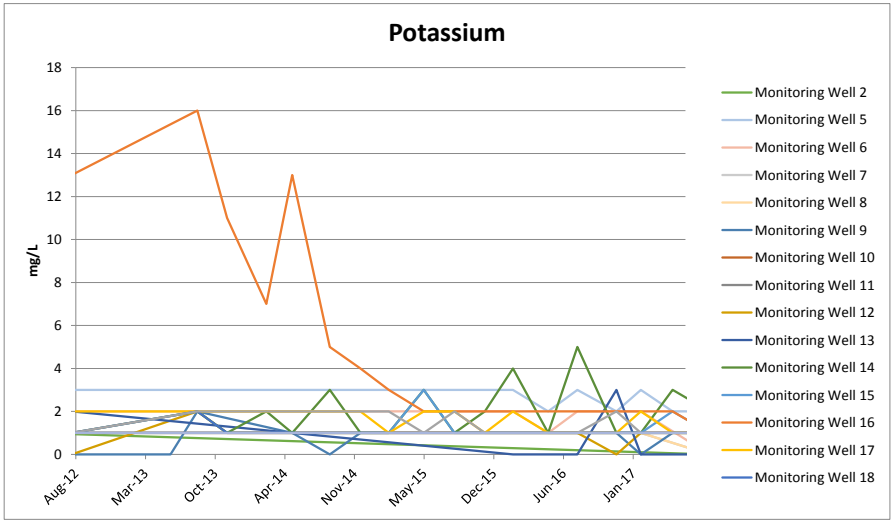

Chromium (Total)
Annual
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20


Cobalt
Annual
mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

Sheet 3C


Electrical Conductivity
µS/cm
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Dec-11
May-13
Sep-14
Jan-16
Jun-17
Oct-18
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Nitrogen (Ammonia)
mg/L
9
8
7
6
5
4
3
2
1
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18


Potassium
mg/L
18
16
14
12
10
8
6
4
2
0
Aug-12
Mar-13
Oct-13
Apr-14
Nov-14
May-15
Dec-15
Jun-16
Jan-17
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
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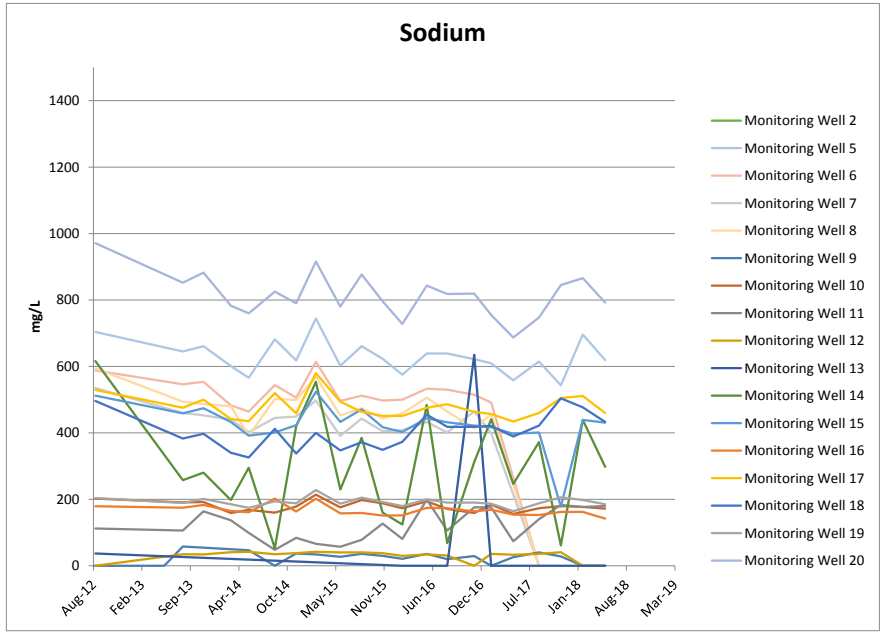
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18


Sodium
mg/L
1400
1200
1000
800
600
400
200
0
Aug-12
Feb-13
Sep-13
Apr-14
Oct-14
May-15
Nov-15
Jun-16
Dec-16
Jul-17
Jan-18
Aug-18
Mar-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
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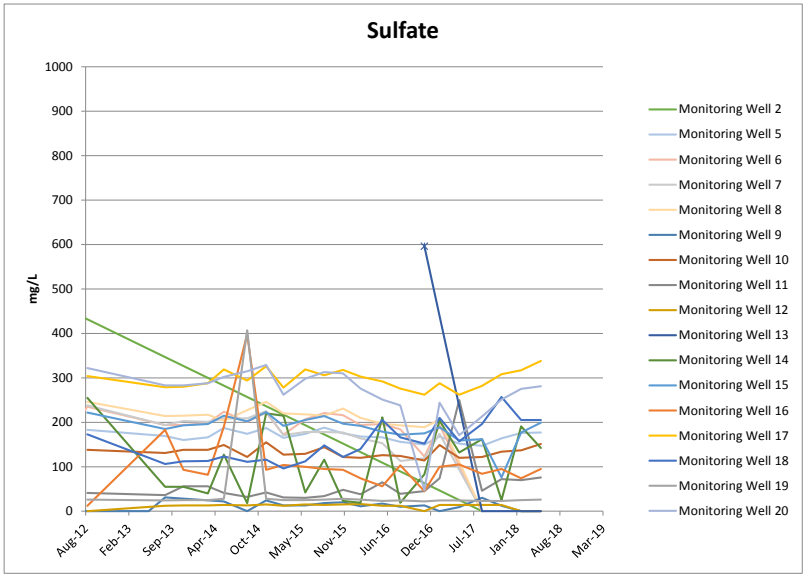
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

Sheet 3D


Sulfate
mg/L
1000
900
800
700
600
500
400
300
200
100
0
Aug-12
Feb-13
Sep-13
Apr-14
Oct-14
May-15
Nov-15
Jun-16
Dec-16
Jul-17
Jan-18
Aug-18
Mar-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
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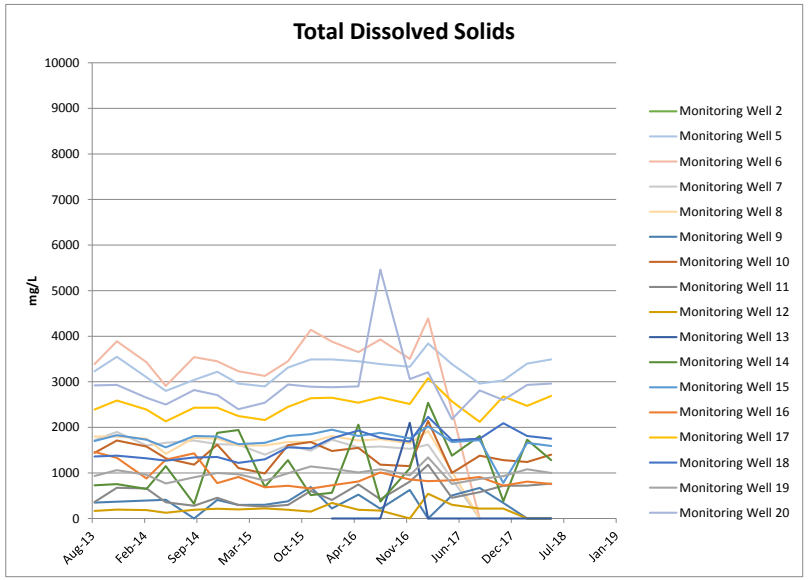
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20


Total Dissolved Solids
mg/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Aug-13
Feb-14
Sep-14
Mar-15
Oct-15
Apr-16
Nov-16
Jun-17
Dec-17
Jul-18
Jan-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
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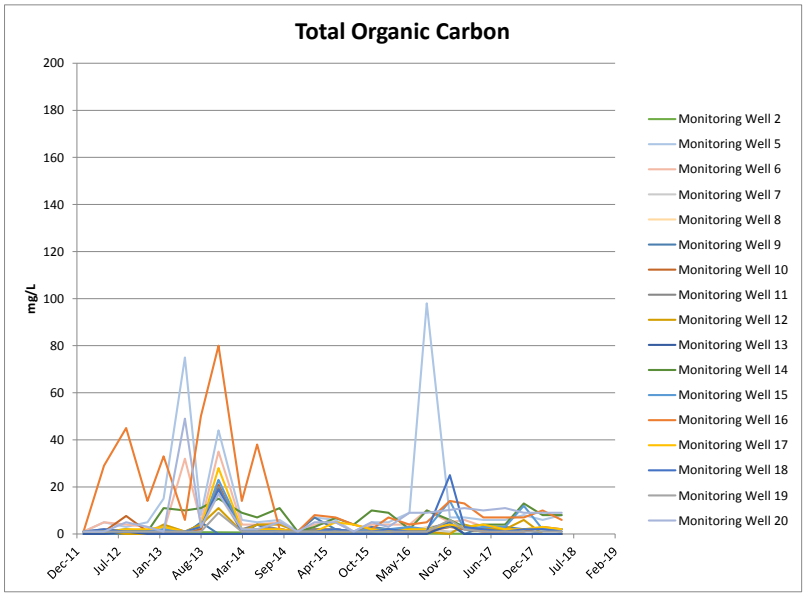
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20


Total Organic Carbon
mg/L
200
180
160
140
120
100
80
60
40
20
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
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Monitoring Well 12
Monitoring Well 13
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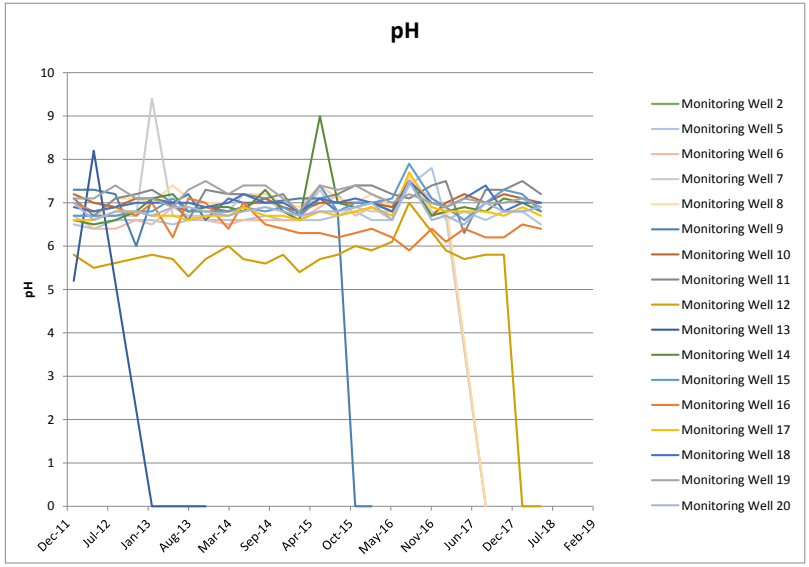
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20


pH
pH
10
9
8
7
6
5
4
3
2
1
0
Dec-11
Jul-12
Jan-13
Aug-13
Mar-14
Sep-14
Apr-15
Oct-15
May-16
Nov-16
Jun-17
Dec-17
Jul-18
Feb-19
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
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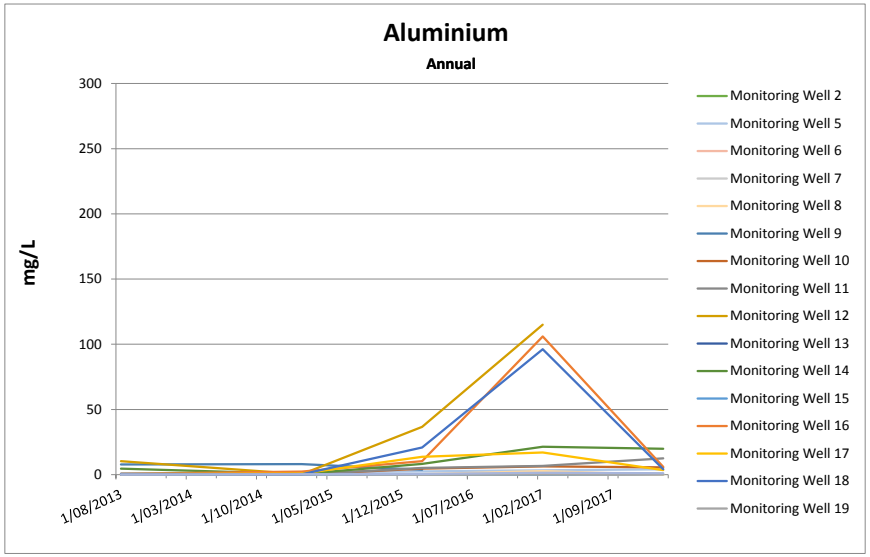
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20

Sheet 3E


Aluminium
Annual
mg/L
300
250
200
150
100
50
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
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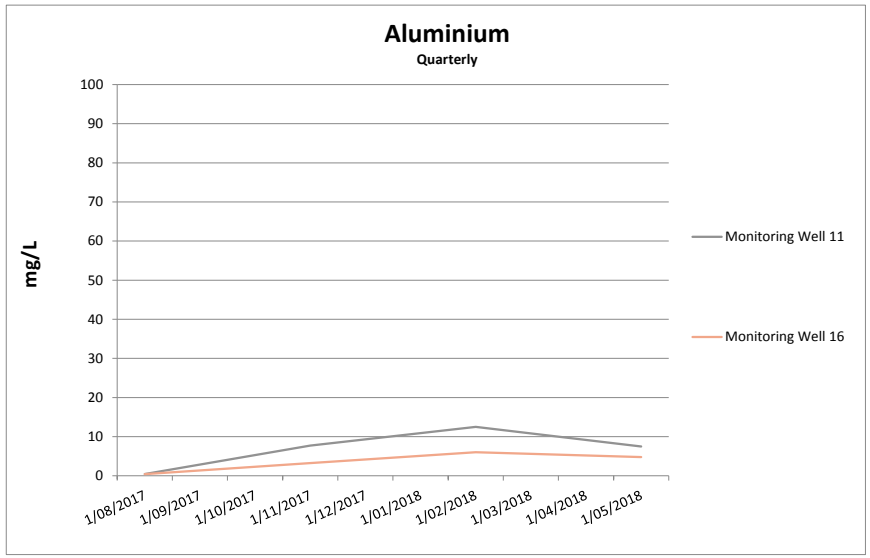
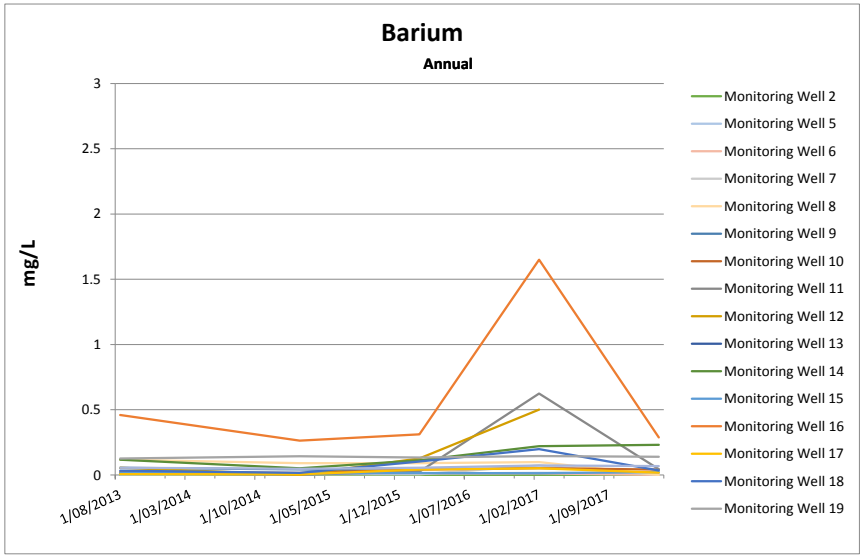
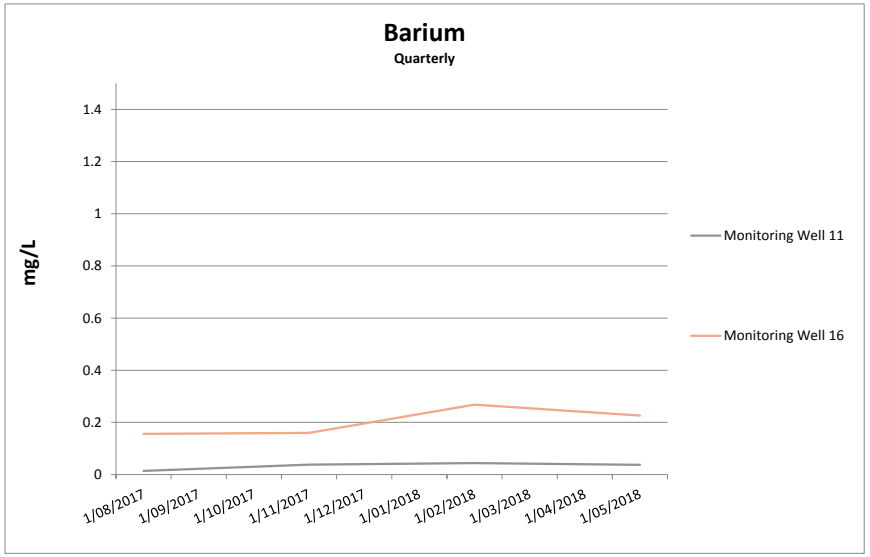
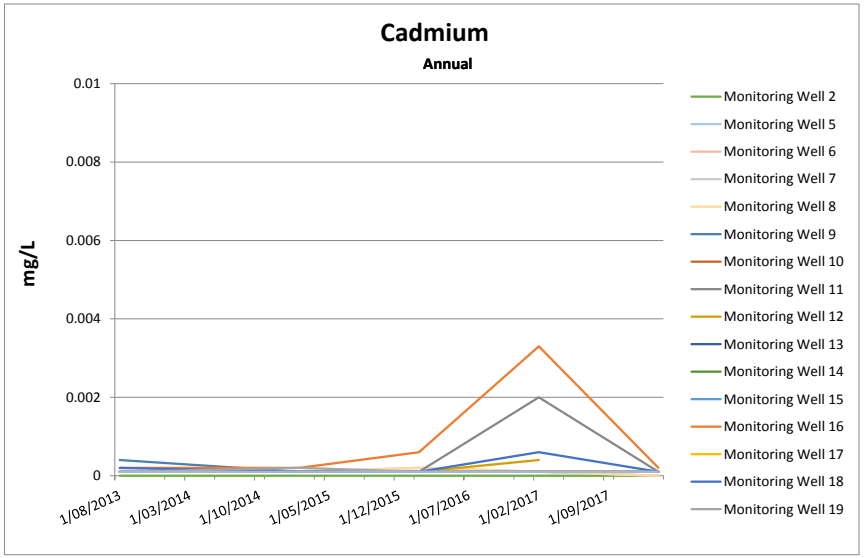
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19

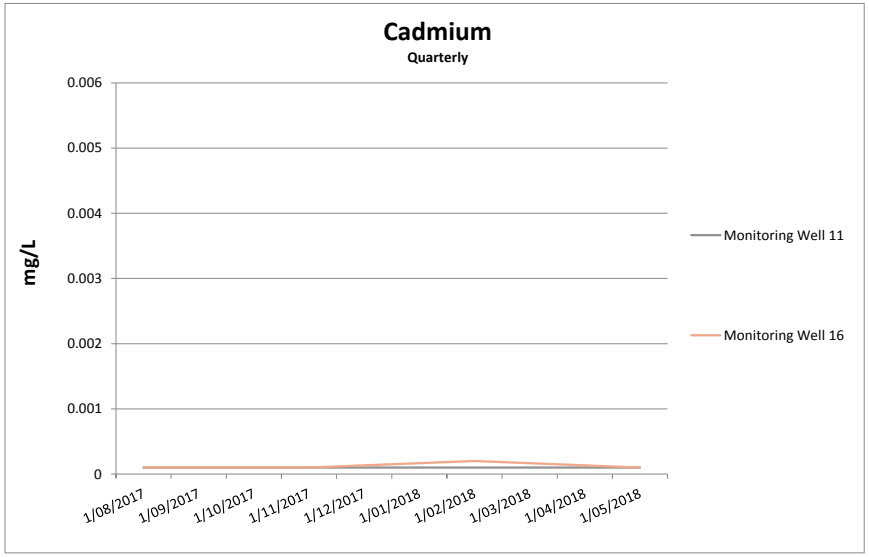

Aluminium
Quarterly
mg/L
100
90
80
70
60
50
40
30
20
10
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16

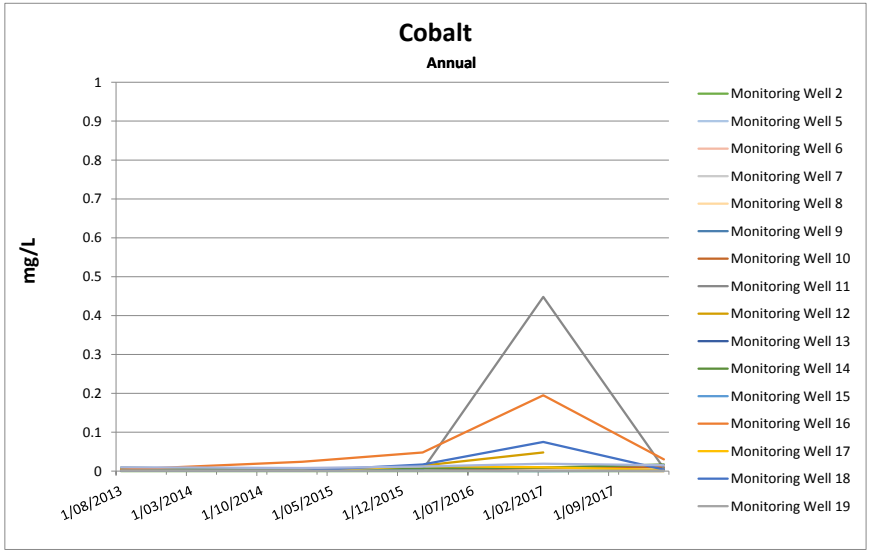

Barium
Annual
mg/L
3
2.5
2
1.5
1
0.5
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Barium
Quarterly
mg/L
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16

Sheet 3F


Cadmium
Annual
mg/L
0.01
0.008
0.006
0.004
0.002
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Cadmium
Quarterly
mg/L
0.006
0.005
0.004
0.003
0.002
0.001
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16


Cobalt
Annual
mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
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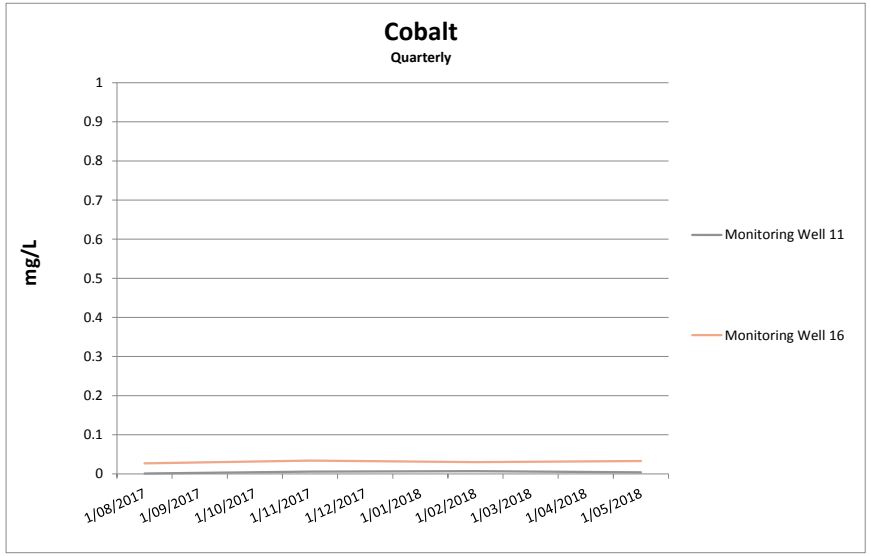
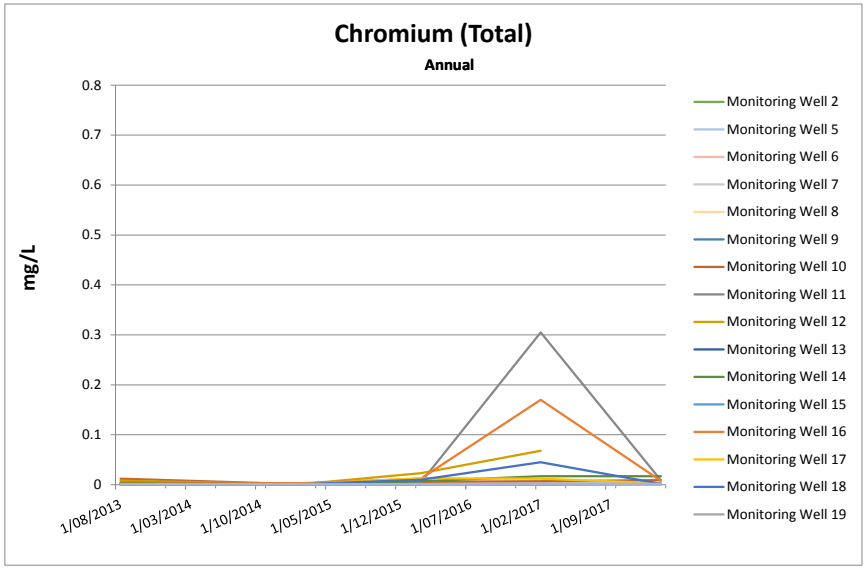
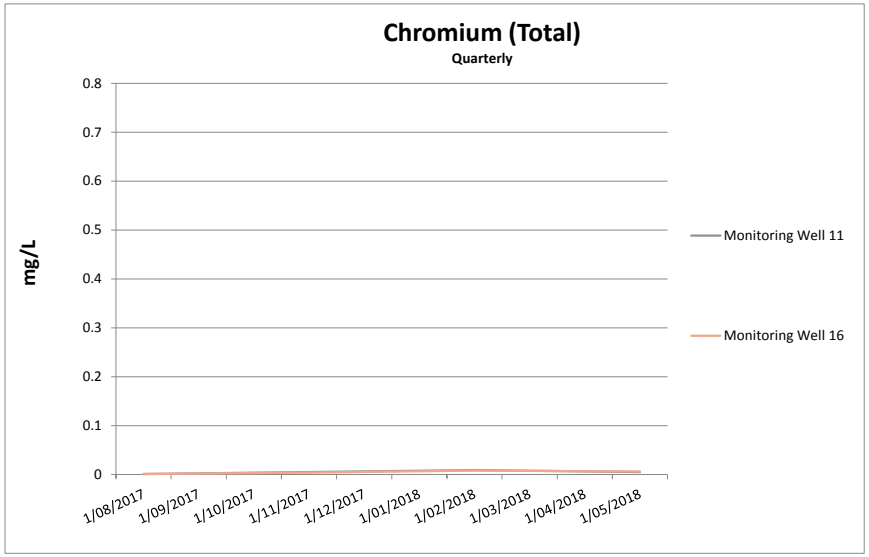
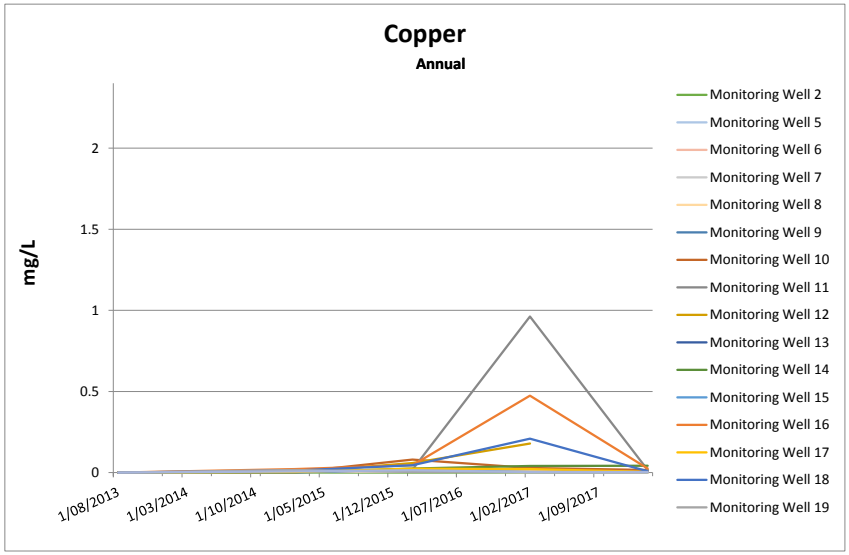
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Cobalt
Quarterly
mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16

Sheet 3G


Chromium (Total)
Annual
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Chromium (Total)
Quarterly
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16


Copper
Annual
mg/L
2
1.5
1
0.5
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
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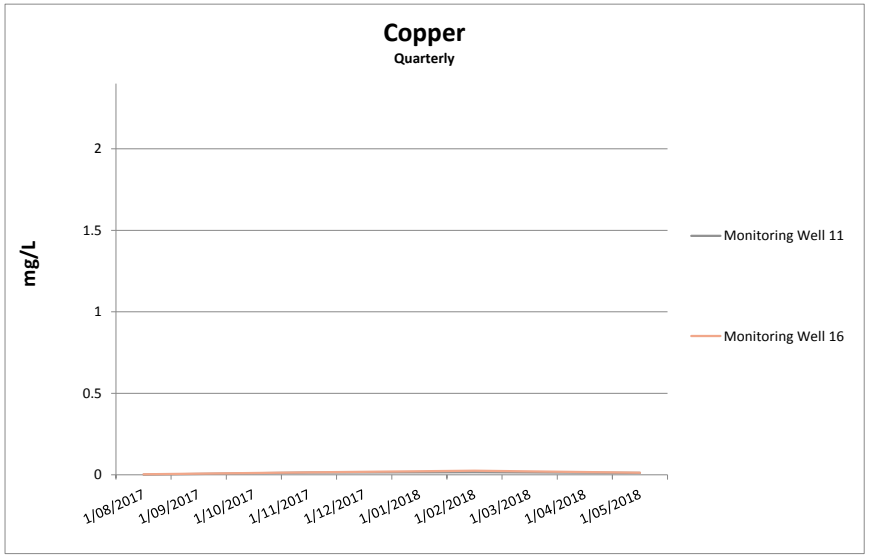
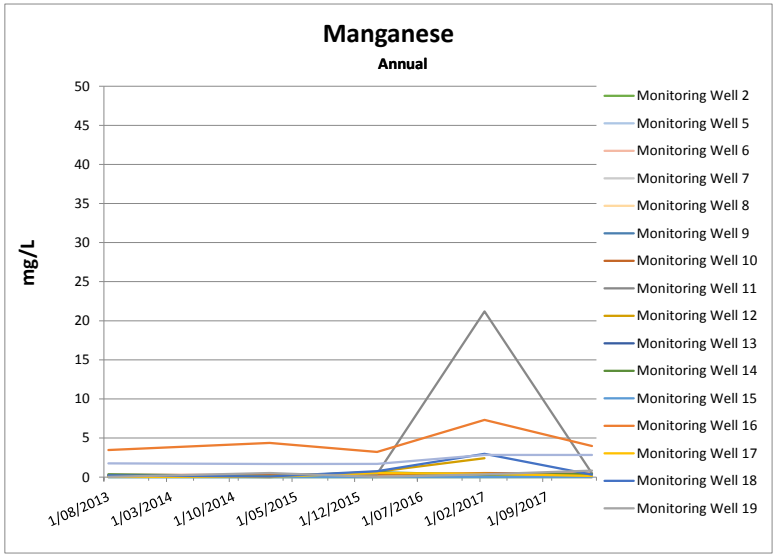
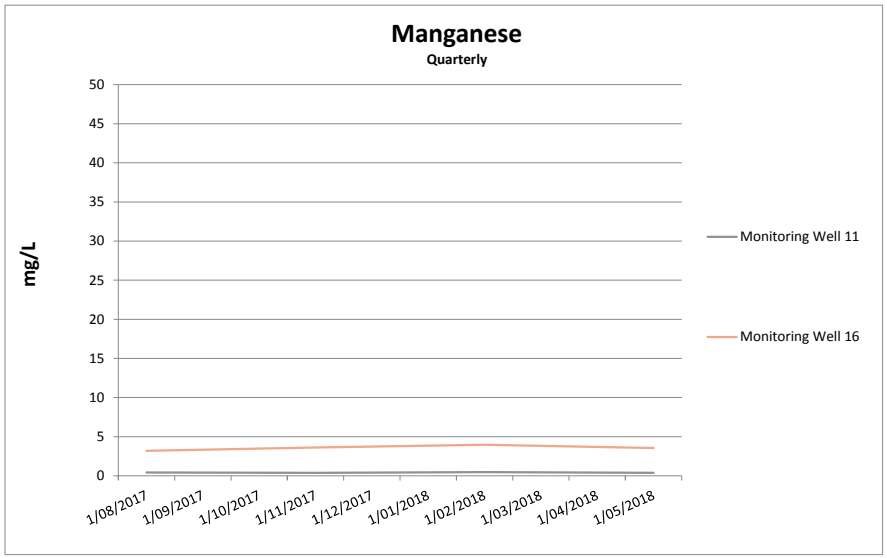
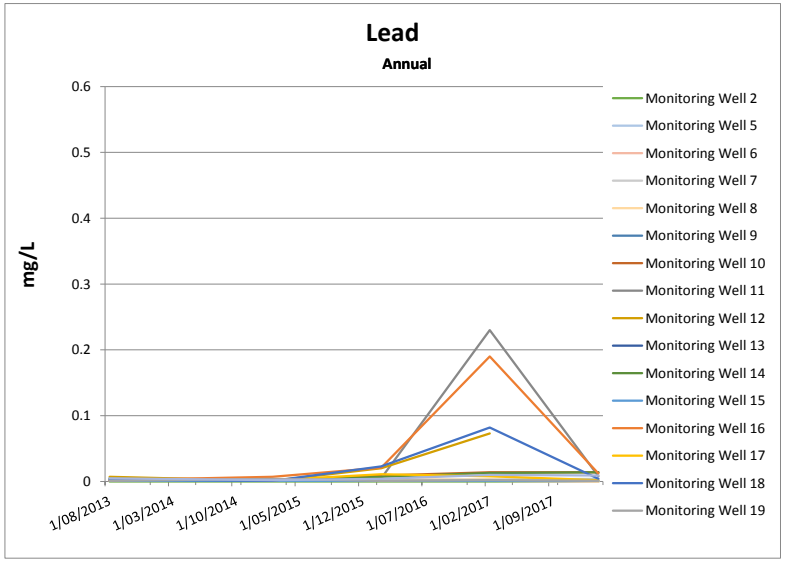
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Copper
Quarterly
mg/L
2
1.5
1
0.5
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16

Sheet 3H


Manganese
Annual
mg/L
50
45
40
35
30
25
20
15
10
5
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
Monitoring Well 11
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Manganese
Quarterly
mg/L
50
45
40
35
30
25
20
15
10
5
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16


Lead
Annual
mg/L
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
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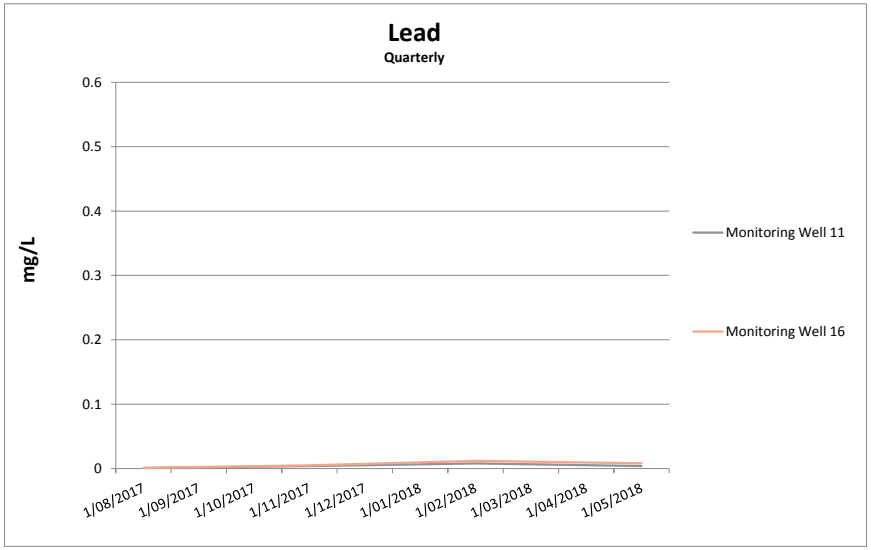
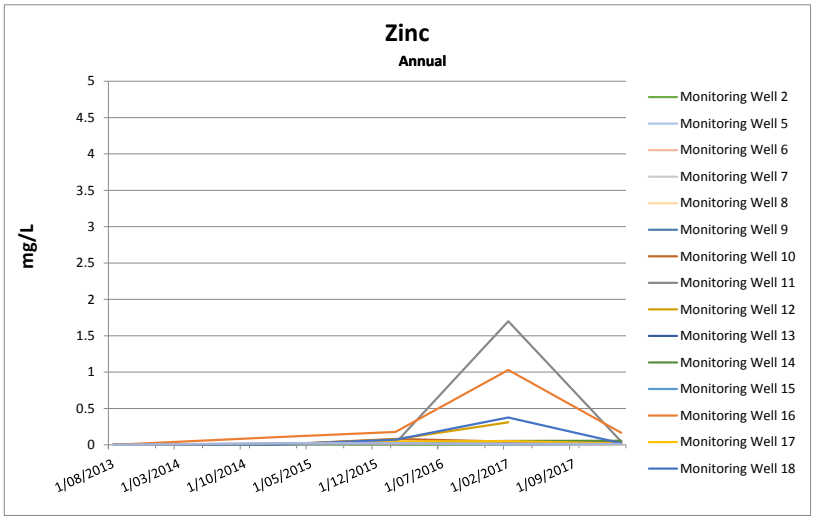
Monitoring Well 12
Monitoring Well 13
Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19


Lead
Quarterly
mg/L
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16

Sheet 3I


Zinc
Annual
mg/L
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
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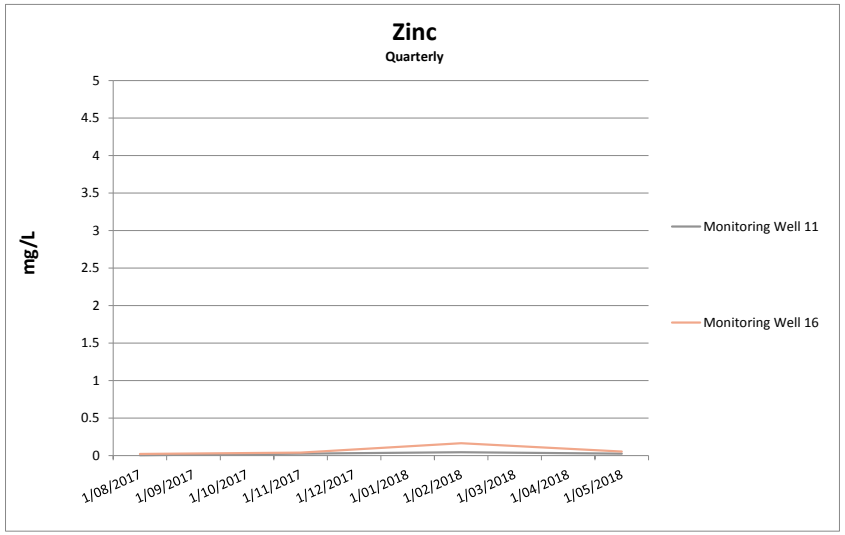
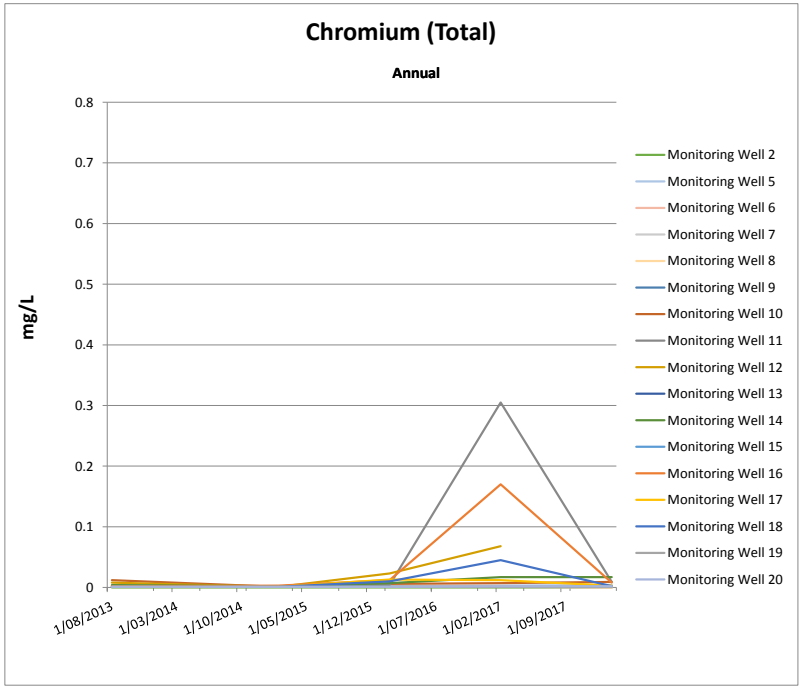
Monitoring Well 17
Monitoring Well 18


Zinc
Quarterly
mg/L
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/08/2017
1/09/2017
1/10/2017
1/11/2017
1/12/2017
1/01/2018
1/02/2018
1/03/2018
1/04/2018
1/05/2018
Monitoring Well 11
Monitoring Well 16


Chromium (Total)
Annual
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
Monitoring Well 5
Monitoring Well 6
Monitoring Well 7
Monitoring Well 8
Monitoring Well 9
Monitoring Well 10
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Monitoring Well 15
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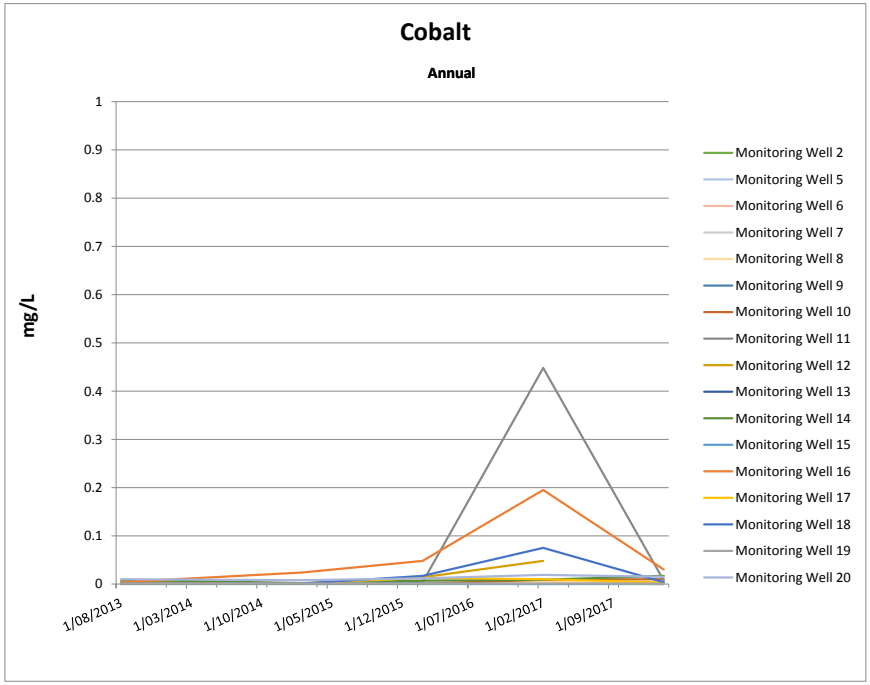
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20


Cobalt
Annual
mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/08/2013
1/03/2014
1/10/2014
1/05/2015
1/12/2015
1/07/2016
1/02/2017
1/09/2017
Monitoring Well 2
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Monitoring Well 14
Monitoring Well 15
Monitoring Well 16
Monitoring Well 17
Monitoring Well 18
Monitoring Well 19
Monitoring Well 20