dulverton
waste management

LANDFILL

Dawsons Siding Rd
Dulverton, Tasmania

PUBLIC ENVIRONMENTAL REPORT

for the period July 2016 to June 2019

Dulverton Waste Management

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Environmental System™
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CEM20661

Contents

1. Introduction

This report has been prepared to detail the operations and environmental compliance at the Dulverton Landfill from July 2016 to June 2019. This is a requirement under the Annual Fee Remission Guidelines under the Environmental Management and Pollution Control (General Fees) Regulations 2007. This report follows the criteria set out in those guidelines.

2. Acronyms

DWM	Dulverton Waste Management
EPA	Environment Protection Authority
EPN	Environment Protection Notice
DORF	Dulverton Organic Recycling Facility
EMS	Environmental Management System
CAR	Corrective Action Request

3. Business Profile

Dulverton Waste Management (DWM) was set up as a jointly owned venture by Devonport City Council, Kentish Council, Central Coast Council, and Latrobe Council. DWM exists to provide regional waste management services for its owners, the community and industry, in a manner that is compliant with current environmental standards and expectations.

The Landfill is not open to the public; arrangements must first be made with the DWM office to become a customer before disposals can be made at the site. DWM's aim is to promote the facility as a 'last resort' and encourage all waste items to be recycled and reused wherever possible to limit the amount of waste to landfill. During the period that this report covers, the operation of the landfill has been contracted to Gradco who employ a Site Supervisor and an average of four to five full time staff to manage the site. One off projects can sometimes require more Gradco staff or other contractors to be available onsite.

DWM can approve and accept a number of controlled wastes for disposal provided the waste products are below Level 3 contaminant levels. EPA approval is sought wherever items are difficult to classify.

DWM have in place an accredited Environmental Management System (EMS) which is annually audited by BSI. To maintain an accredited EMS, DWM is required to show ongoing improvements to the management of the site to minimise any adverse impact on the environment. DWM also combine work health and safety requirements, such as Safe Work Method Statements, into the EMS so that the system encompasses all relevant day to day instructions for staff. To this end, the site contractor has worked continuously with DWM to ensure that all procedures used on site accurately reflect how the task is to be done safely and with minimal impact.

4. Environmental Policy

OBJECTIVE

Dulverton Waste Management (DWM) is committed to responsible environment management and the pursuit of providing a safe and sustainable waste management, minimisation and recycling service for our community.

LEGISLATION

Environmental Management & Pollution Control Act 1994 (TAS)

DEFINITIONS

Environmental Management System (EMS):
An Environmental Management System (EMS) is a structured management tool which provides a methodical approach to planning, implementing and reviewing the performance of an organisation in regard to its compliance obligations for environmental management. It follows the standards set out in AS/NZS ISO 14001:2015, and is regularly audited independently to assess adherence and for ongoing improvement.

Stakeholders:
A person or group that has an investment, share, or interest in something, as a business or industry.

RESPONSIBILITIES

Board:

- To provide the financial and human resources required to support the objectives of this policy.

Chief Executive Officer:

- To provide the systems and procedures to support the objectives of this policy

Employees, Contractors & Sub-Contractors:

- To comply with all the systems and procedures relating to the environment;
- To at all times consider the effect of an activity on the environment; and
- To discontinue an activity if it becomes apparent that environmental harm may occur.

POLICY STATEMENT

DWM is committed to:

- Playing a leading role in promoting best practice in our industry;
- Protection of the local environment and minimisation of waste;
- Compliance with applicable compliance obligations and with other requirements to which the organisation subscribes;
- Communicating with all persons working for or on behalf of the organisation the requirements of the Environmental Management System (EMS);
- Minimising and where possible avoid adverse impacts on our stakeholders, environment and social surrounds;

- The reduction of suitable waste stream volumes to landfill, through effective reuse, composting and minimization strategies; and
- Understanding and minimising our greenhouse gas contribution

DWM will:

- Actively pursue continual improvement in environmental management;
- Provide a framework for setting and reviewing environmental objectives and targets;
- Implement and maintain an Environmental Management System (EMS) certified to ISO 14001:2015; and
- Regularly review its environmental performance through:
  - Management review of the system;
  - Progress against objectives and targets; and
  - An internal and external audit.

REVIEW

This policy will be reviewed every four years or as required by the Board.

REFERENCE			
APPROVED BY:	DWM Board of Directors	**MINUTE NO:**	MFID 45875
APPROVAL DATE:	8th August 2016	**REVIEW DATE:**	by September 2020

5. Reporting Period

The reporting period for this report is July 2016 to June 2019.

6. Activity Profile

Listed below are infrastructure items installed on the landfill site, and plant and machinery used in daily operations.

6.1 Plant and Operations

- Site office and crib room
- Gas collection system and flare
- Weighbridge and boom gate
- Workshop and equipment storage shed
- Firefighting pump and portable water storage tank for use on truck
- Mains and sprinklers, and stormwater storage dam, for firefighting purposes
- Two lined leachate storage dams for collection of leachate from landfill
- One lined emergency leachate storage
- Lined stormwater collection ponds
- Pumps and an underground leachate pipeline from site to the Latrobe sewerage treatment plant for transferring landfill leachate (as trade waste)
- Bulldozer for spreading waste
- Compactor for compacting waste
- Backup compactor
- Excavator for unloading and burial of waste, and for winning cover material
- Articulated truck for transporting cover to site
- Water cart for dust suppression

- Other earthmoving machinery during construction of new landfill cells, landfill cell rehabilitation, for road maintenance and for other non-routine tasks
- Aerator in leachate pond
- Light vehicles for moving personnel around site

6.2 Production Capacity and Actual Production Capacity

Early 2016 saw an updated EPN issued to DWM, which now allows a maximum of 80,000 tonnes of waste per year to be received for disposal.

The following tables show the quantities of waste disposed in landfill for the previous three years.

Table 1 - Landfill Quantities for July 2016 to June 2017

Waste Type	Contribution to total (%)	Total Contribution (Tonnes)	Monthly Average (Tonnes)
Commercial and Industry	23.26	15,328	1277
Construction and Demolition	3.68	2,427	202
Controlled Waste	3.55	2,340	195
Controlled Waste (one-off projects)	9.57	6,306	525
Municipal Solid Waste	59.92	39,478	3289
TOTAL	**100%**	**65,879**	**5488**

Table 2 - Landfill Quantities for July 2017 to June 2018

Waste Type	Contribution to total (%)	Total Contribution (Tonnes)	Monthly Average (Tonnes)
Commercial and Industry	29.84	18,078	1506
Construction and Demolition	0.35	215	17
Controlled Waste	7.00	4,245	353
Controlled Waste (one-off projects)	1.35	818	68
Municipal Solid Waste	61.44	37,222	3101
TOTAL	**100%**	**60,578**	**5045**

Table 3 - Landfill Quantities for July 2018 to June 2019

Waste Type	Contribution to total (%)	Total Contribution (Tonnes)	Monthly Average (Tonnes)
Commercial and Industry	24.40	14,444	1203
Construction and Demolition	0.33	196	16
Controlled Waste	8.31	4,923	409
Controlled Waste (one-off projects)	0.11	67	5
Municipal Solid Waste	66.82	39,543	3294
TOTAL	**100%**	**59,173**	**4,927**

6.3 Raw Material Consumption Level

- Clay is utilised for capping and cell construction.
- Growing medium and soil overburden is utilised for day cover and rehabilitation purposes.

6.4 Product Markets and Sources of Raw Materials

This is not applicable to the Landfill operation.

6.5 Pollution Discharges and Control Measures

As required by the EPA's Annual Fee Remission Guidelines, this section briefly discusses the pollution discharges and wastes generated by the Landfill, and their control measures, in relation to air, water, noise and soil. It also covers general waste and controlled waste, energy use, water use, measures to manage and minimise greenhouse gas emissions, flora/fauna/biodiversity, and cultural and aboriginal heritage.

1. *Air Emissions from Machinery*

The use of machinery is a necessary part of the operation and is consistent with the activity. Machinery use has minimal potential for actual impacts on the local environment. The Landfill has a sufficient vegetative and distance buffer for any air emissions from machinery to be dispersed. Site plant and equipment is modern and well maintained. In 2019 DWM implemented their first landfill compactor with Tier IV engine technology to minimise air emissions.

2. *Air Emissions from Landfill (Odour)*

There is potential for the Landfill to generate odour, at times, due to the nature of the activity. This is minimised by the implementation of the EMS, initially with the use of the Aspects and Impacts Register to assess the risks and control measures needed of all activities on site. A risk assessment is undertaken using the Aspects and Impacts Register followed by formal procedures and processes being put in place for day to day use for staff.

Should any failure occur in this procedure, it would be raised as a Corrective Action Request (CAR) and the site contractors would be required to rectify the problem.

3. *Water Emissions*

The landfill generates leachate – the result of rainwater filtering through the open landfill or moisture contained within the waste. This leachate is collected and stored in two lined storage dams. From here it is pumped via an underground pipeline to the Latrobe sewerage treatment plant, under a Trade Waste Agreement, or is recirculated back to the open landfill to assist with evaporation.

There is potential for environmental pollution to be caused to the nearby waterways and soil if contaminated water were to leave the site. Much work is done to manage the generation of leachate on site, and the groundwater surrounding the site is sampled and analysed on a regular basis in accordance with EPN conditions.

Stormwater is generated on site, and is directed around the site into either Stormwater Pond 3, or to surface drains and off site.

4. Noise emissions

The type of activity on site is generally heavy vehicle operations and is of a type consistent with the activity and land use. There is potential for the site to be noisy, at times, but the actual impact of this is minimal as the site has strict opening hours so noise is generated only during typical business hours. Also, the noise level is sporadic and considering the significant buffer in the surrounding vegetation and distances to neighbouring properties, it is unlikely to create a nuisance. No CAR's have been raised in relation to a noise complaint.

5. Land/soil contamination

The construction of the site is such that contaminated soil, either existing or in disposed waste, is within the boundaries of a constructed cell and therefore contained to prevent land contamination of areas outside those approved.

There is potential for soil to become contaminated with leachate should the storage ponds overflow, therefore a great deal of work is done to manage leachate on site to prevent this occurring. Much of this work is preventative in nature.

6. General waste and controlled waste

General waste and controlled waste are not generated on site, but by the nature of the activity are brought to the site for disposal. Leachate, potentially at controlled waste levels, is a by-product generated by this activity and is discussed under water emissions.

7. Energy use

Energy used on site is as follows;

- Electricity purchased from the grid, used for site office, workshop, aerator and pump operation.

8. *Water use*

The site is not connected to a reticulated water supply, and has rainwater for staff facilities and stormwater collection for other uses. The activities that take place on site require limited amounts of water to be used for the following activities;

- Fire fighting
- Dust suppression

9. *Greenhouse gases*

The greatest contributor to greenhouse gas emissions in a landfill operation is the landfill itself. The landfill emissions will far outweigh the combined emissions from electricity and fuel usage. DWM's response to greenhouse gases has been to:

- Develop and operate a composting facility (Dulverton Organics Recycling Facility). Diverting organic materials from landfill reduces greenhouse gas emissions. The current rate of diversion to the DORF is estimated to be the same as removing over 30,000 cars per year from the road.
- Since the end of 2014, DWM has had landfill gas recovery infrastructure installed. Periodically new gas collection infrastructure is installed to capture gas from new landfill areas. This system of underground pipes and manifold stations draws anaerobic gases to a flare where methane is converted to carbon dioxide delivering significant environmental benefits.

10. Flora, fauna and biodiversity

A fauna conservation area has existed for some time along the eastern boundary of the landfill site to protect vegetation around Caroline Creek, which is habitat for the Giant Freshwater Crayfish. DWM have also created a protected area which includes native vegetation along Caroline Creek to the east of the landfill.

EMS procedures are in place for management of weeds and fire track clearing in this area, but otherwise there is negligible impact from the landfill. A permanent litter fence has been installed to prevent windblown litter entering the area. Three groundwater bores are in this area to monitor any impacts from the landfill on groundwater in this area.

Caroline Creek is also sampled regularly to monitor any potential impacts from the landfill.

11. Cultural and Aboriginal heritage

There is no known cultural or aboriginal heritage associated with the Landfill.

6.6 The Local Environment

DWM leases part of the landfill title to a mushroom composting business, and also operates a composting facility on a neighbouring title of land. Both these businesses are controlled by licences from the EPA.

The landfill is surrounded by privately-owned forest plantations and some natural vegetation. In the wider vicinity there are natural waterways, a railway line coming from Cement Australia, Railton Road (sealed) and unsealed roads leading into the site, small farm holdings and ‘lifestyle’ blocks.

6.7 The Regional Environment

Data from the nearest able weather station:

Temperature Data comes from the station in Sheffield.

Rainfall Data comes from the station in Railton.

Month	Mean maximum temp	Mean minimum temp	Mean rainfall
January	24.3ºC	19.8 ºC	17.0
June	11.8 ºC	3.6 ºC	136.2

(Source; www.bom.gov.au)

There are no air monitoring stations around the site, but generally the air quality is very good.

The typical prevailing winds are South-Westerly.

6.8 Significant Changes during the Reporting Period

Briefly, significant changes to the Landfill operation in the reporting period are as follows;

- Progressive capping of the landfill cell as it increases in height. This is a significant change that reduces the amount of rain which is captured as leachate, and ensures that more clean rainfall is diverted to the stormwater system instead. It also allows for the capping work to be spread over a longer period of time, allowing vegetation to be established on the lower parts of the cap whilst the cell is still open thereby increasing the visual amenity of the landfill cell.
- An overhaul of the Site Induction Video and the booklet that is provided to inductees
- Installation of an additional gas well in the summer of 2018.
- Construction of cell B1 North and signed contracts for construction of cell B1 South
- Final area of Cell 2/3C has was capped in early 2019.

7. Permit Conditions

A copy of the conditions of EPN 7158/3, are attached in Appendix A.

8. Relevant Environmental Legislation

- Environmental Management and Pollution Control Act 1994 (Tas)
- Environmental Management and Pollution Control (Waste Management) Regulations 2010
- Land Use Planning and Approvals Act 1993 (Tas)
- Threatened Species Protection Act 1995 (Tas)
- Weed Management Act 1999 (Tas)
- Information Bulletin No. 105; Classification and Management of Contaminated Soil for Disposal 2010
- Landfill Sustainability Guide 2004
- State Policy on Water Quality Management 1997
- Tasmanian Biosolids Reuse Guidelines, 1999
- Classification and management of contaminated soil for disposal, Bulletin 105
- AS/NZS ISO 14001:2015 – Environmental Management Systems

9. Complaints Received by the Public

Complaints received by the public are dealt with as Corrective Action Requests (CAR's) under the EMS. See Appendix B for a list of these CAR's.

10. Non-Compliance with Permit Conditions

Environmental incidents and incidents of non-compliance with permit conditions and legislation are dealt with as Corrective Action Requests (CAR's) under the EMS. See Appendix C for a list of these CAR's.

11. Infringement Notices and EPN's

The Landfill is permitted to operate under the conditions of Environment Protection Notice 7158/3. No other EPN's or Infringement Notices have been issued in the reporting period.

12. Actions under EMPCA; Environmental Agreements, Improvement Programs, and Mandatory Environmental Audits.

12.1 Environmental Agreements

No environmental agreements, in respect to Division 2, s28 of EMPCA, were made during this reporting period.

12.2 Environmental Improvement Programs

No Environmental Improvement Program, in respect to Division 7, s37 of EMPCA, were made during this reporting period.

12.3 Mandatory Environmental Audits

In respect to Division 3, s30 of EMPCA, there have been no mandatory audits undertaken at DWM.

13. Prosecutions and Enforcement Action

No proceedings have been taken in relation to the activity in the reporting period, either under Tasmanian or Commonwealth environmental legislation, other legislation, or local government by-laws.

14. Environmental Monitoring

A summary of the most recent annual data during the reporting period is attached in Appendix D.

15. Staff and Contractor Environmental Training

Before commencing work all personnel must be inducted onto the DWM site. As noted in section 6.9 of this report, The Site Induction video, and accompanying booklet, provides staff and contractors with an outline of the EMS and why it is used on site.

After inductions, personnel working on site are required to participate in an EMS Awareness session, to develop further understanding of the legal requirements of DWM's operation, and expand their general knowledge of the significant environmental risks on the DWM site.

After viewing the video all staff, on-site contractors, and third party contractors, are required to 'sign on' to a number of Safe Work Method Statements (SWMS) for tasks they will be involved in. SWMS are an industry requirement for construction activities and the like and are used by DWM for all activities where control measures are required to minimise risk, whether they be ongoing day-to-day tasks or one-off project works.

To ensure that the EMS is a relevant and useful tool for daily operations, DWM expands on the SWMS work health and safety format by requiring that staff writing the SWMS consider the activity and any potential environmental impacts it may have. Any necessary control measures are then listed for site personnel to understand and adhere to.

In addition to this the site contractor has regular toolbox meetings using a set agenda. This agenda includes the review of one EMS Work Instruction, one EMS Procedure and one SWMS, to assist in maintaining awareness of the system and giving staff a broader understanding of site operations other than their specific role.

16. Community Engagement

A tour was offered to residents from within the vicinity of the DWM site, the tour took place on the 09/06/2019. The tour provided interested residents with the opportunity to view the site and to learn more about the activities of DWM. The tour was attended by the DWM Chairman and CEO, and the Site Supervisor.

DWM provide updates to Kentish and Latrobe Council when it is believed that information may be of interest to the communities near DWM.

17. Environmental Management over and above Permit Requirements

17.1 Certified Environmental Management System

Since July 2008, DWM has implemented an Environmental Management System (EMS) to ensure that best practice operations are carried out on site. The benefits to DWM of implementing this system have been wide ranging, and far outweigh the significant effort it takes to maintain a certified system. DWM staff continue to receive full support from the Board and CEO for its implementation.

The overall aim of the EMS is to ensure that the site is operated at the optimum level of environmental management.

As mentioned previously in this report, DWM also combine work health and safety requirements into the EMS to achieve maximum effectiveness in all work practices for staff on site

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18. Commitments to Improve Future Environmental Performance

All personnel involved with the DWM operation – Board, CEO and staff, and site contractors – are committed to continual improvement and refinement of the Environmental Management System (EMS) as the best method of assessing and managing environmental issues.

19. Statement by Chief Executive Officer

"I acknowledge the contents of this periodic Environmental Report".

…………………………………………………………….

Matthew Greskie

Chief Executive Officer

Dulverton Waste Management

Date: 19 / 08 / 2019

20. Appendix A – Copy of EPN 7158/3

21. Appendix B – Table of Complaints Received by Public

22. Appendix C – Table of Incidents and Non Compliance

23. Appendix D – Environmental Monitoring Report

ENVIRONMENT PROTECTION NOTICE No. 7158/3

Issued under the *Environmental Management and Pollution Control Act 1994*

Issued to: **DULVERTON REGIONAL WASTE MANAGEMENT AUTHORITY**
ABN 11 784 477 180
LEVEL 1, 35 STEWART ST
DEVONPORT TAS 7300

Environmentally Relevant Activity: **The operation of a waste depot (ACTIVITY TYPE: Other (non-inert) Waste Depots)**
DULVERTON REGIONAL LANDFILL, DAWSONS SIDING RD
DULVERTON TAS 7310

GROUNDS

I, Wes Ford, Director, Environment Protection Authority, (the Director), being satisfied in accordance with section 44(1)(d) of the *Environmental Management and Pollution Control Act 1994* (EMPCA) that in relation to the above-mentioned environmentally relevant activity that it is desirable to vary the conditions of a permit (see table below) hereby issue this environment protection notice to the above-mentioned person as the person responsible for the activity.

Permit No.	Date Granted	Granted By
5931	26 November 1993	Director of Environmental Control

PARTICULARS

The particulars of the grounds upon which this notice is issued are:

1 A regulatory limit which sets the maximum scale or throughput of the activity is needed because any increase in scale or throughput may result in additional environmental impacts or emissions that were not considered at the time of granting of the permit.

2 The permit does not include a condition requiring the person responsible to take action to minimise environmental harm if an incident occurs. It is necessary to update conditions to be in accordance with current incident response protocols.

3 The permit conditions need to be varied to more specifically identify when approvals to effect change are required.

4 A condition requiring notification of a change of ownership of The Land is needed because this Notice may affect title to land and the new owner's interests may be affected by pollutants emitted or disturbed by the activity.

5 It is necessary to add a condition requiring a public complaints register to be maintained so that the Director can appraise the frequency and characteristics of complaints which may indicate nuisance should any complaints be received.

6 The permit does not contain conditions relating to adequate management of stormwater on The Land. It is necessary to add a condition requiring adequate management of stormwater to prevent environmental harm and/or nuisance being cause by stormwater leaving The Land.

7 Conditions relating to receivable wastes need to updated to include all materials currently considered acceptable for deposition at the activity.

8 A condition is included to require the submission of an Annual Environmental Review to ensure timely reporting of environmental performance.

9 It is necessary to add a condition requiring the submission of a publicly available Annual Environmental Review to inform the Director and the public of the environmental performance of the activity.

10 A number of conditions relating to the DPEMP have been removed as they have been fulfilled and are no longer required.

11 It is necessary to add a condition to ensure effective management measures to control dust emissions from The Land to prevent environmental nuisance.

12 The permit does not contain conditions requiring leachate management. Conditions have been included to protect water quality.

13 The permit does not contain a requirement for quality assurance for new cell construction or the notification of commencement of works. Conditions have been included to ensure that new cell construction is adequate to prevent environmental harm.

14 It is necessary to add a condition requiring notification of the likely permanent cessation of the activity so that the Director has sufficient time in which to ensure that appropriate measures are in place to minimise environmental harm arising from the permanent cessation of the activity.

15 Conditions are required to ensure that infrastructure to manage water traversing and discharged from The Land is installed and maintained in order to minimise release of sediment entrained in stormwater.

16 The permit does not contain conditions requiring the management of sediment in the settling ponds.

17 A condition is included to require the maintenance of existing perimeter drains to ensure that their performance is not impeded.

18 A condition is included to require fire-fighting wastewater that is generated from on-site firefighting to be managed to prevent environmental harm from contaminated firewater.

19 The permit does not contain conditions in relation to dealing with environmentally hazardous substances. Environmentally hazardous substances are likely to be stored and handled on The Land and current best practice environmental management necessitates conditions to be included for the storage and handling of environmentally hazardous substances.

20 It is desirable to add a condition to the permit to require the establishment and maintenance of an inventory of environmentally hazardous substances so that the potential environmental harm arising from any escape of such substances into the environment can be properly assessed and/or responded to.

21 The permit has no requirement for the maintenance of a register of controlled wastes deposited on the Land. A condition requiring the maintenance of such a register is included to reduce the risk of environmental harm resulting from the accidental release of these materials.

22 A condition is required to ensure that waste deposition is restricted to specified areas. Uncontrolled deposition of waste may result in environmental harm.

23 The permit does not specify the management of a number of waste types. A condition specifying the management of potentially environmentally hazardous wastes is included to reduce the risk of environmental harm arising from their mismanagement.

24 The permit does not contain a condition requiring compliance with curent requirements for the reporting of waste data. A condition requiring compliance is included to reflect contemporary waste management practices.

25 The permit does not contain a condition requiring the installation of lysimeters within the final capping material for cells. A condition requiring the installation of lysimeters is necessary to measure water flow through the capping material.

26 The permit does not contain a condition that requires signage identifying monitoring points. This signage is necessary to protect monitoring points from damage during operations and to faciliitate their location for monitorig purposes.

27 Monitoring and reporting requirements set out in the permit conditions need to be varied to reflect current best practice environmental management and to require accurate measurement of environmental parameters and their impact upon the receiving environment and to consistently inform the Director of the results of monitoring.

28 It is necessary to add a condition requiring notification in the event of a noise complaint so that the Director can appraise the frequency and characteristics of complaints should any noise complaints be received.

29 It is desirable to add conditions setting noise emission limits, in accordance with the Environment Protection Policy (Noise) 2009.

30 There are no conditions in the permit relating to staff attendance during operating hours. It is necessary to include a requirement for staff to be present during operational hours to manage the deposition of waste and protect against environmental harm.

31 The permit does not contain a condition prescribing the management of tipping faces. In order to prevent environmental harm arising wind-blown debris, the release of odour and the provision of feeding and breeding sites for nuisance animals, it is necessary to include such a condition.

32 The permit does not contain a condition prescribing the management of waste capping to be employed. It is necessary to include such a condition to prevent environmental harm arising from excessive leachate generation, odour production and feeding and breeding of feral animals.

33 The permit does not contain a condition prescribing the management of litter on site. It is necessary to include a condition requiring that litter generation be controlled and loose litter be collected in order to prevent environmental harm arising from the activity.

34 The permit does not include any fencing requirement. Fencing of the activity is required to discourage unauthorised persons or animals from entering the site and coming into contact with waste or any hazardous substance which may give rise to environmental harm.

35 The permit does not contain a condition requiring a fire management plan for the activity. It is necessary to include a condition to require this as landfills contain flammable materials and gases that, if ignited may cause environmental harm.

36 The permit does not contain a condition requiring a weed management plan for the activity. It is necessary to include a condition to require this plan as landfills are point sources of weed infestation and failure to manage any weed outbreak may cause environmental harm..

37 The permit does not contain a condition requiring infrastructure for the management of landfill gas for the activity. It is necessary to include conditions that require this infrastructure as landfills generate greenhouse and flammable gases which must be collected or destroyed to prevent environmental harm arising from the activity.

38 The permit does not contain a condition prohibiting composting on the Land. It is necessary to include a condition prohibiting this activity as the site lacks the infrastructure necessary for the operation and to prevent environmental harm arising from the activity.

39 The permit does not contain a condition prescribing maintenance activities for the settling ponds. It is necessary to include a condition to require these actions to ensure the continuing function of the settling ponds and to prevent environmental harm arising from the activity.

40 The permit does not contain a condition specifying signage for the activity. It is necessary to include a condition to require signage to allow members of the public to report incidents to the person responsible in a timely manner, to prevent environmental harm arising from the activity.

41 The permit does not have a condition requiring the provision of spill kits. It is desirable to add a condition requiring provision, in suitable locations, of spill kits appropriate for the environmental hazardous substances held on The Land for use in any incident to minimise the emissions of a pollutant into the environment.

42 The permit does not contain a condition requiring that leachate be stored in leachate ponds. It is necessary to include a condition to protect groundwater from contamination by leachate.

DEFINITIONS

Unless the contrary appears, words and expressions used in this Notice have the meaning given to them in Schedule 1 of this Notice and in the EMPCA. If there is any inconsistency between a definition in the EMPCA and a definition in this Notice, the EMPCA prevails to the extent of the inconsistency.

REQUIREMENTS

The person responsible for the activity must comply with the varied permit conditions as set out in Schedule 2 of this Notice.

INFORMATION

Attention is drawn to **Schedule 3**, which contains important additional information.

PENALTIES

If a person bound by an environment protection notice contravenes a requirement of the notice, that person is guilty of an offence and is liable on summary conviction to a penalty not exceeding 1000 penalty units in the case of a body corporate or 500 penalty units in any other case (at the time of issuance of this Notice one penalty unit is equal to $154.00).

NOTICE TAKES EFFECT

This notice takes effect on the date on which it is served upon you.

APPEAL RIGHTS

You may appeal to the Appeal Tribunal against this notice, or against any requirement contained in the notice, within 14 days from the date on which the notice is served, by writing to:

The Chairperson
Resource Management and Planning Appeal Tribunal
GPO Box 2036
Hobart TAS 7001

Signed: ______________________

DIRECTOR, ENVIRONMENT PROTECTION AUTHORITY

Date: 22/4/16

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Attachments

Schedule 1: Definitions

Aboriginal Relic has the meaning described in section 2(3) of the *Aboriginal Relics Act 1975.*

Activity means any environmentally relevant activity (as defined in Section 3 of EMPCA) to which this document relates, and includes more than one such activity.

Authorized Officer means an authorized officer under section 20 of EMPCA.

Best Practice Environmental Management or **'BPEM'** has the meaning described in Section 4 of EMPCA.

Capping means the placement of one or more layers to form a permanent covering above landfilled waste and includes a reference to such a layer

Classification And Management Of Contaminated Soil For Disposal means the document *Information Bulletin No. 105 Classification and Management of Contaminated Soil for Disposal* published by the Department of Tourism, Arts and the Environment (Revised 2012) and includes any subsequent versions of this document.

Clean Fill means soil, rock, concrete, bituminised pavement or similar non-putrescible and non-water-soluble material that is not contaminated by other waste; and that does not contain contaminant levels exceeding limits for 'fill material' set by the Director in *Classification and Management of Contaminated Soil for Disposal.*

Composting means the controlled microbiological transformation of organic materials under aerobic and thermophilic conditions

Construction means activities associated with the construction phase of the activity, including but not limited to, activities associated with the clearance of vegetation, site works to create a level site, rock breaking, installation of fences and other infrastructure whether on land or in water.

Controlled Waste has the meaning described in Section 3(1) of EMPCA.

Daily Cover means a cover applied to deposited material at the end of the day's activity that is of a standard to prevent animal access to the waste, movement of the waste by wind and release of odour.

Director means the Director, Environment Protection Authority holding office under Section 18 of EMPCA and includes a person authorised in writing by the Director to exercise a power or function on the Director's behalf.

DRP means Decommissioning and Rehabilitation Plan.

Effluent means wastewater discharged from The Land.

EMP means the document *Dulverton Landfill - EMP for Operation from 2004 to 2007* and includes any amendment to or substitution of this document approved in writing by the Director.

EMPCA means the *Environmental Management and Pollution Control Act 1994.*

Environmental Harm and **Material Environmental Harm** and **Serious Environmental Harm** each have the meanings ascribed to them in Section 5 of EMPCA.

Environmental Nuisance and **Pollutant** each have the meanings ascribed to them in Section 3 of EMPCA.

Environmentally Hazardous Material means any substance or mixture of substances of a nature or held in quantities which present a reasonably foreseeable risk of causing serious or material environmental harm if released to the environment and includes fuels, oils, but does not include waste disposed in the landfill.

Final Capping means capping that complies with Section 5.3.3 of the *Landfill Sustainability Guide* (2004).

Inert Waste means waste that does not undergo environmentally significant physical, chemical or biological transformations and has no potentially hazardous content and is not contaminated with non-inert material, such as putrescible waste, and includes clean fill.

Intermediate Cover means a temporary, uncompacted soil cover that has only limited ability to prevent water penetration, designed to be removed and replaced or amended with a final compacted cover at a later date.

Lagoon Means the feature labelled as Leachate Lagoon in Attachment 1 of this Notice.

Landfill means a waste depot as described in Schedule 2 of EMPCA

Landfill Gas means gaseous emissions arising from the decomposition of waste in a landfill

Landfill Sustainability Guide means the document of this title published by the Department of Primary Industries, Water and Environment in September 2004, and includes any subsequent versions of this document.

Leachate means any liquid that is either released by or has percolated through waste.

Liquid Waste means any waste that is in liquid form or is substantially comprised of free liquids or is not spadeable (able to be lifted and moved in heaps with a spade).

Noise Sensitive Premises means residences and residential zones (whether occupied or not), schools, hospitals, caravan parks and similar land uses involving the presence of individual people for extended periods, except in the course of their employment or for recreation.

Permeability means the level of saturated hydraulic conductivity also known as the K-value.

Person Responsible is any person who is or was responsible for the environmentally relevant activity to which this document relates and includes the officers, employees, contractors, joint venture partners and agents of that person, and includes a body corporate.

Planning Authority means the Council(s) for the municipal area(s) in which The Land is situated.

Putrescible Waste means waste containing materials that are capable of rapid biological decay or rotting

Recycling means a set of processes (including biological) for converting recovered materials that would otherwise be disposed of as wastes, into useful materials and/or products

Reporting Period means the 12 months ending on 26 November of each year.

Sanitary Waste means disposable nappy and incontinence waste as well as feminine hygiene sanitary products such as tampons and sanitary pads. Includes bulk sanitary waste generated from public areas or commercial premises.

Sewage Sludge means concentrated solids separated from wastewater during the wastewater treatment process.

Stormwater means water traversing the surface of the land as a result of rainfall.

Tasmanian Noise Measurement Procedures Manual means the Noise Measurement Procedures Manual referred to in regulation 4 of the *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2014*.

The Land means the land on which the activity to which this document relates may be carried out, and includes: buildings and other structures permanently fixed to the land, any part of the land covered with water, and any water covering the land. The Land falls within the area defined by:

1 Title Reference 153999/1
2 as further delineated at Attachment 1 "The Land".

Waste has the meaning ascribed to it in Section 3 of EMPCA.

Wastewater means spent or used water (whether from industrial or domestic sources) containing a pollutant and includes stormwater which becomes mixed with wastewater.

Weed means a declared weed as defined in the *Weed Management Act 1999*.

Schedule 2: Conditions

Maximum Quantities

Q1 Regulatory limits

1 The activity must not exceed the following limits (annual fees are derived from these figures):

1.1 80,000 tonnes per year of waste received or likely to be received (excluding materials for recycling)

General

G1 Access to and awareness of conditions and associated documents

A copy of these conditions and any associated documents referred to in these conditions must be held in a location that is known to and accessible to the person responsible for the activity. The person responsible for the activity must ensure that all persons who are responsible for undertaking work on The Land, including contractors and sub-contractors, are familiar with these conditions to the extent relevant to their work.

G2 Incident response

If an incident causing or threatening environmental nuisance, serious environmental harm or material environmental harm from pollution occurs in the course of the activity, then the person responsible for the activity must immediately take all reasonable and practicable action to minimise any adverse environmental effects from the incident.

G3 No changes without approval

1 The following changes, if they may cause or increase the emission of a pollutant which may cause material or serious environmental harm or environmental nuisance, must only take place in relation to the activity if such changes have been approved in writing by the EPA Board following its assessment of an application for a permit under the *Land Use Planning and Approvals Act 1993*, or approved in writing by the Director:

1.1 a change to a process used in the course of carrying out the activity; or

1.2 the construction, installation, alteration or removal of any structure or equipment used in the course of carrying out the activity; or

1.3 a change in the quantity or characteristics of materials used in the course of carrying out the activity.

G4 Change of ownership

If the owner of The Land upon which the activity is carried out changes or is to change, then, as soon as reasonably practicable but no later than 30 days after becoming aware of the change or intended change in the ownership of The Land, the person responsible must notify the Director in writing of the change or intended change of ownership.

G5 Complaints register

1 A public complaints register must be maintained and made available for inspection by an Authorized Officer upon request. The public complaints register must, as a minimum, record the following detail in relation to each complaint received in which it is alleged that environmental harm (including an environmental nuisance) has been caused by the activity:

1.1 the time at which the complaint was received;

1.2 contact details for the complainant (where provided);

1.3 the subject-matter of the complaint;

1.4 any investigations undertaken with regard to the complaint; and

1.5 the manner in which the complaint was managed, including any mitigation measures implemented.

2 Complaint records must be maintained for a period of at least 3 years.

G6 Landfill area

The deposition of waste must be confined to within landfill cells constructed in accordance with CN1, CN2, CN3 and CN4. Documentation which demonstrates compliance with these conditions must be provided to an Authorized Officer upon request.

G7 Permitted waste types

1 Unless otherwise approved by the Director, no wastes may be deposited or stored on The Land other than wastes of the following types:

1.1 General Wastes:

1.1.1 inert waste;

1.1.2 clean fill; and

1.1.3 putrescible waste; and

1.2 The following controlled wastes (subject to Hazardous Substances conditions):

1.2.1 asbestos waste, provided that the waste is appropriately wrapped to avoid the release of asbestos fibres into the atmosphere during handling;

1.2.2 scrap tyres for storage and/or recycling in accordance with these conditions;

1.2.3 spadeable sewage sludge (including grit, silt and screenings), provided that the total and leachable concentration values of the sludge do not exceed those specified for Low Level Contaminated Soil in Classification and Management of Contaminated Soil for Disposal;

1.2.4 animal effluent and residues, provided that the waste is of a spadeable consistency;

1.2.5 sanitary waste;

1.2.6 low level contaminated soil (as defined in *Classification and Management of Contaminated Soil for Disposal*)

1.2.7 batteries (where stored for recycling); and

1.2.8 waste oil (where stored for recycling).

1.3 Where there is doubt concerning the classification of waste as controlled waste, clarification must be sought from the Director.

G8 Non-permitted waste types

1 Unless otherwise approved under these conditions or in writing by the Director, the following waste types must not be accepted for disposal on The Land:

1.1 controlled wastes; and

1.2 liquid waste.

G9 Annual Environmental Review

1 Unless otherwise specified in writing by the Director, a publicly available Annual Environmental Review for the activity must be submitted to the Director each year within three months of the end of the reporting period. Without limitation, each Annual Environmental Review must include the following information:

1.1 a statement by the General Manager, Chief Executive Officer or equivalent for the activity acknowledging the contents of the Annual Environmental Review;

1.2 subject to the *Personal Information Protection Act 2004*, a list of all complaints received from the public during the reporting period concerning actual or potential environmental harm or environmental nuisance caused by the activity and a description of any actions taken as a result of those complaints;

1.3 details of environment-related procedural or process changes that have been implemented during the reporting period;

1.4 a summary of the amounts (tonnes or litres) of both solid and liquid wastes produced and treatment methods implemented during the reporting period. Initiatives or programs planned to avoid, minimise, re-use, or recycle such wastes over the next reporting period should be detailed;

1.5 details of all non-trivial environmental incidents and/or incidents of non compliance with permit or environment protection notice conditions that occurred during the reporting period, and any mitigative or preventative actions that have resulted from such incidents;

1.6 a summary of the monitoring data and record keeping required by these conditions. This information should be presented in graphical form where possible, including comparison with the results of at least the preceding reporting period. Special causes and system changes that have impacted on the parameters monitored must be noted. Explanation of significant deviations between actual results and any predictions made in previous reports must be provided;

1.7 identification of breaches of limits specified in these conditions and significant variations from predicted results contained in any relevant DPEMP or EMP, an explanation of why each identified breach of specified limits or variation from predictions occurred and details of the actions taken in response to each identified breach of limits or variance from predictions;

1.8 a list of any issues, not discussed elsewhere in the report, that must be addressed to improve compliance with these conditions, and the actions that are proposed to address any such issues;

1.9 a summary of fulfilment of environmental commitments made for the reporting period. This summary must include indication of results of the actions implemented and explanation of any failures to achieve such commitments; and

1.10 a summary of any community consultation and communication undertaken during the reporting period.

G10 Change of Responsibility

1 Within 30 days of becoming aware that the person responsible for the activity will cease or has ceased to be responsible for the activity, that person must:

1.1 notify the relevant planning authority in writing of the fact;

1.2 notify the Director in writing of the fact;

1.3 provide the relevant planning authority and the Director with full particulars in writing of any person succeeding him or her as the person responsible; and

1.4 notify any such person of the requirements of any relevant permit, environment protection notice or other environmental management obligations.

G11 Environmental Management Plan (EMP)

1 The Land must be developed and the activity must be carried out and monitored in accordance with the EMP and in accordance with Best Practice Environmental Management, unless otherwise specified in these conditions or contrary to EMPCA.

2 Within 15 months of the date on which these conditions take effect, or by a date otherwise specified in writing by the Director, the EMP must be must be critically reviewed by the person responsible and a revised EMP must be submitted to the Director for approval.

3 The revised EMP must detail prescriptions, consistent with these conditions, for the prevention or mitigation of environmental harm and environmental nuisance arising from the activity.

4 The revised EMP must include specific Plans, as detailed in Attachment 5 'Guidelines for EMP Production' attached to this Notice.

5 When reviewing the EMP, the person responsible must take into account environment related complaints, incidents and changes to the activity since the previous EMP.

6 The EMP must be critically reviewed at 5 yearly intervals and the person responsible must submit a revised EMP in accordance with the above requirements within 5 years of the date on which the Director approved the previous EMP. Such a revised EMP may take the form of a substitute EMP or a written statement that the previous EMP remains substantially current together with any written amendments to the previous EMP.

Atmospheric

A1 Control of dust emissions

Dust emissions from The Land must be controlled to the extent necessary to prevent environmental nuisance beyond the boundary of The Land.

A2 Odour management

The person responsible must institute such odour management measures as are necessary to prevent odours causing environmental nuisance beyond the boundary of The Land.

Construction

CN1 Leachate barrier

1 The landfill must be designed and constructed so that pollution of groundwater or surface water by leachate is prevented.

2 Waste must not be deposited in any new cell on The Land until the engineered liner and leachate collection system for that new cell has been constructed and completed in accordance with these conditions and in accordance with any design specifications approved by the Director.

3 Unless otherwise approved by the Director the landfill liner for any new cell must comply with the prescriptions in Table 3.1 of the *Landfill Sustainability Guide*.

CN2 Leachate collection system

1 A leachate collection system must be designed and constructed to collect all leachate likely to arise from waste deposited on The Land and to prevent it from escaping from The Land into groundwater or surface waters.

2 The landfill leachate system must be designed and constructed to ensure that leachate accumulating on the landfill liner does not exceed a hydraulic head of 0.3 metres above any part of the landfill liner.

CN3 Quality assurance

1 As new cells are constructed, a suitably qualified person with sound knowledge and relevant experience must be present for as much time as is necessary to enable him to properly discharge the responsibilities specified in this condition.

2 The person must supervise liner installation and construction quality control. The person must be directly responsible for:

   2.1 The supervision of all technical staff involved;

   2.2 'Signing off' of all quality control testing;

   2.3 The recording of engineering construction and quality assurance activities; and

   2.4 Full testing of clay material (where used) using methods outlined in Australian Standard 1289.5 series (*Methods Of Testing Soils For Engineering Purposes. Soil Compaction and Density Tests*).

3 Quality assurance specifications must be prepared for construction and testing of landfill engineering works, including liners, capping and the leachate collection system. In particular:

   3.1 Construction supervision must include Level 1 supervision and field testing by a qualified geotechnician, as per Australian Standard 3798 (*Guidelines On Earth Works For Commercial And Residential Developments*), for Type 1 earthworks;

   3.2 The geometry and thickness of clay liners must be measured by a registered surveyor;

   3.3 All testing and certification must be performed by a person who is independent of both the person responsible and the construction contractor; and

   3.4 A report documenting conformity with the specifications and these conditions must be prepared on completion of the works, and submitted to the Director within 30 days of such completion.

CN4 Commencement of works

Preparatory works for a new cell must not be undertaken unless at least 28 days prior notice in writing has been given to the Director of the intention to do so. The notification must include details of the works that are to be undertaken and the date of commencement of these works.

Decommissioning And Rehabilitation

DC1 Notification of cessation

Within 30 days of becoming aware of any event or decision which is likely to give rise to the permanent cessation of the activity, the person responsible for the activity must notify the Director in writing of that event or decision. The notice must specify the date upon which the activity is expected to cease or has ceased.

DC2 Temporary suspension of activity

1 Within 30 days of becoming aware of any event or decision which is likely to give rise to the temporary suspension of the activity, the person responsible for the activity must notify the Director in writing of that event or decision. The notice must specify the date upon which the activity is expected to suspend or has suspended.

2 During temporary suspension of the activity:

   2.1 The Land must be managed and monitored by the person responsible for the activity to ensure that emissions from The Land do not cause serious environmental harm, material environmental harm or environmental nuisance; and

   2.2 If required by the Director a Care and Maintenance Plan for the activity must be submitted, by a date specified in writing by the Director, for approval. The person responsible must implement the approved Care and Maintenance Plan, as may be amended from time to time with written approval of the Director.

3 Unless otherwise approved in writing by the Director, if the activity on The Land has substantially ceased for 2 years or more, rehabilitation of The Land must be carried out in accordance with the requirements of these conditions as if the activity has permanently ceased.

DC3 Decommissioning and Rehabilitation Plan

1 At least 12 months prior to the planned cessation of waste deposition or by a date specified in writing by the Director a Decommissioning and Rehabilitation Plan for the activity must be prepared in accordance with the Acceptable Standards provisions of Section 5 of the *Landfill Sustainability Guide* and must specify, without limitation, the following:

- 1.1 the closure date;
- 1.2 redundant site structures and equipment to be removed;
- 1.3 details relating to interim cover and final capping;
- 1.4 details of signs to be erected to inform the public that the site has closed;
- 1.5 perimeter fences to be installed or maintained and other security measures to be implemented to prevent unauthorised access to waste deposition areas on The Land;
- 1.6 post-closure management procedures for the leachate collection and containment system;
- 1.7 post-closure maintenance procedures for stormwater drains and landfill capping;
- 1.8 intended final profile of The Land;
- 1.9 revegetation plans;
- 1.10 proposed post-closure groundwater and surface water monitoring program; and
- 1.11 any other details requested in writing by the Director.

DC4 Implementation of the DRP

Following permanent cessation of the activity, the decommissioning of the activity and the rehabilitation of The Land must be carried out in accordance with the most recent Decommissioning and Rehabilitation Plan (DRP) approved by the Director, as may be amended from time to time with written approval of the Director.

DC5 Progressive Rehabilitation

1 Progressive rehabilitation must be carried out during the operational phase of the activity and in accordance with the following:

- 1.1 revegetation of each cell must commence as soon as is practicable after completion of final capping of the cell; and
- 1.2 rehabilitation must include planting or seeding compatible with the proposed end use of the The Land and protection of the capping.

2 Maintenance and monitoring of rehabilitated areas must continue until the potential for environmental harm resulting from the deposition of waste in those areas has been mitigated in accordance with the Acceptable Standards provisions of Section 5 of the Landfill Sustainability Guide.

Effluent

EF1 Stormwater

1 Polluted stormwater that will be discharged from The Land must be collected and treated prior to discharge to the extent necessary to prevent serious or material environmental harm, or environmental nuisance.

2 Notwithstanding the above, all stormwater that is discharged from The Land must not carry pollutants such as sediment, oil and grease in quantities or concentrations that are likely to degrade the visual quality of any receiving waters outside the Land.

3 All reasonable measures must be implemented to ensure that solids entrained in stormwater are retained on The Land. Such measures may include appropriately sized and maintained sediment settling ponds or detention basins.

4 Stormwater discharged in accordance with this condition must not be directed to sewer without the approval of the operator of the sewerage system.

EF2 Contamination of stormwater

1 In the event that stormwater becomes polluted by leachate, measures must be implemented immediately to prevent pollutants from discharging beyond the boundaries of The Land. Polluted stormwater may be either:

1.1 transferred to the leachate collection system, providing that the leachate dam has adequate capacity; or

1.2 irrigated over the landfill cells; or

1.3 removed to an approved Wastewater Treatment Plant.

EF3 Design and maintenance of settling ponds

1 Sediment settling ponds must be designed and maintained to the satisfaction of the Director and in accordance with the following requirements:

1.1 ponds must be designed to successfully mitigate reasonably foreseeable sediment loss which would result from a 1 in 10 year storm event;

1.2 discharge from ponds must occur via a stable spillway that is not subject to erosion;

1.3 all pond walls must be maintained in such a manner as to prevent erosion; and

1.4 sediment settling ponds must be periodically cleaned out to ensure that the pond design capacity is maintained.

EF4 Retention of sediment

During construction activities all reasonable measures must be implemented to ensure that solids entrained in stormwater traversing the construction site are retained on The Land. Such measures may include provision of strategically located sediment fences, and appropriately sized and maintained sediment settling ponds.

EF5 Fire fighting wastewater

In the event of a fire, potentially contaminated wastewater arising from fire fighting must be treated on The Land to the satisfaction of the Director or removed from the site by a person holding all necessary approvals for such transport.

EF6 Leachate Storage

Unless otherwise approved in writing by the Director, leachate may only be stored in the leachate lagoons.

EF7 Perimeter drains

1 Perimeter cut-off drains must be constructed at strategic locations on The Land to prevent surface run-off from entering the area that is being used for landfilling. All reasonable measures must be implemented to ensure that sediment transported along these drains remains on The Land. Such measures may include provision of strategically located sediment fences, appropriately sized and maintained sediment settling ponds, vegetated swales, detention basins and other measures designed and operated in accordance with the principles of Water Sensitive Urban Design.

2 Drains must have sufficient capacity to contain run-off that could reasonably be expected to arise during a 1 in 10 year rainfall event. Maintenance activities must be undertaken regularly to ensure that this capacity does not diminish.

Hazardous Substances

H1 Storage and handling of hazardous materials

1 Unless otherwise approved in writing by the Director, all environmentally hazardous materials, including all chemicals, fuels, and oils, held on The Land in volumes exceeding 250 litres must be stored and handled in accordance with the following:

  1.1 Any storage facility must be contained within a spill collection bund with a net capacity of whichever is the greater of the following:

    1.1.1 at least 110% of the combined volume of any interconnected vessels within that bund; or

    1.1.2 at least 110% of the volume of the largest storage vessel; or

    1.1.3 at least 25% of the total volume of all vessels stored in that spill collection bund; or

    1.1.4 the capacity of the largest tank plus the output of any firewater system over a twenty minute period.

  1.2 All activities that involve a significant risk of spillages, including the loading and unloading of bulk materials, must take place in a bunded containment area or on a transport vehicle loading apron.

  1.3 Bunded containment areas and transport vehicle loading aprons must:

    1.3.1 be made of materials that are impervious to any environmentally hazardous material stored within the bund;

    1.3.2 be graded or drained to a sump to allow recovery of liquids;

    1.3.3 be chemically resistant to the chemicals stored or transferred;

    1.3.4 be designed and managed such that any leakage or spillage is contained within the bunded area (including where such leakage emanates vertically higher than the bund wall);

    1.3.5 be designed and managed such that the transfer of materials is adequately controlled by valves, pumps and meters and other equipment wherever practical. The equipment must be adequately protected (for example, with bollards) and contained in an area designed to permit recovery of any released chemicals;

    1.3.6 be designed such that chemicals which may react dangerously if they come into contact have measures in place to prevent mixing; and

    1.3.7 be managed such that the capacity of the bund is maintained at all times (for example, by regular inspections and removal of obstructions).

H2 Hazardous materials (< 250 litres)

1 Unless otherwise approved in writing by the Director, each environmentally hazardous material, including chemicals, fuels and oils, held on The Land in discrete volumes not exceeding 250 litres, but not including discrete volumes of 25 litres or less, must be located within bunded containment areas or spill trays which are designed to contain at least 110% of the volume of the largest container.

2 Bunded containment areas and spill trays must be made of materials that are impervious to any environmentally hazardous materials stored within the bund or spill tray.

H3 Spill kits

Spill kits appropriate for the types and volumes of materials handled on The Land must be kept in appropriate locations to assist with the containment of spilt environmentally hazardous materials.

H4 Inventory of hazardous materials

An inventory must be kept of all environmentally hazardous materials stored and handled on The Land. The inventory must specify the location of storage facilities and the maximum quantities of each environmentally hazardous material likely to be kept in storage and must include material safety data sheets for those environmentally hazardous materials.

H5 Record of controlled wastes

1 A record of all controlled waste deposited at the landfill must be kept and provided to the Director as part of the Annual Environmental Review. This record must include:
    1.1 the composition and description of the waste;
    1.2 the quantity of controlled waste deposited;
    1.3 where possible, the person or organisation which generated the waste.

H6 Sanitary waste

1 Sanitary waste from non-patient areas, commercial premises, aged care facilties, geriatric and maternity wards, child care centres, restaurants, and other public places must be buried immediately under supervision and covered with 300mm of cover material in a designated area of the landfill.

2 Untreated sanitary waste from patient areas and sanitary waste that is saturated with or contains free flowing blood or other body fluids and sanitary waste from those receiving chemotherapy treatment must not be deposited at the landfill.

H7 Lead acid batteries

Used motor vehicle lead acid batteries may only be received at the landfill if stored in a facility that conforms to Australian Standard 3780 (*Storage and Handling Of Corrosive Substances*).

H8 Scrap tyres

1 Scrap tyres must be managed in accordance with the following:
    1.1 no more than 500 whole tyres may be stored on The Land unless otherwise approved in writing by the Director. Such storage may only occur as an interim measure while awaiting disposal or removal to another site;
    1.2 tyre stockpiles must contain no greater than 200 tyres per stockpile;
    1.3 tyre storage must be on a clean, hard stand area that has all weather access;
    1.4 no whole tyres except earthmoving tyres may be disposed in the landfill. Where cut tyres are disposed in the landfill the size of the pieces must not exceed 250 mm in any dimension; and
    1.5 earthmoving vehicle tyres must be individually buried and must be filled completely, to remove any voids, with an inert and non-degradable material such as soil or sand.

Monitoring

M1 Dealing with samples obtained for monitoring

1 Any sample or measurement required to be obtained under these conditions must be taken and processed in accordance with the following:

1.1 Australian Standards, NATA approved methods, the American Public Health Association Standard Methods for the Analysis of Water and Waste Water or other standard(s) approved in writing by the Director;

1.2 measurement equipment must be maintained and operated in accordance with the manufacturer's specifications;

1.3 samples must be tested in a laboratory accredited by the National Association of Testing Authorities (NATA), or a laboratory approved in writing by the Director, for the specified test;

1.4 results of measurements and analysis of samples and details of methods employed in taking measurements and samples must be retained for at least three years after the date of collection; and

1.5 noise measurements must be undertaken in accordance with the Tasmanian Noise Measurement Procedures Manual.

M2 Reporting of waste tonnage

1 The person responsible must submit to the Director a report on the quantity of waste (measured as tonnes) disposed of at the landfill during each financial year. The report must be submitted by 30 September each year and must, as a minimum, contain details of:

1.1 the total quantity of waste disposed of at the facility, measured as tonnes using a methodology approved by the Director; and

1.2 the method by which the quantity disposed of has been calculated.

M3 Waste data reporting

1 The person responsible must submit to the Director a report on the destination and source of waste received while carrying on the activity as follows:

1.1 By 30 September each year the person responsible must submit to the Director a report detailing the Processing Route, the Primary Source and Secondary Source for all waste received in the preceding financial year. The report must break down the total tonnage disposed using the categories listed in the tables below.

1.2 Processing Route for waste received may be broken down into any of the following categories:

Processing Route
1 Recycling
2 Composting
3 Incineration
4 Landfill
5 Other

1.3 Source of waste received may be broken down into any of the following categories:

Primary Source	Secondary Source
A Municipal	1 Domestic Waste
	2 Other Domestic
	3 Other Council
	X Waste Processing Facility
B Commercial & Industrial	0 Unknown
	X Waste Processing Facility
C Construction & Demolition	0 Unknown
	2 Other Domestic
	3 Other Council
	X Waste Processing Facility

1.4 For the purposes of this condition the following definitions apply:

1.4.1 'Commercial & Industrial' means the component of waste stream originating from wholesale, retail or service establishments and the waste stream arising from industrial processes and manufacturing operations;

1.4.2 'Construction and Demolition' means materials in the waste stream which arise from construction, refurbishment or demolition activities and includes bricks, tiles, concrete, steel, glass, plastics, and soil or naturally occurring excavated material;

1.4.3 'Domestic waste' means all household waste placed on the kerbside for collection by council or council contractors;

1.4.4 'Municipal' means waste arising from domestic premises and Council activities largely associated with servicing urban areas; such as street sweeping, street tree lopping, park and garden maintenance, and litter bins. (For waste data purposes, Municipal waste = Domestic Waste + Other Domestic waste + Other Council waste.)

1.4.5 'Other Council' means waste collected by council or council contractors from the clean-up of municipal parks and gardens, street sweepings, council engineering works, litter bins, and other clean-up resulting from large festivities organised within the council's jurisdiction;

1.4.6 'Other Domestic' means waste collected by council or council contractors from irregular residential clean-ups at the kerbside; and other wastes transported by residents (*e.g.* in cars, vans or utes) directly to a waste management facility;

1.4.7 'Waste Processing Facility' means a facility approved to receive waste and includes a waste transfer station

M4 Leachate Generation Management Plan

Within 18 months of the date on which these conditions take effect, a Leachate Generation Management Plan in accordance with the requirements of Attachment 5 must be submitted to the Director for approval. The person responsible must implement the approved plan as may be amended from time with the written agreement of the Director.

M5 Signage of monitoring points

With the exception of open water sampling, all monitoring points must be clearly marked to indicate the location and name of the monitoring point.

M6 Surface water monitoring

1 Representative samples of surface water must be collected at sampling points numbered S1 to S8 inclusive as identified in Attachment 3 of this Notice.

2 Surface water must be sampled at 3 monthly intervals. If there is no flow at time of sampling then the sample must be collected, as far as is practicable, at the next occurrence of flow.

3 Unless otherwise approved in writing by the Director, the parameters listed in Column 1 of Table 1 must be monitored by sampling and analysis or by field measurement as the case may be.

4 If leachate has become mixed with the surface water, or if required in writing by the Director, additional sampling of the parameters listed in Column 1 of Table 1 must be undertaken in accordance with the requirements of the Director.

5 **Table 1 Surface Water Monitoring**

Column 1
MONITORING PARAMETER
pH
Biological Oxygen Demand (mgO2/L)
Total Suspended Solids (TSS) (mg/L)
Conductivity Ds/m)
Total Nitrogen (mg/L)
Ammonium (ug-N/L)
Oxides of nitrogen (ug-N/L)
Total phosphorus (mg/L)
Dissolved Free Phosphorus (ug - P/L)

M7 Leachate monitoring

1 If required in writing by the Director, results of analyses of leachate water collected as a requirement of any Trade Waste Agreement, including the location of leachate sampling points, must be supplied within 14 days of receipt.

2 If required in writing by the Director, leachate pond water must be sampled for the monitoring parameters listed in Column 1 of Table 2 at the frequency specified by the Director.

3 All metals are to be tested for total content, but also for filtered content on written request of the Director.

4 Table 2 Leachate Monitoring

Column 1
MONITORING PARAMETERS (units)
pH
Conductivity (uS/cm)
Total Suspended Solids (TSS) (mg/L)
Alkalinity (as CaCO3) (mg/L)
Total Nitrogen (mg/L)
Ammonia (ug-N/L)
Nitrate (ug-N/L)
Nitrite (ug-N/L)
Total phosphorus (mg/L)
Orthophosphate (ug-P/L)
Dissolved Organic Carbon (mg/L)
Biochemical Oxygen Demand (mgO2/L)
Dissolved Oxygen (mg/L)
Total CN (as CN) (mg/L)
Total Iron (Fe) (mg/L)
Aluminium (Al) (mg/L)
Copper (Cu) (mg/L)
Zinc (Zn) (mg/L)
Chromium (Cr) (mg/L)
Manganese (Mn) (mg/L)
Nickel (Ni) (mg/L)
Lead (Pb) (mg/L)
Cadmium (Cd) (mg/L)
Chloride (mg/L)
Sulphate (mg/L)
Sodium (Na) (mg/L)
Potassium (K) (mg/L)
Magnesium (Mg) (mg/L)
Arsenic (As) (mg/L)
Mercury (Hg) (mg/L)
Selenium (Se) (mg/L)

Column 1
TPH

M8 Groundwater monitoring

1 Unless otherwise approved in writing by the Director, groundwater bores B2, B6, B7, B8, B11, B12, B14, B15, B16, and B17 identified in Attachment 4 of this Notice, must have the parameters listed in Column 1 of Table 4 monitored in accordance with the frequency specified in Column 2 of Table 4.

2 **Table 4. Groundwater Monitoring**

Column 1	Column 2
MONITORING PARAMETERS	**FREQUENCY**
Bore depth (m)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Ground water depth (m)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Co ordinates, GDA 94 Zone 55 - Easting, Northing, AHD	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
pH	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Conductivity (uS/cm)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Total Dissolved Salts (TDS) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Redox potential (Eh) (mV)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Total Nitrogen(ug-N/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Ammonia (ug-N/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Nitrate (ug-N/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Nitrite (ug-N/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Total phosphorus (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Orthophosphate (ug-P/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Dissolved Organic Carbon (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals

Column 1	Column 2
Biochemical Oxygen Demand (mO_2/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Total CN (as CN) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Total Iron and dissolved (Fe) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Copper (Cu) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Zinc (Zn) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Chromium (Cr) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Manganese (Mn) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Nickel (Ni) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Lead (Pb) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Cadmium (Cd) (mg/L)	**Once within 6 weeks of the issue date of these conditions, then at 12 monthly intervals**
Bromide (ug/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Iodide (ug/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Chloride (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Sulphate (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Sodium (Na) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals

Column 1	Column 2
Potassium (K) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Magnesium (Mg) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Arsenic (As) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Mercury (Hg) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
Selenium (Se) (mg/L)	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals
TPH	Once within 6 weeks of the issue date of these conditions, then at 6 monthly intervals

Note: Bold denotes annual sampling required

M9 Sampling of groundwater

1 Sampling of all groundwater bores must be recorded on a pre-drafted recording sheet which includes, at least, the following:

1.1 Standing water level;

1.2 Volume of water in litres within the installed casing before purging;

1.3 Volume of water in litres purged before sampling;

1.4 Time required to purge the bore casing before sampling;

1.5 Method of purging the casing water column;

1.6 Flow rate of the purging method used for sampling;

1.7 Time, date and identification code of the water sample; and

1.8 Field primary water quality parameters, including at least, conductivity, pH and temperature.

M10 Groundwater Monitoring program

1 Groundwater investigations must be carried out as follows:

1.1 Any new groundwater monitoring bore(s) must have an approved installation and development record as outlined in these conditions. A hydraulic pump test must be carried out within 7 days after the installation and development of any new bore(s) and the results forwarded to the Director within 7 days of receipt.

1.2 Any new groundwater monitoring bore(s) must be monitored quarterly for one year. Monitoring bore(s) must be monitored for the chemical analytes outlined in Column 1 of Table 4 (Groundwater Monitoring). After this period of initial monitoring, and dependent on results, the range of parameters and freqency of monitoring may be reduced with the Director's approval.

1.3 Groundwater monitoring results and interpretation must be included in the annual environmental review prepared in accordance with these conditions.

M11 Monitoring, record keeping and reporting

Unless otherwise approved in writing by the Director, the results of laboratory analysis of samples collected in the course of monitoring in accordance with these conditions, must be submitted to the Director in the Annual Environmental Review following completion of those analyses by the laboratory.

Noise Control

N1 Noise complaints

In the event that a noise complaint is received in relation to the activity, the complaint must be reported to the Director within 24 hours.

N2 Noise emission limits

1 Noise emissions from the activity when measured at any noise sensitive premises in other ownership and expressed as the equivalent continuous A-weighted sound pressure level must not exceed:

  1.1 45 dB(A) between 0800 hours and 1800 hours (Day time); and

  1.2 40 dB(A) between 1800 hours and 2200 hours (Evening time); and

  1.3 35 dB(A) between 2200 hours and 0800 hours (Night time).

2 Where the combined level of noise from the activity and the normal ambient noise exceeds the noise levels stated above, this condition will not be considered to be breached unless the noise emissions from the activity are audible and exceed the ambient noise levels by at least 5 dB(A).

3 The time interval over which noise levels are averaged must be 10 minutes or an alternative time interval specified in writing by the Director.

4 Measured noise levels must be adjusted for tonality, impulsiveness, modulation and low frequency in accordance with the Tasmanian Noise Measurement Procedures Manual.

5 All methods of measurement must be in accordance with the Tasmanian Noise Measurement Procedures Manual.

Operations

OP1 Site staff

While The Land is open for reception of waste, The Land must be attended by a person or persons whose duties must include supervising the management of waste deposition and ensuring compliance with these conditions.

OP2 Tipping Faces

1 The person responsible may choose to operate separate tipping faces for inert and putrescible materials.

2 Active tipping face(s) for putrescible waste must not exceed 50 metres in combined length, and public access to the tipping face must be kept to a minimum.

3 Unless otherwise approved in writing by the Director, each successive landfilling lift must not exceed 2 metres in height, excluding cover material.

OP3 Waste Capping

1 Machinery capable of spreading, compacting and covering deposited waste must be kept on The Land at all times. A person competent in operating the machinery must be available for an adequate period of time to spread, compact and cover all waste deposited on a daily basis.

2 Daily cover of a standard to prevent animal access to the waste, movement of the waste by wind and the release of odour must be applied to the tipping face at the end of each day of operation.

3 The active tipping area without intermediate cover must not exceed 7,000 square metres. Intermediate cover comprised of, at least, low permeability (hydraulic conductivity $< 1 \times 10^{-7}$ m/s unless otherwise approved by the Director) materials must be applied to a depth of 300 mm to areas in excess of 7,000 square metres except where further waste deposition or final capping will be applied within 90 days.

4 Daily cover and intermediate cover may be provided simultaneously by a single 300mm layer.

5 Unless otherwise approved by the Director, areas to which intermediate cover has been applied must have final capping applied within 2 years unless further waste deposition occurs.

6 Unless otherwise approved by the Director, final capping must comply with Table 5.1 of the *Landfill Sustainability Guide*.

OP4 Litter management

1 Measures must be implemented and maintained throughout the operational life of the landfill to control and monitor the escape of litter from The Land.

2 Litter control measures, for example mobile litter fences of sufficient height to capture airborne litter, must be employed around and close to active landfilling areas. Fences must be regularly cleared of litter in order to maintain their effectiveness (i.e. the fences must remain permeable to wind).

3 Neighbouring properties within a one half kilometre radius of The Land and the access road, and areas of The Land outside active tipping face(s) must be kept clear of windblown litter originating from The Land.

4 The areas specified in the above paragraph must be inspected and all visible litter must be collected on a weekly basis, or more frequently when litter is readily visible on neighbouring properties. A record of the dates of inspections and litter collection activities must be kept. The responsible person must notify the Director if any owner of adjoining land refuses to allow staff to undertake litter removal on their land.

5 Waste compaction and covering must be carried out immediately after waste deposition if wind conditions are such that litter cannot be contained within the active landfill area.

6 During times of gale force wind and at any other time when wind strength is such that, notwithstanding all other litter control measures litter cannot be contained within the boundaries of The Land, the landfill must not receive putrescible waste. The person responsible must keep a record of all such occasions and provide a copy to an Authorized Officer upon request.

OP5 Fencing

1 Within 12 months of the issue of this Notice;

1.1 The current landfill footprint, as identified in Attachment 2 of this Notice, must be contained within a stock-proof fence sufficient to restrict the entry of native animals (excluding birds); and

1.2 The leachate management infrastructure must be contained within a secure fence sufficient to restrict unauthorised access.

OP6 Fire management

1 Fire control measures on The Land must be to the satisfaction of the Tasmania Fire Service (TFS). Correspondence from the TFS indicating the suitability of fire control measures must be submitted to the Director within 6 months of the date on which these conditions take effect.

2 Fires occurring on The Land must be extinguished as soon as possible using all practical means available.

3 The lighting of fires on The Land is not permitted.

4 The person responsible must make all reasonable efforts to prevent unauthorised ignition of green waste stockpiles.

OP7 Weed management

The Land must be kept substantially free of weeds to minimise the risk of weeds being spread through the transport of products from The Land.

OP8 Landfill gas management

1 If waste deposition on The Land, excluding cover material, exceeds 20,000 tonnes per annum in any three consecutive years, landfill gas management infrastructure must be installed progressively as final capping is installed.

2 Following installation of landfill gas management infrastructure landfill gas must either be collected and reused, or flared.

OP9 Landfill Gas Management Infrastructure

1 Unless gas management infrastructure approved in writing by the Director is installed within 12 months of this Notice taking effect, the person responsible must undertake an assessment of landfill gas arising from waste deposited on The Land. The assessment must be completed and results submitted to the Director within 18 months of the date on which these conditions take effect. This assessment must include:

2 Details of the volumes of gas produced;

3 Design details and a program for the installation of a gas recovery systems; and

4 An investigation of potential re-use or destruction options.

OP10 Composting

Composting activities must not occur on The Land without the prior written approval of the Director.

OP11 Lagoon maintenance

1 Floating matter including grass, weeds and rubbish must not be allowed to accumulate on the surface of any ponds or lagoons.

2 All lagoon and pond embankments must be kept in good repair and free of woody vegetation and rubbish.

OP12 Signage

1 Signs must be erected and maintained in legible condition to convey the following important operational and safety information:

1.1 contact staff/organisation and relevant telephone numbers to report any fire or other emergency incident on The Land.

1.2 The hours of operation.

Schedule 3: Information

Legal Obligations

LO1 EMPCA

The activity must be conducted in accordance with the requirements of the *Environmental Management and Pollution Control Act 1994* and Regulations thereunder. The conditions of this document must not be construed as an exemption from any of those requirements.

LO2 Storage and handling of Dangerous Goods, Explosives and dangerous substances

1 The storage, handling and transport of dangerous goods, explosives and dangerous substances must comply with the requirements of relevant State Acts and any regulations thereunder, including:

- 1.1 *Work Health and Safety Act 2012* and subordinate regulations;
- 1.2 *Explosives Act 2012* and subordinate regulations; and
- 1.3 *Dangerous Goods (Road and Rail Transport) Act 2010* and subordinate regulations.

LO3 Aboriginal relics requirements

1 The *Aboriginal Relics Act 1975*, provides legislative protection to Aboriginal heritage sites in Tasmania regardless of site type, condition, size or land tenure. Section 14(1) of the Act states that; Except as otherwise provided in this Act, no person shall, otherwise than in accordance with the terms of a permit granted by the Minister on the recommendation of the Director of National Parks and Wildlife:

- 1.1 destroy, damage, deface, conceal or otherwise interfere with a relic;
- 1.2 make a copy or replica of a carving or engraving that is a relic by rubbing, tracing, casting or other means that involve direct contact with the carving or engraving;
- 1.3 remove a relic from the place where it is found or abandoned;
- 1.4 sell or offer or expose for sale, exchange, or otherwise dispose of a relic or any other object that so nearly resembles a relic as to be likely to deceive or be capable of being mistaken for a relic;
- 1.5 take a relic, or permit a relic to be taken, out of this State; or
- 1.6 cause an excavation to be made or any other work to be carried out on Crown land for the purpose of searching for a relic.

2 If a relic is suspected and/or identified during works then works must cease immediately and the Tasmanian Aboriginal Land and Sea Council and the Aboriginal Heritage Tasmania be contacted for advice before work can continue. In the event that damage to an Aboriginal heritage site is unavoidable a permit under section 14 of the *Aboriginal Relics Act 1975* must be applied for. The Minister may refuse an application for a permit, where the characteristics of the relics are considered to warrant their preservation.

3 Anyone finding an Aboriginal relic is required under section 10 of the Act to report that finding as soon as practicable to the Director of National Parks and Wildlife or an authorized officer under the *Aboriginal Relics Act 1975*. It is sufficient to report the finding of a relic to Aboriginal Heritage Tasmania to fulfil the requirements of section 10 of the Act.

LO4 Change of responsibility

If the person responsible for the activity ceases to be responsible for the activity, they must notify the Director in accordance with Section 45 of the EMPCA.

Other Information

OI1 Notification of incidents under section 32 of EMPCA

Where a person is required by section 32 of EMPCA to notify the Director of the release of a pollutant, the Director can be notified by telephoning 1800 005 171 (a 24-hour emergency telephone number).

Attachment 1. The Land

Dulverton Landfill

Location of Dulverton Landfill in relation to Devonport

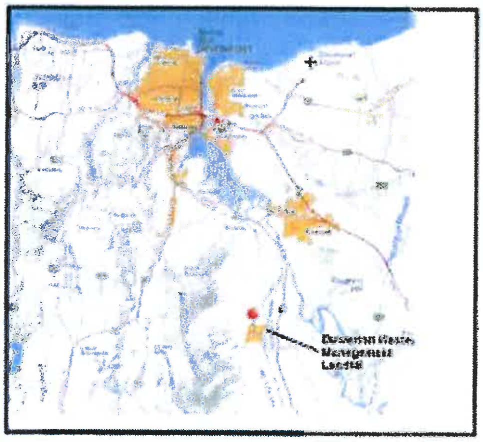
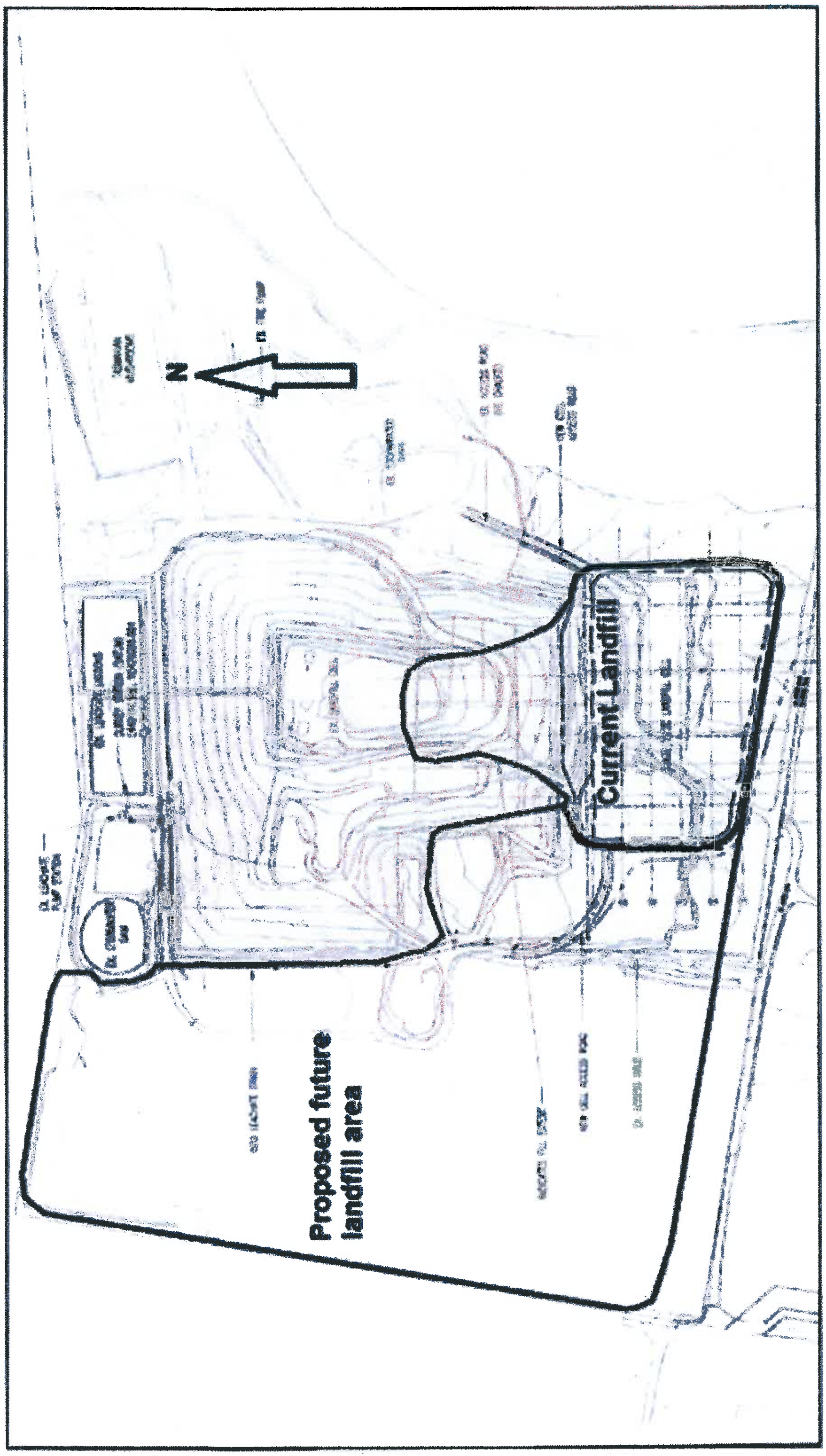


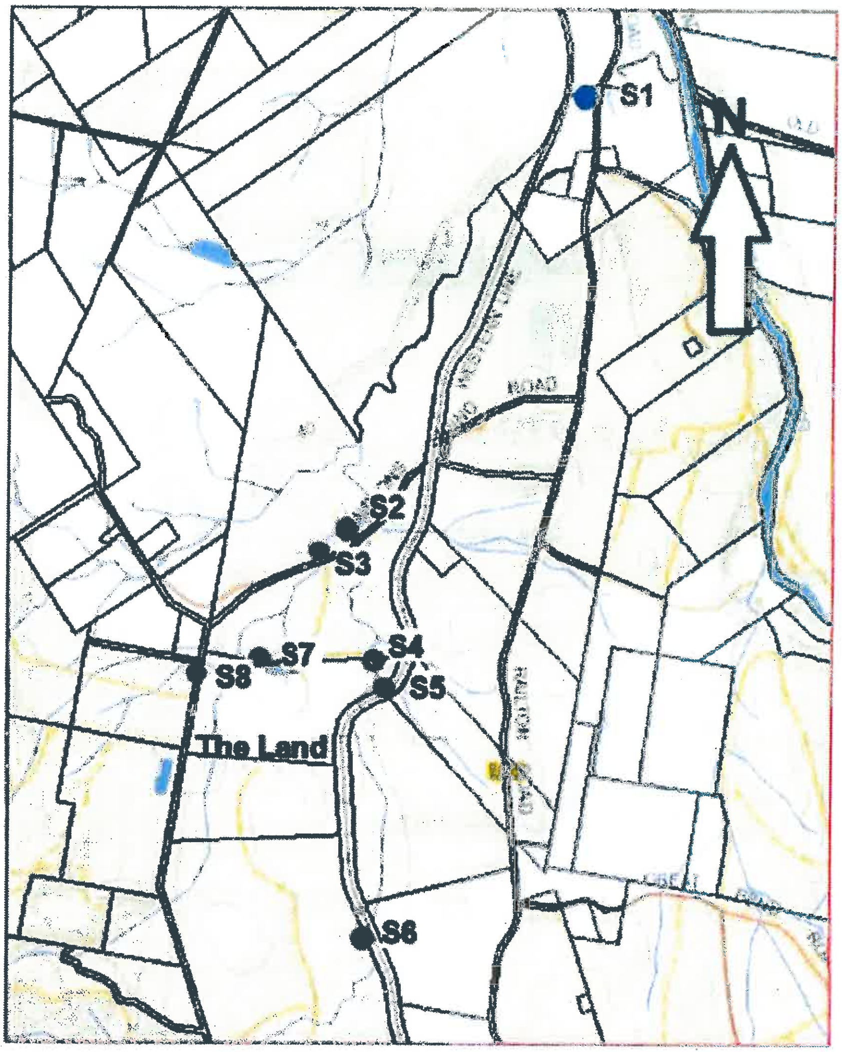
Image from theList

Attachment 2. Landfilling Footprint



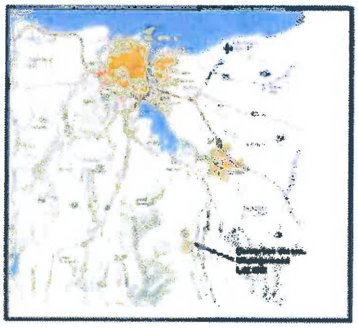
Base image supplied by DRWMA

Attachment 3. Surface Water Monitoring Points



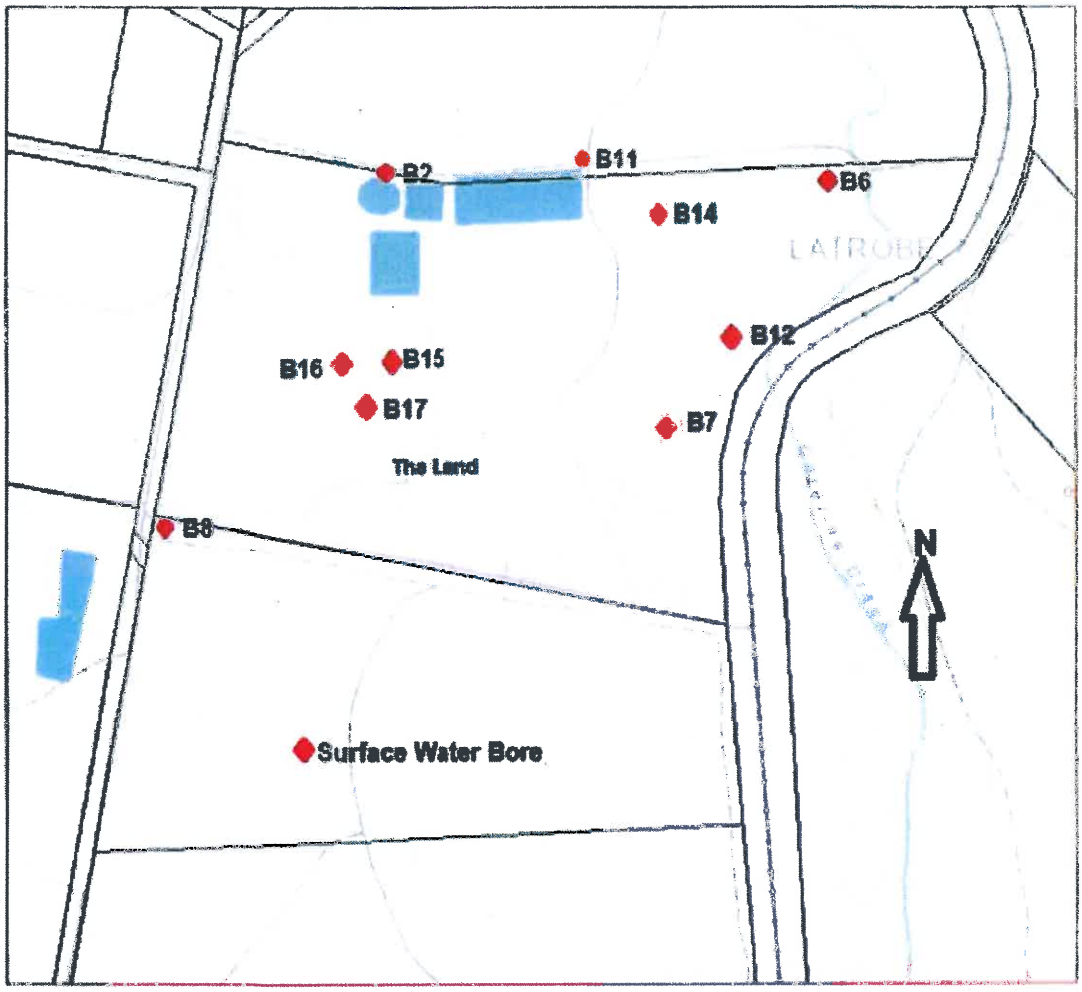
Approximate sampling point locations derived from Fig. 1 of Annual Review Report for Dulverton Landfill 2013-2014.

Location of the Dulverton Landfill in relation to Devonport

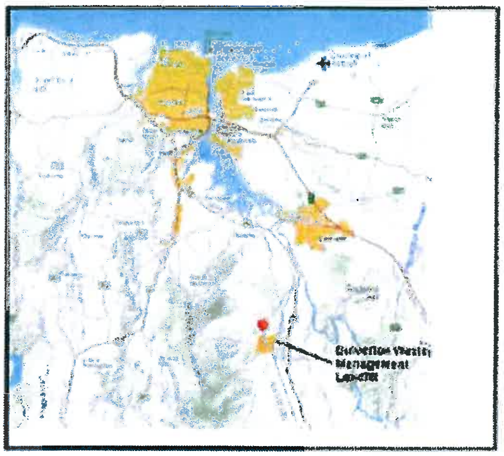


Images from theList

Attachment 4. Groundwater Monitoring Points



Location of the Dulverton Landfill in relation to Devonport



Images from theList

Attachment 5 Guidelines for EMP Production

Dulverton Landfill

The following Plans must be included in the EMP.

The plans may be

- Prepared, submitted and updated as a single item;
- Prepared, submitted and updated as individual plans; or
- Excerpts from existing Management Plans or Management Systems.

They must be prepared in accordance with best practice environmental management and include, but are not limited to the following content:

Site layout Plan

1. The plan must clearly show the actual location of all infrastructure associated with the activity including
   - Waste cells;
   - Buildings;
   - Machinery;
   - Roads;
   - Stockpiles;
   - Ponds, drains and drainage controls; and
   - Monitoring locations.
2. The plan must also depict the current and proposed future extent of disturbance associated with the activity.

Odour Management Plan

The Plan must

1. Identify:
   - All known potential odour sources.
   - Factors that influence the production of odour emissions from these sources.
   - Operational practices to effectively reduce these emissions and to minimise their impacts on neighbours and the local community
2. Include commitments to implement the identified operational practices to effectively reduce these emissions, and a schedule for the implementation of these practices.

Pest Animal Control Plan

The Plan must include

1. Provision to identify all pest animals known to be active on the Land;

2. Strategies designed to limit access or control the activity of the identified animals to putrescible materials on site. This may include control methods for the elimination of targeted species while not affecting non-targeted species; and
3. Actions specifically designed to restrict the ability of pest animals to breed and feed on the land.

Leachate Generation Management Plan

The Plan must:

- Include a description of the physical components of the leachate management system
- Identify all known mechanisms effecting leachate generation
- Identify trends in leachate generation of the activity
- Identify all existing controls to manage leachate generation mechanisms
- Identify operational practices and/or investigations to be implemented to manage leachate generation

Appendix B - Record of Complaints 2016 -2019

INITIAL ACTION								FURTHER INVESTIGATION					
CAR No.	**DWM CAR ID Form #**	**Generated from**	**Date** *(The non-conformance occurred)*	**Description of Non-conformance/Area for Improvement** *(details of the incident as received by reporting officer)*	**Action Taken** *(Outlines direct action taken to rectify the non-conformance. Staff to include MFID for documents and notes kept).*	**Action By** *(Name of staff member who carried out 'action taken')*	**Action Date** *(Is the date that the staff member carried out the 'action taken' or commenced the action)*	**Root Cause of Problem** *(to be updated following an investigation of the non-conformance and what underlying factors may have contributed to it).*	**Preventative Action** *(Measures put in place to prevent the non-conformance from reoccurring).*	**Preventive Action Verified By** *(Name of staff member who carried out 'Root Cause' and 'Preventative Action' investigations)*	**Verification Date** *(Is the date that the staff member has completed the 'Root Cause' and 'Preventative Action' investigations, this cell is to be left blank until both the investigations have been completed)*	**Status**	**COMMENTS**
ENV-639	DWM1034	ML	20.06.2019	Oddour complaint received via EPA								NS	
ENV-627	DWM1024	ML	12.04.2019	Odour complaint received from Coal Road via email to EPA 12.04.19 9am suggesting they could smell Fish and Poultry odours	EPA indicated they will meet with the complaintee mid May, while also indicating investigators need to have more of a presence to put some independence around some of these claims							NS	
ENV-630	DWM1027	AW	17.05.2019	Odour complaint received from Site Supervisor - Gary re strong odour at Mushroom Compost Facility	Matthew Layton has advised the EPA							NS	
ENV-633	DWM1031	AW	05.02.2018	EPA contacted DWM regarding and odour complaint from Coal Hill Road	TBA							NS	
ENV-634	DWM1032	AW	26.02.2018	EPA contacted DWM regarding and odour complaint from Coal Hill Road	TBA							NS	
ENV-501		Latrobe Council	27.02.2017	Odour complaint received by Council from a resident of Sherwood Drive.	Email saved on M-Files. Discussed with Site Supervisor, no unusual activity could be determined on this day.	AH	02.03.2017	The root cause of the odour that the complainant reported has not been confirmed.	The SS is required to log any instances of odour generated from DWM site operations and/or the mushroom compost facility on the Weekly Diary. Should regular occurrences of bad odour be noted, action to rectify will be investigated.	AH	27.03.2017	TC	
ENV-502		Neighbour	31.03.2017	Odour complaint received from resident at Castle Drive, Tarleton.	MP had a detailed discussion with the SS who advised that there was a general odour noticed from the site and the mushroom facility that day, but nothing out of the ordinary. The SS drove further up Dawsons Siding Road to check for odour leaving site and nothing was detected. The SS confirmed that odour from the mono-cell could only be detected from close proximity and no odour was observed from the trucks carting the product to the monocell. AH followed up with complainant to discuss the matter.	AB/AH/MP	5/04/2017	The root cause of the odour that the complainant reported has not been confirmed.	The SS is required to log any instances of odour generated from DWM site operations and/or the mushroom compost facility on the Weekly Diary. Should regular occurrences of bad odour be noted, action to rectify will be investigated.	AH	05.04.2017	TC	
ENV-530		Latrobe Council	15.01.2018	Odour complaint received from a resident of Sherwood Drive, just off Railton Road. The complainant believes the odour is from the DORF.	Discussed with DORF personnel, who raised some good suggestions. Composting work instruction will be updated.	AH/SS	24.01.2018	The cause of the odour that complainants are reporting has not been confirmed.	DORF staff will continue to adhere to EMS Work Instruction 151 for making compost, and suggest changes if necessary.	AH	19.02.2018	TC	
ENV-555	n/a	EPA	03.5.2018	Odour complaint notified to the EPA earlier this week.	Advice was received a few days after the notification, however, EPA was advised that DWM's acting Site Supervisor had also received a complaint (our of hours), and when the Site Supervisor returned to work the next day he spoke to all previous complainants and none had reported any issues.	SS	30.04.2018	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	Possibly there is a correlation between complaints and wind direction. The SS has been instructed that fresh windrows are not to be turned if there is a light southerly wind as a precautionary measure.	AH	06.06.2018	TC	
ENV-573	n/a	MG	28.05.2018	DWM Chief Representative received an odour complaint from a resident of Coal Hill Road.	Chief Rep visited the complainant's house, and believed the odour to be from the mushroom composting facility. The CR then contacted DWM CEO to advise. See MFID 1541305 for all correspondence.	MG	28.05.2018	It is not for DWM to determine the root cause of this odour, given the likelihood that it is not being generated from DWM operations.	No preventative action required.	AH	06.06.2018	TC	
ENV-549	n/a	MP	16.03.2018	DWM has received a number of odour complaints from Coal Hill Road residents, Latrobe Council EHO and the EPA between 16.03.18 - 17.04.2018.	The SS has been conducting regular visits to the Coal Hill Road residents, discussing their concerns and explaining rectification matters occurring onsite. DWM has also been working closely with the EPA who are satisfied with the actions taken by DWM to date.	MP	16.03.2018	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	Possibly there is a correlation between complaints and wind direction. The SS has been instructed that fresh windrows are not to be turned if there is a light southerly wind as a precautionary measure.	AH	06.06.18	TC	

ENV-589	n/a	AH	10.08.2018	Odour complaint from Coal Hill Road resident made to Site Supervisor.	Site Supervisor discussed with the complainant over the phone.	SS	10.08.2018	The root cause of the odour that the complainant reported has not been confirmed.	The SS is required to log any instances of odour generated from DWM site operations and/or the mushroom compost facility on the Weekly Diary. Will continue to monitor and ensure that operations are continuing to adhear to Work Instructions and Procedures. Should regular occurrences of odour be noted, further investigations will be conducted.	AH	22.08.2018	TC	
ENV-584	1003	Latrobe Council	16.07.2018	Odour complaint received to the Latrobe Council from resident Stewart Gear who lives in Castle Drive.	The SS has been conducting regular visits to nearby residents, discussing their concerns and explaining rectification matters occurring onsite. DWM has also been working closely with the EPA who are satisfied with the actions taken by DWM to date.	ML	16.07.2018	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	The SS is required to log any instances of odour generated from DWM site operations and/or the mushroom compost facility on the Weekly Diary. Will continue to monitor and ensure that operations are continuing to adhere to Work Instructions and Procedures. Should regular occurrences of odour be noted, further investigations will be conducted.	MP	01.11.2018	TC	
ENV-596	97	SS (GP)	09.11.2018	Odour complaint received from Miss Lamprey of Coal Hill.	Mr Lamprey came on site and the odour was identified as the mushroom compost facility.	GP	09.11.2018	Odour from Mushroom Farm onsite, complainant.	CEO advised the EPA of the incident.	ML	28.11.2018	TC	
ENV-618	N/A	ML	13.12.2018	A call was received from Shane Hogue at the EPA advising they had received an odour complaint.	Discussed with SS who advised that there was no noticeable odour being emitted.	ML	14.12.2018	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	DWM continue to improve processes and site personnel adhere to EMS procedures to reduce the likelihood of odour.	ML	15.12.2018	TC	
ENV-619	N/A	ML	14.12.2018	A call was received from Shane Hogue at the EPA advising they had received an odour complaint.	Visited Site, confirmed a strong poultry odour at the entry to the site which was emanating from the Tas Mushroom site. EPA were advised.	ML	14.12.2018	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	DWM continue to improve processes and site personnel adhere to EMS procedures to reduce the likelihood of odour.	ML	16.12.2018	TC	
ENV-620	DWM1017	ML	01.02.2019	A call was received from Shane Hogue at the EPA advising they had received an odour complaint.	Spoke to the EPA and SS to understand background.	ML	01.02.2019	Possibly the odour has been generated from one of the 3 activities on site. DWM are reviewing all procedures and refining any practices as appropriate.	Further conversations identified that the complainant had been incorrectly advised that DWM were accepting fish. It was clarified with the EPA 06.02.2019 that DWM were not accepting fish to the DORF.	ML	06.02.2019	TC	
ENV-625	1023	AW/ML	28.03.2019	Odour complaint from Tarleton Road	SS visited area, didn't raise any concerns	SS/ML	28.03.2019	No noticeable odour could be detected on site.	Day of complaint the weather was blowing to the east, away from the resident and their home is approx. 6km away. Communicated this information to the EPA verbally.	ML	01.04.2019	TC	
ENV-471		Kentish Council	21.07.2016	Council EHO advised that a complaint had been received from a resident of Coal Hill Road to say that 'the odour from Dulverton was unbearable this morning between 8.30am and 9.00am', and that it had smelt like 'off milk'.	EO spoke to DORF personnel. No unusual waste was received this morning, and personnel had noted that the windrows were not particularly odorous during turning. EO also spoke to the complaint to discuss their concerns - no further action was requested.	AH	21.07.2016	The root cause of the odour that complainants are reporting has not been confirmed.	All monitoring and records are being kept. Notes are being kept in Supervisors daily diary when odour occurs from any activities on site, inc. mushroom composting.	AH	03.08.2016	TC	
ENV-472		Latrobe Council	20.10.2016	Council EHO had received a complaint from a resident of Railton Road to say that 'flies had been particularly bad on her property at the moment'. MFID 47394)	EO discussed with Site Supervisor. Flies are not a problem at the DORF at present, but can be found around the landfill site. This is despite normal operational procedures being carried out. No unusual fly activity noted when on site that day.	AH	20.10.2016	The nature of DWM operations means that a food source is available year round; seasonal changes will often see an increase in fly numbers. However, it has not been proven that flies breeding on DWM land are causing a nuisance for surrounding property owners.	Continue to maintain operational procedures for burial and covering on waste.	AH		TC	

Appendix C - Record of Incidents and Non-Compliance

INITIAL ACTION								FURTHER INVESTIGATION					
CAR No.	**DWM CAR ID Form #**	**Generated from**	**Date** *(The non-conformance occurred)*	**Description of Non-conformance/Area for Improvement** *(details of the incident as received by reporting officer)*	**Action Taken** *(Outlines direct action taken to rectify the non-conformance. Staff to include MFID for documents and notes kept).*	**Action By** *(Name of staff member who carried out 'action taken')*	**Action Date** *(Is the date that the staff member carried out the 'action taken' or commenced the action)*	**Root Cause of Problem** *(to be updated following an investigation of the non-conformance and what underlying factors may have contributed to it).*	**Preventative Action** *(Measures put in place to prevent the non-conformance from reoccurring).*	**Preventive Action Verified By** *(Name of staff member who carried out 'Root Cause' and 'Preventative Action' investigations)*	**Verification Date** *(Is the date that the staff member has completed the 'Root Cause' and 'Preventative Action' investigations, this cell is to be left blank until both the investigations have been completed)*	**Status**	**COMMENTS**
ENV-474		DWM	5.09.2016	One of the sprinklers in the pine plantation had blown out, where it joins into the main line.	Sprinkler line shut off and AH advised SS to stop pumping for the rest of the day.	AH/SS	05.09.2016	All irrigation fittings subject to failure. The preventative action in place (daily checks) allowed early intervention and resolution.	The preventative action in place (daily checks) allowed early intervention and resolution - continue this procedure.	MG	07.09.2016	TC	
ENV-483		Site contractor	10.10.16	Power cut at office & DORF - tree across power lines.	Notified TasNetworks	SS	10.10.16	Tree was on land not owned by DWM.	TasNetworks may contact the landowners and request trees with potential to fall and hit the powerlines be removed.	MP	17.10.2016	TC	
ENV-485		DWM	3.11.2016	Small amount of leachate breached the active landfill area.	Immediately the Site contractor used an excavator to re-shape the waste in the area to prevent leachate leaving the cell and the leachate affected soil was removed and placed into the landfill.	SS	4.11.2016	Due to persistent heavy rainfall the leachate generation is at an all time high.	Capping methodology has been modified to provide bunding of landfill perimeter.	MG	8/12/2016	TC	
ENV-489		Latrobe Council	8.12.2016	Report from landowner of leachate pipeline leaking into paddock.	Pump switched off. Site Supervisor looked at area, and contacted the landowner. Palmers Plumbing contacted and repaired the leak.	MG/SS/AH	8.12.2016	Root cause not able to be confirmed.	Proactive checking and maintenance has been done previously, but the plumbing company is now locked in for this to be done quarterly on the leachate pipeline. Purchase order issued January 2017.	AH	18/01/2017	TC	
ENV-494		Site Manager	27.1.2017	A fire occurred in the tipping area at the landfill during working hours, affecting customer access to the site for part of the day.	Site contractor and Tas Fire personnel dealt with the fire, DWM staff dealt with customers. The incident report is saved on the DWM electronic filing system (MFID 49134).	Gradco and DWM staff	27.1.2016	The exact cause of the fire was not discovered.	Fires can occur in landfills unexpectedly and without prior warning. There is no indication in this case that the correct site procedures, in relation to accepting and handling waste, were not adhered to by site personnel.	AH	2/02/2017	TC	
ENV-436		EPA	24.11.2015	**Landfill EPN 7158/3** Attachment 5 Odour Management Plan;	All sources of odour have been considered in the A&I Register. Work has begun on formatting these for EPA approval.	AH	06.06.2016	Identified by the EPA as a new proactive requirement.	n/a			TC	
ENV-437		EPA	24.11.2015	**Landfill EPN 7158/3** Attachment 5 Pest Animal Control Plan; gather all pest-related parts of the EMS, updated where necessary, and put into format suitable for EPA approval.	Gather all pest animal management-related parts of the EMS, updated where necessary, and put into format suitable for EPA approval. (1 quote provided for cat control, another 1 to be provided).	AH	04.05.2016	Identified by the EPA as a new proactive requirement.	n/a			TC	
ENV-486		DWM	9.11.2016	During routine sludge pump out of landfill pump pits the valve could not be accessed to stop leachate flowing into the pit.	Works to be undertaken to allow for safe access to valve.	MG		When the pumps area was not enclosed by a shed, the valve could be accessed by reaching over the rear wall. Since the shed has been built there is no safe access to this valve.	Reminder to office and contractor staff to consider the impacts of site works on access to surrounding infrastructure, at the project planning stage, prior to construction.	MG	16.11.2016	TC	
ENV-499		SAI Global re-certification audit	09.02.2017	*(NCR item 4 - minor non-conformance)* The SWSM for weed spraying notes that personnel require a specific certificate and EMS awareness. There was no evidence in the system that the contractor hired by Gradco for this task had completed these requirements.	Added this item to Comms meeting agenda for discussion, and for site contractor to show how this will not re-occur. DWM has discussed this non-conformance with Site Supervisor and has confirmed this discussion in writing.	AH	08.03.2017	Aspects of the applicable SWMS not fully complied with and evidence was not provided to DWM as required.	Preventative action to be discussed at Comms meeting and the importance of reviewing SWMS in detail prior to signoff will be reinforced.	AH	01.06.2017	TC	

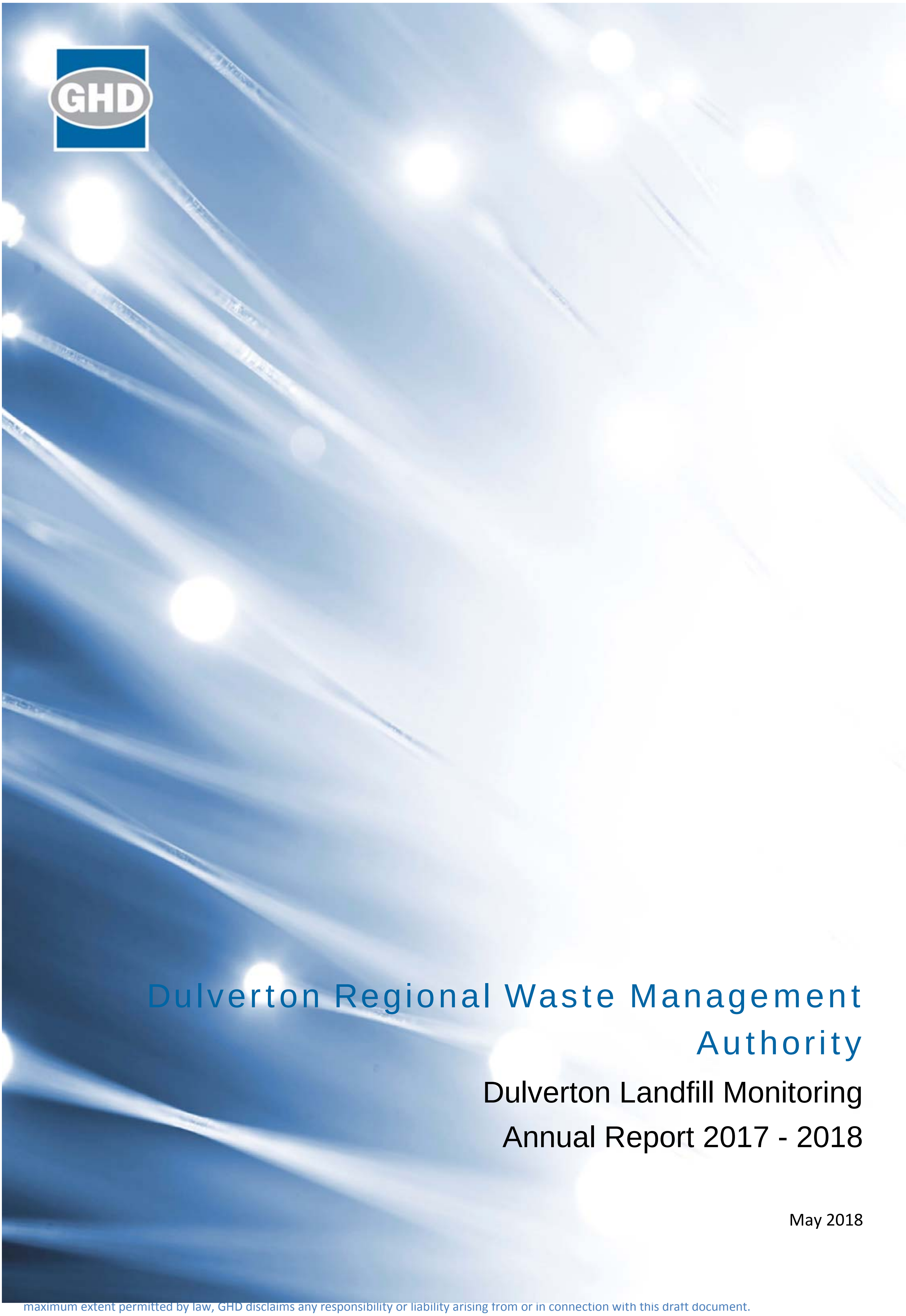
ENV-496		SAI Global re-certification audit	09.02.2017	*(NCR item1 - Minor non-conformance)* Awareness of the EMS and relevant requirements as applicable to the site and Gradco personnel will require further enhancement. E.g. hiring contractors, things that should be raised as CARs, special values around the site, significant aspects and the link to controls and monitoring etc.	EMS Awareness session carried out with Gradco employees who are working on the monocell.	AH	23.02.2017	Missing a process to ensure that this is scheduled to happen following the site induction.	Will discuss at the next Comms Meeting and will add a tick box/reminder to the Induction Form.	AH	31.07.2017	TC	
ENV-497		SAI Global re-certification audit	09.02.2017	*(NCR item 2 - Minor non-conformance)* A number of the MSDS/SDS in the folder at the site office and in the emergency canister were found to be outside the five year limit described in the legal and other requirements register.	Current versions of the MSDS are now saved on M-Files, copies have been printed out for site folder and canisters. Hazardous substances procedure, and Register, have been reviewed and updated.	AH	27.02.2017	Non compliance with Core Task Register task which requires MSDS/SDS documents to be reviewed and updated annually.	More detail to be added to CTR specifying that a review of the hard copy documents must be included in the process.	AH	21.06.2017	TC	
ENV-507		SP	20.04.17	Dust - Roads from weighbridge to DORF are very dusty and could use a watering. Hazard for drivers	Roads were watered.	SS	21.04.2017	Site roads are unsealed which may result in localised dust during dry periods and high vehicle movement.	SS to monitor the road and dust levels. To be raised at a toolbox meeting for site staff to drive to conditions and to discuss whether current site speed limits are appropriate. Site staff are also requested to monitor customer driving behaviour and compliance with speed limits (and report any concerns to DWM for follow up with customer).	MP	28.07.17	TC	
ENV-435		EPA	24.11.2015	**Landfill EPN 7158/3** Attachment 5 Site Layout Plan; provide plan to EPA showing location of all infrastructure, and proposed future extent of disturbance.	Maps to be produced from the GIS. This will be done once the GIS has been updated to allow DWM staff access to update information in-house.	AH	03.08.2016	Identified by the EPA as a new proactive requirement.	n/a	AH	31.07.17	TC	
ENV-498		SAI Global re-certification audit	09.02.2017	*(NCR item 3 - Minor non-conformance)* The number of items from the legal and other register that are relevant are not being evaluated for compliance at a sufficient frequency i.e. only a few things have been sampled to date.	Evaluation of Compliance Register will be combined with the Compliance Obligations Register. A more suitable plan for evaluations will be drawn up and implemented.	AH	05.07.2017	Evaluations of compliance were being done as per DWM's understanding of the process discussed in previous audits.	Preventative action is to continue to improve and refine the process to better suit the needs of DWM and to seek process signoff from auditor prior to proceeding.	AH	07.09.2017	TC	
ENV-500		SAI Global re-certification audit	09.02.2017	*(NCR item 5 - minor non-conformance)* The internal audit programme requires more information to indicate how the whole system will plan to be audited over a period of time and how it takes into account the importance of operations and when conformance with the Standard will be tested.	Compliant program to be developed. Investigate different means of delivering internal audit program. Appointment set with CEO to finalise delivery. Quote has been sought for the option of a third party to carry out some of this work. 12.09.2017 first part of the internal audit program was carried out by GHD. Date has been set for second session.	AH /MG /AB	31.05.2017	Misunderstanding of the process detailed for Internal Audits by SAI Global.	Continue to improve and refine the process to better suit the needs of DWM. Seek process signoff from auditor prior to proceeding.	AH	12.09.2017	TC	
ENV-516		Palmers Plumbing (pipeline inspection report)	01.09.2017	Number identification plates are missing from two pit lids.	Plates were on order during time of inspection. Have now been made and will be installed week of 11.09.2017.	AH	15.09.2017	Not confirmed - either inadequate adhesive, or vandalism.	ID plate are now screwed onto pit lids, now glued.	AH	15.09.2017	TC	
ENV-520		Internal audit by GHD *partial compliance*	11.10.2017	Internal auditing hadn't been carried out as per a structured program.	DWM engaged the services of GHD to develop an internal audit program for the next two years, and liaise with SAI Global auditor to ensure that the program would meet the requirements of the new Standard.	MG/AH	11.10.2017	Using DWM staff for internal auditing was considered suitable at previous audits, but staff were unable to apply the necessary time required, on a regular basis.	GHD program will be implemented over coming years.	AH	16.11.2017	TC	

ENV-526		Internal audit by GHD *other recommendations*	11.10.2017	Leachate sampling is done in accordance with the Trade Waste Agreement, but this agreement has been out of date for some time. DWM should maintain communication with Taswater to have the agreement reviewed.	DWM consider that it is the responsibility of Taswater to drive the requirement for a new TWA, not DWM.	MG	16.11.2017	Taswater presented DWM with a draft agreement over two years ago. Recommendations made by DWM were to be considered by Taswater and a new draft presented but this has yet to occur.	No preventative action is required by DWM.	AH	16.11.2017	TC	
ENV-527		SS	29.11.2017	Dust created from traffic activity on roads from weighbridge to DORF & Landfill.	Matter has been discussed with SS who will continue to monitor and if adverse conditions persist, a reduction in speed limit may be applied.	MG	29.11.2017	The roads onsite are unsealed and during dry periods this can result in dust.	Will continue to monitor and has been left of the weekly site meeting list with MP, MG & SS.	MP	06.12.17	TC	
ENV-515		Palmers Plumbing (pipeline inspection report)	01.09.2017	Landfill leachate pipeline Pit 0300 needs sealing of gaps in the concrete riser to stop groundwater infiltration.	Email sent to Palmers from MG to advise what action needs to be taken. 09.10.16 Palmers provided quote for work to be done. 16.10.17 Site Supervisor looking at pits to determine if work could be done by site contractor personnel (will be best done in dry weather). Work to be completed week of 23.01.2018.	MG	11.09.2017	Not known, although it is possible that sealing of pits should have been done at the time of installation.	Once sealed, no further action will be required other than inspection during the quarterly preventative maintenance checks.	AH	24.01.2018	TC	
ENV-517		Palmers Plumbing (pipeline inspection report)	01.09.2017	4WD vehicles are driving over the top of pits 0302 and 03030, which contain valves installed along the landfill leachate pipeline to Latrobe (concern that the pit lids may become damaged). These pits are in the road verge along Dawsons Siding Road, between the railway line and the entry road into site.	Works have been undertaken to raise the pits.	MG/SS	24.01.2018	Pits are on a long stretch of flat, low lying road verge. This part of Dawsons Siding Road has long been a popular area to drive off-road, parallel to the sealed road, due to the muddy conditions.	Investigate options to minimise damage to pits, but which do not cause a safety hazard to passing motorists.	AH	24.01.2018	TC	
ENV-528		SS	10.12.2017	Smoke from flare up of TFS burn off. Proactive phone call from Site Supervisor to advise in case of reports from nearby residents.	Tas Fire Service attended site and dealt with the flare up.	GP	10.12.2017	Flare up believed to be from the recent controlled burn off carried out by the Fuel Reduction Unit of TFS.	Fire was extinguished and no further flare ups have occurred.	AH	15.12.2017	TC	
ENV-531		Site Personnel	16.01.2018	Veolia truck on site was leaking hydraulic oil.	Site personnel placed gravel on the oil to contain it, then disposed of the gravel in the landfill.	SS	16.01.2018	General wear and tear on trucks - an incident that could not necessarily have been foreseen.	Veolia trucks are on site daily and are well maintained and operated; generally no issues occur around these vehicles on site. Personnel knew how to deal with this incident in the correct manner. No preventative action is required.	AH	18.01.2018	TC	
ENV-548	87	SS	13.03.2018	Pumping leachate in to Pump Station 1 (Gilbert) when the pit overflowed. Leachate ran through some electrical conduit and flooded into the site office.	Cromarty electrician came out and check all electrical leads. Conduit was filled up with filler foam. Quotes have been requested to put an over flow pipe in the pit.	SS	14.03.2018	No one was aware of the conduit that allowed the leachate to escape from the pit.	Filler foam will prevent the conduit being filled up with leachate again.	AH	10.04.2018	TC	
ENV-534	759	SS	22.02.2018	A Veolia truck stopped outside the front gate to place the bin on the ground and remove the tarp prior to entering the DWM site. As he lifted his bin off, the load shifted and tipped some of the contents onto the ground. The load contained cheese.	Site staff assisted with the clean-up. MP contacted Veolia who conducted their own investigation, including a visit to site. A Veolia incident form was received.	SS	22.02.2018	Uneven loading of the bin at the client site (heavy cheese loaded onto one side of the bin resulting in a high centre of gravity).	Veolia will discuss correct bin loading practices with client. MP, SS & Veolia representative determined that untarping could occur near the green shed, to prevent the potential for an environmental impact occurring outside the site (should this occur again).	MP	05.04.2018	TC	
ENV-535	n/a	AH	26.02.2018	Contractor noted during service of aerator that the pond has some debris from construction and some small penetrations in the top of the liner.	Site Supervisor advised they are few small holes on the southern wall of the pond. He will contact Irrigation Tasmania and see if they can repair when next on site. Due to the very low level in the pond there is no risk at the moment. 'Debris' in the report refers to a small block of concrete that was likely to have come from the pump shed wall when the access hole or window was installed.	AH/SS	26.02.2018	Not known how or when the damage to the liner occurred.	The leachate pond SWMS clearly states requirements to prevent damage to liner. SS will also ensure any works carried out within the compound are monitored and contractors are aware of the importance of preventing liner damage.	MP	02.04.18	TC	

ENV-552	762	Site	8.04.2018	Tasmania Fire reported to Site Supervisor that a fire was occurring in the Landfill.	Fire brigade was called and put out the fire. Site personnel monitored the situation afterwards, but no further action was required.	SS	08.04.2018	Cause of the fire was not able to be identified.	Fires cannot be absolutely prevented, however, all emergency management procedures were activated and worked well.	AH	11.04.2018	TC	
ENV-546	761	SP	8.03.2018	While compacting waste, noticed smoke, found a small battery smouldering	Picked up and applied water	SP	08.03.2018	There are occasionally wastes that are disposed of that can heat up and smoulder or catch fire.	It is impossible to prevent every potential item of this nature from being disposed of. All machines carry portable fire extinguishers and are able to deal with these incidents quickly and efficiently.	AH	09.04.2018	TC	
ENV-556	90	SS	08.05.2018	Veolia truck was dumping his load when hydraulic hoses split.	Hydraulic Hose Doctor was called. Once on site he was escorted to truck and hose fixed. Oil was cleaned up and removed from tipping area.	SS	08.05.2018	The root cause is for Veolia to determine.	All trucks coming onto site are expected to be in suitable condition for the site - damages like these cannot be predicted.	AH	06.06.2018	TC	
ENV-558	n/a	External audit by SAI Global	02.06.2018	*Minor non-conformance 2* - The management review procedure and agenda are yet to be updated to the additional requirements of the 2015 version of the Standard to ensure they will be discussed at the next meeting e.g. risk and opportunity, interested parties, and significant aspects.	The procedure and agenda have been updated to include these items.	AH	06.06.2018	The previous agenda did refer to some of these items but was perhaps not clear enough for what the new Standard required.	Now the procedure and agenda have been updated there will be no preventative action required.	AH	06.06.2018	TC	
ENV-559	n/a	External audit by SAI Global	02.06.2018	*Minor non-conformance 23* - the business has not met the EPN reporting deadline for submission of the results within three months of the end of the reporting period.	The report has now been submitted to the EPA.	AH	06.06.2018	The results of the first sampling event in 2018 was to be included in the reporting. Various reasons then caused the consultant to delay providing the final report.	A schedule has been drawn up, and agreed upon, by GHD confirming all sampling events and dates reports are required to be submitted.	AH	13.06.2018	TC	
ENV-580	92	SS	20.06.2018	When arriving on site of a morning & unlocking the green shed a strong smell of gas was noticed from the nearby man holes in the landfill.	LMS were consulted and they indicated the issue is normal.	ML	20.06.2018	As the Cell is getting full, the gas pressure is increasing.	Sump lids were ordered, to be installed by LMS, this will also capture the emissions from the Monocell. This will then be flared.	ML	26.07.2018	TC	
ENV-586	1004	AH	23.07.2018	TasWater asserted that DWM had used the pump override switch during wet weather, and that the maximum flow rate has been increased by 5%.	Claims do not match DWM records. ML has emailed TasWater requesting they provide evidence demonstrating this claim. Multifile created at MFID 1543873. 21.08.18 - no response received, so a new email sent to a Taswater customer service rep for follow up.	ML	19.07.2018	Claim has yet to be substantiated.	Site personnel are aware of pumping limitations and DWM is confident these have not been deliberately breached. TasWater have issued a verbal apology and retracted the claims	ML	23/09/2018	TC	
ENV-587	1005	AH	02.08.2018	A DBYD request was made by contractors working on the river bank where DWM pipeline goes underneath. They were not made aware of the pipeline when making a request to DBYD for information, but noticed a pit lid in the paddock nearby that had DWM nameplate on it.	SS and ML met the contractors and discussed the pipeline and its location under the river. AH later contacted DBYD to check why the contractors weren't alerted, and confirm that the entire pipeline appears on the DBYD alert system	GP/ML /AH	02.08.2018	DBYD staff have stated that the closest DBYD request for a site approx. 300m away. It is likely that the contractors did not nominate the entire area they anticipated to be working in, therefore the system didn't alert to the presence of the pipeline.	No further action required.	AH	15.10.2018	TC	
ENV-591	1010	ML	03.10.2018	During a weekly site meeting, the eastern leachate pond was found to have the liner floating and contacting the base of the aerator.	The aerator has been Isolated and a site meeting was carried out with MG and the SS to determine whether repairs are required.	ML	04.10.2018	After onsite visit, it's likely the cover is visible due to the very low liquid levels, the pond is low level and DWM will take the opportunity to install an interlock for the aerator.	No Action Required	ML	08.10.2018	TC	

ENV-557	n/a	External audit by SAI Global	02.06.2018	*Minor non-conformance 1 -* The Compliance Register still requires further work to outline the interested parties (i.e. Regulators) and some of the column entries for requirements, location etc. in line with the new Standard certification.	The Register will be updated by 30th November in time to be distributed for board review before next meeting.	AH	28.11.2018	Gap analysis (by a third party) of the EMS did not focus on the Register or identify any missing information.	Once the Register has been updated the problem will not occur again (there will be no preventative action required).	AH	02.06.18	TC	
ENV-595	1015 - 0096	SP	18.10.2018	Hydraulic leak on Bomag under carriage, leaked on to floor pan in engine bay and through to landfill. Bomag would not move as runs on hydraulic oil to move wheels.	JF Machinery came out and fixed problems of 3 x hydraulic lines.	SP	18.10.2018	Hose chaffing on the main hydraulic line caused a rupture of the hose.	Requested JF machinery to inspect all hoses on the machine to ensure no other hoses were exposed. Requested Gradco to also undertake regular inspections.	ML	28.11.2018	TC	
ENV-610	99	SS	19.11.2018	Poultry waste delivered to site in a very odorous state.	SS spoke immediately to transporter and reported to DWM.	ML	28.11.2018	Waste stored unsatisfactorily and for too long prior to delivery to DWM.	Given this is an isolated incident from this customer, DWM will monitor the situation, should it occur again arrange a meeting with the business.	ML	28.11.2018	TC	
ENV-611	100	SS	19.11.2018	Tana compactor has blown small hose while pushing material on landfill. About 2 litres of oil was lost.	Spill cleaned up and hose repaired.	SS	19.11.2018	Root cause due to a perforated hose, under a cover which isn't accessed easily for inspection	Similar hoses were inspected and replaced as required, Tana will be Traded June 30 2019	ML	28.11.2018	TC	
ENV-617	N/A	ML	14.12.2018	Site operators were made aware of a truck which was releasing odour on the way into site, the waste was from an abattoir ramping up after the JBS shutdown.	Made contact with the carrier and customer to raise concerns about the condition of the waste on entry to the site.	ML	14.12.2018	The customer was using a bin which was unacceptable in size and prevention of odour release.	The customer immediately stopped using the carrier concerned, and now has moved to a carrier who has appropriate bins for the waste being carted.	ML	16.12.2018	TC	
ENV-590	95 & 1007	SS	13.09.2018	A Launceston-based contracting company disposed of a load of liquid/sludgy hydrocarbon-contaminated waste at the landfill, without prior discussion or approval from DWM. The SS questioned the driver prior to disposal, questioning the type of waste in his truck, and was given the impression that it was their usual landfill organic waste disposal.	Letter sent and acknowledged by the offending company. Deliveries received from this company since the incident have occurred without an issue and with prior discussion with the DWM office. This CAR will be completed once a review has been conducted of the waste acceptance and disposal systems, for opportunities to prevent future occurrences.	SS / ML	13.09.2018	The DWM induction process clearly states that liquid waste is not accepted at the landfill. The type of truck used by the company is unable to have the contents viewed by the SS, resulting in the SS relying on the word of the truck driver.	All Vac Truck customers are now required to completed an application (in advance) to dispose of waste via the DWM Controlled Waste Application Form. Known Vac Truck companies have been advised and truck drivers will be reminded as part of the next round of inductions.	ML	30.03.2019	TC	
ENV-616	0767	SS	05.12.2018	Pomona Pump #2 drive is broken.	Quotes were requested when the pump failed and works were awarded to Cromarty.	ML	14.12.2018	Failure of the VSD occurred due to internal failure of the unit which was quite old.	Cromarty replaced the VSD with a new unit in February 2019.	ML	14.02.2019	TC	

ENV-623	1020	JW	08.03.2019	It was discovered that truck drivers have been using the incorrect waste code when disposing of fish. The code allocated the income to the compost facility when the waste was being disposed into the landfill.	The old codes were cancelled and the customer was issued new tags with the landfill code.	ML	08.03.2019	As a consequence of the odour issues in March 2018, fish was diverted from the DORF to the Landfill for deep burial. This change was not clearly communicated to DWM administration staff.	The CAR form was updated to include a category for waste change which will be reported to admin as part of an automatic workflow. An informal audit of this process will be carried out quarterly to ensure that the process is adequately capturing all changes.	ML	30.03.2019	TC	
ENV-626	N/A	EPA Audit	29.03.2019	**Landfill EPN 7158/3 Minor Non Compliant:** OP4 Litter Management - Within 6 months implement measures to ensure litter is obtained on site - particularly as relates to the stormwater drainage system.	The litter in question was located in a stormwater drain in the Caroline Creek protected habitat area. The OPO was aware of the litter and was awaiting approval from the EO to clear the drain with an excavator. Once approval was received litter was immediately removed.	SS/ML	25.10.2018	Litter is noticed and dealt with regularly however it can sometimes become out of spec with licence due to weather conditions or personnel availability.	The Site Supervisor undertakes regular litter monitoring and collection as part of the weekly checklist. The Site Supervisor was reminded to always check stormwater drains as part of this process.	ML	25.10.2018	TC	
ENV-635	DWM1033	JW	11.06.2019	A staff member incorrectly used a manual tag to tag in a known customer for waste disposal. The staff member allocated the incorrectly to the customer. The total waste weight was 0.97 tonne.	A discussion was held between the SS, JW & ML where it was decided that an actual weight could not accurately be determined now and therefore customer has been credited in full.	ML/JW/SS	12.06.2019	Site staff member used the incorrect tag to tag a customer in over the weigh bridge.	Where possible DWM provides customers with tags to minimise the need for manual tags to be used by site staff, where possible only the SS. The issue was discussed with the SS who raised the matter at a toolbox to remind staff of the importance of using the correct Manual Tag and to contact DWM immediately if they have made an error.	ML	12.06.209	TC	
ENV-631	DWM1028	ML	27.05.2019	As a result of an Internal Audit carried out by ML - Question was raised as to whether the contractor should provide their own Safety Data Sheet (SDS) register (instead of DWM maintaining a register) so that it can be updated by them when a product is changed. Rather than DWM relying in the info to be provided for the DWM register.	Started a discussion with Gradco regarding them having their own SDS register for oils etc.	ML	17.05.2019	This is an opportunity for improvement which has been followed up with Gradco.	N/A	ML		IP	
ENV-632	DWM1029	AW	27.05.2019	As a result of internal Audit carried out by ML - It was noticed that a 200lt drum of hydraulic oil had a missing bund.	The Site Supervisor ordered a replacement.	ML	17.05.2019	An oil drum was brought to site by the contractor and was not contained in the appropriate manner (a bund).	Continue to conduct internal Audits, stress the importance to site staff of adequate bunding. In July this will be reaffirmed as part of the site staff induction and EMS awareness training.	ML		IP	



Dulverton Regional Waste Management Authority

Dulverton Landfill Monitoring Annual Report 2017 - 2018

May 2018

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Appendices

1. Introduction

Dulverton Waste Management (DWM) retained GHD Pty Ltd (GHD) to undertake regular monitoring of groundwater and surface water at the Dulverton Waste Management Landfill (“the landfill”), situated in Dulverton, Tasmania (the site). GHD has been conducting routine quarterly and 6-monthly surface and groundwater monitoring at the site since August, 2016. This report outlines the results of the surface and groundwater monitoring for 2017 - 2018. Much of the general information provided in the previous report has been reproduced in this prior report from 2016 – 2017 for completeness. Where changes have occurred, these have been noted and/or explained.

The landfill currently operates under an Environmental Protection Notice (EPN) 7158/3, which was issued on 20 November 2015. The adjacent Dulverton composting facility operates under a separate EPN (No. 7852/1), although for the purpose of this report, both sites will be assessed together.

1.1 Objectives

The principal objective of the work was to assess the status of groundwater and surface water at the site, and to determine the impact (if any) the landfill is having on the surrounding environment, with particular emphasis placed on down-gradient receptors at Caroline Creek.

1.2 Scope of works

To meet the requirements outlined in the site EPN 7158/3 and 7852/1 and address the stated project objectives above, the following scope of works was undertaken:

- Quarterly sampling of surface water;
- Bi-annual monitoring of groundwater;
- Laboratory analysis of all water samples; and
- Compilation of a concise technical report summarising the monitoring results.

1.3 Limitations of report

This report: has been prepared by GHD for Dulverton Regional Waste Management Authority and *may only be used and relied on by Dulverton Regional Waste Management Authority for the purpose agreed between GHD and the Dulverton Regional Waste Management Authority as set out in section 1 of this report.*

GHD otherwise disclaims responsibility to any person other than Dulverton Regional Waste Management Authority arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report at the date of preparation of the report (refer sections 5, 6 and 7 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Dulverton Regional Waste Management Authority and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has not been involved in the preparation of DWM's EPN submission, and has had no contribution to, or review of the EPN submission other than in DWM Annual Report. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the EPN submission.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Site description and history

The Dulverton landfill is located approximately 15 km south of Devonport in northern Tasmania. The landfill receives waste streams from waste transfer stations and private contractors, but is not open to the public. The site is classified as a Category B – Putrescible Landfill under the *Landfill Sustainability Guidelines* (DPIPWE, 2004), and can accept inert waste, clean fill and putrescible waste. Category B landfills can also accept some controlled wastes and low level contaminated material (as defined under *Information Bulletin 105 – Classification and Management of Contaminated Soil for Disposal*) subject to EPA approval and the site's EPN conditions.

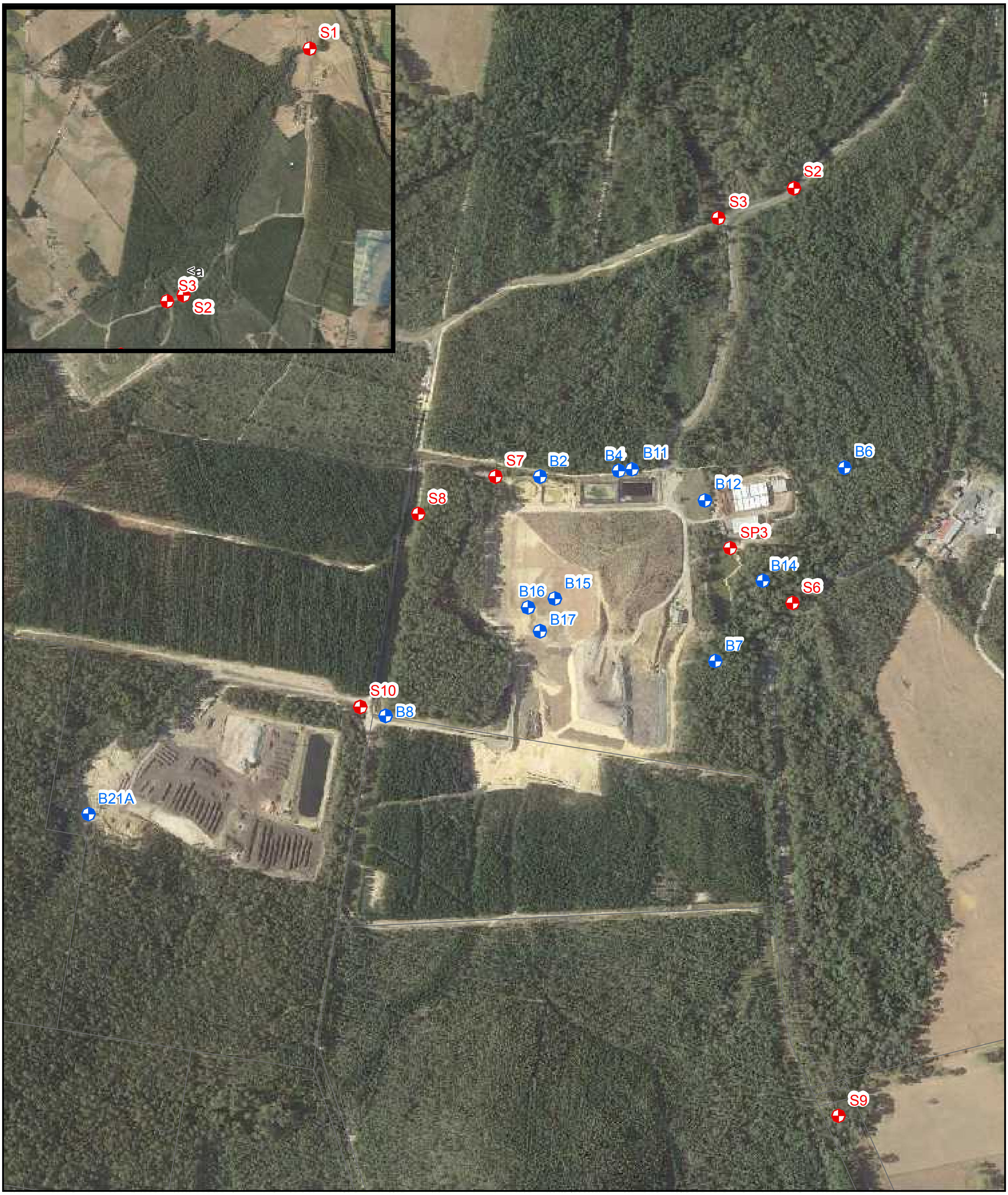
The site began operation in 1995. The key features of the site include:

- The landfill, consisting of an open tip face of approximately 50 metres;
- Two leachate storage lagoons: One of lagoon uses an aerator to reduce nutrient load and odour; the other is used an overflow/storage pond. Leachate drains through the open waste cell and is collected underneath. Pipes gravity feed the leachate into the storage pond. The leachate is then discharged to sewer via an underground pipeline to the Latrobe sewerage treatment plant;
- One HDPE-lined emergency leachate overflow pond (formerly SP1 and SP2), and one stormwater pond;
- A composting area for composting of organic waste streams that have been successfully diverted from landfill disposal;
- A compost leachate storage pond at the composting site. This storage pond is also connected to a system of sprinklers in a nearby pine plantation for irrigation onto land;
- Historical hazardous waste cell that has been entombed for over four years;
- Underground gas recovery infrastructure on the closed landfill cells, and a gas flare;
- A weighbridge at the front gate for all customer loads to be weighed;
- Site office and facilities for on-site staff;
- A workshop for housing site machinery, and includes fuel storage tank and fuel trailer; and
- Firefighting infrastructure including a portable water cart, hydrants, and gear for personnel including self-contained breathing apparatus sets.

The active landfill is lined and has a leachate collection system. The landfill is progressively covered and capped as per the site EPN. The current active cell in the south-eastern section of the site is nearing capacity (as of March, 2018), and DWM have been in the process of extending the landfill on the western side of the site (outlined in Figure 2-1).

Adjacent to the landfill site is an active composting operation (as listed above), also managed by DWM, and operates under a separate EPN licence. This site receives waste streams that have been tested and analysed before being approved for acceptance on site, and which are then mixed with high carbon material including woodchips and green waste to achieve the correct ratio for composting. Once the material is blended, it is stored in windrows where it is regularly monitored and turned to achieve pasteurisation as required under the Australian Standard for Composts, Soil Conditioners and Mulches. After 16 weeks, the windrows are screened to remove larger pieces of material and the resulting product is sold as premium compost within Tasmania.

The composting site is not lined but stormwater and surface runoff are directed through drains to ensure that all clean water leaves the site and enters stormwater drains outside the composting site boundaries (stormwater is not directed into the compost leachate storage pond). The stormwater pond has previously not been lined (where surface water monitoring sites S7 and S8 were collected) and in the past has suffered overflow through periods of heavy rainfall. DWM investigated methods of reducing the likelihood of this occurring again. Recent works as a part of the landfill extension on the western side of the site have resulted in re-alignment of the surface / stormwater drainage lines, and construction of a new, lined stormwater catchment pond.



LEGEND

● Surface Water Sampling Sites

● Groundwater Moniotring Wells

Paper Size A3

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Dulverton Regional Waste Management Authority
DWMC - Annual Monitoring 16/17

Groundwater & Surface Water Sampling Locations

Job Number	32-12345
Revision	B
Date	07 Apr 2017

Figure 2-1

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2 Salamanca Square Hobart TAS 7000 Australia **T** 61 3 6210 0600 **F** 61 3 6210 0601 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by: drockliff

3. Monitoring network and program

3.1 Groundwater monitoring network

The groundwater monitoring network has historically numbered up to 17 bores as stated in the EPN. This included bores from various networks which have been installed over the history of the site, some of which have now been decommissioned:

- Bores installed as part of the original EMP work, for which no bore logs are available (B1 to B10);
- A second set of bores as part of a GHD hydrogeology review in 2009 (B11, B12, B14 and B21A); and
- Hazardous waste cell bores B15, B16 and B17 (now decommissioned).

Table 1 provides updated location information and a summary of bore details (where available) of those bores in and around the site. Due to the limited bore logs, GHD undertook a down-hole camera and down-hole geophysics assessment as part of a hydrogeology review in 2009 (GHD, 2009). The results were used to determine the likely screen aquifer of each bore. This is included in Table 1.

Some bores in the previous EPNs, such as B1, B3, B5 and B10 have not been included in the current EPN (as bore logs are unavailable, and field observations of bore conditions indicate that construction may not be adequate). The current groundwater monitoring network consist of the following bores:

- The landfill
  - *9 bores - B2, B4, B6, B7, B8, B9, B11, B12, B14*
- The composting site:
  - *1 bore* - B8

The EPN states that groundwater monitoring shall include recording of the following:

- Standing water level;
- Volume of water in litres within the installed casing before purging;
- Volume of water in litres purged before sampling;
- Time required to purge the bore casing before sampling;
- Method of purging the casing water volumes;
- Flow rate of the purging method used for sampling;
- Time, date and identification code of the water sample; and

Field primary water quality parameters, including at least, conductivity, pH and temperature.

Previously three bores (B15, B16 and B17) that were installed in an entombed and capped hazardous waste cell (HWC) that were monitored as a part of the EPN. These bores were decommissioned as a part of the planned expansion of the landfill, and from recommendations made in a hydrogeological risk assessment of the HWC (GHD, 2017).

Additional bores have been drilled by Tasman Geotechnics to monitor groundwater levels in the proposed landfill extension area to the west of the current site. These additional bores are not included in this report, or the current EPN, but may be useful for any further detailed groundwater assessment.

There has been some confusion over the past as to the nomenclature of some monitoring bores. In the field, the bore downhill from the mushroom compositing facility adjacent to Caroline Creek, which has a total depth of 4.85 m labelled as ‘B12’. Bore logs from the GHD Groundwater Review (2009) indicate that B12’s total depth is 10.5 m. Similarly, a bore located in-between the landfill gas flare and the mushroom composting facility is labelled as ‘B14’ and has a total depth of 10.5 m. Bore logs from the 2009 investigation note that the total depth of B14 is 4.5 m. Given this, it appears that at some point the labels for B12 and B14 have been switched by accident.

Table 1 Summary of groundwater network

Bore ID	Easting	Northing	Total Depth	Screened from (mBG)	Screened to (mBG)	Screened lithology	Location and purpose
B2	**449234**	**5429501**	**21.8***	**18.3***	**21.7***	**Sandstone***	**Next to stormwater pond**
B3	449396	5429537	17.5	14.5*	18*	Limestone*	North of leachate pond No 1
B4	449371	5429511	19.6	16.6*	19.6*	Sandstone*	Between leachate pond 1 and 2
B6	**449766**	**5429518**	**6.72**	**3.5***	**6.5***	**Shale/mudstone**	**Eastern side of boundary between the landfill and Caroline Creek**
B7	**449541**	**5429180**		**17.6***	**20***	**Sandstone***	**South of sediment pond and in between landfill and Caroline Creek**
B8	**448967**	**5429085**	**18.92**	**17**	**19**	**Sandstone/limestone***	**Southwest corner of the landfill and down gradient of the composting site**
B11	**449397**	**5429515**	**7.95**	**4.95**	**7.95**	**Clayey silts**	**Monitoring the upper most aquifer down gradient of the leachate ponds**
B12	**449523**	**5429461**	**14.33**	**6.98**	**9.98**	**Clayey silts**	**Monitoring the deeper aquifer between the landfill and Caroline Creek**
B14	**449624**	**5429320**	**4.47**	**1.47**	**4.47**	**Gravelly silt**	**Monitoring the upper most aquifer down gradient of the landfill**
B15	**449261**	**5429288**	**14.5**	**10.5**	**14.5**	**Clayey silts**	**Monitoring the hazardous waste cell**
B16	**449215**	**5429275**	**14.5**	**10.5**	**14.5**	**Limestone**	**Monitoring the hazardous waste cell**
B17	**449236**	**5429234**	**16**	**11**	**16**	**Clayey silts**	**Monitoring the hazardous waste cell**
B21A	**448448**	**5428914**	**23**	**17**	**23**	**Clay, dolerite boulders and limestone**	**Background groundwater site**

3.2 Surface water monitoring sites

The main surface water feature near the landfill is Caroline Creek, which flows northwards through the north-eastern corner of the site. Caroline Creek joins the Mersey River approximately 3 km north-east of the Landfill.

There have been 10 sampling sites that sample Caroline Creek, including a background site (S9), down-gradient sites, sites that are seasonally dry and sites that have been removed due to the landfill extension (Refer to Table 2 below). Figure 2-1 shows the location of the surface water sampling sites.

Table 2 Summary of surface monitoring sites

Sample ID	Location and Purpose
S1	Furthest downstream site of Caroline Creek. Provides water quality prior to entering the Mersey River (600 m upstream from junction)
S2	On Caroline Creek, approximately 500 metres downstream of the landfill
S3	A small drainage line, which flows after high rainfall events. This monitors stormwater run-off water quality leaving the site to Caroline Creek
S4	Caroline Creek culvert on the road between the railway and Tas Mushrooms. Monitoring down-gradient Caroline Creek water quality as it passes adjacent the site
S5	Removed from the monitoring program due to re-alignment of the landfill.
S6	This was the listed as an historical background Caroline Creek site but due to proposed landfill expansion, a new background site has been added (S9).
S7	This is a stormwater drainage line from sediment pond 1 at the northern site boundary
S8 (Decommissioned)	This was a small pond incorporated into the stormwater drainage line from the south of the site near the composting facility. This site was filled in as a part of road construction / realignment for the planned expansion of the landfill (see photos).
S9	The background surface water site monitored at Caroline Creek
S10	Monitors stormwater coming from the composting site during high rainfall events (typically dry most times of year).

Sample ID	Location and Purpose
SP1	No longer monitored. This is the stormwater pond that captures run off from the landfill areas which is then discharged off site. SP1 and SP2 were joined together to form one stormwater pond that is monitored by DWM independently.
SP2	
SP3	Surface water pit adjacent to the mushroom compost on the eastern side of the site adjacent to Caroline Creek.
LP2	This was the onsite leachate pond which is now monitored by DWM through the site trade waste agreement
CP1*	This is the stormwater/leachate pond for the composting site, this is no longer monitored through the EPN. DWM did allow for 2 sampling events as a part of the surface and groundwater monitoring, which have been included in this report.

*Previously BS1

A landfill leachate monitoring program is not specified in the EPN, and is only to occur when requested in writing by the Director of the EPA. DWM currently undertakes leachate monitoring as part of their Trade Waste Agreement. Samples are taken weekly and quarterly by DWM and these results have been provided to GHD as part of this assessment.

Similarly, the compost site EPN does not stipulate a leachate monitoring program. The EPN states that representative samples of leachate need only be collected when a change in raw materials or processes may result in changes to the leachate, or prior to commencement of seasonal irrigation, or when required by the director.

3.3 Rainfall

The Australian Bureau of Meteorology rainfall station 91291 (Sheffield School Farm) provides rainfall data from 1950. Monthly rainfall, recorded during the 2017/2018 monitoring period detailed in Figure 3-1**Error! Reference source not found.** below. Rainfall in the 5 days preceding sampling is shown below in Table 3.

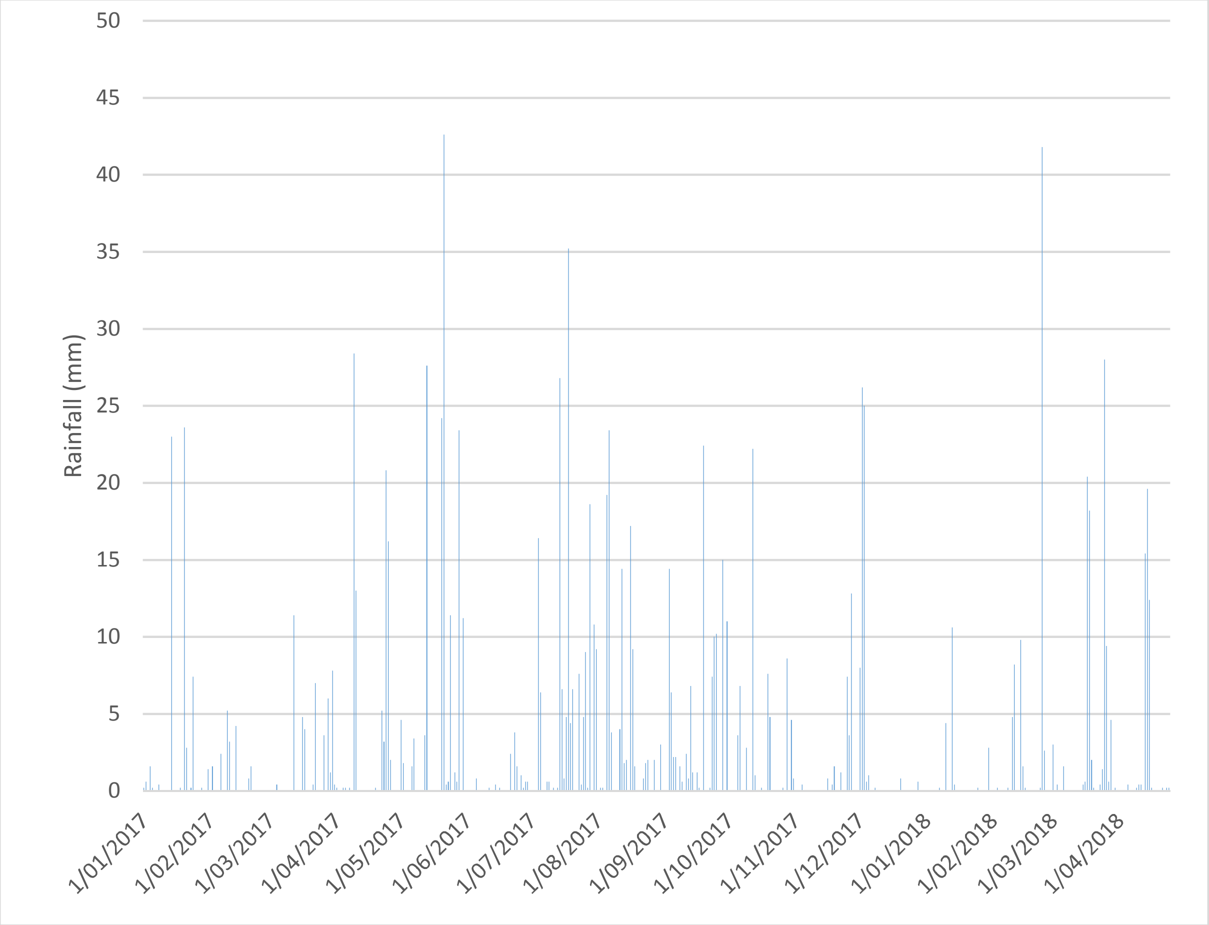

Figure 3-1 Daily rainfall for the reporting period

Rainfall for the most recent monitoring period is much drier than for the previous 12 months. There have been fewer high rainfall events, such as the two recorded for the previous 12 months where 215 mm was recorded in June, 2016 and 75 mm was recorded in November, 2016. In contrast for the most recent reporting period, there have been no recorded rainfall events over 50 mm. In addition, the sum of the total monthly rainfall for 2016/2017 was 1405.8 mm (not including October and March, where data was missing) compared to 941.8 mm for the 2017 / 2018 period[1].

Table 3 Rainfall for 5 days preceding sampling[1]

Sampling start date	Rainfall on sampling day (mm)	Rainfall preceding 5 days (mm)
21 March 2018	0	0.2, 2, 18.2, 20.4, 0.6
15 December 2017	0	0, 0, 0, 0, 0, 0
13 September 2017	6.8	0.8, 2.4, 0, 0.6, 1.6
14 June 2017	0.4	0, 0, 0.2, 0, 0, 0

1 BOM, 2018 <http://www.bom.gov.au/climate/data/index.shtml?bookmark=136> accessed 30/04/2018.

4. Sampling and analysis plan

Sampling and analyses were carried out according to relevant Australian guidelines. For a detailed description of the sampling plan, refer to Appendix A. GHD carry out a quality control and assurance plan which is detailed in Appendix B. The sampling program is based on the current EPN, as summarised in Table 4 and Table 5.

Table 4 Groundwater program

Frequency	Parameters
Six-monthly	Bore depth, Standing Water Level, location coordinates, Total Dissolved Salts, redox, total nitrogen, ammonia, nitrite, total phosphorus, orthophosphate, Dissolved Organic Carbon, Biochemical Oxygen Demand, total cyanide, total and dissolved iron, bromide, iodide, chloride, sulfate, sodium, potassium, magnesium, calcium, alkalinity bicarbonate, alkalinity carbonate, arsenic, mercury, selenium, TPH
Annually	Copper, zinc, chromium, manganese, nickel, lead, cadmium, nitrate, pH, conductivity

Table 5 Surface water program

Frequency	Parameters
Three monthly	pH, biological oxygen demand, total suspended solids, conductivity, total nitrogen, ammonium, oxides of nitrogen, total phosphorus, dissolved free phosphorus

Leachate sampling is undertaken weekly and quarterly by DWM staff though the landfill’s trade waste agreement. The EPN states that these results may be required by the Director and if required by the director, leachate pond water must be sampled for parameters as listed in the EPN. DWM provided GHD with quarterly results (where available), which have been used in this assessment.

4.1 Monitoring frequency

Environmental monitoring began at the DWM landfill site in approximately February 2005, which included a similar network of groundwater and surface water sites. The monitoring in the earlier EPN was more frequent and for a larger set of parameters. Since this time, there have been additional bores drilled, surface water sites added and lost, and leachate is now monitored through a trade waste agreement.

Monitoring undertaken by GHD for this annual report occurred in:

- March, 2018 – Groundwater and surface water monitoring ;
- December – 2017 Surface water monitoring;
- September – 2017 – Groundwater and surface water monitoring;
- June, 2017 – Surface water monitoring and hazardous waste bores.

In addition, monitoring during this period also included targeted sampling of the hazardous waste bores (B15, B16 and B17) prior to their decommissioning. The results of this sampling are included in a separate assessment (GHD, 2017), and are not included in this report.

Previous monitoring undertaken during the 2016/2017 period occurred in:

- February 2017 – Groundwater and surface water monitoring
- December 2016 – Additional groundwater monitoring of B15, B16 and B17*;
- November 2016 – Surface water monitoring; and
- August 2016 – Groundwater and surface water monitoring.

As part of the sampling and analysis program, GHD conduct a quality assurance and quality control program. The details of which are included in Appendix A.

*as a part of the HWC hydrogeological risk assessment and closure of the HWC (GHD, 2017).

5. Basis of assessment

The water quality results are compared against those guidelines as defined through the *State Policy on Water Quality Management 1997.* The State Policy defines a series of water quality objectives for protecting the environmental value of a water resource, depending on the usage of the environment in a given area. Achieving these objectives is met by either maintaining or enhancing water quality for the water resource in question.

The first step in the implementation of the *State Policy on Water Quality Management 1997* is the identification of Protected Environmental Values (PEVs) for the surface waters in the region of interest. PEVs are the current values and uses of a water body for which water quality should be protected.

The DWM landfill is located within the Mersey catchment, as defined in the *Environmental Management Goals for Tasmanian Surface Waters – Mersey December 2001.* The landfill is located on what is defined as “private land” in the report. PEVs apply to all surface waters within each land tenure category (i.e. public, private etc.), other than privately owned waters that are accessible to the public, or are not connected to, or flow directly into waters that are publically accessible.

Caroline Creek flows through part of the site, which feeds into the Mersey River that is publically accessible and used for a variety of activities. Therefore the Landfill qualifies as having PEVs for surface waters that flow through private land, which sets specific target objectives for surface waters.

For surface waters flowing through private land (including forest on private land) the PEVs are:

- A: Protection of aquatic ecosystems
  - (ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested
- B: Recreational Water Quality and Aesthetics
  - (i) Primary contact water quality (Mersey River - at Union Bridge; adjacent to Bridle Track Road Kimberley Bridge picnic area, at Olivers Road Bridge, at Liena Road Bridge, at Merseylea Bridge and from Lovetts Flats to Bells Pde)
  - Secondary contact water quality
  - Aesthetic water quality
- C: Raw Water for Drinking Water Supply (Unnamed creek with co-ordinates 448 500 E 5 394 800 N – Mole Creek town water supply)
  - (ii) Subject to coarse screening plus disinfection
- D: Agricultural Water Uses
  - Irrigation
  - Stock watering
- E: Industrial Water Supply (Industrial Water Supply - Wesley Vale Pulp Mill off-take at Big Bend, Mersey River; water for mining and chemical works on Redwater Creek and Mersey River and for brick production on Caroline Creek.

Overall, the management goals, (as taken from *Environmental Management Goals for Tasmanian Surface Waters – Mersey December)* for this area are “*That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for irrigation and stock watering purposes; is suitable for industrial supply in* *specified areas (pulp and paper production, mining and chemical works and brick production); for town drinking water supply (subject to coarse screening and disinfection) in specified area; and which will allow people to safely engage in recreation activities such as swimming (in specified areas), paddling or fishing in aesthetically pleasing waters. For private land (including forest on private land) within the Mole Creek karst system, water quality management should also have particular regard to the values associated with that system"* (2001, Department of Primary Industries, Water and the Environment).

The PEVs refer to the following nationally recognised documents for specific trigger values:

- Australian and New Zealand Environmental Conservation Council & Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ 2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- Australian and New Zealand Environmental Conservation Council& Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ 2000) Australian and New Zealand Guidelines for Primary Health and Contact Recreation;
- Australian and New Zealand Environmental Conservation Council& Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ 2000) Australian and New Zealand Guidelines for Stock and Domestic
- Australian and New Zealand Environmental Conservation Council& Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ 2000) Australian and New Zealand Guidelines for Irrigation Long Term Trigger values
- National Health and Medical Research Council and Natural Resource Management Council (NHMRC & NRMMC 2011) Australian Drinking Water Guidelines

6. Site assessment results

GHD has conducted quarterly surface water and 6-monthly groundwater monitoring on site since 2016, as outlined in Section 4.1. Prior to this, as noted in the 2016/2017 report, there is a high degree of uncertainty around the results collected at the site between 2005 and 2016.

Due to this uncertainty, the results prior to 2016 were discussed separately. A brief summary of those results, adapted from the previous report is provided in the following sections for completeness and comparison, however these results should still be treated with caution. As noted previously, the reasons for the uncertainty was due to the groundwater sampling procedures followed, which were not in line with Australian standards such as:

- No filtered metals results – samples were analysed for total metals only, which is difficult to assess against the guidelines as the trigger values are for bioavailable, filtered metals;
- The previous groundwater sampling method did not include purging or stabilising field parameters prior to collecting a groundwater sample;

Long-term surface water trends have been included, but as outlined above groundwater trends have only been included dating back to the start of 2016, as results prior to this are not considered reliable.

As described above in section 5, the PEV for the Mersey catchment include protecting the receiving waters for a number of values. The trigger values used for comparison with site results are:

- ANZECC & ARMCANZ (2000) Trigger values for freshwater aquatic ecosystems with a level of protection for 95% of species **(FAE95%)**;
- National Health and Medical Research Council Primary Health and Contact, 2011 which is taken from the Australian Drinking Water Guidelines 2011 **(REC)**;
- ANZECC & ARMCANZ (2000) Irrigation Long Term Trigger values **(LTV),** Irrigation Short term Trigger Values **(STV);** and
- ANZECC & ARMCANZ (2000) Stock and Domestic **(S&D).**

Field sheets, with stabilised field parameters are provide in Appendix D. All laboratory documentation for the 2017 to 2018 monitoring period is provided in Appendix E.

6.1 Historical water chemistry results

This section provides a summary of monitoring results against trigger values in two sections for results collected before and after 2016. The first section summarises those sites that have monitoring results above trigger values prior to 2016. All available historical data is tabulated and compared against the trigger values in Appendix C.

The following sections summarise the most recent 2017 – 2018 period, compared to 2016 to 2017 results against trigger values as well as figures showing the water chemistry trends. Water chemistry for these periods is summarised in Tables 1 – 2 (groundwater) and Table 3 – 4 (surface water), Appendix C.

6.1.1 Historical groundwater monitoring data

Table 6 summarises those sites that have parameters above each of the trigger values. The FAE95% trigger values are typically the lowest trigger values, and as such this column shows the highest number of exceedances. As the ANZECC & ARMCANZ (2000) guidelines use bioavailable (filtered) metals and only total metal concentrations are available for this period, the concentrations are predictably higher, as total metals includes metals adsorbed on suspended clays and other fine particles.

The guidelines do not take into account background conditions, which in this case are monitored at B9. Previously, bore B21A was used to represent background groundwater conditions. Upon review from the previous year’s monitoring, it was decided that B9 would be better suited to sample for baseline groundwater chemistry. This was due to B21A being difficult to sample, as the bore only contained a small volume of water, recharged poorly and as a result purged dry after 0.5 L. Attempts to sample found that the B21A would purge dry before any water would reach the top of the tubing, and alternative sampling methods (manual bailing) found the water to contain high amounts of sediment that caused the bailer to leak before it could be drawn from the well.

Therefore B9 was considered a suitable replacement, as it is up-gradient of the landfill and recharges quickly, allowing an adequate volume of water to be purged, in-situ chemistry to be collected and sampled. B21A historically showed exceedances for aluminium, cadmium, chromium, copper, lead, nickel and zinc, which was attributed to (at least in part) to the surrounding geology. B9 reported exceedances of copper (filtered), iron, zinc (filtered) and total phosphorus (but no aluminium, cadmium, chromium, lead or nickel). The reason for this is uncertain.

Sites B6, B7 and B8 do not show exceedances above the FAE95% trigger values, with each bore being down-gradient of the landfill operations, at mixed depths and geology. Monitoring bores that did show exceedances different or elevated when compared to B9 (background) included B2, B12, B14, B16, and B17 (B16 and B17 now being decommissioned).

Table 6 Summary of historical groundwater metals and nutrients above trigger values*

	FAE95%	REC	LTV	STV	S&D
B2	Al, Cd, Cr, Cu, Pb, Mn, Ni, Zn, ammonia, nitrate		Fe (total and filtered), Mn, phosphorus		
B4	Zn		Fe (total and filtered),		
B6			Fe (total), phosphorus		
B7			Fe (total), phosphorus		
B8	Nitrate		Fe (total), phosphorus		
B11	Al, Cd, Cr, Cu, Pb, Ni, Zn		Fe (total and filtered), phosphorus		
B12	Al, Cd, Cr, Cu, Pb, Ni, Zn, nitrate		Al, Fe (total and filtered), phosphorus		Al
B14	Al, Cd, Cr, Cu, Pb, Ni, Zn, nitrate		Al, Fe (total and filtered), phosphorus		Al
B15	Cd, Cr, Cu, Pb, Ni, Zn	Ni	Pb, Fe (total), Cu, Ni, phosphorus		Pb
B16	Cd, Cr, Cu, Pb, Mn, Ni, Zn, nitrate	Ni	Pb, Fe (total), Cu, Ni, phosphorus		Pb
B17	Cd, Cr, Cu, Ni, Zn, nitrate	Ni	Fe (total), Ni, phosphorus		Pb
B21A	Al, Cd, Cr, Cu, Pb, Ni, Zn		Fe (total and filtered), Mn, phosphorus		

*above trigger values more than 3 events or 50% results

The historical data show that where monitored, all total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene, xylene (BTEX), organochlorine pesticides (OC pesticides), organophosphate pesticides (OP pesticides), poly cyclical aromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCB), have typically been below laboratory limits of reporting (LOR).

6.1.2 Groundwater monitoring results 2017 – 2018

This section describes the results of monitoring from September 2017 and March 2018. These monitoring results are for filtered metals, which are needed to compare against ANZECC & ARMCANZ (2000) guidelines.

Table 7 shows those sites with analytes above the adopted trigger levels (trigger levels as described above). This sampling program adopted Australian Standards for sampling, which includes purging to achieve stabilised field parameters prior to a sample collection.

Table 7 Summary of groundwater 2017 – 2018 parameters above trigger levels

	FAE95%	REC	LTV	STV	S&D
B2	Mn, Zn, ammonia	Mn	Mn, Fe (total and filtered), phosphorus, nitrogen (total)	Fe, Nitrogen (total)	
B4	Zn		Fe, Mn, phosphorus	Fe	
B6	Cu*		Fe, phosphorus		
B7			Fe, phosphorus		
B8	Cu*, Zn*		Fe, phosphorus	Fe	
B9	Cu*, Zn*		Fe, phosphorus	Fe*	
B11	Cu, Pb, Ni, Zn	Pb*	Fe, phosphorus	Fe	
B12	Cu*		Fe, phosphorus	Fe**	
B14	Cu* Zn		Fe (total), phosphorus*		

*March 2018 sampling event only.

**September 2017 sampling event only

Generally, most metals that exceeded the trigger values in the historic data set, particularly for the FAE95% have not been exceeded in the recent monitoring events. This is consistent with the 2016 – 2017 groundwater results. Cadmium and chromium were below the laboratory limit of detection in all samples collected in September and March, 2017/2018. Total Fe and phosphorus are above the LTV for irrigation PEVs in all bores. This is also consistent with the previous groundwater monitoring results, and it is possible that phosphorus is a product of the regions' agricultural setting and iron is naturally occurring.

Copper, lead, zinc and nickel were generally low in concentration or below the laboratory LOR in line with the previous monitoring round, and much lower than concentrations recorded prior to 2016 (which is to be expected given that they are filtered and the bores have been purged to a greater degree than during the last 2 years of monitoring).

The replacement background bore B9, once purged and metals are filtered reported elevated dissolved copper, nickel, zinc, total phosphorus over the FAE95% assessment criteria in March, 2018. Previously, neither of these metals were elevated above the LOR. The exact cause of this is unknown.

In comparison, some of the down-gradient bores continue to show elevated concentrations above the PEV criteria. B11 appears to be the most enriched well on site in terms of dissolved metal concentrations (Cu, Pb, Zn, Ni). However, given that B9 is currently taken to represent background groundwaters, and has low dissolved Cu, Ni and Zn concentrations, it is possible that elevated dissolved Cu and Zn concentrations in B6, B8, B12 and B14 are a result of background levels, or only partial mixing of background waters and leachate. Concentrations of Cu, Ni and Zn over the two monitoring periods are shown in Figure 6-1, Figure 6-2, and Figure 6-3 respectively. Total phosphorus (Figure 6-4) and Ammonia (Figure 6-5) have also been included in as they are a chemicals of potential concern (COPC), and concentrations on site have fluctuated over the monitoring periods.

It should be noted that four sampling events are considered the minimum number of data points to establish a relationship. As such, any possible relationships or trends in the data should be treated with some uncertainty.

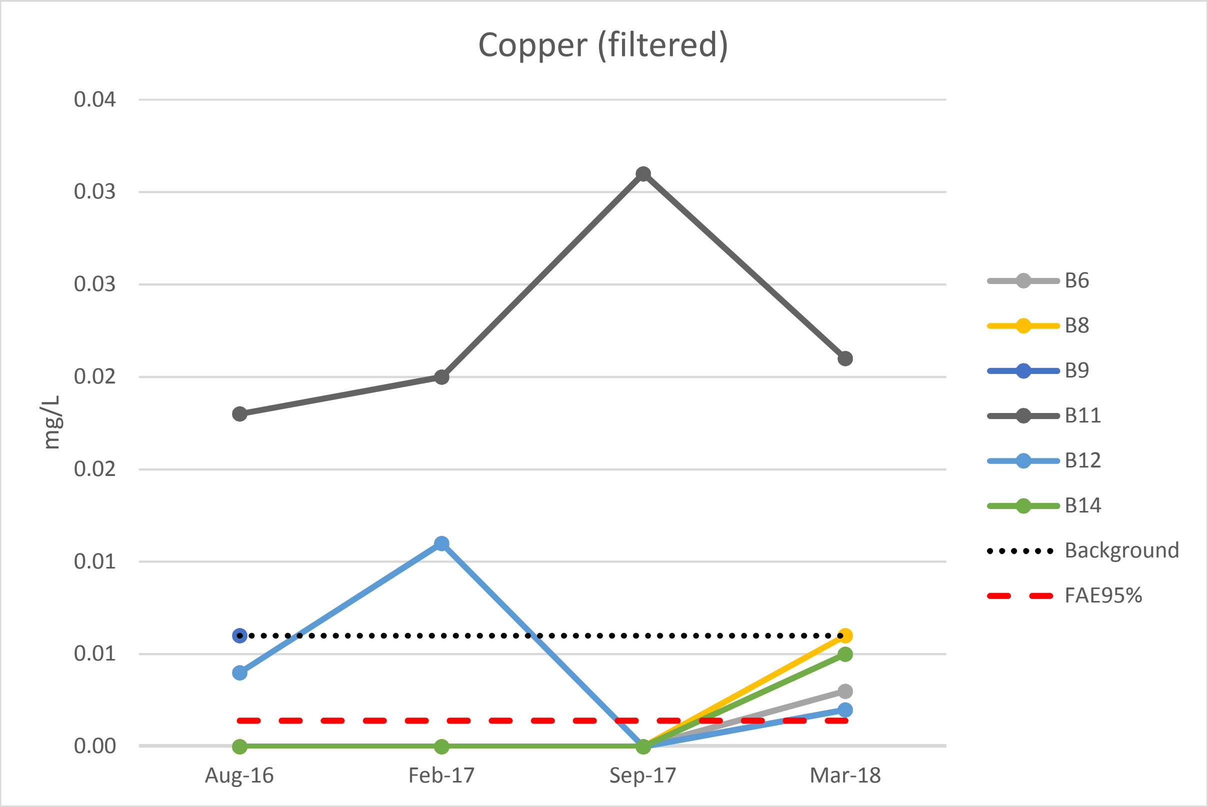

Figure 6-1 Filtered copper concentrations (monitoring bores)

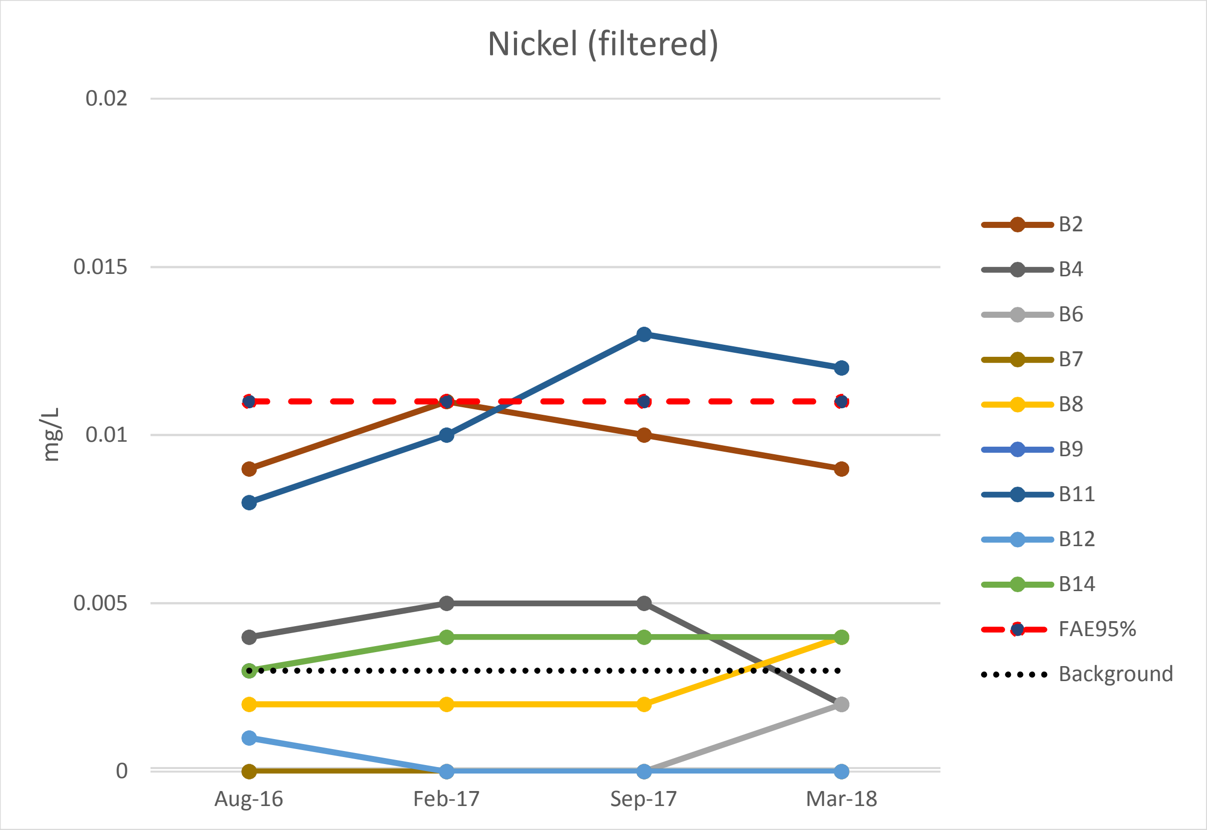

Figure 6-2 Filtered nickel concentrations (monitoring bores)

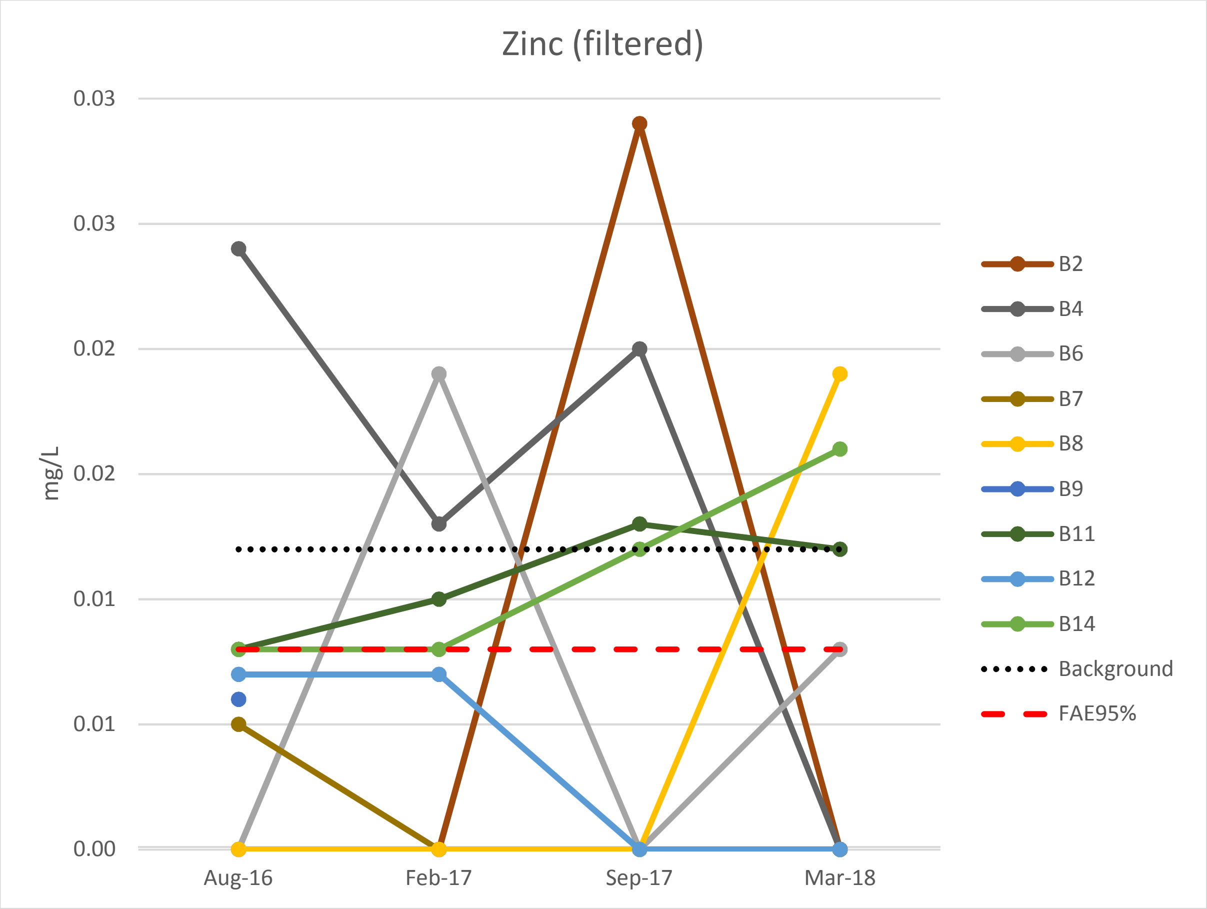

Figure 6-3 Filtered zinc (monitoring bores)

Copper concentrations appear to fluctuate seasonally, with B11 being the most enriched in dissolved copper. Note that B2, B4 and B7 were not included on the chart as they reported no elevated copper concentrations over 2 years.

Nickel concentrations in groundwater appear to be relatively stable over the 2 year period, with some bores increasing slightly over time (B11), or decreasing (B2). B11 and B2 are also the two bores of most interest, as their reported concentrations have fluctuated within FAE95% limits.

Zinc concentrations appeared to have fluctuated the most across the monitoring bore network. Some bores appear to vary seasonally (B4, B6), however some have increased consistently over the two years of monitoring and are over the FAE95% criteria (B8, B11, B14).

Total phosphorus concentrations have either fluctuated or declined over the last two monitoring periods. B8 and B12 that reported the highest concentrations of total phosphorus have consistently declined in concentration since 2016. Concentrations are still elevated, and are over the STV assessment criteria.

Ammonia concentrations in groundwater across site are in general less than 0.15 mg/L, which is well below the FAE95% assessment criteria (0.9 mg/L). However, concentrations reported in B2 across the monitoring period are consistently above the FAE95%, ranging from 27.5 – 32 mg/L. B2 has not been included in Figure 6-5 as the B2 results skew the scale. The exact cause of the elevated ammonia concentrations in B2 is unknown. As discussed earlier, and in prior reports given the agricultural regional use, it is not unusual for elevated nutrients such as ammonia and phosphorus to be present on site. However the high occurrence of ammonia in B2 is likely to not be just as a result of enriched elevated ammonia levels from agricultural run-off.

During the 2016/2017 groundwater monitoring events, BTEX compounds were also included in the list of analytes for analysis. Of the BTEX compounds, toluene was detected on one occasion each in monitoring bores B14 and B15, at relatively low concentrations of 7 and 5 µg/L respectively. The most recent groundwater results reported no concentrations of BTEX chemicals over the laboratory LOR in the remaining bores.

Monitoring should continue to draw out any similarities between the landfill leachate and groundwater chemistry signatures. Major ion analysis (discussed later) will also aid in classifying the amount of mixing, if any, of these waters.

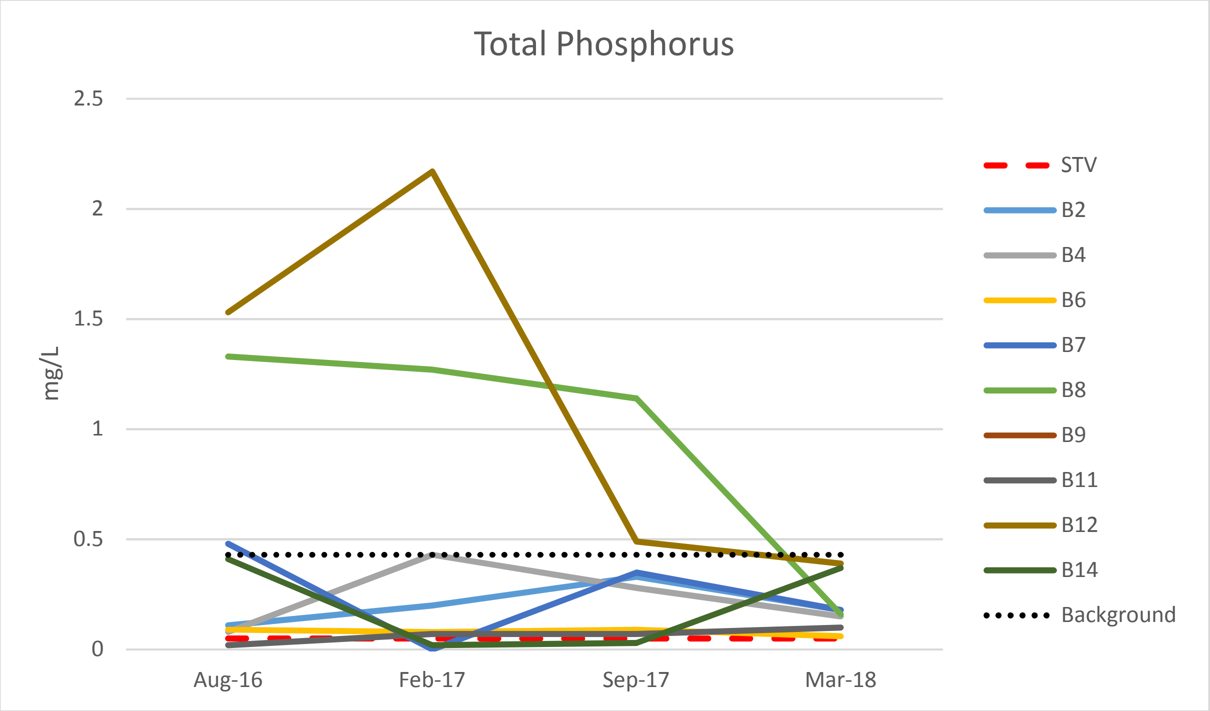

Figure 6-4 Total Phosphorus (monitoring bores)

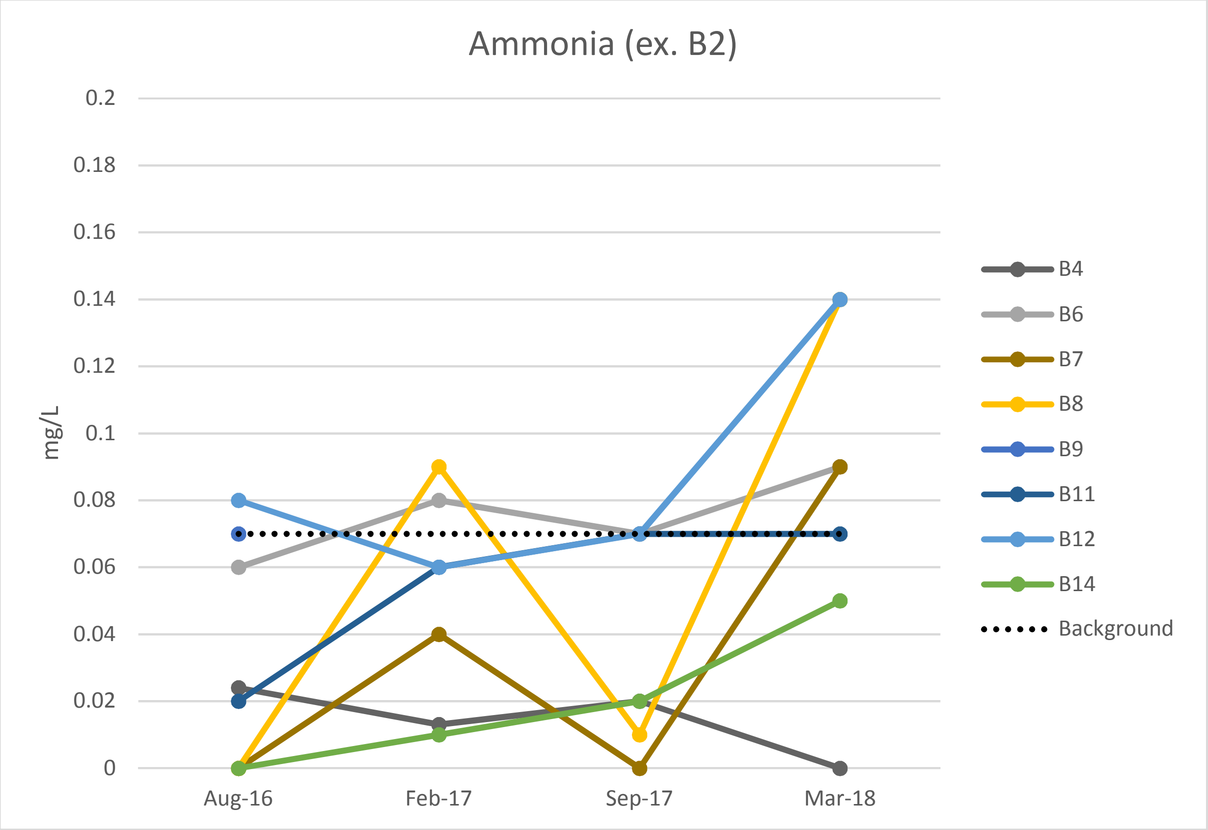

Figure 6-5 Ammonia concentrations (monitoring bores)

6.2 Landfill leachate

The following section outlines the results of the leachate sampling conducted by GHD at the composting facility's leachate pond over the most recent monitoring period. Results are summarised in Tables 5 – 6, Appendix C. Included in Table 6 are the quarterly leachate data collected by DWM from 2013 until August 2017 for comparison. This section aims to classify the leachate make up so that potential contaminants or parameters may be able to be used to identify leachate seepage to the environment.

Results that are in exceedance of PEV assessment criteria are summarised in Table 8. It is important to note that landfill leachate is unlikely to be continuously discharged to Caroline Creek, but does provide a snapshot of the elevated parameters and likely contaminants. It should also be noted that landfill leachate collected by DWM is analysed for total metals, which is likely to be elevated in comparison to filtered metals (against which the trigger values should be assessed).

Given this, the longer-term leachate data trends for metals cannot be reliably compared to more recently collected dissolved metal concentrations. However, COPC trends such as ammonia (Figure 6-6), total phosphorus (Figure 6-7) and formaldehyde (Figure 6-8) have been included.

Table 8 Landfill leachate against trigger levels – total metals

Sampling point	FAE95%	REC	LTV	STV	S&D
Landfill Leachate*	Al, As, Cd, Cr, Cu, Fe, Pb, Ni, Zn, ammonia, nitrate	Pb, Mn, Ni,	Fe, Mn, Cu, Cr, phosphorus, total nitrogen	Fe	Cu
Compost Leachate	As, Cr^, Cu, Ni, ammonia, nitrite	Ni, Pb, Mn	Fe (filtered), Total P	Total N	

*total metals only
^Cr III + VI

Figure 6-6 Landfill leachate ammonia concentrations over time

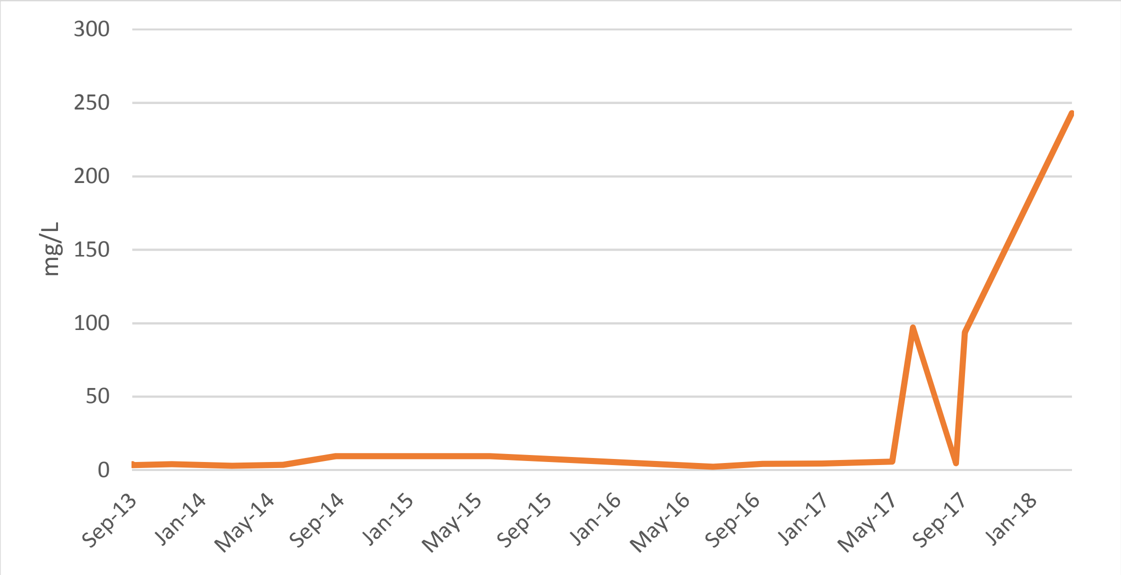

Figure 6-7 Landfill leachate total phosphorus concentration over time

COPC that were not detected in leachate samples over the laboratory LOR were PAHs, OC Pesticides, herbicides and PCBs. Over the past five years of data, synthetic substances that have been detected in the landfill leachate include the following:

- Chlorfenvinphos (OP Pesticide);
- Phenols;
- Acetone;
- Formaldehyde;
- BTEX; and
- TPH (all chain lengths).

The presence of these chemicals in landfill leachate has been intermittent and low in concentrations over time, with the exception of formaldehyde. They may be used as tracer parameter for the groundwater and surface water monitoring program, as their presence in the natural environment is limited, although they can be adsorbed and broken down within the aquifer.

Formaldehyde has also been a consistent COPC that has been elevated, and in exceedance of the REC PEV assessment criteria. Concentrations of formaldehyde in landfill leachate have been plotted in Figure 6-8.

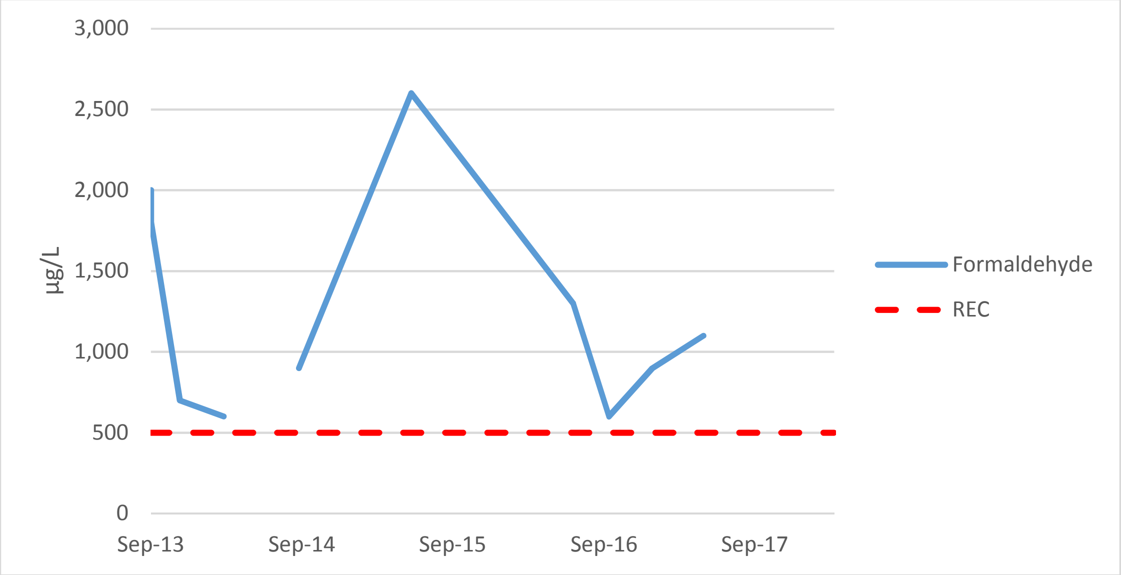

Figure 6-8 Landfill leachate formaldehyde concentration over time

6.3 Surface water monitoring

Exceedances for the parameters analysed in the surface water results are shown in Table 9. It should be noted that sampling site S8 was decommissioned (filled in as a part of the landfill extension to the west), and S10 was dry four consecutive sampling events in a row. Other exceedances in the PEV screening criteria in the following analytes are summarised as follows:

- Cadmium (filtered) exceeded the FAE95% criteria at S7 (June, September 2017) and S1 (March, '18);
- Copper (filtered) and zinc (filtered) exceeded FAE95% criteria at S1, S2, S3, S4 (March 2018 only), S6 (March '18 only) and S9 (December 2017 / March 2018 only);
- Lead (filtered) exceeded the FAE95% and REC critera in December 2017 at S9;
- Ammonia (as N) exceeded FAE95% criteria at S7 and S3 (September, 2017 only);
- Manganese,. Nitrogen (total), Phosphorus (total and filtered) and exceeded LTV criteria in September 2017 at S3 and S7;
- Nitrogen (total) concentrations also exceeded the STV for Irrigation PEVs; and
- Total phosphorus also exceeded the LTV criteria at S1, S2, S6 and S9;

Table 9 Surface water exceedances 2017 – 2018*

	FAE95%	REC	LTV	STV	S&D
S1	Cr, Cu, Zn, Phosphorus				
S2	Cu, Zn				
S3	Cu, Ammonia		Mn, P (total + filtered)		
S4	Cu**, Zn**				
S6	Cu** Zn**		P (total)		
S7	Cu, ammonia		P (filtered & total), Total N	Total N	
S9	Cu, Pb, Zn		Total P		

*Note that S8 site was decommissioned, and S10 was dry the last four consecutive sampling rounds.

**March 2018 event only.

In comparison to the previous years' monitoring, nitrate values from the most recent monitoring rounds (June 2017 – present) have decreased significantly, where all sampling sites recorded nitrate concentrations in exceedance of the FAE95% criteria. Nitrate is still detectable in all surface waters, however concentrations have decreased below the assessment criteria. Phosphorus (total and dissolved) still persists in concentration over the LTV criteria. Previous reports have noted that given the surrounding land use adjacent to the landfill appears to be agricultural and forestry (industries that typically use fertilizer), elevated nutrient levels in back ground monitoring site(s) are not necessarily unexpected. It is considered that this explanation is still valid.

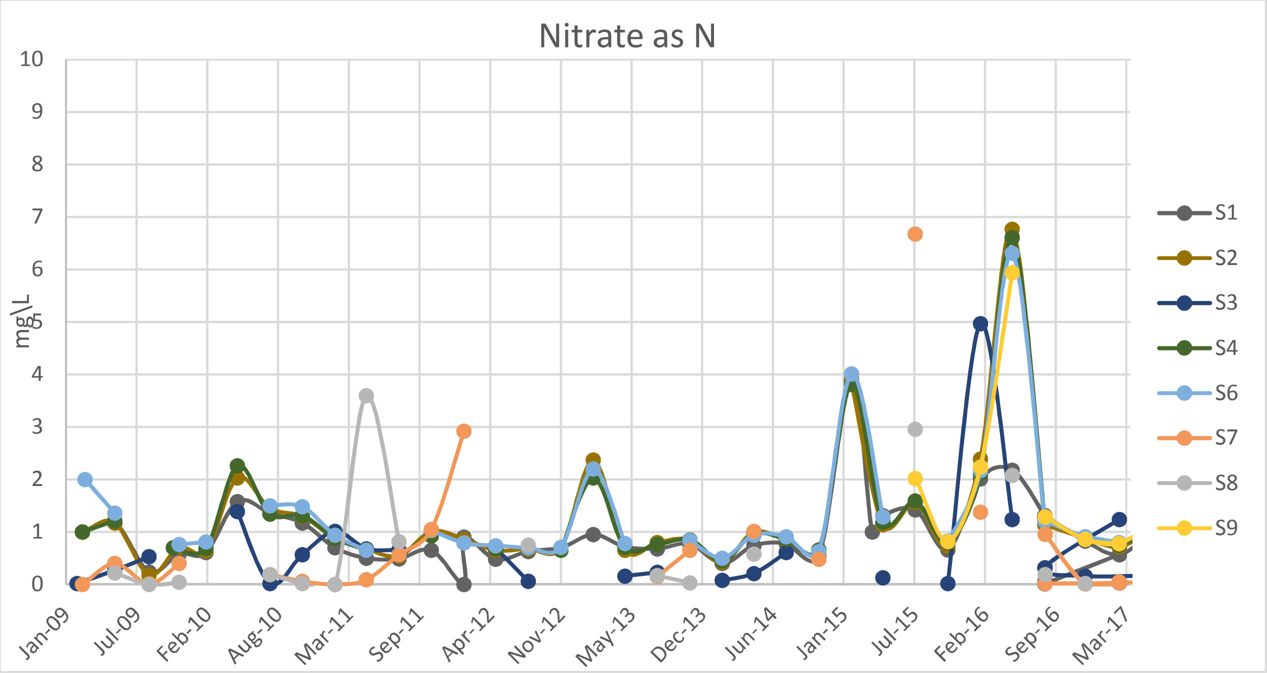

Figure 6-9 Historic and recent Nitrate results from surface water

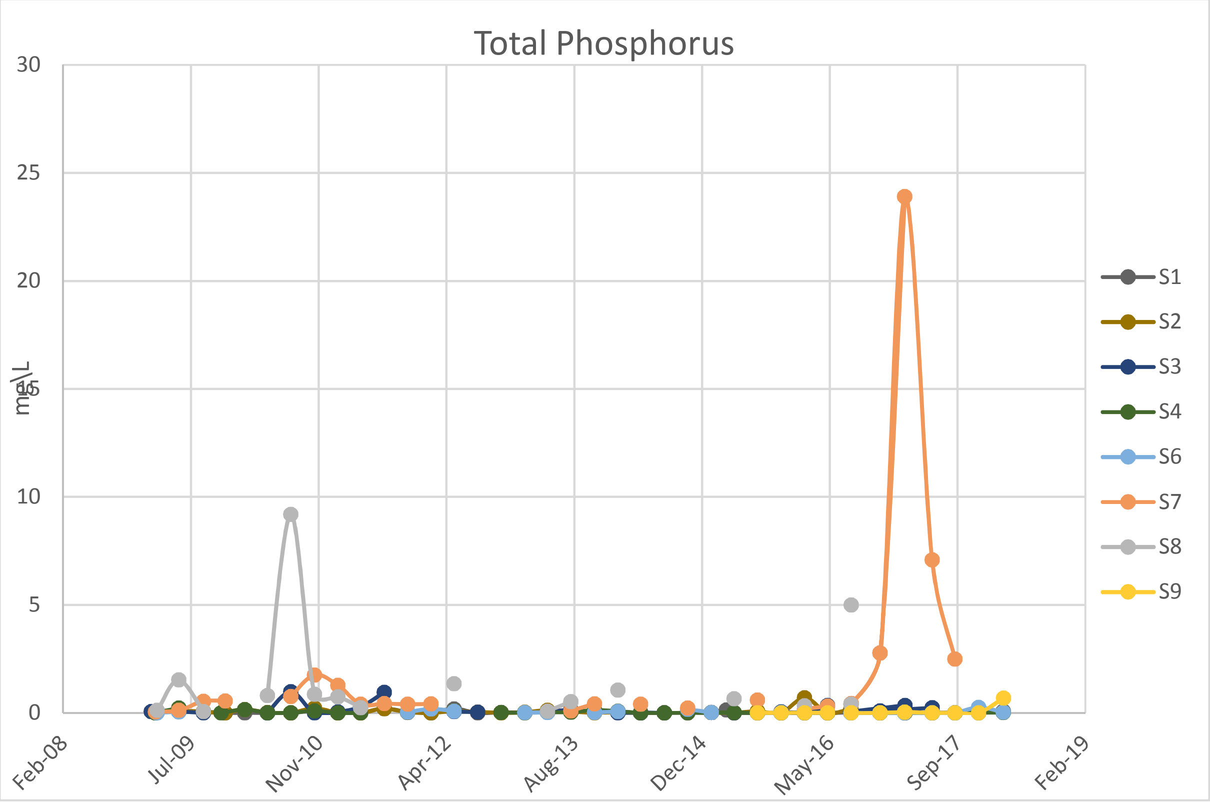

Figure 6-10 Historic and recent Total Phosphorus results from surface water

Figure 6-9 and Figure 6-10 plot the concentration (mg/L) of nitrate and total phosphorus respectively since 2009 (data prior to 2016 is included as this is still considered valid for non-metal analytes). Concentrations are generally low (i.e. <3 and 5 mg/L for nitrate and total phosphorus respectively), but have sharply increased during some sampling events over the last decade of monitoring. The exact cause of this is unknown, but as discussed above could be attributed to irrigation / fertilisation events in the surrounded agricultural land.

It is unlikely that the spikes in nutrient chemicals is associated (at least entirely) with landfill leachate mixing with surface water. As discussed, and shown in Figure 6-6 and Figure 6-7 concentrations of ammonia, total phosphorus and nitrate (not plotted) have increased over the 2017 / 2018 monitoring period. Given that leachate concentrations have recently increased, in contrast to surface water concentrations that have decreased since a sharp increase observed in 2016, it is reasonable to conclude that little, if any mixing has occurred.

Chromium, copper, lead and zinc have previously reported elevated concentrations across sampling sites for surface waters over the last two years of surface water monitoring. Prior to 2016, these results were not filtered and so have not been included (as discussed earlier). Results are summarised in Appendix C.

7. Discussion

The following discussion and subsequent recommendations should be considered in order to assess more completely the impact of the landfill operations on the surrounding environment. Recommendations from the previous annual report have been implemented, such as the inclusion of major ions, BTEX and dissolved metals in the analytical suite, as outlined in Section 6. These have contributed to the overall program and validity of the risk assessment, by confirming the presence (or absence in most cases) of these COPC, or providing further information on the interactions between surface, groundwater and leachate.

7.1 Monitoring parameters

7.1.1 Naturally occurring background elements

Collecting background information of regional groundwater and surface water for the site is a key piece of evidence for informing interpretations and risk assessment. Given that it was decided that the background bore 'B21a' was no longer suitable to collect samples from, and B9 was chosen as a replacement, there are some differences in reported chemical concentrations that have been observed in the results.

B21a has previously reported elevated concentrations of Cd, Cr, Cu, Pb, Ni, Zn over the FAE95% assessment criteria, and total and dissolved Fe and Mn over the STV criteria. B9 in comparison reported dissolved Cu and Zn over the FAE95% criteria, and elevated Ni, Cd, Cr and Pb were below the LOR. Given this, it was speculated that some occurrences of Cd, Cr and Pb reported in other surface and / or bores were possibly as a result of regional geology, and not landfill leachate.

However, given the reported concentrations in B9 it is possible that there aren't naturally elevated concentrations of Cd, Cr and Pb in groundwater for the region. The cause of concentrations reported in B21a are unknown. Given this, elevated concentrations of Cd, Cr and Pb on site should be treated with more caution in any future risk assessments.

7.1.2 Contaminants of potential concern

Dissolved metals have been included in the analytical suite since GHD began monitoring the site in 2016. Consistency should be maintained by ensuring that samples continued to be filtered, in order to build a substantial dataset for risk assessment purposes.

Collection of dissolved metal results so far has shown that total metal concentrations recorded up until 2016 are higher than the corresponding dissolved concentrations, on which risk assessment criteria are based. Given this, prior assessments based the total concentrations are conservative at best, as some reported total concentrations (i.e. copper, cadmium, lead and zinc) subsequently reported dissolved concentrations for the same element below the laboratory LOR. Therefore, the risk posed by such elements is lower.

Analysis of landfill leachate intermittently shows levels of toluene above the laboratory limit of reporting suggesting that toluene is present and mobile in the landfill however it is not being detected in the groundwater. Groundwater bores were analysed for BTEX over the 2017 / 2018 period, and reported no elevated concentrations. It should be noted that this did not include the bores decommissioned as a part of the HWC closure (B15, B16 and B17). The bores were decommissioned as a part of recommendations aimed at closing the potential pathway groundwater bores can pose to migrating COPC from leachate to groundwater aquifers. Previously, these bores have reported low concentrations of BTEX (B15, December, 2016). Given that no elevated BTEX concentrations have been reported on the wider site, it is likely that this was an issue confined to the vicinity of the HWC. Since the closure of the HWC and removal of the bores, there has been no evidence of migration of BTEX (particularly toluene) in the wider well network.

7.1.3 Major ion analysis

As water flows through an aquifer it assumes a diagnostic signatures related to the composition of the aquifer material and recharge chemistry. The major anions and cations are used to determine this signature and they can also be used to aid in determining if there is any mixing of water from other potential sources.

The major ions have been plotted on the Piper Plot show in Figure 7-1 below. The majority of the groundwater appears to be a predominantly calcium bicarbonate type (Ca-HCO_3) which is indicative of a groundwater that has had a close association with a limestone aquifer.

Groundwater monitoring bores B14, B2, B15 and B11 are predominantly a sodium chloride (Na-Cl) water type. These bores are recorded as being installed in a silt or sandstone unit suggesting that there may be more than one aquifer underlying the site.

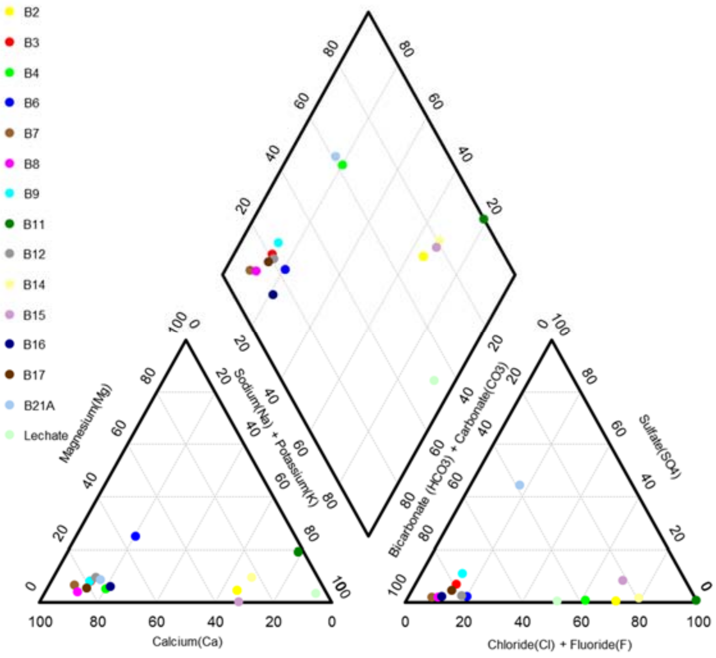

Figure 7-1 Piper Plot indicating groundwater types

The leachate is sodium chloride-bicarbonate (Na-Cl-HCO_3) type which may indicates that there is some contribution of landfill leachate in to the shallower groundwater system.

7.2 Monitoring frequency

Future monitoring events at the landfill site should continue at the current frequency, as detailed in Section 4.1, unless any changes are required due to site conditions at the time of sampling.

Parameters will continue to be sampled according to the requirements of the EPN and relevant standards.

7.3 Groundwater and surface monitoring network

7.3.1 Groundwater bores

There are two groundwater monitoring bores, B5 and B10 that are not currently monitored. The condition of these bores should be investigated and if found to be no longer required or damaged they should be decommissioned, to prevent contamination of the aquifer. They should be decommissioned by an appropriately trained and licenced contractor in accordance with the *"Minimum construction requirements for water bores in Australia, 3rd Edition"* standard.

Monitoring bore B3, is down-gradient of the leachate ponds and is screened across a limestone aquifer. It was recommended that consideration be given to this bore for re-inclusion in the EPN during the 6 monthly groundwater sampling events.

The bore was located, purged and sampled during the September 2017 GME. Upon inspection of the bore, it was found to be poorly capped. The steel monument no longer has a lid, and the state of the grout and bentonite surface seal is unknown. The PVC casing contained inside the monument swings freely when touched, indicating that the top of the casing near the surface is not well set in the ground. If the grout / bentonite surface seal has failed, then it is possible that surface water run-off may be infiltrating during high rainfall periods, and mixing with aquifer waters.

Results from B3 were compared to B4 and B11, which are located approximately 50 m up inferred hydraulic gradient. Results are comparable, however B3 does report significantly more total Fe (10 – 100 times the concentration recorded in B4 and B11) and total phosphorus (up to 20 times higher in concentration). Given this, is it suspected that surface run off is infiltrating the bore and it is unsuitable for inclusion in the EPN.

As previously recommended, a general condition assessment of the bores should be undertaken. This should take into account the condition of the surface seal, if the bores have caps, if any need to be labelled etc. If required the bores should be fixed appropriately. Although some rusting/wear and tear was observed, there was no need for any immediate repair work.

In addition to this, given that the number of bores used to monitor the landfill has been reduced, due to the decommissioning of the HWC, it is recommended that other bores on site be considered for inclusion to account for this. Additional bores have been installed recently for geotechnical purposes, as a part of the expansion of the Landfill to the west. These new bores could also be utilised to supplement the EPN.

7.3.2 Surface water

Over the most recent monitoring period, monitoring site S8 has been removed (as a part of the landfill expansion) and S10 has been dry for four consecutive sampling events. It is noted that a new lined stormwater catchment pond has been installed up gradient and adjacent to where S7 is located, and that S7 has been cleared of encroaching vegetation (blackberries, bulrushes). S7 is still suitable for collection of a sample, however care should be taken to only collect samples when the drain from the stormwater pond to the pond (S7) is flowing. The stormwater pond should be added to the EPN as replacement for S8, as both S7 and S8 locations have reported elevated ammonia.

Given that S10 is rarely flowing and only appear to do so during high rainfall events, it is also recommended that S10 be collected on a reactive basis during high rainfall events within the same month as the scheduled surface water sampling events.

Appendices

Appendix A – Sampling and analysis plan

Data Quality Objectives

The purpose of establishing Data Quality Objectives (DQOs) is to ensure that the field investigations and subsequent analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the assessment.

A process for establishing DQOs for a site has been defined by the US EPA. That process has been adopted within the Australian Standard: AS 4482.1-2005 and referenced by the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPC, 1999). The DQO process was taken into account in designing the scope of work carried out over the course of the program.

Investigation Strategy

The works included monitoring of all groundwater bores and surface water sites and leachate sumps.

Groundwater Investigation

Groundwater samples were collected in accordance with the following guidelines:

- *AS/NZ 5667.1:1998*: Water Quality – Sampling. Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. Standards Australia, New South Wales; and
- *AS/NZ 5667.11:1998:* Water quality – Sampling. Part 11: Guidance on sampling of groundwaters. Standards Australia, New South Wales.
- Groundwater Sampling

Groundwater sampling and analysis was conducted on all existing monitoring bores as follows:

- The standing water level and LNAPL thickness (if present) was gauged using an electronic interface probe;
- Bores which did not contain LNAPL were purged and sampled using either pre-installed waterra inertial tubing or with clean, disposable bailers. During sampling, field parameters (pH, electrical conductivity (EC), oxidation-reduction potential (redox), dissolved oxygen (DO) and temperature) were recorded. The presence of a sheen or odour was also noted;
- When field parameters (i.e. pH and EC) reached equilibrium (i.e. consecutive measurements within 10% of each other), a groundwater sample was collected directly from the dedicated waterra tubing or bailer;
- The groundwater samples were immediately placed into laboratory prepared bottles suitable for the required analyses. The sample containers were labelled with the job number, sample identification, date collected and sampler’s initials;
- Sample bottles were immediately transferred to an ice filled cooler for preservation prior to being transported to the contract laboratory. Samples were accompanied with chain of custody documentation to the project laboratory;
- Groundwater samples were submitted for laboratory analysis in accordance with the EPN 7158/3; and
- Quality assurance / quality control sampling included one blind duplicate and one split duplicate.

Surface Water Investigation

Surface water samples (including leachate) were collected in accordance with the following guidelines:

- *AS/NZ 5667.1:1998*: Water Quality – Sampling. Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. Standards Australia, New South Wales; and
- *AS/NZ 5667.6:1998:* Water quality – Sampling. Part 6: Guidance on sampling of rivers and streams. Standards Australia, New South Wales.

Surface Water Sampling

Surface water sampling and analysis was conducted as follows:

- Samples were collected from leachate and surface water using laboratory supplied bottles and preservatives suitable for the selected analysis.
- The surface water and leachate samples were immediately placed into laboratory prepared bottles suitable for the required analyses. The sample containers were labelled with the job number, sample identification, date collected and sampler's initials;
- Sample bottles were immediately transferred to an ice filled cooler for preservation prior to being transported to the contract laboratory. Samples were accompanied with chain of custody documentation to the project laboratory;
- Surface water and leachate samples were submitted for laboratory analysis in accordance with the EPN 7189/2; and
- Quality assurance / quality control sampling included one blind duplicate and one split duplicate.

Stabilised field sampling results are provided in Table 10 below. Detailed field sheets and calibration certificates of field equipment are provided in Appendix D.

Table 10 Results from final field measurements 2017 - 2018

Well ID	Date	Temp	pH	EC	DO	ORP	SWL
		°C	pH units	µS/cm	ppm	mV	mbgl
B2	Sept 17	13.1	6.77	2534	0.32	-55.9	5.444
B2	March 18	13.4	6.72	2520	0.09	-107.8	8.765
B3	Sept 17	12.9	6.41	337	0.24	12.4	4.648
B4	Sept 17	13.4	6.78	660	0.51	-21.5	5.633
B4	March 18	13.9	6.59	1711	0.4	-103.4	7.268
B6	Sept 17	10.8	6.43	333.8	0.58	-13.5	1.655
B6	March 18	13.2	6.87	345	5.69	-106.7	2.245
B7	Sept 17	12.2	6.91	391.7	0.51	12.2	2.063
B7	March 18	12.9	6.68	391.8	-	-58.9	3.820
B8	Sept 17	13.5	6.65	478.6	4.99	29.0	8.036
B8	March 18	13.8	6.99	503	0.24	38.4	11.912
B9	Sept 17	12.4	7.43	220.4	3.74	99.7	26.751
B9	March 18	13.0	7.65	333.9	3.76	83	30+
B11	Sept 17	12.2	3.66	387.4	3.70	117.7	3.173
B11	March 18	12.2	4.40	312.5	3.07	283.8	6.673
B12	Sept 17	13.6	5.25	117.1	4.43	48.7	3.599
B12	March 18	14.3	6.64	128.6	5.57	194.3	5.347
B14	Sept 17	8.8	6.98	420.3	0.59	23.2	0.744
B14	March 18	14.5	6.86	583	0.68	-51.7	1.725
B15	June 17	14.5	4.71	85	5.70	175	10.31
B15	Sept 17	15.0	4.84	87.6	8.60	106.5	8.836
B16	June 17	13.7	7.45	542	7.70	38	10.805
B16	Sept 17	14.0	7.02	467.7	8.00	35.1	9.347
B17	June 17	13.4	7.27	616	1.75	55	9.51
B17	Sept 17	13.4	6.84	505	0.52	52.3	7.958
B21A	June 17	Very little water in bore and difficult to collect					

Appendix B – QA/QC Information

Field Program

All fieldwork was conducted in general accordance with GHD's Standard Field Operating Procedures (SFOP), which are aimed at collecting environmental samples using uniform and systematic methods, as required by GHD's Quality Assurance system. Key requirements of these procedures are as follows:

- Decontamination procedures – including the use of new disposable gloves for the collection of each sample, decontamination of all multiple use sampling equipment between each sampling location using a phosphate free detergent (i.e. Decon 90) and the use of dedicated sampling containers provided by the laboratory;
- Sample identification procedures – collected samples were immediately transferred to sample containers of appropriate composition and preservation for the required laboratory analysis. All sample containers were clearly labelled with a sample number, sample location, sample depth and sample date. The sample containers were then transferred to an ice filled cooler for sample preservation prior to and during shipment to the testing laboratory;
- Chain of custody protocols – a chain-of-custody form was completed and forwarded to the testing laboratory with each discrete batch of samples; and
- Sample duplicate frequency – field duplicates (blinds and splits) were collected and analysed at a rate not less than 10%.

Field Quality Control

All field works were conducted by experienced environmental scientists in general accordance with GHD's SFOP. Field quality control procedures used during the project comprised the collection and analysis of the following:

Blind duplicates: Comprise a single sample that is divided into two separate sampling containers. Both samples are sent anonymously to the primary laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity.

Split duplicates: Identical to a blind duplicate, except that the primary sample is sent to the project (primary) laboratory and the duplicate is sent to a secondary laboratory (check laboratory).

One blind duplicate (QC1) and one split duplicate (QQC1) sample were collected and analysed during each quarterly monitoring event, as part of the overall sampling program.

The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where Co = Analyte concentration of the original sample

Cd = Analyte concentration of the duplicate sample

GHD adopts nominal acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations.

The project laboratories (ALS Melbourne/ALS Sydney) adopted their internal procedures and NATA accredited methods in accordance with their quality assurance systems.

Laboratory Quality Control

Laboratory quality control procedures used during the project were:

Laboratory duplicate samples: The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result.

Spiked Samples: An authentic field sample is ‘spiked’ by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory Control Sample: A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

Surrogate Standard/Spikes: These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are ‘spiked’ into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Method Blank: Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The laboratory is required to provide this information to GHD. The individual testing laboratories conduct an internal assessment of the laboratory QC program; however, the results were also independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPDs within the NEPM acceptance criteria of ±30%. Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery, although dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix; should normally range from about 70-130%. Method (laboratory) blanks should return analyte concentrations as ‘below the practical quantitation limit (PQL)’.

Laboratory QA/QC documentation is provided in Appendix E.

RPD Calculations

		Field ID	B2	B2	RPD
		Date	12/09/2017	12/09/2017	
Chemical	units	EQL			
Arsenic (filtered)	mg/L	0.00	0.00	0.00	-50.00
Cadmium (filtered)	mg/L	0.00	<0.0001	<0.0001	-
Chromium (III+VI) (filtered)	mg/L	0.00	<0.001	<0.001	-
Copper (filtered)	mg/L	0.00	<0.001	<0.001	-
Lead (filtered)	mg/L	0.00	<0.001	<0.001	-
Manganese (filtered)	mg/L	0.00	2.14	2.23	-4.04
Mercury (filtered)	mg/L	0.00	<0.0001	<0.0001	-
Nickel (filtered)	mg/L	0.00	0.01	0.01	-16.67
Selenium (filtered)	mg/L	0.01	<0.01	<0.01	-
Zinc (filtered)	mg/L	0.01	0.03	<0.005	-
Naphthalene	µg/L	1.00	<5	<5	-
Dissolved Organic Carbon	mg/L	1.00	13.00	18.00	-27.78
C6-C10 minus BTEX (F1)	µg/L	20.00	<20	<20	-
C6-C10 Fraction	µg/L	20.00	<20	<20	-
>C10-C16 minus Naphthalene (F2)	µg/L	100.00	<100	<100	-
>C10-C16 Fraction	µg/L	100.00	<100	<100	-
>C16-C34 Fraction (F3)	µg/L	100.00	150.00	<100	-
>C34-C40 Fraction (F4)	µg/L	100.00	<100	<100	-
>C10-C40 (Sum of Total)	µg/L	100.00	150.00	<100	-
C6-C9 Fraction	µg/L	20.00	<20	<20	-
C10-C14 Fraction	µg/L	50.00	<50	<50	-
C15-C28 Fraction	µg/L	100.00	140.00	<100	-
C29-C36 Fraction	µg/L	50.00	<50	<50	-
C10-C36 (Sum of Total)	µg/L	50.00	140.00	<50	-
Benzene	µg/L	1.00	<1	<1	-
Toluene	µg/L	2.00	<2	<2	-
Ethylbenzene	µg/L	2.00	<2	<2	-
Xylene (o)	µg/L	2.00	<2	<2	-
Xylene (m & p)	µg/L	2.00	<2	<2	-
Xylene Total	µg/L	2.00	<2	<2	-

Appendix C – Tables of results

Table 1
2017 / 2018
Groundwater Bore Results

		Inorganics			Metals											
		BOD	Bromide	Cyanide (Total)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Iron	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Selenium (filtered)	Zinc (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
EQL		2	0.01	0.004	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01	0.005
ADWG 2015 Health **REC**				0.08	0.01	0.002		2		0.01	0.5	0.001	0.02	0.01	
ANZECC 2000 - Stock Watering **S&D**					0.5	0.01	1	0.5		0.1		0.002	1	0.02	20
ANZECC 2000 FW 95% **FAE95%**				0.007	0.013	0.0002	0.001	0.0014		0.0034	1.9	0.0006	0.011	0.011	0.008
ANZECC 2000 Irrigation - **LTV**					0.1	0.01	0.1	0.2	0.2	2	0.2	0.002	0.2	0.02	2
ANZECC 2000 Irrigation - **STV**					2	0.05	1	5	10	5	10	0.002	2	0.05	5
Date/Time	Field ID														
Sep-17	B2	<2		<0.004	0.001	<0.0001	<0.001	<0.001	61.8	<0.001	2.14	<0.0001	0.010	<0.01	0.029
Mar-18		<2	1.01	<0.004	0.001	<0.0001	<0.001	<0.001	33.8	<0.001	3.55	<0.0001	0.009	<0.01	<0.005
Sep-17	B4	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	36.8	<0.001	0.158	<0.0001	0.005	<0.01	0.020
Mar-18		<2	0.421	<0.004	<0.001	<0.0001	<0.001	<0.001	24.0	<0.001	0.470	<0.0001	0.002	<0.01	<0.005
Sep-17	B6	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	7.33	<0.001	0.104	<0.0001	<0.001	<0.01	<0.005
Mar-18		<2	0.095	<0.004	<0.001	<0.0001	<0.001	0.003	5.59	<0.001	0.116	<0.0001	0.002	<0.01	0.008
Sep-17	B7	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	2.62	<0.001	0.005	<0.0001	<0.001	<0.01	<0.005
Mar-18		<2	0.051	<0.004	<0.001	<0.0001	<0.001	<0.001	5.76	<0.001	0.009	<0.0001	<0.001	<0.01	<0.005
Sep-17	B8	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	32.1	<0.001	0.092	<0.0001	0.002	<0.01	<0.005
Mar-18		<2	0.087	<0.004	<0.001	<0.0001	<0.001	0.006	2.81	<0.001	0.027	<0.0001	0.004	<0.01	0.019
Sep-17	B9	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	2.44	<0.001	<0.001	<0.0001	<0.001	<0.01	<0.005
Mar-18		<2	0.062	<0.004	<0.001	<0.0001	<0.001	0.006	10.1	<0.001	0.021	<0.0001	0.003	<0.01	0.012
Sep-17	B11	<2		<0.004	<0.001	<0.0001	<0.001	0.031	25.6	0.018	0.056	<0.0001	0.013	<0.01	0.045
Mar-18		<2	0.186	<0.004	<0.001	<0.0001	<0.001	0.021	41.5	0.008	0.077	<0.0001	0.012	<0.01	0.071
Sep-17	B12	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	28.4	<0.001	0.053	<0.0001	<0.001	<0.01	<0.005
Mar-18		<2	0.113	<0.004	<0.001	<0.0001	<0.001	0.002	2.75	<0.001	0.087	<0.0001	<0.001	<0.01	<0.005
Sep-17	B14	<2		<0.004	<0.001	<0.0001	<0.001	<0.001	0.98	<0.001	0.014	<0.0001	0.004	<0.01	0.012
Mar-18		<2	0.059	<0.004	<0.001	<0.0001	<0.001	0.005	0.26	<0.001	0.016	<0.0001	0.004	<0.01	0.016

Table 1
2017 / 2018
Groundwater Bore Results

		NA	PAHs	Unassigned		TRH - NEPM 2013							TRH - NEPM 1999			
		Nitrite + Nitrate as N (Sol.)	Naphthalene	Dissolved Organic Carbon	Iodide	C6-C10 minus BTEX (F1)	C6-C10 Fraction	>C10-C16 minus Naphthalene (F2)	>C10-C16 Fraction	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction
		mg/kg	µg/L	mg/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
EQL		0.01	5	1	10	20	20	100	100	100	100	100	20	50	100	50
ADWG 2015 Health **REC**					500											
ANZECC 2000 - Stock Watering **S&D**																
ANZECC 2000 FW 95% **FAE95%**			16													
ANZECC 2000 Irrigation - **LTV**																
ANZECC 2000 Irrigation - **STV**																
Date/Time	**Field ID**															
Sep-17	B2	0.01	<5	13		<20	<20	<100	<100	150	<100	150	<20	<50	140	<50
Mar-18		0.08	<5	<10	432	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B4	0.01	<5	2		<20	<20	<100	<100	150	<100	150	<20	<50	<100	80
Mar-18		<0.01	<5	<1	146	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B6	<0.01	<5	3		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		0.03	<5	3	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B7	0.01	<5	<1		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		<0.01	<5	<1	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B8	0.82	<5	<1		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		0.18	<5	8	<50	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B9	0.26	<5	4		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		0.56	<5	6	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B11	0.02	<5	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		0.01	<5	4	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B12	0.02	<5	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		<0.01	<5	2	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Sep-17	B14	1.71	<5	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50
Mar-18		1.92	<5	9	<100	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50

Table 1
2017 / 2018
Groundwater Bore Results

			BTEX						Acidity & Alkalinity							
		C10-C36 (Sum of Total)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Calcium (filtered)	Chloride	Magnesium (filtered)	Anions Total
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L
EQL		50	1	2	2	2	2	2	1	1	1	1	1	1	1	0.01
ADWG 2015 Health **REC**			1	800	300			600								
ANZECC 2000 - Stock Watering **S&D**													1,000			
ANZECC 2000 FW 95% **FAE95%**			950			350										
ANZECC 2000 Irrigation - **LTV**																
ANZECC 2000 Irrigation - **STV**																
Date/Time	**Field ID**															
Sep-17	B2	140	<1	<2	<2	<2	<2	<2	<1	<1	455	455	156	764	14	30.9
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	414	414	159	762	14	29.9
Sep-17	B4	80	<1	<2	<2	<2	<2	<2	<1	<1	293	293	124	64	5	7.89
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	261	261	253	518	11	19.9
Sep-17	B6	<50	<1	<2	<2	<2	<2	<2	<1	<1	151	151	45	44	12	4.40
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	186	186	46	24	13	4.46
Sep-17	B7	<50	<1	<2	<2	<2	<2	<2	<1	<1	257	257	90	17	4	5.72
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	250	250	84	17	4	5.60
Sep-17	B8	<50	<1	<2	<2	<2	<2	<2	<1	<1	293	293	107	23	3	6.59
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	304	304	109	22	3	6.92
Sep-17	B9	<50	<1	<2	<2	<2	<2	<2	<1	<1	112	112	45	17	3	2.99
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	168	168	69	21	4	4.49
Sep-17	B11	<50	<1	<2	<2	<2	<2	<2	<1	<1	<1	<1	2	195	7	5.52
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	<1	<1	1	95	6	2.70
Sep-17	B12	<50	<1	<2	<2	<2	<2	<2	<1	<1	272	272	95	39	7	6.68
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	288	288	103	56	8	7.52
Sep-17	B14	<50	<1	<2	<2	<2	<2	<2	<1	<1	21	21	6	117	2	3.74
Mar-18		<50	<1	<2	<2	<2	<2	<2	<1	<1	21	21	6	24	1	1.14

Table 1
2017 / 2018
Groundwater Bore Results

		Major Ions					Nutrients						
		Potassium (filtered)	Sodium (filtered)	Cations Total	Sulfate (filtered)	Ionic Balance	Ammonia as N	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus (Total)	Phosphorus (Reactive)
		mg/L	mg/L	meq/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL		1	1	0.01	1	0.01	0.01	0.1	0.01	0.01	0.1	0.01	10
ADWG 2015 Health **REC**					500								
ANZECC 2000 - Stock Watering **S&D**					1,000				90	9.1			
ANZECC 2000 FW 95% **FAE95%**							0.9		7.2				
ANZECC 2000 Irrigation - **LTV**											5	0.05	
ANZECC 2000 Irrigation - **STV**											25		
Date/Time	Field ID												
Sep-17	B2	64	350	25.8	14	9.05	31.0	31.4	0.01	<0.01	31.4	0.33	<10
Mar-18		57	350	25.8	7	7.44	27.5	28.8	0.08	<0.01	28.9	0.18	<10
Sep-17	B4	<1	32	7.99	11	0.64	0.08	0.3	<0.01	0.01	0.3	0.28	<10
Mar-18		<1	94	17.6	2	6.00	0.17	0.2	<0.01	<0.01	0.2	0.15	<10
Sep-17	B6	1	22	4.22	7	2.18	0.07	0.1	<0.01	0.02	0.1	0.09	<10
Mar-18		1	17	4.13	3	3.79	0.09	<0.1	0.03	<0.01	<0.1	0.06	<10
Sep-17	B7	<1	10	5.26	5	4.22	<0.01	0.2	<0.01	0.02	0.2	0.35	<10
Mar-18		<1	10	4.96	6	6.10	0.09	<0.1	<0.01	<0.01	<0.1	0.18	<10
Sep-17	B8	1	17	6.35	4	1.82	0.01	1.5	0.81	0.01	2.3	1.14	<10
Mar-18		1	15	6.36	11	4.21	0.14	0.2	0.18	<0.01	0.4	0.16	20
Sep-17	B9	<1	11	2.97	13	0.29	<0.01	0.4	0.25	0.01	0.7	0.12	<10
Mar-18		<1	11	4.25	26	2.74	0.07	0.3	0.56	<0.01	0.9	0.43	<10
Sep-17	B11	1	52	2.96	1	30.1	0.07	0.2	0.01	0.01	0.2	0.07	<10
Mar-18		<1	47	2.59	1	2.13	0.07	<0.1	0.01	<0.01	<0.1	0.10	<10
Sep-17	B12	2	17	6.11	7	4.48	0.07	1.4	<0.01	0.02	1.4	0.49	<10
Mar-18		3	24	6.92	9	4.17	0.14	0.2	<0.01	<0.01	0.2	0.39	<10
Sep-17	B14	<1	20	1.33	1	47.4	0.02	0.3	1.70	0.01	2.0	0.03	<10
Mar-18		<1	18	1.16	2	1.15	0.05	<0.1	1.92	<0.01	1.9	0.37	<10

Table 2
Historical Groundwater Results

		Inorganics				Metals										
		Moisture (%)	BOD	Bromide	Cyanide (Total)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Iron	Iron (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Selenium (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
EQL		1	2	0.01	0.004	0.001	0.0001	0.001	0.001	0.05	0.05	0.001	0.001	0.0001	0.001	0.01
ADWG 2015 Health					0.08	0.01	0.002		2			0.01	0.5	0.001	0.02	0.01
ANZECC 2000 - Stock Watering						0.5	0.01	1	0.5			0.1		0.002	1	0.02
ANZECC 2000 FW 95%					0.007	0.013	0.0002	0.001	0.0014			0.0034	1.9	0.0006	0.011	0.011
ANZECC 2000 Irrigation - Long-term Trigger Values						0.1	0.01	0.1	0.2	0.2	0.2	2	0.2	0.002	0.2	0.02
ANZECC 2000 Irrigation - Short-term Trigger Values						2	0.05	1	5	10	10	5	10	0.002	2	0.05
Date	**Field ID**															
Aug-16	B2		<2		<0.004	0.002	<0.0001	<0.001	<0.001	27.9	15.6	<0.001	1.50	<0.0001	0.009	<0.01
Feb-17			11	1.03	<0.004	0.002	<0.0001	<0.001	<0.001	50.7	29.9	<0.001	3.35	<0.0001	0.011	<0.01
Sep-17			<2		<0.004	0.001	<0.0001	<0.001	<0.001	61.8	-	<0.001	2.14	<0.0001	0.010	<0.01
Mar-18			<2	1.01	<0.004	0.001	<0.0001	<0.001	<0.001	33.8	21.20	<0.001	3.55	<0.0001	0.009	<0.01
Sep-17	B3		<2		<0.004	<0.001	<0.0001	<0.001	<0.001	483	2.00	<0.001	0.226	<0.0001	0.009	<0.01
Aug-16	B4		4		<0.004	<0.001	<0.0001	<0.001	<0.001	6.81	12.0	<0.001	0.128	<0.0001	0.004	<0.01
Feb-17			<2	0.295	<0.004	0.001	<0.0001	<0.001	<0.001	45.3	-	<0.001	0.358	<0.0001	0.005	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	36.8	16.40	<0.001	0.158	<0.0001	0.005	<0.01
Mar-18			<2	0.421	<0.004	<0.001	<0.0001	<0.001	<0.001	24.0	-	<0.001	0.470	<0.0001	0.002	<0.01
Aug-16	B6		<2	0.115	<0.004	<0.001	<0.0001	<0.001	<0.001	6.03	5.62	<0.001	0.11	<0.0001	<0.001	
Feb-17			3	0.133	<0.004	<0.001	<0.0001	<0.001	<0.001	7.78	-	<0.001	0.120	<0.0001	<0.001	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	7.33	4.33	<0.001	0.104	<0.0001	<0.001	<0.01
Mar-18			<2	0.095	<0.004	<0.001	<0.0001	<0.001	0.003	5.59	<0.05	<0.001	0.116	<0.0001	0.002	<0.01
Aug-16	B7		4		<0.004	<0.001	<0.0001	<0.001	<0.001	2.61	<0.05	<0.001	0.004	<0.0001	<0.001	<0.01
Feb-17			<2	0.071	<0.004	<0.001	<0.0001	<0.001	<0.001	4.31	-	<0.001	0.008	<0.0001	<0.001	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	2.62	0.06	<0.001	0.005	<0.0001	<0.001	<0.01
Mar-18			<2	0.051	<0.004	<0.001	<0.0001	<0.001	<0.001	5.76	<0.05	<0.001	0.009	<0.0001	<0.001	<0.01
Aug-16	B8		6		<0.004	<0.001	0.0001	<0.001	<0.001	29.5	<0.05	<0.001	0.080	<0.0001	0.002	<0.01
Feb-17			3	0.092	<0.004	<0.001	<0.0001	<0.001	<0.001	41.7	-	<0.001	0.135	<0.0001	0.002	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	32.1	<0.05	<0.001	0.092	<0.0001	0.002	<0.01
Mar-18			<2	0.087	<0.004	<0.001	<0.0001	<0.001	0.006	2.81	-	<0.001	0.027	<0.0001	0.004	<0.01
Mar-18	B9		<2	0.062	<0.004	<0.001	<0.0001	<0.001	0.006	10.1	<0.05	<0.001	0.021	<0.0001	0.003	<0.01
Aug-16	B11		2		<0.004	<0.001	<0.0001	<0.001	0.018	10.4	3.15	0.006	0.038	<0.0001	0.008	<0.01
Feb-17			2	0.248	<0.004	<0.001	<0.0001	0.001	0.020	34.7	17.1	0.007	0.047	<0.0001	0.010	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	0.031	25.6	-	0.018	0.056	<0.0001	0.013	<0.01
Mar-18			<2	0.186	<0.004	<0.001	<0.0001	<0.001	0.021	41.5	19.10	0.008	0.077	<0.0001	0.012	<0.01
Aug-16	B12		<2	0.085	<0.004	<0.001	<0.0001	<0.001	0.004	44.2	-	<0.001	0.062	<0.0001	0.001	
Feb-17			2	0.102	<0.004	<0.001	<0.0001	<0.001	0.011	32.4	0.06	<0.001	0.081	<0.0001	<0.001	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	28.4	-	<0.001	0.053	<0.0001	<0.001	<0.01
Mar-18			<2	0.113	<0.004	<0.001	<0.0001	<0.001	0.002	2.75	0.22	<0.001	0.087	<0.0001	<0.001	<0.01
Aug-16	B14		<2		<0.004	<0.001	<0.0001	<0.001	<0.001	27.3	<0.05	<0.001	0.014	<0.0001	0.003	<0.01
Feb-17			<2	0.068	<0.004	<0.001	<0.0001	<0.001	<0.001	1.24	<0.05	<0.001	0.016	<0.0001	0.004	<0.01
Sep-17			<2		<0.004	<0.001	<0.0001	<0.001	<0.001	0.98	-	<0.001	0.014	<0.0001	0.004	<0.01
Mar-18			<2	0.059	<0.004	<0.001	<0.0001	<0.001	0.005	0.26	<0.05	<0.001	0.016	<0.0001	0.004	<0.01

Table 2
Historical Groundwater Results

		NA	Unassigned		TRH - NEPM 2013							TRH - NEPM 1999				
	Zinc (filtered)	Nitrite + Nitrate as N (Sol.)	Dissolved Organic Carbon	Iodide	C6-C10 minus BTEX (F1)	C6-C10 Fraction	>C10-C16 minus Naphthalene (F2)	>C10-C16 Fraction	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)
	mg/L	mg/kg	mg/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
EQL	0.005	0.01	1	10	20	20	50	50	100	100	100	20	50	100	50	50
ADWG 2015 Health				500												
ANZECC 2000 - Stock Watering	20															
ANZECC 2000 FW 95%	0.008															
ANZECC 2000 Irrigation - Long-term Trigger Values	2															
ANZECC 2000 Irrigation - Short-term Trigger Values	5															

Date	Field ID	Zinc (filtered)	Nitrite + Nitrate as N (Sol.)	Dissolved Organic Carbon	Iodide	C6-C10 minus BTEX (F1)	C6-C10 Fraction	>C10-C16 minus Naphthalene (F2)	>C10-C16 Fraction	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)
Aug-16	B2	<0.005	<0.01	24		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		<0.005	0.02	14	820	<20	<20	<100	<100	100	<100	100	<20	<50	110	<50	110
Sep-17		0.029	0.01	13		<20	<20	<100	<100	150	<100	150	<20	<50	140	<50	140
Mar-18		<0.005	0.08	<10	432	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17	B3	0.022	0.03	6		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B4	0.024	0.07	14		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		0.013	0.01	2	90	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		0.020	0.01	2		<20	<20	<100	<100	150	<100	150	<20	<50	<100	80	80
Mar-18		<0.005	<0.01	<1	146	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B6	<0.005	0.04	13	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		0.019	<0.01	2	28	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		<0.005	<0.01	3		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		0.008	0.03	3	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B7	0.005	0.03	5		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		<0.005	<0.01	2	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		<0.005	0.01	<1		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		<0.005	<0.01	<1	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B8	<0.005	0.92	15		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		<0.005	0.23	1	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		<0.005	0.82	<1		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		0.019	0.18	8	<50	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18	B9	0.012	0.56	6	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B11	0.046	<0.01	5		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		0.038	<0.01	3	20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		0.045	0.02	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		0.071	0.01	4	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B12	0.007	0.06	2	<20	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		0.007	<0.01	2	11	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		<0.005	0.02	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		<0.005	<0.01	2	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Aug-16	B14	0.008	2.21	15		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Feb-17		0.008	1.70	2	<10	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Sep-17		0.012	1.71	2		<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
Mar-18		0.016	1.92	9	<100	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50

Table 2
Historical Groundwater Results

		BTEX						Acidity & Alkalinity				Major Ions					
		Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Calcium (filtered)	Chloride	Magnesium (filtered)	Anions Total	Potassium (filtered)	Sodium (filtered)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L
EQL		1	1	1	1	2	2	1	1	1	1	1	1	1	0.01	1	1
ADWG 2015 Health		1	800	300			600										
ANZECC 2000 - Stock Watering												1,000					
ANZECC 2000 FW 95%		950			350												
ANZECC 2000 Irrigation - Long-term Trigger Values																	
ANZECC 2000 Irrigation - Short-term Trigger Values																	
Date	**Field ID**																
Aug-16	B2	<1	<2	<2	<2	<2	<2					132	729	14		65	407
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	442	442	150	896	14	34.2	64	376
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	455	455	156	764	14	30.9	64	350
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	414	414	159	762	14	29.9	57	350
Sep-17	B3	<1	<2	<2	<2	<2	<2	<1	<1	180	180	66	23	4	4.56	<1	13
Aug-16	B4	<1	<2	<2	<2	<2	<2					107	51	5		<1	24
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	284	284	206	374	8	16.3	<1	56
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	293	293	124	64	5	7.89	<1	32
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	261	261	253	518	11	19.9	<1	94
Aug-16	B6	<1	<2	<2	<2	<2	<2						40	14		1	20
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	193	193	47	30	13	4.81	1	19
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	151	151	45	44	12	4.40	1	22
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	186	186	46	24	13	4.46	1	17
Aug-16	B7	<1	<2	<2	<2	<2	<2					84	18	5		<1	10
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	254	254	78	16	4	5.63	<1	10
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	257	257	90	17	4	5.72	<1	10
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	250	250	84	17	4	5.60	<1	10
Aug-16	B8	<1	<2	<2	<2	<2	<2					96	22	3		<1	16
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	314	314	106	31	3	7.25	<1	15
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	293	293	107	23	3	6.59	1	17
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	304	304	109	22	3	6.92	1	15
Mar-18	B9	<1	<2	<2	<2	<2	<2	<1	<1	168	168	69	21	4	4.49	<1	11
Aug-16	B11	<1	<2	<2	<2	<2	<2					<1	52	2		<1	24
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	1	1	<1	111	5	3.19	<1	40
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	<1	<1	2	195	7	5.52	1	52
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	<1	<1	1	95	6	2.70	<1	47
Aug-16	B12	<1	7	<2	<2	<2	<2						49	8		3	21
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	272	272	91	40	7	6.73	3	18
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	272	272	95	39	7	6.68	2	17
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	288	288	103	56	8	7.52	3	24
Aug-16	B14	<1	<2	<2	<2	<2	<2					34	22	3		<1	20
Feb-17		<1	<2	<2	<2	<2	<2	<1	<1	16	16	4	29	1	1.18	<1	17
Sep-17		<1	<2	<2	<2	<2	<2	<1	<1	21	21	6	117	2	3.74	<1	20
Mar-18		<1	<2	<2	<2	<2	<2	<1	<1	21	21	6	24	1	1.14	<1	18

Table 2
Historical Groundwater Results

					Nutrients						
		Cations Total	Sulfate (filtered)	Ionic Balance	Ammonia as N	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus (Total)	Phosphorus (Reactive)
		meq/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL		0.01	1	0.01	0.01	0.1	0.01	0.01	0.1	0.01	10
ADWG 2015 Health			500								
ANZECC 2000 - Stock Watering			1,000				90	9.1			
ANZECC 2000 FW 95%					0.9		7.2				
ANZECC 2000 Irrigation - Long-term Trigger Values									5	0.05	
ANZECC 2000 Irrigation - Short-term Trigger Values									25		
Date	**Field ID**										
Aug-16	B2		11		27.4	30.8	<0.01	<0.01	30.8	0.11	<10
Feb-17		30.6	5	5.51	32.0	40.1	0.02	<0.01	40.1	0.20	<10
Sep-17		25.8	14	9.05	31.0	31.4	0.01	<0.01	31.4	0.33	<10
Mar-18		25.8	7	7.44	27.5	28.8	0.08	<0.01	28.9	0.18	<10
Sep-17	B3	4.19	15	4.22	0.05	19.5	0.01	0.02	19.5	19.2	<10
Aug-16	B4		14		0.03	<0.1	0.07	<0.01	<0.1	0.08	<10
Feb-17		14.0	3	7.50	0.18	0.4	0.01	<0.01	0.4	0.43	<10
Sep-17		7.99	11	0.64	0.08	0.3	<0.01	0.01	0.3	0.28	<10
Mar-18		17.6	2	6.00	0.17	0.2	<0.01	<0.01	0.2	0.15	<10
Aug-16	B6		8		0.06	<0.1	0.04	<0.01	<0.1	0.09	<10
Feb-17		4.57	5	2.57	0.08	0.2	<0.01	<0.01	0.2	0.08	<10
Sep-17		4.22	7	2.18	0.07	0.1	<0.01	0.02	0.1	0.09	<10
Mar-18		4.13	3	3.79	0.09	<0.1	0.03	<0.01	<0.1	0.06	<10
Aug-16	B7		5		<0.01	<0.1	0.03	<0.01	<0.1	0.48	<10
Feb-17		4.66	5	9.47	0.04	<0.1	<0.01	<0.01	<0.1	<0.01	<10
Sep-17		5.26	5	4.22	<0.01	0.2	<0.01	0.02	0.2	0.35	<10
Mar-18		4.96	6	6.10	0.09	<0.1	<0.01	<0.01	<0.1	0.18	<10
Aug-16	B8		5		<0.01	1.2	0.92	<0.01	2.1	1.33	<10
Feb-17		6.19	5	7.91	0.09	0.5	0.23	<0.01	0.7	1.27	<10
Sep-17		6.35	4	1.82	0.01	1.5	0.81	0.01	2.3	1.14	<10
Mar-18		6.36	11	4.21	0.14	0.2	0.18	<0.01	0.4	0.16	20
Mar-18	B9	4.25	26	2.74	0.07	0.3	0.56	<0.01	0.9	0.43	<10
Aug-16	B11		3		0.02	<0.1	<0.01	<0.01	<0.1	0.02	<10
Feb-17		3.07	2	1.96	0.06	0.3	<0.01	<0.01	0.3	0.07	<10
Sep-17		2.96	1	30.1	0.07	0.2	0.01	0.01	0.2	0.07	<10
Mar-18		2.59	1	2.13	0.07	<0.1	0.01	<0.01	<0.1	0.10	<10
Aug-16	B12		12		0.08	3.1	0.06	<0.01	3.2	1.53	<10
Feb-17		5.98	8	5.92	0.06	4.4	<0.01	<0.01	4.4	2.17	<10
Sep-17		6.11	7	4.48	0.07	1.4	<0.01	0.02	1.4	0.49	<10
Mar-18		6.92	9	4.17	0.14	0.2	<0.01	<0.01	0.2	0.39	<10
Aug-16	B14		2		<0.01	0.5	2.21	<0.01	2.7	0.41	<10
Feb-17		1.02	2		0.01	0.4	1.70	<0.01	2.1	0.02	<10
Sep-17		1.33	1	47.4	0.02	0.3	1.70	0.01	2.0	0.03	<10
Mar-18		1.16	2	1.15	0.05	<0.1	1.92	<0.01	1.9	0.37	<10

Table 3
2017/2018
Surface Water Results

		Inorganics		Metals							
		BOD	Total Suspended Solids	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		2	5	0.001	0.0001	0.001	0.001	0.001	0.001	0.0001	0.001
ADWG 2015 Health **REC**				0.01	0.002		2	0.01	0.5	0.001	0.02
ANZECC 2000 - Stock Watering **S&D**				0.5	0.01	1	0.5	0.1		0.002	1
ANZECC 2000 FW 95% **FAE95%**				0.013	0.0002	0.001	0.0014	0.0034	1.9	0.0006	0.011
ANZECC 2000 Irrigation - **LTV**				0.1	0.01	0.1	0.2	2	0.2	0.002	0.2
ANZECC 2000 Irrigation -**STV**				2	0.05	1	5	5	10	0.002	2
Date/Time	**Field ID**										
Jun-17	S1	3	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.0001	<0.001
Sep-17		<2	<5		<0.0001	<0.001	0.003	<0.001	0.006		<0.001
Mar-18		3	10		<0.0001	0.002	0.015	0.002	0.016		0.006
Jun-17	S2	2	<5	<0.001	<0.0001	<0.001	0.001	<0.001		<0.0001	<0.001
Sep-17		3	<5		<0.0001	<0.001	0.043	<0.001	0.006		0.002
Mar-18		4	8		<0.0001	<0.001	0.035	0.002	0.009		0.006
Jun-17	S3	2	<5	<0.001	<0.0001	<0.001	0.002	<0.001		<0.0001	0.003
Sep-17		10	46		<0.0001	<0.001	<0.001	<0.001	0.451		0.002
Jun-17	S4	7	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.0001	<0.001
Sep-17		5	<5		<0.0001	<0.001	<0.001	<0.001	0.006		<0.001
Dec-17		4	<5		<0.0001	<0.001	<0.001	<0.001	0.040		0.002
Mar-18		2	7		<0.0001	<0.001	0.018	0.002	0.008		0.006
Jun-17	S6	6	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.0001	<0.001
Sep-17		2	<5		<0.0001	<0.001	<0.001	<0.001	0.004		<0.001
Dec-17		4	<5		<0.0001	<0.001	0.001	<0.001	0.029		<0.001
Mar-18		5	8		<0.0001	<0.001	0.018	0.001	0.006		0.003
Jun-17	S7	68	266	0.010	<0.0001	0.004	0.001	<0.001		<0.0001	0.009
Sep-17		15	134		<0.0001	0.002	0.001	<0.001	0.226		0.004
Jun-17	S9	4	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.0001	<0.001
Sep-17		7	9		<0.0001	<0.001	<0.001	<0.001	0.006		<0.001
Dec-17		3	<5		0.0001	<0.001	0.002	0.016	0.042		<0.001
Mar-18		<2	<5		<0.0001	<0.001	0.019	0.001	0.007		0.006

Table 3
2017/2018
Surface Water Results

			NA	Acidity & Alkalinity				Major Ions				
		Zinc (filtered)	Nitrite + Nitrate as N (Sol.)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Calcium (filtered)	Chloride	Magnesium (filtered)	Anions Total	Potassium (filtered)
		mg/L	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L
EQL		0.005	0.01	1	1	1	1	1	1	1	0.01	1
ADWG 2015 Health **REC**												
ANZECC 2000 - Stock Watering **S&D**		20						1,000				
ANZECC 2000 FW 95% **FAE95%**		0.008										
ANZECC 2000 Irrigation - **LTV**		2										
ANZECC 2000 Irrigation -**STV**		5										
Date/Time	**Field ID**											
Jun-17	S1	<0.005	1.01	<1	<1	185	185	69	22	5	5.04	<1
Sep-17		<0.005	0.93	<1	<1	182	182	71	30	6	5.17	1
Mar-18		0.035	0.29	16	<1	194	179	72	24	6	5.72	2
Jun-17	S2	0.007	1.06	<1	<1	196	196	69	23	5	5.29	<1
Sep-17		0.035	1.14	<1	<1	185	185	74	22	6	4.86	1
Mar-18		0.063	1.03	<1	<1	198	198	78	21	6	5.34	1
Jun-17	S3	<0.005	0.16	<1	<1	189	189	60	65	6	6.55	18
Sep-17		<0.005	0.21	<1	<1	245	245	87	32	8	6.30	12
Jun-17	S4	<0.005	1.11	<1	<1	193	193	72	22	5	5.23	<1
Sep-17		<0.005	1.07	<1	<1	196	196	79	22	6	5.29	1
Dec-17		<0.005	0.17	<1	<1	68	68	21	35	3	2.49	<1
Mar-18		0.028	1.02	<1	<1	193	193	79	20	6	5.21	1
Jun-17	S6	<0.005	1.13	<1	<1	198	198	77	22	6	5.33	<1
Sep-17		<0.005	1.14	<1	<1	199	199	80	23	6	5.35	1
Dec-17		0.006	0.73	<1	<1	203	203	75	31	6	5.53	1
Mar-18		0.031	1.07	<1	<1	196	196	81	21	6	5.36	1
Jun-17	S7	0.005	<0.01	<1	<1	391	391	12	398	7	19.0	118
Sep-17		<0.005	0.14	<1	<1	111	111	12	64	6	4.31	30
Jun-17	S9	<0.005	1.15	<1	<1	200	200	75	22	5	5.37	<1
Sep-17		0.012	1.02	<1	<1	194	194	77	42	6	5.75	1
Dec-17		0.024	0.69	<1	<1	188	188	72	32	6	5.32	<1
Mar-18		0.036	0.94	<1	<1	183	183	82	20	6	5.01	1

Table 3
2017/2018
Surface Water Results

						Nutrients						
		Sodium (filtered)	Cations Total	Sulfate (filtered)	Ionic Balance	Phosphorous filterable reactive (P)	Ammonia as N	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus (Total)
		mg/L	meq/L	mg/L	%	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		1	0.01	1	0.01	10	0.01	0.1	0.01	0.01	0.1	0.01
ADWG 2015 Health **REC**				500								
ANZECC 2000 - Stock Watering **S&D**				1,000					90	9.1		
ANZECC 2000 FW 95% **FAE95%**							0.9		7.2			
ANZECC 2000 Irrigation - **LTV**											5	0.05
ANZECC 2000 Irrigation -**STV**											25	
Date/Time	**Field ID**											
Jun-17	S1	14	4.46	35	6.12		0.02	<0.1	1.01	<0.01	1.0	<0.01
Sep-17		14	4.67	33	5.06		0.02	<0.1	0.92	0.01	0.9	<0.01
Mar-18		15	4.79	56	8.84	20	0.09	<0.1	0.29	<0.01	0.3	0.08
Jun-17	S2	13	4.42	35	8.99		0.03	<0.1	1.06	<0.01	1.1	<0.01
Sep-17		13	4.78	26	0.84		0.01	<0.1	1.13	0.01	1.1	0.01
Mar-18		13	4.98	38	3.51	<10	0.04	0.2	1.03	<0.01	1.2	0.03
Jun-17	S3	37	5.56	45	8.17		0.04	0.6	0.16	<0.01	0.8	0.09
Sep-17		33	6.74	24	3.41		0.95	1.3	0.17	0.04	1.5	0.24
Jun-17	S4	13	4.57	36	6.70		0.02	<0.1	1.11	<0.01	1.1	<0.01
Sep-17		14	5.07	36	2.08		0.01	<0.1	1.06	0.01	1.1	<0.01
Dec-17		14	1.90	7		<10	0.09	<0.1	0.17	<0.01	0.2	<0.01
Mar-18		13	5.03	38	1.80	<10	0.08	0.3	1.02	<0.01	1.3	0.02
Jun-17	S6	13	4.90	36	4.15		0.02	0.3	1.13	<0.01	1.4	<0.01
Sep-17		13	5.08	35	2.65		0.02	0.2	1.13	0.01	1.3	<0.01
Dec-17		13	4.83	29	6.82	<10	0.08	0.5	0.72	0.01	1.2	0.25
Mar-18		12	5.08	41	2.67	<10	0.06	<0.1	1.07	<0.01	1.1	0.03
Jun-17	S7	185	12.2	<1	21.7		11.6	29.0	<0.01	<0.01	29.0	7.09
Sep-17		44	3.77	14	6.69		5.63	7.5	0.13	0.01	7.6	2.49
Jun-17	S9	13	4.72	36	6.41		0.04	0.5	1.15	<0.01	1.6	<0.01
Sep-17		13	4.93	33	7.69		0.02	<0.1	1.01	0.01	1.0	<0.01
Dec-17		12	4.61	32	7.21	<10	0.13	0.2	0.68	0.01	0.9	<0.01
Mar-18		13	5.18	38	1.62	<10	0.16	0.1	0.94	<0.01	1.0	0.68

Table 3
2017/2018
Surface Water Results

	Phosphorus (Total) (filtered)	Phosphorus (Reactive)
	mg/L	µg/L
EQL	0.01	10
ADWG 2015 Health **REC**		
ANZECC 2000 - Stock Watering **S&D**		
ANZECC 2000 FW 95% **FAE95%**		
ANZECC 2000 Irrigation - **LTV**	0.05	
ANZECC 2000 Irrigation -**STV**		

Date/Time	Field ID	Phosphorus (Total) (filtered)	Phosphorus (Reactive)
Jun-17	S1		<10
Sep-17		<0.01	<10
Mar-18			20
Jun-17	S2		<10
Sep-17		<0.01	<10
Mar-18			<10
Jun-17	S3		50
Sep-17		0.22	10
Jun-17	S4		<10
Sep-17		<0.01	<10
Dec-17			<10
Mar-18			<10
Jun-17	S6		<10
Sep-17		<0.01	<10
Dec-17			<10
Mar-18			<10
Jun-17	S7		5,080
Sep-17		1.47	800
Jun-17	S9		20
Sep-17		<0.01	<10
Dec-17			<10
Mar-18			<10

Table 4
Historical Surface Water Results

		Inorganics				Metals								NA		Acidity & Alkalinity					
		BOD	Electrical conductivity (lab)	pH (Lab)	Total Suspended Solids	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Manganese (filtered)	Nickel (filtered)	Zinc (filtered)	Filtered Total Phosphorus as P (filtered)	Nitrite + Nitrate as N (Sol.)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Calcium (filtered)	Chloride
		mg/L	µS/cm	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		2	1	0.01	5	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.005	0.01	0.01	1	1	1	1	1	1
ADWG 2015 Health						0.01	0.002		2	0.01	0.5	0.02									
ANZECC 2000 - Stock Watering						0.5	0.01	1	0.5	0.1		1	20							1,000	
ANZECC 2000 FW 95%						0.013	0.0002	0.001	0.0014	0.0034	1.9	0.011	0.008								
ANZECC 2000 Irrigation - Long-term Trigger Values						0.1	0.01	0.1	0.2	2	0.2	0.2	2								
ANZECC 2000 Irrigation - Short-term Trigger Values						2	0.05	1	5	5	10	2	5								
Location Code	**Date**																				
S1	1/08/2016	<2	299	7.83	18									<0.01	1.32						
	23/11/2016	10	440	8.10	<5									<0.01	0.83						
	28/02/2017	<2			<5										0.57	<1	<1	181	181	67	23
	14/06/2017	3	506	8.11	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.001	<0.005		1.01	<1	<1	185	185	69	22
	11/09/2017	<2			<5		<0.0001	<0.001	0.003	<0.001	0.006	<0.001	<0.005		0.93	<1	<1	182	182	71	30
	20/03/2018	3			10		<0.0001	0.002	0.015	0.002	0.016	0.006	0.035		0.29	16	<1	194	179	72	24
	18/04/2018	3	10				<0.0001	0.002	0.015	0.002	0.016		0.006	0.035	0.29	16	<1	194	179	72	24
S2	1/08/2016	4	308	7.81	7									<0.01	1.14						
	23/11/2016	8	455	8.09	<5									<0.01	0.88						
	28/02/2017	<2			8										0.72	<1	<1	197	197	70	23
	14/06/2017	2	522	7.98	<5	<0.001	<0.0001	<0.001	0.001	<0.001		<0.001	0.007		1.06	<1	<1	196	196	69	23
	11/09/2017	3			<5		<0.0001	<0.001	0.043	<0.001	0.006	0.002	0.035		1.14	<1	<1	185	185	74	22
	20/03/2018	4			8		<0.0001	<0.001	0.035	0.002	0.009	0.006	0.063		1.03	<1	<1	198	198	78	21
	18/04/2018	4	8				<0.0001	<0.001	0.035	0.002	0.009		0.006	0.063	1.03	<1	<1	198	198	78	21
S3	1/08/2016	2	375	7.53	116									0.1	1.27						
	23/11/2016	14	660	7.88	<5									0.03	0.38						
	14/06/2017	2	678	7.25	<5	<0.001	<0.0001	<0.001	0.002	<0.001		0.003	<0.005		0.16	<1	<1	189	189	60	65
	11/09/2017	10			46		<0.0001	<0.001	<0.001	<0.001	0.451	0.002	<0.005		0.21	<1	<1	245	245	87	32
S4	1/08/2016	<2	299	7.8	6									<0.01	1.27						
	23/11/2016	6	440	8.03	<5									<0.01	0.88						
	27/02/2017	6			<5										0.75	<1	<1	197	197	73	20
	14/06/2017	7	526	7.78	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.001	<0.005		1.11	<1	<1	193	193	72	22
	11/09/2017	5			<5		<0.0001	<0.001	<0.001	<0.001	0.006	<0.001	<0.005		1.07	<1	<1	196	196	79	22
	13/12/2017	4			<5		<0.0001	<0.001	<0.001	<0.001	0.040	0.002	<0.005		0.17	<1	<1	68	68	21	35
	20/03/2018	2			7		<0.0001	<0.001	0.018	0.002	0.008	0.006	0.028		1.02	<1	<1	193	193	79	20
S6	1/08/2016	<2	315	7.84	8									<0.01	1.21						
	23/11/2016	<2	460	8.08	<5									<0.01	0.91						
	27/02/2017	6			<5										0.80	<1	<1	204	204	75	21
	14/06/2017	6	522	8.14	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.001	<0.005		1.13	<1	<1	198	198	77	22
	11/09/2017	2			<5		<0.0001	<0.001	<0.001	<0.001	0.004	<0.001	<0.005		1.14	<1	<1	199	199	80	23
	13/12/2017	4			<5		<0.0001	<0.001	0.001	<0.001	0.029	<0.001	0.006		0.73	<1	<1	203	203	75	31
	20/03/2018	5			8		<0.0001	<0.001	0.018	0.001	0.006	0.003	0.031		1.07	<1	<1	196	196	81	21
S7	2/08/2016	2	351	7.42	45									0.18	0.98						
	23/11/2016	11	270	7.05	737									2.19	0.03						
	27/02/2017	35			35										0.08	<1	<1	957	957	43	638
	14/06/2017	68	2,020	7.39	266	0.010	<0.0001	0.004	0.001	<0.001		0.009	0.005		<0.01	<1	<1	391	391	12	398
	12/09/2017	15			134		<0.0001	0.002	0.001	<0.001	0.226	0.004	<0.005		0.14	<1	<1	111	111	12	64
S8	2/08/2016	6	350	7.38	16									0.23	0.21						
	23/11/2016	8	365	7.31	1,110									3.99	<0.01						
S9	2/08/2016	4	286	7.76	30									<0.01	1.29						
	23/11/2016	<2	430	8.03	267									<0.01	0.86						
	27/02/2017	4			91										0.78	<1	<1	208	208	73	22
	14/06/2017	4	536	8.11	<5	<0.001	<0.0001	<0.001	<0.001	<0.001		<0.001	<0.005		1.15	<1	<1	200	200	75	22
	12/09/2017	7			9		<0.0001	<0.001	<0.001	<0.001	0.006	<0.001	0.012		1.02	<1	<1	194	194	77	42
	13/12/2017	3			<5		0.0001	<0.001	0.002	0.016	0.042	<0.001	0.024		0.69	<1	<1	188	188	72	32
	21/03/2018	<2			<5		<0.0001	<0.001	0.019	0.001	0.007	0.006	0.036		0.94	<1	<1	183	183	82	20

Table 4
Historical Surface Water Results

		Major Ions							Nutrients								
		Magnesium (filtered)	Anions Total	Potassium (filtered)	Sodium (filtered)	Cations Total	Sulfate (filtered)	Ionic Balance	Phosphorous filterable reactive (P)	Ammonia as N	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus (Total)	Phosphorus (Total) (filtered)	Phosphorus (Reactive)
		mg/L	meq/L	mg/L	mg/L	meq/L	mg/L	%	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL		1	0.01	1	1	0.01	1	0.01	10	0.01	0.1	0.01	0.01	0.1	0.01	0.01	10
ADWG 2015 Health							500										
ANZECC 2000 - Stock Watering							1,000					90	9.1				
ANZECC 2000 FW 95%										0.9		7.2					
ANZECC 2000 Irrigation - Long-term Trigger Values														5	0.05	0.05	
ANZECC 2000 Irrigation - Short-term Trigger Values														25			
Location Code	**Date**																
S1	1/08/2016									0.77	0.8	1.31	0.01	2.1	0.03		
	23/11/2016									0.02	0.4	0.83	<0.01	1.2	<0.01		
	28/02/2017	5	4.83	<1	13	4.32	27	5.54		0.07	0.3	0.57	<0.01	0.9	<0.01	<0.01	
	14/06/2017	5	5.04	<1	14	4.46	35	6.12		0.02	<0.1	1.01	<0.01	1.0	<0.01		<10
	11/09/2017	6	5.17	1	14	4.67	33	5.06		0.02	<0.1	0.92	0.01	0.9	<0.01	<0.01	<10
	20/03/2018	6	5.72	2	15	4.79	56	8.84	20	0.09	<0.1	0.29	<0.01	0.3	0.08		20
	18/04/2018	6	5.72	2	15	4.79	56	8.84	20	0.09	<0.1	0.29	<0.01	0.3	0.08		20
S2	1/08/2016									0.03	<0.1	1.14	<0.01	1.1	0.02		
	23/11/2016									0.02	0.1	0.88	<0.01	1.0	<0.01		
	28/02/2017	5	5.17	<1	13	4.47	28	7.24		0.17	0.4	0.72	<0.01	1.1	0.01	<0.01	
	14/06/2017	5	5.29	<1	13	4.42	35	8.99		0.03	<0.1	1.06	<0.01	1.1	<0.01		<10
	11/09/2017	6	4.86	1	13	4.78	26	0.84		0.01	<0.1	1.13	0.01	1.1	0.01	<0.01	<10
	20/03/2018	6	5.34	1	13	4.98	38	3.51	<10	0.04	0.2	1.03	<0.01	1.2	0.03		<10
	18/04/2018	6	5.34	1	13	4.98	38	3.51	<10	0.04	0.2	1.03	<0.01	1.2	0.03		<10
S3	1/08/2016									4.04	4.4	1.24	0.03	5.7	0.35		
	23/11/2016									0.50	0.6	0.32	0.06	1.0	0.05		
	14/06/2017	6	6.55	18	37	5.56	45	8.17		0.04	0.6	0.16	<0.01	0.8	0.09		50
	11/09/2017	8	6.30	12	33	6.74	24	3.41		0.95	1.3	0.17	0.04	1.5	0.24	0.22	10
S4	1/08/2016									0.04	<0.1	1.27	<0.01	1.3	<0.01		
	23/11/2016									0.03	0.1	0.88	<0.01	1.0	<0.01		
	27/02/2017	5	5.10	<1	13	4.62	29	4.98		0.02	0.2	0.75	<0.01	1.0	<0.01	<0.01	
	14/06/2017	5	5.23	<1	13	4.57	36	6.70		0.02	<0.1	1.11	<0.01	1.1	<0.01		<10
	11/09/2017	6	5.29	1	14	5.07	36	2.08		0.01	<0.1	1.06	0.01	1.1	<0.01	<0.01	<10
	13/12/2017	3	2.49	<1	14	1.90	7		<10	0.09	<0.1	0.17	<0.01	0.2	<0.01		<10
	20/03/2018	6	5.21	1	13	5.03	38	1.80	<10	0.08	0.3	1.02	<0.01	1.3	0.02		<10
S6	1/08/2016									0.06	<0.1	1.21	<0.01	1.2	<0.01		
	23/11/2016									0.01	0.2	0.91	<0.01	1.1	<0.01		
	27/02/2017	6	5.29	<1	13	4.80	30	4.86		0.06	0.3	0.80	<0.01	1.1	<0.01	<0.01	
	14/06/2017	6	5.33	<1	13	4.90	36	4.15		0.02	0.3	1.13	<0.01	1.4	<0.01		<10
	11/09/2017	6	5.35	1	13	5.08	35	2.65		0.02	0.2	1.13	0.01	1.3	<0.01	<0.01	<10
	13/12/2017	6	5.53	1	13	4.83	29	6.82	<10	0.08	0.5	0.72	0.01	1.2	0.25		<10
	20/03/2018	6	5.36	1	12	5.08	41	2.67	<10	0.06	<0.1	1.07	<0.01	1.1	0.03		<10
S7	2/08/2016									6.04	6	0.96	0.02	7	0.44		
	23/11/2016									3.85	7.5	0.01	0.02	7.5	2.77		
	27/02/2017	30	37.1	382	406	32.0	<10	7.34		36.3	69.4	0.05	0.03	69.5	23.9	20.5	
	14/06/2017	7	19.0	118	185	12.2	<1	21.7		11.6	29.0	<0.01	<0.01	29.0	7.09		5,080
	12/09/2017	6	4.31	30	44	3.77	14	6.69		5.63	7.5	0.13	0.01	7.6	2.49	1.47	800
S8	2/08/2016									5.36	5.9	0.19	0.02	6.1	0.4		
	23/11/2016									9.24	12.9	<0.01	<0.01	12.9	5.00		
S9	2/08/2016									<0.01	<0.1	1.29	<0.01	1.3	<0.01		
	23/11/2016									0.01	0.4	0.86	<0.01	1.3	<0.01		
	27/02/2017	6	5.40	<1	13	4.70	30	6.92		0.05	0.5	0.78	<0.01	1.3	0.04	<0.01	
	14/06/2017	5	5.37	<1	13	4.72	36	6.41		0.04	0.5	1.15	<0.01	1.6	<0.01		20
	12/09/2017	6	5.75	1	13	4.93	33	7.69		0.02	<0.1	1.01	0.01	1.0	<0.01	<0.01	<10
	13/12/2017	6	5.32	<1	12	4.61	32	7.21	<10	0.13	0.2	0.68	0.01	0.9	<0.01		<10
	21/03/2018	6	5.01	1	13	5.18	38	1.62	<10	0.16	0.1	0.94	<0.01	1.0	0.68		<10

Table 5
2017/2018
Leachate Monitoring Results

							Date	Jun-17
							Sample ID	Compost Leachate
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term	
Inorganics								
BOD	mg/L	2						1,410
Bromide	mg/L	0.01						
Cyanide (Total)	mg/L	0.004	0.08		0.007			
Electrical conductivity (lab)	µS/cm	1						7,170
pH (Lab)	pH Units	0.01						6.99
Total Suspended Solids	mg/L	5						321
Metals								
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2	0.032
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1	0.010
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5	<0.001
Iron	mg/L	0.05				0.2	10	
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10	
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002	<0.0001
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2	0.017
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05	
Zinc (filtered)	mg/L	0.005		20	0.008	2	5	<0.005
NA								
Nitrite + Nitrate as N (Sol.)	mg/kg	0.01						<0.01
PAHs								
Naphthalene	µg/L	5			16			
Unassigned								
Dissolved Organic Carbon	mg/L	1						
Iodide	µg/L	10	500					
TRH - NEPM 2013								
C6-C10 minus BTEX (F1)	µg/L	20						
C6-C10 Fraction	µg/L	20						
>C10-C16 minus Naphthalene (F2)	µg/L	100						
>C10-C16 Fraction	µg/L	100						
>C16-C34 Fraction (F3)	µg/L	100						
>C34-C40 Fraction (F4)	µg/L	100						
>C10-C40 (Sum of Total)	µg/L	100						
TRH - NEPM 1999								
C6-C9 Fraction	µg/L	20						
C10-C14 Fraction	µg/L	50						
C15-C28 Fraction	µg/L	100						
C29-C36 Fraction	µg/L	50						
C10-C36 (Sum of Total)	µg/L	50						
BTEX								

Table 5
2017/2018
Leachate Monitoring Results

							Date	Jun-17
							Sample ID	Compost Leachate
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term	
Benzene	µg/L	1	1		950			
Toluene	µg/L	2	800					
Ethylbenzene	µg/L	2	300					
Xylene (o)	µg/L	2			350			
Xylene (m & p)	µg/L	2						
Xylene Total	µg/L	2	600					
Acidity & Alkalinity								
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1
Alkalinity (total as CaCO3)	mg/L	1						1,900
Bicarbonate Alkalinity as CaCO3	mg/L	1						1,900
Major Ions								
Calcium (filtered)	mg/L	1		1000				63
Chloride	mg/L	1						944
Magnesium (filtered)	mg/L	1						34
Anions Total	meq/L	0.01						64.6
Potassium (filtered)	mg/L	1						645
Sodium (filtered)	mg/L	1						648
Cations Total	meq/L	0.01						50.6
Sulfate (filtered)	mg/L	1	500	1000				<5
Ionic Balance	%	0.01						12.1
Nutrients								
Phosphorous filterable reactive (P)	µg/L	10						
Ammonia as N	mg/L	0.01			0.9			218
Kjeldahl Nitrogen Total	mg/L	0.1						302
Nitrate (as N)	mg/L	0.01		90	7.2			<0.01
Nitrite (as N)	mg/L	0.01		9.1				<0.01
Nitrogen (Total)	mg/L	0.1				5	25	302
Phosphorus (Total)	mg/L	0.01				0.05		97.2
Phosphorus (Total) (filtered)	mg/L	0.01				0.05		
Phosphorus (Reactive)	µg/L	10						74,200

Table 5
2017/2018
Leachate Monitoring Results

							Date	Sep-17	Mar-18
							Sample ID	Compost Leachate	Compost Leachate
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term		
Inorganics									
BOD	mg/L	2						1,750	2,500
Bromide	mg/L	0.01							
Cyanide (Total)	mg/L	0.004	0.08		0.007				
Electrical conductivity (lab)	µS/cm	1							
pH (Lab)	pH Units	0.01							
Total Suspended Solids	mg/L	5						526	1,250
Metals									
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2		
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1	0.008	0.012
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5	0.001	0.008
Iron	mg/L	0.05				0.2	10		
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5	<0.001	0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10	0.738	0.167
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002		
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2	0.019	0.048
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05		
Zinc (filtered)	mg/L	0.005		20	0.008	2	5	0.005	0.040
NA									
Nitrite + Nitrate as N (Sol.)	mg/kg	0.01						0.70	0.02
PAHs									
Naphthalene	µg/L	5			16			<5	
Unassigned									
Dissolved Organic Carbon	mg/L	1							
Iodide	µg/L	10	500						
TRH - NEPM 2013									
C6-C10 minus BTEX (F1)	µg/L	20						300	
C6-C10 Fraction	µg/L	20						510	
>C10-C16 minus Naphthalene (F2)	µg/L	100						2,410	
>C10-C16 Fraction	µg/L	100						2,410	7,030
>C16-C34 Fraction (F3)	µg/L	100						2,990	4,180
>C34-C40 Fraction (F4)	µg/L	100						370	360
>C10-C40 (Sum of Total)	µg/L	100						5,770	11,600
TRH - NEPM 1999									
C6-C9 Fraction	µg/L	20						550	
C10-C14 Fraction	µg/L	50						2,170	5,730
C15-C28 Fraction	µg/L	100						3,050	4,960
C29-C36 Fraction	µg/L	50						350	940
C10-C36 (Sum of Total)	µg/L	50						5,570	11,600
BTEX									

Prepared by Stuart Hughes 23/05/2018

Table 5
2017/2018
Leachate Monitoring Results

							Date	Sep-17	Mar-18
							Sample ID	Compost Leachate	Compost Leachate
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term		
Benzene	µg/L	1	1		950			<1	
Toluene	µg/L	2	800					213	
Ethylbenzene	µg/L	2	300					<2	
Xylene (o)	µg/L	2			350			<2	
Xylene (m & p)	µg/L	2						<2	
Xylene Total	µg/L	2	600					<2	
Acidity & Alkalinity									
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1	<1
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1	<1
Alkalinity (total as CaCO3)	mg/L	1						1,220	4,400
Bicarbonate Alkalinity as CaCO3	mg/L	1						1,220	4,400
Major Ions									
Calcium (filtered)	mg/L	1		1000				117	106
Chloride	mg/L	1						1,070	2,370
Magnesium (filtered)	mg/L	1						52	44
Anions Total	meq/L	0.01						54.6	155
Potassium (filtered)	mg/L	1						496	2,030
Sodium (filtered)	mg/L	1						468	1,520
Cations Total	meq/L	0.01						43.2	127
Sulfate (filtered)	mg/L	1	500	1000				<10	<5
Ionic Balance	%	0.01						11.7	9.88
Nutrients									
Phosphorous filterable reactive (P)	µg/L	10							141,000
Ammonia as N	mg/L	0.01			0.9			12.1	458
Kjeldahl Nitrogen Total	mg/L	0.1						208	553
Nitrate (as N)	mg/L	0.01		90	7.2			0.58	0.02
Nitrite (as N)	mg/L	0.01		9.1				0.12	<0.01
Nitrogen (Total)	mg/L	0.1				5	25	209	553
Phosphorus (Total)	mg/L	0.01				0.05		93.9	243
Phosphorus (Total) (filtered)	mg/L	0.01				0.05		66.5	
Phosphorus (Reactive)	µg/L	10						58,300	141,000

Table 6
Historical Leachate Monitoring Results

							Date	Sep-13	Sep-13	Nov-13	Mar-14
							Sample ID	Pone 1	Pond 2	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Inorganics											
BOD	mg/L	2						588	1,240	140	74
COD	mg/L	10						1,930	2,860	788	938
Oil and Grease	mg/L	5						11	<5	<5	9
Sulphide	mg/L	0.1						6	5	3.2	<0.1
Total Dissolved Solids	mg/L	10						4,170	4,870	3,290	4,920
Total Suspended Solids	mg/L	5						205	482	189	194
Metals											
Aluminium	mg/L	0.01		5	0.055	5	20	0.59	1.23	0.33	0.26
Arsenic	mg/L	0.001	0.01	0.5	0.013	0.1	2	0.021	0.025	0.014	0.022
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2				
Cadmium	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	0.0008	0.0006	0.0002	<0.0001
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05				
Chromium (III+VI)	mg/L	0.001		1	0.001	0.1	1	0.06	0.081	0.062	0.066
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1				
Copper	mg/L	0.001	2	0.5	0.0014	0.2	5	2.59	0.023	0.558	0.786
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5				
Iron	mg/L	0.05				0.2	10	7.53	10.9	2.84	2.09
Iron (filtered)	mg/L	0.05				0.2	10				
Lead	mg/L	0.001	0.01	0.1	0.0034	2	5	0.016	0.016	0.036	0.011
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5				
Manganese	mg/L	0.001	0.5		1.9	0.2	10	0.945	0.726	0.22	0.088
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10				
Mercury	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002				
Nickel	mg/L	0.001	0.02	1	0.011	0.2	2	0.064	0.066	0.044	0.075
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2				
Selenium	mg/L	0.01	0.01	0.02	0.011	0.02	0.05	<0.01	<0.01	<0.01	<0.01
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05				
Zinc	mg/L	0.005		20	0.008	2	5	1.37	0.864	0.977	1.31
Zinc (filtered)	mg/L	0.005		20	0.008	2	5				
NA											
Filtered Total Phosphorus as P (filtered)	mg/L	0.01									
Nitrite + Nitrate as N (Sol.)	mg/L	0.01						<0.01	<0.01	0.02	<0.01
Surfactants											
Anionic Surfactants as MBAS	µg/L	100						100	300	200	400
TRH - NEPM 2013											
C6-C10 minus BTEX (F1)	µg/L	20						460	420	<20	<20
C6-C10 Fraction	µg/L	20						490	420	<20	<20
>C10-C16 minus Naphthalene (F2)	µg/L	100						15,800	8,090	<100	350
>C10-C16 Fraction	µg/L	100						15,800	8,090	<100	350
>C16-C34 Fraction (F3)	µg/L	100						1,400	1,470	<100	1,200
>C34-C40 Fraction (F4)	µg/L	100						<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100						17,200	9,560	<100	1,550
TRH - NEPM 1999											
C6-C9 Fraction	µg/L	20						530	450	<20	<20
C10-C14 Fraction	µg/L	50						19,100	9,200	<50	220
C15-C28 Fraction	µg/L	100						1,980	1,870	<100	1,080
C29-C36 Fraction	µg/L	50						60	100	<50	180
C10-C36 (Sum of Total)	µg/L	50						21,100	11,200	<50	1,480
BTEX											
Benzene	µg/L	1	1		950			<1	<1	<1	<1
Toluene	µg/L	2	800					12	2	4	<2

Table 6
Historical Leachate Monitoring Results

							Date	Sep-13	Sep-13	Nov-13	Mar-14
							Sample ID	Pone 1	Pond 2	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Ethylbenzene	µg/L	2	300					5	<2	<2	<2
Xylene (o)	µg/L	2			350			2	<2	<2	<2
Xylene (m & p)	µg/L	2						6	<2	<2	<2
Xylene Total	µg/L	2	600					8	<2	<2	<2
OP Pesticides											
Azinphos methyl	µg/L	0.5	30		0.02			<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L	0.5						1.2	1.2	1.1	<0.5
Chlorpyrifos	µg/L	0.5	10		0.01			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.5						<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.5	4		0.01			<0.5	<0.5	<0.5	<0.5
Dichlorvos	µg/L	0.5	5					<0.5	<0.5	<0.5	<0.5
Dimethoate	µg/L	0.5	7		0.15			<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.5	4					<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L	0.5	7					<0.5	<0.5	<0.5	<0.5
Malathion	µg/L	0.5	70		0.05			<0.5	<0.5	<0.5	<0.5
Methyl parathion	µg/L	2	0.7					<2	<2	<2	<2
Monocrotophos	µg/L	2	2					<2	<2	<2	<2
Parathion	µg/L	2	20		0.004			<2	<2	<2	<2
Phenols											
2,4,5-T	µg/L	10	100		36			<10	<10	<10	<10
2,4,5-TP (Silvex)	µg/L	10	10					<10	<10	<10	<10
2,4,5-trichlorophenol	µg/L	1						<5	<5	<1	<1
2,4,6-trichlorophenol	µg/L	1	20		20			<5	<5	<1	<1
2,4-DB	µg/L	10						<10	<10	<10	<10
2,4-dichlorophenol	µg/L	1	200		160			<5	<5	<1	<1
2,4-dimethylphenol	µg/L	1						<5	<5	<1	<1
2,4-DP	µg/L	10	100					<10	<10	<10	<10
2,6-D	µg/L	10									
2,6-dichlorophenol	µg/L	1						<5	<5	<1	<1
2-chlorophenol	µg/L	1	300		490			<5	<5	<1	<1
2-methylphenol	µg/L	1						<9	<8	<1	<1
2-nitrophenol	µg/L	1						<5	<5	<1	<1
3-&4-methylphenol	µg/L	2						655	707	132	<2
4-chloro-3-methylphenol	µg/L	1						<5	<5	8.2	<1
MCPA	µg/L	10	40					11	26	<10	<10
MCPB	µg/L	10						<10	<10	<10	<10
Pentachlorophenol	µg/L	2	10		10			<10	<10	<2	<2
Phenol	µg/L	1			320			82.5	121	1.7	<1
VOCs											
Acetone	µg/L	50						590	1,270	<50	<50
Formaldehyde	µg/L	100	500					1,800	2,000	700	600
Major Ions											
Fluoride	mg/L	0.1	1.5	2		1	2				
Calcium	mg/L	1		1000				169	194	80	50
Calcium (filtered)	mg/L	1		1000							
Chloride	mg/L	1						1,270	1,360	1,210	2,200
Magnesium	mg/L	1						54	63	46	68
Magnesium (filtered)	mg/L	1									
Anions Total	meq/L	0.01									
Potassium (filtered)	mg/L	1									
Sodium	mg/L	1						791	854	724	1,190
Sodium (filtered)	mg/L	1									
Cations Total	meq/L	0.01									
Sulfate (filtered)	mg/L	1	500	1000							
Ionic Balance	%	0.01									
Nutrients											

Table 6
Historical Leachate Monitoring Results

							Date	Sep-13	Sep-13	Nov-13	Mar-14
							Sample ID	Pone 1	Pond 2	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Nitrogen (Total Oxidised) (as N)	mg/L	0.01									
Phosphorous filterable reactive (P)	µg/L	10									
Ammonia as N	mg/L	0.01			0.9			216	306	141	52.7
Kjeldahl Nitrogen Total	mg/L	0.1						417	399	231	99.9
Nitrate (as N)	mg/L	0.01		90	7.2			<0.01	<0.01	0.02	<0.01
Nitrite (as N)	mg/L	0.01		9.1				<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1				5	25	417	399	231	99.9
Phosphorus (Total)	mg/L	0.01				0.05		3.42	4.04	4.14	2.94
Phosphorus (Total) (filtered)	mg/L	0.01				0.05					
Phosphorus (Reactive)	µg/L	10									
Sulphate as S (filtered)	mg/L	1		333				<1	<1	<1	37
Sulphite as SO3-	µg/L	2,000						52,000	10,000	10,000	<2,000

Table 6
Historical Leachate Monitoring Results

							Date	Jun-14	Sep-14	Jun-15	Jun-16
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Inorganics											
BOD	mg/L	2							217	2	56
COD	mg/L	10						1,260	2,020	1,490	1,370
Oil and Grease	mg/L	5						<5	<5	12	<5
Sulphide	mg/L	0.1						0.4	12.8	1	28.5
Total Dissolved Solids	mg/L	10							6,070	5,660	2,790
Total Suspended Solids	mg/L	5							76	104	44
Metals											
Aluminium	mg/L	0.01		5	0.055	5	20	0.4	1.19	3.47	0.67
Arsenic	mg/L	0.001	0.01	0.5	0.013	0.1	2	0.02	0.062	0.047	0.036
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2				
Cadmium	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	0.0002	0.0003	0.0003	0.0006
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05				
Chromium (III+VI)	mg/L	0.001		1	0.001	0.1	1	0.11	0.244	0.334	0.131
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1				
Copper	mg/L	0.001	2	0.5	0.0014	0.2	5	0.915	0.866	1.01	0.664
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5				
Iron	mg/L	0.05				0.2	10	4.76	4.89	6.01	4.40
Iron (filtered)	mg/L	0.05				0.2	10				
Lead	mg/L	0.001	0.01	0.1	0.0034	2	5	0.014	0.014	0.014	0.028
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5				
Manganese	mg/L	0.001	0.5		1.9	0.2	10	0.343	0.516	0.311	0.583
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10				
Mercury	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002	<0.001	<0.0001	<0.0001	<0.0001
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002				
Nickel	mg/L	0.001	0.02	1	0.011	0.2	2	0.067	0.093	0.1	0.048
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2				
Selenium	mg/L	0.01	0.01	0.02	0.011	0.02	0.05	<0.01	<0.01	<0.01	<0.01
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05				
Zinc	mg/L	0.005		20	0.008	2	5	1.18	0.456	0.839	2.34
Zinc (filtered)	mg/L	0.005		20	0.008	2	5				
NA											
Filtered Total Phosphorus as P (filtered)	mg/L	0.01									
Nitrite + Nitrate as N (Sol.)	mg/L	0.01						0.2	0.27	0.63	
Surfactants											
Anionic Surfactants as MBAS	µg/L	100						200	300	100	500
TRH - NEPM 2013											
C6-C10 minus BTEX (F1)	µg/L	20						120	50	<20	20
C6-C10 Fraction	µg/L	20						190	70	<20	50
>C10-C16 minus Naphthalene (F2)	µg/L	100						1,620	2,390	530	1,010
>C10-C16 Fraction	µg/L	100						1,620	2,390	530	1,010
>C16-C34 Fraction (F3)	µg/L	100						1,300	2,700	850	910
>C34-C40 Fraction (F4)	µg/L	100						<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100						2,920	5,090	1,380	1,920
TRH - NEPM 1999											
C6-C9 Fraction	µg/L	20						200	110	<20	50
C10-C14 Fraction	µg/L	50						1,280	1,880	380	890
C15-C28 Fraction	µg/L	100						1,630	2,920	950	1,080
C29-C36 Fraction	µg/L	50						<50	260	<50	70
C10-C36 (Sum of Total)	µg/L	50						2,910	5,060	1,330	2,040
BTEX											
Benzene	µg/L	1	1		950			2	<1	<1	<1
Toluene	µg/L	2	800					28	6	<2	9

Table 6
Historical Leachate Monitoring Results

							Date	Jun-14	Sep-14	Jun-15	Jun-16
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Ethylbenzene	µg/L	2	300					9	2	<2	3
Xylene (o)	µg/L	2			350			10	5	<2	4
Xylene (m & p)	µg/L	2						22	10	<2	9
Xylene Total	µg/L	2	600					32	15	<2	13
OP Pesticides											
Azinphos methyl	µg/L	0.5	30		0.02			<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	µg/L	0.5						0.8	14.8	3.5	<0.5
Chlorpyrifos	µg/L	0.5	10		0.01			<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.5						<0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	0.5	4		0.01			<0.5	<0.5	<0.5	<0.5
Dichlorvos	µg/L	0.5	5					<0.5	<0.5	<0.5	<0.5
Dimethoate	µg/L	0.5	7		0.15			<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.5	4					<0.5	<0.5	<0.5	<0.5
Fenthion	µg/L	0.5	7					<0.5	<0.5	<0.5	<0.5
Malathion	µg/L	0.5	70		0.05			<0.5	<0.5	<0.5	<0.5
Methyl parathion	µg/L	2	0.7					<2	<2	<2	<2.0
Monocrotophos	µg/L	2	2					<2	<2	<2	<2.0
Parathion	µg/L	2	20		0.004			<2	<2	<2	<2.0
Phenols											
2,4,5-T	µg/L	10	100		36			<10	<10	<20	<10
2,4,5-TP (Silvex)	µg/L	10	10					<10	<10	<20	<10
2,4,5-trichlorophenol	µg/L	1						<10	<1	<1	<1.0
2,4,6-trichlorophenol	µg/L	1	20		20			<10	<1	<1	<1.0
2,4-DB	µg/L	10						<10	<10	<20	<10
2,4-dichlorophenol	µg/L	1	200		160			<10	<1	<1	<1.0
2,4-dimethylphenol	µg/L	1						<10	1.5	<1	<1.0
2,4-DP	µg/L	10	100					<10	<10	<20	<10
2,6-D	µg/L	10									<10
2,6-dichlorophenol	µg/L	1						<10	<1	<1	<1.0
2-chlorophenol	µg/L	1	300		490			<10	<1	<1	<1.0
2-methylphenol	µg/L	1						<10	15.7	<1	<1.0
2-nitrophenol	µg/L	1						<10	<1	<1	<1.0
3-&4-methylphenol	µg/L	2						311	11.4	<2	222
4-chloro-3-methylphenol	µg/L	1						<10	<1	<1	<1.0
MCPA	µg/L	10	40					<10	<10	<20	<10
MCPB	µg/L	10						<10	<10	<20	<10
Pentachlorophenol	µg/L	2	10		10			<20	<2	<2	<2.0
Phenol	µg/L	1			320			100	14.6	<1	93.7
VOCs											
Acetone	µg/L	50						560	290	<100	440
Formaldehyde	µg/L	100	500						900	2,600	1,300
Major Ions											
Fluoride	mg/L	0.1	1.5	2		1	2				
Calcium	mg/L	1		1000				103	122	72	146
Calcium (filtered)	mg/L	1		1000							
Chloride	mg/L	1							2,510	1,800	733
Magnesium	mg/L	1						63	59	33	36
Magnesium (filtered)	mg/L	1									
Anions Total	meq/L	0.01									
Potassium (filtered)	mg/L	1									
Sodium	mg/L	1						1,220	1,520	1,090	525
Sodium (filtered)	mg/L	1									
Cations Total	meq/L	0.01									
Sulfate (filtered)	mg/L	1	500	1000							138
Ionic Balance	%	0.01									
Nutrients											

Table 6
Historical Leachate Monitoring Results

							Date	Jun-14	Sep-14	Jun-15	Jun-16
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Nitrogen (Total Oxidised) (as N)	mg/L	0.01									0.05
Phosphorous filterable reactive (P)	µg/L	10									
Ammonia as N	mg/L	0.01			0.9			236	683	451	193
Kjeldahl Nitrogen Total	mg/L	0.1						247	753	521	328
Nitrate (as N)	mg/L	0.01		90	7.2				0.27	0.63	0.05
Nitrite (as N)	mg/L	0.01		9.1					<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1				5	25	247	753	522	328
Phosphorus (Total)	mg/L	0.01				0.05		3.7	9.48	9.55	2.35
Phosphorus (Total) (filtered)	mg/L	0.01				0.05					
Phosphorus (Reactive)	µg/L	10									
Sulphate as S (filtered)	mg/L	1		333					<1	22	
Sulphite as SO3-	µg/L	2,000						4,000	29,000	4,000	6,000

Table 6
Historical Leachate Monitoring Results

							Date	Sep-16	Jan-17	May-17	Jun-17
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Inorganics											
BOD	mg/L	2						125	203	32	1,410
COD	mg/L	10						1,380	2,130	2,050	
Oil and Grease	mg/L	5						12	19	<5	
Sulphide	mg/L	0.1						7.2	8.2	<0.1	
Total Dissolved Solids	mg/L	10									
Total Suspended Solids	mg/L	5						462	70	40	321
Metals											
Aluminium	mg/L	0.01		5	0.055	5	20	0.61	0.54	0.90	
Arsenic	mg/L	0.001	0.01	0.5	0.013	0.1	2	0.036	0.036	0.104	
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2				0.032
Cadmium	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	0.0003	0.0002	0.0002	
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05				<0.0001
Chromium (III+VI)	mg/L	0.001		1	0.001	0.1	1	0.143	0.155	0.352	
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1				0.010
Copper	mg/L	0.001	2	0.5	0.0014	0.2	5	0.141	0.191	0.609	
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5				<0.001
Iron	mg/L	0.05				0.2	10	3.59	3.83	8.85	
Iron (filtered)	mg/L	0.05				0.2	10				
Lead	mg/L	0.001	0.01	0.1	0.0034	2	5	0.011	0.012	0.025	
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5				<0.001
Manganese	mg/L	0.001	0.5		1.9	0.2	10	0.456	0.354	0.347	
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10				
Mercury	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002	<0.0001	<0.0001	<0.0001	
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002				<0.0001
Nickel	mg/L	0.001	0.02	1	0.011	0.2	2	0.051	0.050	0.122	
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2				0.017
Selenium	mg/L	0.01	0.01	0.02	0.011	0.02	0.05	<0.01	<0.01	<0.01	
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05				
Zinc	mg/L	0.005		20	0.008	2	5	0.237	0.161	0.545	
Zinc (filtered)	mg/L	0.005		20	0.008	2	5				<0.005
NA											
Filtered Total Phosphorus as P (filtered)	mg/L	0.01									
Nitrite + Nitrate as N (Sol.)	mg/L	0.01						<0.01			<0.01
Surfactants											
Anionic Surfactants as MBAS	µg/L	100							600	700	
TRH - NEPM 2013											
C6-C10 minus BTEX (F1)	µg/L	20						<20	<20	<20	
C6-C10 Fraction	µg/L	20						<20	<20	<20	
>C10-C16 minus Naphthalene (F2)	µg/L	100						400	550	570	
>C10-C16 Fraction	µg/L	100						400	550	570	
>C16-C34 Fraction (F3)	µg/L	100						680	680	810	
>C34-C40 Fraction (F4)	µg/L	100						<100	<100	<100	
>C10-C40 (Sum of Total)	µg/L	100						1,080	1,230	1,380	
TRH - NEPM 1999											
C6-C9 Fraction	µg/L	20						<20	<20	<20	
C10-C14 Fraction	µg/L	50						270	420	390	
C15-C28 Fraction	µg/L	100						740	810	1,000	
C29-C36 Fraction	µg/L	50						100	60	<50	
C10-C36 (Sum of Total)	µg/L	50						1,110	1,290	1,390	
BTEX											
Benzene	µg/L	1	1		950			<1	<1	<1	
Toluene	µg/L	2	800					<2	4	<2	

Table 6
Historical Leachate Monitoring Results

							Date	Sep-16	Jan-17	May-17	Jun-17
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Ethylbenzene	µg/L	2	300					<2	<2	<2	
Xylene (o)	µg/L	2			350			<2	<2	<2	
Xylene (m & p)	µg/L	2						<2	<2	<2	
Xylene Total	µg/L	2	600					<2	<2	<2	
OP Pesticides											
Azinphos methyl	µg/L	0.5	30		0.02			<0.5	<0.5	<0.5	
Chlorfenvinphos	µg/L	0.5						<0.5	<0.5	<0.5	
Chlorpyrifos	µg/L	0.5	10		0.01			<0.5	<0.5	<0.5	
Chlorpyrifos-methyl	µg/L	0.5						<0.5	<0.5	<0.5	
Diazinon	µg/L	0.5	4		0.01			<0.5	<0.5	<0.5	
Dichlorvos	µg/L	0.5	5					<0.5	<0.5	<0.5	
Dimethoate	µg/L	0.5	7		0.15			<0.5	<0.5	<0.5	
Ethion	µg/L	0.5	4					<0.5	<0.5	<0.5	
Fenthion	µg/L	0.5	7					<0.5	<0.5	<0.5	
Malathion	µg/L	0.5	70		0.05			<0.5	<0.5	<0.5	
Methyl parathion	µg/L	2	0.7					<2.0	<2.0	<2.0	
Monocrotophos	µg/L	2	2					<2.0	<2.0	<2.0	
Parathion	µg/L	2	20		0.004			<2.0	<2.0	<2.0	
Phenols											
2,4,5-T	µg/L	10	100		36			<10	<10	<10	
2,4,5-TP (Silvex)	µg/L	10	10					<10	<10	<10	
2,4,5-trichlorophenol	µg/L	1						<1.0	<1.0	<1.0	
2,4,6-trichlorophenol	µg/L	1	20		20			<1.0	<1.0	<1.0	
2,4-DB	µg/L	10						<10	<10	<10	
2,4-dichlorophenol	µg/L	1	200		160			<1.0	<1.0	<1.0	
2,4-dimethylphenol	µg/L	1						<1.0	<1.0	<1.0	
2,4-DP	µg/L	10	100					<10	<10	<10	
2,6-D	µg/L	10						<10	<10	<10	
2,6-dichlorophenol	µg/L	1						<1.0	<1.0	<1.0	
2-chlorophenol	µg/L	1	300		490			<1.0	<1.0	<1.0	
2-methylphenol	µg/L	1						2.5	<1.0	<1.0	
2-nitrophenol	µg/L	1						<1.0	<1.0	<1.0	
3-&4-methylphenol	µg/L	2						<2.0	134	<2.0	
4-chloro-3-methylphenol	µg/L	1						<1.0	<1.0	<1.0	
MCPA	µg/L	10	40					<10	<10	<10	
MCPB	µg/L	10						<10	<10	<10	
Pentachlorophenol	µg/L	2	10		10			<2.0	<2.0	<2.0	
Phenol	µg/L	1			320			2.6	<1.0	<1.0	
VOCs											
Acetone	µg/L	50						240	<50	<50	
Formaldehyde	µg/L	100	500					600	900	1,100	
Major Ions											
Fluoride	mg/L	0.1	1.5	2		1	2				
Calcium	mg/L	1		1000				118	103		
Calcium (filtered)	mg/L	1		1000						96	63
Chloride	mg/L	1						909	1,130	1,910	944
Magnesium	mg/L	1						34	36		
Magnesium (filtered)	mg/L	1								49	34
Anions Total	meq/L	0.01								106	64.6
Potassium (filtered)	mg/L	1								602	645
Sodium	mg/L	1						596	717		
Sodium (filtered)	mg/L	1								1,360	648
Cations Total	meq/L	0.01								110	50.6
Sulfate (filtered)	mg/L	1	500	1000				9	81	25	<5
Ionic Balance	%	0.01								1.55	12.1
Nutrients											

Table 6
Historical Leachate Monitoring Results

							Date	Sep-16	Jan-17	May-17	Jun-17
							Sample ID	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Landfill leachate (quarterly)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term				
Nitrogen (Total Oxidised) (as N)	mg/L	0.01						<0.01	0.18	2.63	
Phosphorous filterable reactive (P)	µg/L	10									
Ammonia as N	mg/L	0.01			0.9			250	177	372	218
Kjeldahl Nitrogen Total	mg/L	0.1						403	248	465	302
Nitrate (as N)	mg/L	0.01		90	7.2			<0.01	0.18	<0.10	<0.01
Nitrite (as N)	mg/L	0.01		9.1				<0.01	<0.01	2.57	<0.01
Nitrogen (Total)	mg/L	0.1				5	25	403	248	468	302
Phosphorus (Total)	mg/L	0.01				0.05		4.42	4.43	5.89	97.2
Phosphorus (Total) (filtered)	mg/L	0.01				0.05					
Phosphorus (Reactive)	µg/L	10									74,200
Sulphate as S (filtered)	mg/L	1		333							
Sulphite as SO3-	µg/L	2,000						<2,000	<2,000	<2,000	

Table 6
Historical Leachate Monitoring Results

							Date	Aug-17	Sep-17	Mar-18
							Sample ID	Quarterly leachate samples	Leachate (compost)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term			
Inorganics										
BOD	mg/L	2						92	1,750	2,500
COD	mg/L	10						1,190		
Oil and Grease	mg/L	5						<5		
Sulphide	mg/L	0.1						0.5		
Total Dissolved Solids	mg/L	10								
Total Suspended Solids	mg/L	5						80	526	1,250
Metals										
Aluminium	mg/L	0.01		5	0.055	5	20	1.16		
Arsenic	mg/L	0.001	0.01	0.5	0.013	0.1	2	0.064		
Arsenic (filtered)	mg/L	0.001	0.01	0.5	0.013	0.1	2			
Cadmium	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05	0.0003		
Cadmium (filtered)	mg/L	0.0001	0.002	0.01	0.0002	0.01	0.05		<0.0001	<0.0001
Chromium (III+VI)	mg/L	0.001		1	0.001	0.1	1	0.219		
Chromium (III+VI) (filtered)	mg/L	0.001		1	0.001	0.1	1		0.008	0.012
Copper	mg/L	0.001	2	0.5	0.0014	0.2	5	0.072		
Copper (filtered)	mg/L	0.001	2	0.5	0.0014	0.2	5		0.001	0.008
Iron	mg/L	0.05				0.2	10	4.41		
Iron (filtered)	mg/L	0.05				0.2	10			1.07
Lead	mg/L	0.001	0.01	0.1	0.0034	2	5	0.030		
Lead (filtered)	mg/L	0.001	0.01	0.1	0.0034	2	5		<0.001	0.001
Manganese	mg/L	0.001	0.5		1.9	0.2	10	0.326		
Manganese (filtered)	mg/L	0.001	0.5		1.9	0.2	10		0.738	0.167
Mercury	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002	<0.0001		
Mercury (filtered)	mg/L	0.0001	0.001	0.002	0.0006	0.002	0.002			
Nickel	mg/L	0.001	0.02	1	0.011	0.2	2	0.055		
Nickel (filtered)	mg/L	0.001	0.02	1	0.011	0.2	2		0.019	0.048
Selenium	mg/L	0.01	0.01	0.02	0.011	0.02	0.05	<0.01		
Selenium (filtered)	mg/L	0.01	0.01	0.02	0.011	0.02	0.05			
Zinc	mg/L	0.005		20	0.008	2	5	0.573		
Zinc (filtered)	mg/L	0.005		20	0.008	2	5		0.005	0.040
NA										
Filtered Total Phosphorus as P (filtered)	mg/L	0.01								
Nitrite + Nitrate as N (Sol.)	mg/L	0.01							0.70	0.02
Surfactants										
Anionic Surfactants as MBAS	µg/L	100						800		
TRH - NEPM 2013										
C6-C10 minus BTEX (F1)	µg/L	20						<20	300	
C6-C10 Fraction	µg/L	20						20	510	
>C10-C16 minus Naphthalene (F2)	µg/L	100						940	2,410	
>C10-C16 Fraction	µg/L	100						940	2,410	7,030
>C16-C34 Fraction (F3)	µg/L	100						2,240	2,990	4,180
>C34-C40 Fraction (F4)	µg/L	100						300	370	360
>C10-C40 (Sum of Total)	µg/L	100						3,480	5,770	11,600
TRH - NEPM 1999										
C6-C9 Fraction	µg/L	20						40	550	
C10-C14 Fraction	µg/L	50						900	2,170	5,730
C15-C28 Fraction	µg/L	100						2,180	3,050	4,960
C29-C36 Fraction	µg/L	50						490	350	940
C10-C36 (Sum of Total)	µg/L	50						3,570	5,570	11,600
BTEX										
Benzene	µg/L	1	1		950			<1	<1	
Toluene	µg/L	2	800					<2	213	

Table 6
Historical Leachate Monitoring Results

							Date	Aug-17	Sep-17	Mar-18
							Sample ID	Quarterly leachate samples	Leachate (compost)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term			
Ethylbenzene	µg/L	2	300					<2	<2	
Xylene (o)	µg/L	2			350			<2	<2	
Xylene (m & p)	µg/L	2						2	<2	
Xylene Total	µg/L	2	600					2	<2	
OP Pesticides										
Azinphos methyl	µg/L	0.5	30		0.02			<1.3		
Chlorfenvinphos	µg/L	0.5						<1.3		
Chlorpyrifos	µg/L	0.5	10		0.01			<1.3		
Chlorpyrifos-methyl	µg/L	0.5						<1.3		
Diazinon	µg/L	0.5	4		0.01			<1.3		
Dichlorvos	µg/L	0.5	5					<1.3		
Dimethoate	µg/L	0.5	7		0.15			<1.3		
Ethion	µg/L	0.5	4					<1.3		
Fenthion	µg/L	0.5	7					<1.3		
Malathion	µg/L	0.5	70		0.05			<1.3		
Methyl parathion	µg/L	2	0.7					<2.0		
Monocrotophos	µg/L	2	2					<2.0		
Parathion	µg/L	2	20		0.004			<2.0		
Phenols										
2,4,5-T	µg/L	10	100		36			<10		
2,4,5-TP (Silvex)	µg/L	10	10					<10		
2,4,5-trichlorophenol	µg/L	1						<1.3		
2,4,6-trichlorophenol	µg/L	1	20		20			<1.3		
2,4-DB	µg/L	10						<10		
2,4-dichlorophenol	µg/L	1	200		160			<1.3		
2,4-dimethylphenol	µg/L	1						<1.3		
2,4-DP	µg/L	10	100					<10		
2,6-D	µg/L	10						<10		
2,6-dichlorophenol	µg/L	1						<1.3		
2-chlorophenol	µg/L	1	300		490			<1.3		
2-methylphenol	µg/L	1						9.2		
2-nitrophenol	µg/L	1						<1.3		
3-&4-methylphenol	µg/L	2						4.5		
4-chloro-3-methylphenol	µg/L	1						<1.3		
MCPA	µg/L	10	40					<10		
MCPB	µg/L	10						<10		
Pentachlorophenol	µg/L	2	10		10			<2.6		
Phenol	µg/L	1			320			5.0		
VOCs										
Acetone	µg/L	50						80		
Formaldehyde	µg/L	100	500					800		
Major Ions										
Fluoride	mg/L	0.1	1.5	2		1	2			
Calcium	mg/L	1		1000						
Calcium (filtered)	mg/L	1		1000				40	117	106
Chloride	mg/L	1						1,160	1,070	2,370
Magnesium	mg/L	1								
Magnesium (filtered)	mg/L	1						21	52	44
Anions Total	meq/L	0.01						76.9	54.6	155
Potassium (filtered)	mg/L	1						322	496	2,030
Sodium	mg/L	1								
Sodium (filtered)	mg/L	1						734	468	1,520
Cations Total	meq/L	0.01						75.5	43.2	127
Sulfate (filtered)	mg/L	1	500	1000				10	<10	<5
Ionic Balance	%	0.01						0.91	11.7	9.88
Nutrients										

Prepared by Stuart Hughes 23/05/2018

Table 6
Historical Leachate Monitoring Results

							Date	Aug-17	Sep-17	Mar-18
							Sample ID	Quarterly leachate samples	Leachate (compost)	Leachate (compost)
	Unit	EQL	ADWG 2015 Health	ANZECC 2000 - Stock Watering	ANZECC 2000 FW 95%	ANZECC 2000 Irrigation - Long-term	ANZECC 2000 Irrigation - Short-term			
Nitrogen (Total Oxidised) (as N)	mg/L	0.01						0.02		
Phosphorous filterable reactive (P)	µg/L	10								141,000
Ammonia as N	mg/L	0.01			0.9			443	12.1	458
Kjeldahl Nitrogen Total	mg/L	0.1						461	208	553
Nitrate (as N)	mg/L	0.01		90	7.2			<0.01	0.58	0.02
Nitrite (as N)	mg/L	0.01		9.1				0.02	0.12	<0.01
Nitrogen (Total)	mg/L	0.1				5	25	461	209	553
Phosphorus (Total)	mg/L	0.01				0.05		4.69	93.9	243
Phosphorus (Total) (filtered)	mg/L	0.01				0.05			66.5	
Phosphorus (Reactive)	µg/L	10							58,300	141,000
Sulphate as S (filtered)	mg/L	1		333						
Sulphite as SO3-	µg/L	2,000						<2,000		

Appendix D – Field Sheets

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: Surface waters

Job Information

Client: Dulverton Land fill
Project: December 2017
Proj. No.: 3218559
Sampler: Sam King

Sampling Information

Sample Method: surface
WQ Meter Type: YSI
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: .... m
Date: 13/12/17
Ref.datum: ....
Bore Depth: .... m
Screen From: ....m
Logic Check: ....
Time: ....
Stick Up: .... m
Bore Diam.: .... m
To: .... m

Time (..........)	~~Volume (L)~~	Temp (°C)	pH (pH units)	Elec.Cond (US/cm)	Dis.Oxygen (....%....)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
12:05	S9	20.3	7.77	491.2	7.22	65.6			Clear, no odour. No flow.
1305	S4	17.7	7.95	224.5	6.91mg/L	37.2	QC site.		clear, no odour.
1345	S6	20.3	8.07	503	7.42mg/L	61.6			clear, no odour. No flow.
1425	SP3	26.6	8.58	514	8.87mg/L	40.9			light brown, no odour/sediment.
	S3								→ DRY
	S7								→ DRY - see photos
	S10								→ DRY - see photos
	S2								→ Could not find - probably dry.
	S1								→ Could not find.

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

See COC.
Many sites dry or no flow.

Conditions:
Clear ☒
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☒
Strong (> 15 km/h) ☐

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: Surface water

Job Information

Client: Dulverton
Project: March 2018 Monitoring
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Grub sample
WQ Meter Type: YSI
Flow Cell: Y / [✓ N]
Pump Depth: — m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: — m
Logic Check:
Date: 20.3 – 21.3
Time:
Ref.datum: —
Stick Up: — m
Bore Depth: — m
Bore Diam.: — m
Screen From: m To: m

Time (..........)	~~Volume~~ Time (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
S4	10:00 | 20.3	13.1	8.30	377.3	9.09	88.7			Low, minor turbidity/cloudiness, no flow/sheen.
S6	1055 | 20.3	13.1	7.82	375.7	9.95	87.1			Flowing, minor turbidity " "
SP3	1145 | 20.3	17.7	7.19	439	5.31↓	64.7			Light brown, turbid
S2	1200 | 20.3	13.2	7.85	370.2	9.87	113.6			Fairly clear. Minor turbidity.
S1	12:10 | 20.3	13.3	7.87	357.1	9.90	114.3			Clear, clean, no turb./sheen/odour.
S3'		—	—	—	—	—			Dry.
S9	1325/21.3	13.4	6.31	366.1	9.81↓	159.7			Minor turbidity/cloudiness, no flow/sheen

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

B2 – Dulverton Monitoring 2018

3218559

method : YSI / waterra / flow cell / Interface probe.

Purging & Sampling

10:30 AM
21/03/2018
100mm Bore
Stick up : 2.3 m ?
SWL : 8.765
TO : 22.23

clear.
windy.
no rainfall.

Time	Volume	Temp.	pH	EC	DO	ORP (+/-)	Comment / observations.
10:41	0.5	14.2	7.21	2469	4.10	42.1	clear, no turb. & odour?
10:45	3.0	14.0	6.98	1116	9.32	-107.9	Dark grey, low turb. odour.
10:48	5.0	14.0	6.92	2283	2.84	-106.5	– " " , low turb – clear.
10:52	7.0	14.9	6.87	2571	2.67	-102.1	– – – "
10:55	9.0	13.8	6.83	2588	2.24	-102.5	– " " " "
10:58	11.0	13.6	6.82	2596	2.07	-102.7	– " ..
11:01	15.0	13.7	6.79	2593	1.68	-102.6	odour more present
11:05	20.0	13.4	6.75	2480	0.16	-101.7	No change
11:08	25.0	13.4	6.73	2500	0.11	-104.8	
11:10	30.0	13.4	6.72	2520	0.09	-107.8	

QC1 | QAC1

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: B4

Job Information

Client: Dulverton
Project: March 2018 Water Monitoring
Proj. No.: 3218559
Sampler: SH / SK

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell [✓ Y] / N
Pump Depth: – m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check:

Bore Information

SWL: 7.263 m
Logic Check: – ??
Date: 21/3/2018
Time: 0930
Ref.datum:
Stick Up: 1.65 m
Bore Depth: 20.2 m
Bore Diam.: 0.05 m
Screen From: ...... m **To:** ...... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..MS..)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
0936	0.5	13.9	7.89	640	3.14	152.5			Grey / green, turbid.
0944	3	14.8	7.06	1966	0.15	-73.3			
0945	5	13.9	6.95	1930	–	-93.5			
0946	10	13.9	6.84	1780	0.11	-100.8			Some odour.
0949	14	13.9	6.73	1618	0.28	-104.0			
0951	19	13.9	6.63	1751	0.33	-101.2			
0954	24	13.9	6.61	1702	0.56	-103.0			
0956	28	13.9	6.59	1711	0.4	-103.4			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☒
Overcast ☐
Rainfall:
~~low~~ ☐
~~moderate~~ ☐
~~high~~ ☐ nil

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☒
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: B6

Job Information

Client: Dulverton WM
Project: Groundwater Sampling
Proj. No.: 3218559
Sampler: Sam K

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI Pro Plus
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: 2.245 m
Logic Check: ....
Date: 20/3/18
Time: 1000
Ref.datum: ....
Stick Up: 0.63 m
Bore Depth: 6.81 m
Bore Diam.: .... m
Screen From: ....m **To:**........... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS.......)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
1010	4	13.2	7.68	347	0.07	-146.2			Fairly clear
10 12	10	13.2	7.19	347	0.39	-135.1			" " No odour
1014	13	13.2	7.07	347	0.63	-130.3			No change
10 16	18	13.2	6.95	344	2.49	-113.2			" "
10 18	22	13.2	6.90	345	5.68	-113.1			" "
10 21	26	13.2	6.87	345	5.69	-106.7			" "

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

* Sig. diff to last GME?

Bore ID: B7 (in bush down gradient f/ Landfill).

Job Information

Client: Pulverton
Project: March 2018 GW/SW Monitoring
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: watera
WQ Meter Type: YSI
Flow Cell [✓ Y] / N
Pump Depth: – m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check:

Bore Information

SWL: 3.820 m
Date: 20.3.18
Ref.datum: *
Bore Depth: 21.18 m
Screen From: m To: m
Logic Check:
Time: 2:30
Stick Up: 0.825 m
Bore Diam.: 0.05 m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
2:45	0.5	13.7	5.28	398.7	1.44	-89.3		–	Clear w/ minor turbidity, odour.
2:48	5.0	13.4	6.44	398.2	0.23	-112.3		–	Brown / grey turbid, odour -
2:50	10.0	13.3	6.54	397.3	0.51	-114.3		–	grey, turbid (less turbid). odour.
2:52	15.0	13.3	6.60	396.6	0.62	-100.1		–	" " " " " ".
2:55	20.0	12.9	6.65	391.7	0.09	-69.4		–	" " " " " "
2:57	25.0	12.9	6.67	391.7	–	-62.8			
3:00	30.0	12.9	6.68	391.8	–	-58.9			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
- Fire burned through area since last GME.

Conditions:
Clear ☒
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐ na

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☒
Strong (> 15 km/h) ☐

B21 A 20/3
15:40
SWL: 24.911m
Depth: 25.25m

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: B8

Job Information

Client: Dulverton WM
Project: GW Sampling
Proj. No.: 3219559
Sampler: Sam K

Sampling Information

Sample Method: Waterra footvalve
WQ Meter Type:
Flow Cell: Y / N
Pump Depth: m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check:

Bore Information

SWL: 11.912 m
Logic Check:
Date: 21/3/18
Time: 1440
Ref.datum:
Stick Up: m
Bore Depth: 19.45 m
Bore Diam.: m
Screen From: m **To:** m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
1446	0.5	15.4	7.67	46.3	4.67	-106.2			Fairly clear, slight odour
1450	3	14.2	7.32	519	0.28	-30.7			orange/brown, increased turbidity
1455	5	14.4	7.19	522	1.17	-10.9			No change, slightly clearer.
1459	10	14.5	7.13	518	1.95	-33.0			" "
1510	15	14.6	7.06	521	1.83	-27.9			" " " "
1515	20	14.1	7.15	520	2.01	+1.4			" " " "
1517	25	14.1	7.04	520	1.70	+24.9			" "
1519	30	13.8	6.99	503	0.24	+38.4			"

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☒
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☒
Strong (> 15 km/h) ☐

Dulverton
March 2018
Monitoring

YSI / waterral
No flow cell.

1:30 pm /21.03.2018

B9

SWL: 30 + m ??

TD: ____ ? 50 + m

STICK UP: 0.7 m

Time	VOL	TEMP	pH	EC	DO	Oxy Red
1350	2	14.6	8.23	314.6	5.20 ↓	55.2
1353	5	14.0	8.01	304.4	4.51 ↓	61.4
1355	10	13.5	7.86	281.3	4.05	67.7
1400	15	13.4	7.77	304.7	3.83	72.6
1405	20	13.0	7.73	333.9	3.86	77.4
1409	25	13.0	7.68	333.9	3.87	80.4
1411	30	13.0	7.65	333.9	3.~~8~~76 ↓	83.0

Light brown, slight turbidity

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: B11

f/ –up track B3, n/ to leachate pond fence.

Job Information

Client: Dulverton
Project: March 2018 Monitoring
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: waterra
WQ Meter Type: YSI
Flow Cell: [✓ Y] / N **Pump Depth:** ....m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 6.673 m **Logic Check:** ....
Date: 20/3/2018 **Time:** 2:45
Ref.datum: .... **Stick Up:** 0.6 m
Bore Depth: 8.58 m **Bore Diam.:** 0.05 m
Screen From:...... ....m **To:**........... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
1:50	0.5	13.0	5.80	356.9	0.16	315.0			– Brown/orange, turbid, odour.
1:53	1.5	12.7	5.63	224.6	0.37	178.1			– " " " " no change.
1:55	2.5	12.6	5.39	250.1	3.81	159.2			– beginning to purge dry.
1:58	3.5	12.7	5.23	249.0	2.15	159.7			– no sig. change; still
2:03	5.0	12.6	5.10	260.9	2.53	159.7			purging dry.
2:06	6.0	12.8	5.05	270.9	3.63*	159.2			– no change.
2:07	→	TU	BING	TOO	SHORT		7.695		– purging dry *bubbles in
									tubing.
21/3 0845	–						6.671		See
0850	0.5	11.7	6.33	309.8	4.97	87.2			comments
0852	1.5	12.1	5.42	399.4	1.63	114.5			– Brown/orange, turbid, odour.
0854	3.0	12.4	5.11	340.7	1.25	127.3			– " " " "
0857	5.0	12.4	4.60	264.5	2.82	237.4			– no change, not purging dry ??
0859	7.0	12.4	4.30	259.4	3.06	328.0			– " " " "
0902	10.0	12.2	4.40	312.5	3.07	283.8	8.24 mbTOC @ 9:05 AM		– purged dry.

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

waterra tubing too short?
replaced tubing on 21/3

Conditions:
Clear ☒
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐
n/a

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☒
Strong (> 15 km/h) ☐

labelled B3

Purging and Sampling Record

Bore ID: ~~B14~~ SWL 5.214

Job Information

Client: Dulverton WM
Project: GW Sampling
Proj. No.: 3218559
Sampler: Sam K

Sampling Information

Sample Method: Waterra footvalve
WQ Meter Type: YSI Pro
Flow Cell: Y / N **Pump Depth:** ....m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 5.347 m **Logic Check:** ....
Date: 20/3 **Time:** 1340
Ref.datum: .... **Stick Up:** 0.7 m
Bore Depth: 10.53 m **Bore Diam.:** 0.05 m
Screen From: ....m **To:**........... m

B12 Borelogs
TD = 10.5 mbgl.

Time (...........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.µS.....)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL change (m)	(...........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
1345	3	14.8	6.64	126.4	1.92	107.9			Cloudy, orange brown,
1347	6	15.3	6.08	126.2	2.16	110.4			high sediment, no odour
1350	10	14.8	5.88	125.4	3.69	112.8			no change
1357	12	15.3	6.57	121.9	3.70	115.1			DRY
1515							6.705		Re-measured
21/3									
0845	3	14.2	8.26	130.5	4.64	111.5			Cloudy, orange, high sediment
0847	6	14.4	7.35	125.9	5.23	174.9			
0849	9	14.3	6.86	127.9	5.41	190.3			
0851	11	14.3	6.64	128.6	5.57	194.3	8.800		DRY - Re-measured

21/3 8:40am
5.346 SWL prior to purging

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

near S6. ←

(labelled)

Bore ID: B12 ~~[illegible]~~

B14
=
Bore logs

B14 TD: 4.5 mbgl.

Job Information	*Sampling Information*	*Bore Information*
Client: Diverton	**Sample Method:** Waterra	**SWL:** 1.725 m **Logic Check:**
Project: March 2018 Monitoring	**WQ Meter Type:** YSI	**Date:** 20.3 **Time:** 10:45
	Flow Cell: Y / N **Pump Depth:** ……m	**Ref.datum:** **Stick Up:** 0.78 m
Proj. No.: 3218559	**WLevel Meter Type:** Dip / Fox / [✓ Int.Fce] / Gge	**Bore Depth:** 4.85 m **Bore Diam.:** 0.05 m
Sampler: SH	**NAPL Check:**	**Screen From:** ……m **To:** ……m

watch 2 mins — Slow.

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
10:52	0.5	14.1	6.88	456.3	1.26	-75.9		-	Brown, turbid, odour (landfill),
10:54	3.0	14.1	6.80	566.0	0.08	-66.9			no sheen.
10:56	6.0	14.5	6.82	586.0	0.29	-52.9		-	As above, no change.
10:57	9.0	14.4	6.84	574.0	0.66	-53.6		-	" " " "
11:00	12.0	14.5	6.84	582.0	0.75	-50.4		-	no sig. change.
11:03	15.0	14.4	6.86	572.0	1.01	-47.3		-	" " " "
11:05	20.0	14.5	6.85	588.0	0.65	-51.0		-	" " " "
11:06	25.0	14.5	6.86	583.0	0.68	-51.7		-	" "

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☒
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☒
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

Surface water -

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

~~Bore ID:~~ Leachate Pond.

Job Information

Client: Dulverton WM

Project: GW/SW sampling

Proj. No.: 3218559

Sampler: SH/SK

Sampling Information

Sample Method: ....

WQ Meter Type: ....

Flow Cell: Y / N **Pump Depth:**.............m

WLevel Meter Type: Dip / Fox / Int.Fce / Gge

NAPL Check: ....

Bore Information

SWL: .... m **Logic Check:** ....

Date: 20/3 **Time:** ....

Ref.datum: .... **Stick Up:** .... m

Bore Depth: .... m **Bore Diam.:** .... m

Screen From:...... ....m **To:**............ m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
1600		18.9	6.54	1527	0.45	-196			Black, turbid, some odour.

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:

Clear ☐

Overcast ☐

Rainfall:

low ☐

moderate ☐

high ☐

Wind:

Nill (0 km/h) ☐

Low (1 - 5 km/h) ☐

Moderate (5 - 15 km/h) ☐

Strong (> 15 km/h) ☐

Purging and Sampling Record

Bore ID: SURFACE WATER

Job Information

Client: Dulverton Landfill
Project: Sept. GME - Surface + Groundwater
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: GRAB
WQ Meter Type: YSI
Flow Cell: Y [✓ N] ~~Pump Depth:............m~~
~~WLevel Meter Type: Dip / Fox / Int.Fce / Gge~~
~~NAPL Check:~~ ....

Bore Information

SWL: .... m **Logic Check:** ....
Date: .... **Time:** ....
Ref.datum: .... **Stick Up:** .... m
Bore Depth: .... m **Bore Diam.:** .... m
Screen From:...... ....m **To:**........... m

~~Time~~ (Date)	~~Volume~~ (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
9/11/2017	S4	11.3	7.74	368.8	10.12	+42.2			Mod - high flow, minor turbidity
"	S6	11.4	8.01	373.5	10.26	+22.1			- " "
"	S2	11.9	7.75	362.1	9.17	+46.4			- "
"	S3	9.7	7.31	487.9	6.13	+18.6			- Brown, turbid, low flow
"	S1	11.0	8.02	349.0	10.08	+38.5			- clear, lots of algae
12/9	S7	9.5	6.95	355.7	0.93	-13.0			- Brown, turbid, barely flowing
"	S10						DQ-1		
"	S9	12.9	7.11	374.7	9.08	59.6			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

~~SAMPLED 12/9 @ 0800~~

GHD

Purging and Sampling Record

Bore ID: B2

Job Information	*Sampling Information*	*Bore Information*
Client: Dulverton	**Sample Method:** waterra	**SWL:** 5.444 m **Logic Check:**
Project: 6-monthly GME	**WQ Meter Type:** YSI	**Date:** 12/9/17 **Time:** 940
	Flow Cell: Y [✓ N] **Pump Depth:** ....m	**Ref.datum:** **Stick Up:** m
Proj. No.: 3218559	**WLevel Meter Type:** Dip / Fox / [✓ Int.Fce] / Gge	**Bore Depth:** m **Bore Diam.:** 0.01 m
Sampler: SH	**NAPL Check:**	**Screen From:** ....m **To:** m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
0950	3	12.9	6.87	2646	1.00	-35.7		>	Black, turbid, strong odour,
0952	6	13.0	6.81	2689	0.30	-42.2			Sheen.
0955	9	13.0	6.79	2701	0.12	-46.8		>	As above; no change.
0958	13	13.1	6.77	2664	0.16	-55.6		>	" " " "
1002	18	13.1	6.77	2617	0.17	-54.8			- some flocculation?
1004	22	13.1	6.77	2534	0.32	-55.9		>	" "
								>	"
									"

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

QC1 / QQC1

*Down overgrown track from B11/N. B3"

Purging and Sampling Record

Bore ID: B3

Job Information

Client: Dulverton Landfill

Project: 6-monthly GME

Proj. No.: 3218559

Sampler: SH

Sampling Information

Sample Method: Waterra

WQ Meter Type: YSI

Flow Cell: Y [✓ N]

Pump Depth: – m

WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge

NAPL Check: ....

Bore Information

SWL: 4.648 m

Logic Check: ....

Date: 11/9/2017

Time: 2:10

Ref.datum: ....

Stick Up: .... m

Bore Depth: 17.5 m

Bore Diam.: 0.01 m

Screen From: .... m **To:** .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
2:15	3	12.7	6.53	277.5	1.35	34.5		-	Brown, turbid, no odour / sheen.
2:19	6	12.7	6.40	290.5	0.24	28.3		-	as above.
2:21	9	12.8	6.36	295.7	0.09	26.2		-	" "
2:26	13	12.8	6.40	330.8	0.12	18.9		-	" "
2:29	18	12.9	6.40	331.5	0.09	17.0		-	" "
2:33	22	12.9	6.42	330.8	0.44	13.8		-	"
2:35	27	12.9	6.41	337.0	0.24	12.4		-	"

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: BH

Job Information

Client: Dulverton
Project: 6-monthly GME
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell: Y / [✓ N]
Pump Depth: — m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 5.633 m
Logic Check: ....
Date: 12/9/2017
Time: 0840
Ref.datum: ....
Stick Up: .... m
Bore Depth: .... m
Bore Diam.: 0.01 m
Screen From: .... m To: .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
0847	3	12.7	6.89	668	2.33	-5.9			- Grey / brown, turbid, sediment.
0853	6	13.0	6.77	753	1.36	-13.8			- as above, no sheen / odour.
0855	9	13.1	6.73	795	0.84	-18.8			- Sheen; no odour
0858	13	13.4	6.77	700	0.54	-24.3			- as above; sheen gone??
900	18	13.4	6.76	676	0.32	-21.2			- no sig. change, sheen absent?
0905	22	13.4	6.78	660	0.51	-21.5			- " " " " "

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

well difficult / dangerous to sample; & needs fixing?

MANAGEMENT
ENGINEERING
ENVIRONMENT

Purging and Sampling Record

Bore ID: B7

Job Information

Client: Bulverton Landfill
Project: 6 monthly GME (Surface + Groundwater)
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell: ~~Y~~ / [✓ N]
Pump Depth: — m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check:

Bore Information

SWL: 2.063 m
Logic Check:
Date: 11/9/2017
Time: 12:30
Ref.datum:
Stick Up: m
Bore Depth: m
Bore Diam.: 0.01 m
Screen From: m **To:** m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		+/- 0.2 C	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV			
12:35	4	11.7	6.85	387.2	1.31	-34.2		-	Brown, turbid, no sheen/odour.
12:39	9	11.9	6.89	389.4	0.55	-32.5		-	" " " "
12:41	13	12.2	6.91	391.4	0.62	-6.9		-	"
12:45	18	12.2	6.89	392.0	0.36	-0.5		-	"
12:48	22	12.2	6.91	391.0	0.65	6.2		-	"
12:50	27	12.2	6.89	391.8	0.35	8.6		-	as above; no sig.
12:53	31	12.2	6.91	391.7	0.51	12.2			change.
								-	no change

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☒
Rainfall:
low ☐
moderate ☒
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☒
Strong (> 15 km/h) ☐

Purging and Sampling Record

Bore ID: B6

Job Information

Client: Dulverton Landfill
Project: 6-monthly GME Sept '17 - Surface + GW
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: waterra
WQ Meter Type: YSI
Flow Cell: [✓ Y] / N **Pump Depth:** - m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 1.655 m **Logic Check:** ....
Date: 11/9/2017 **Time:** 0930
Ref.datum: .... **Stick Up:** 0.63 m
Bore Depth: 6.5 m **Bore Diam.:** 0.1 m
Screen From: .... m **To:** .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
0934	4	10.2	6.60	330.0	1.91	-7.1		-	Orange ~~precipitate~~ staining on tubing.
0939	9	10.4	6.44	325.6	0.99	-10.9			black sediment, no sheen / odour.
0941	13	10.6	6.44	326.6	0.85	-12.5		-	turbid, green/black/brown.
0945	18	10.7	6.42	329.0	0.56	-12.1			no other change.
0949	22	10.8	6.44	333.4	0.73	-13.3		-	" "
0955	27	10.8	6.43	333.8	0.58	-13.5		-	" "
				SAMPLED					

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: B8

Job Information	*Sampling Information*	*Bore Information*
Client: Dulverton	**Sample Method:** Waterra	**SWL:** 8.036 m **Logic Check:**
Project: 6-monthly GME	**WQ Meter Type:** YSI	**Date:** 12/9/2017 **Time:** 1115
	Flow Cell: Y / N **Pump Depth:** ...m	**Ref.datum:** **Stick Up:** ... m
Proj. No.: 3218559	**WLevel Meter Type:** Dip / Fox / Int.Fce / Gge	**Bore Depth:** ... m **Bore Diam.:** ... m
Sampler: SH	**NAPL Check:**	**Screen From:** ... m **To:** ... m

Time (...........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (...........)	Dis.Oxygen (...........)	Ox-Red Pt. (± mV)	SWL change (m)	(...........)	Comment: Colour, turbidity, sediment load, sheen, odour
1135	4	13.4	6.80	456.4	2.36	28.7			→ Brown, turbid, odour.
1138	9	13.4	6.66	461.2	2.97	25.6			→ as above, no sig. change
1141	13	13.5	6.65	467.5	3.25	27.3			→ " "
1144	18	13.5	6.63	469.3	1.84	26.4			→ "
1146	22	13.5	6.66	476.5	3.53	27.4			→ "
1149	27	13.5	6.65	478.6	4.99	29.0			→ "

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

B9 Dulverton 13/9

SWL: 26.751 Waterra | YSI ok.

TD : 30+ m

V	C°	pH	EC	DO	ORP	COMMENT
Leachat	12.4°	6.45	3632	0.51	-9.6	
B9						
4	12.6	7.33	170.9	0.91	+122.3	
8	12.5	7.17	165.3	7.03	+114.8	
13	12.5	7.21	199.5	5.75	+91.3	
17	12.5	7.38	221.2	4.04	+91.3	
22	12.5	7.40	222.4	3.74	+64.7	
26	12.4	7.43	220.5	3.84	+96.5	
27	12.4	7.43	220.4	3.74	+99.7	

[redacted]

Purging and Sampling Record

Bore ID: B311

Job Information

Client: Dulverton Landfill
Project: 6-monthly GME + surface water (Sept '17)
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell: Y [✓ N]
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 3.173 m
Logic Check: ....
Date: 11/9/17
Time: 1:30
Ref.datum: ....
Stick Up: .... m
Bore Depth: 8.59 m
Bore Diam.: 0.01 m
Screen From:...... ....m **To:**........... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
1:32	3	11.8	3.59	446.1	0.54	127.6		>	Orange / Brown, turbid, no sheen /
1:35	6	11.8	3.55	455.1	0.48	155.8			odour.
1:37	9	11.8	3.55	461.5	0.69	166.6		>	as above; no change (no odour??)
1:40	12	11.9	3.52	492.2	1.42	161.6		>	" " " "
1:43	15	12.0	3.50	514.0	1.51	162.7		>	" "
1:46	18	12.0	3.53	521.0	1.78	165.4		>	" "
1:49	21	12.2	3.86	383.6	2.40	144.4	7.1	>	Purging dry
1:52	23	12.2	3.66	378.4	3.70	117.7			
								>	Purging dry.

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

SAMPLED @ 0800 | 12/9

*near S6 location.

Purging and Sampling Record

Bore ID: B12

Job Information

Client: Dulverton
Project: 6 monthly GME - Sept '17 (Surface + GW)
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell: Y / [✓ N]
Pump Depth: — m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check: ....

Bore Information

SWL: 0.744 m
Logic Check: ....
Date: 11/9/'17
Time: 1030
Ref.datum: ....
Stick Up: .... m
Bore Depth: 14.87 m
Bore Diam.: 0.01 m
Screen From: ....m **To:** .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
1034	4	9.1	7.29	425.8	1.68	+25.2			- Brown, turbid, no sheen / odour -
1036	6	9.0	7.11	427.0	1.20	+27.3			- " "
1039	9	8.9	7.05	420.1	0.96	+27.9			- " "
1041	13	8.7	7.03	417.8	0.86	+26.1			- " "
1044	18	8.7	6.99	419.5	0.68	+24.1			- " "
1047	21	8.8	6.98	420.3	0.59	+23.2			- " -
				SAMPLED					

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

SWL has come right up to surface?

Purging and Sampling Record

1.7 m bgl (previously?

Bore ID: B14

Job Information

Client: Dulverton Landfill
Project: 6 monthly CAME (Surface + Groundwater)
Proj. No.: 3218559
Sampler: SH

Sampling Information

Sample Method: Waterra
WQ Meter Type: YSI
Flow Cell: Y [✓ N]
Pump Depth: – m
WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge
NAPL Check:

Bore Information

SWL: 3.599 m
Logic Check:
Date: 11/9/2017
Time: 1100
Ref.datum:
Stick Up: m
Bore Depth: 10.57 m
Bore Diam.: 0.01 m
Screen From: m **To:** m

Time (...........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (mS.....)	Dis.Oxygen (ppm.....)	Ox-Red Pt. (± mV)	SWL change (m)	(...........)	Comment: Colour, turbidity, sediment load, sheen, odour
1124	3	13.3	6.19	136.3	1.90	+53.9			– Brown, turbid, no sheen / odour.
1128	6	13.4	5.32	130.4	1.82*	+70.4			– as above,
1131	9	13.4	5.21	128.4	1.78*	+67.2			– as above – DO variable?
1134	12	13.5	5.11	123.4	2.51	+62.4			– "
1140	15	13.6	5.08	123.0	2.72	+58.1			– "
1144	17	13.7	5.08	121.0	3.02	+56.0			– purging dry.
1201	20	13.5	5.21	117.7	3.28	+50.7	8.443		~~– well recharging okay?~~
1207	21	13.6	5.25	117.1	4.43	+48.7			– purging dry again

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

SWL – dropped ?? 2 m

DO variable (1.2 – 3.4)

Purging and Sampling Record

Bore ID: B15

Job Information	Sampling Information	Bore Information
Client: Dulverton	**Sample Method:** Waterra	**SWL:** 8.836 m **Logic Check:**
Project: 6-monthly GME	**WQ Meter Type:** YSI	**Date:** 12/9/2017 **Time:** 1:30
	Flow Cell: Y / [✓ N] **Pump Depth:** — m	**Ref.datum:** **Stick Up:** m
Proj. No.: 3218559	**WLevel Meter Type:** Dip / Fox / [✓ Int.Fce] / Gge	**Bore Depth:** m **Bore Diam.:** m
Sampler: SH	**NAPL Check:**	**Screen From:** m **To:** m

Time (........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
1:29	3	14.9	5.45	93.9	4.05	62.8			
1:31	6	15.0	5.02	92.2	4.03	83.1			
1.34	9	14.9	4.93	90.8	3.84	92.8			
1:37	12	15.0	4.86	88.1	7.34	106.6			→ Purging Dry
1:39	13	15.0	4.84	87.6	8.60	106.5			→ " "

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: B16

Job Information

Client: Dulverton Landfill

Project: 6-monthly GME

Proj. No.: 3218559

Sampler: SH

Sampling Information

Sample Method: Waterra

WQ Meter Type: YSI

Flow Cell: Y [✓ N] Pump Depth: – m

WLevel Meter Type: Dip / Fox / [✓ Int.Fce] / Gge

NAPL Check:

Bore Information

SWL: 9.347 m Logic Check:

Date: 12/9/2017 Time: 12:30

Ref.datum: Stick Up: m

Bore Depth: m Bore Diam.: m

Screen From: m To: m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
12:42	3	13.9	7.10	478.5	7.48 (?)	43.6			> Brown, turbid, no odour / sheen.
12:45	6	14.0	7.04	485.4	7.04	39.9			> as above.
12:48	9	14.0	7.03	485.9	7.68	37.4			> " " High DO?
12:50	13	14.0	7.04	481.9	7.99	38.4			> "
12:53	18	14.0	7.02	477.2	8.66	42.4			> "
12:55	22	14.0	7.04	469.5	8.01	41.1			> "
12:58	27	14.0	7.02	467.7	8.00	35.1			> "

SAMPLED

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

B17 Dulverton Landfill SWL: 7.958

13/9/2017

T	V	pH	EC	DO	ORP	°C	Comment
0837	4	7.03	487.3	1.77	65.0	13.2	Brown, turbid, odour.
0838	6	6.89	501	1.10	56.2	13.2	" " " "
0841	9	6.86	506	0.95	56.3	13.2	" " " "
0843	13	6.86	507	0.56	54.3	13.4	" " " "
0845	18	6.84	505	6 52	52 3	13 4	" "

SAMPLED

Multi Parameter Water Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 10H100324

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0 ppm		1612235007	0 ppm
2. Conductivity		2760uS		312321	2760uS
3. pH7		pH 7.00		307926	pH 7.00
4. pH4		pH 4.00		307927	pH 4.00
5. ORP mV		227.18		305536/ 305538	227.18
7. Temp °C		23.1		Hanna- 163377	23.1

Calibrated by: Steven Sagayaraj

Calibration date: 15-Mar-18

Next calibration due: 11-Sep-18

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 10E101053

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0 ppm		1612235007	0 ppm
2. Conductivity		2760uS		312321	2760uS
3. pH7		pH 7.00		307926	pH 7.00
4. pH4		pH 4.00		307927	pH 4.00
5. ORP mV		228.28		305536/ 305538	228.28
7. Temp °C		22.6		Hanna- 163377	22.6

Calibrated by: Steven Sagayaraj

Calibration date: 15-Mar-18

Next calibration due: 11-Sep-18

Oil / Water Interface Meter

Instrument **Interface Meter (30M)**
Serial No. **288151**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
	above 7.9V	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Tested by: **Steven Sagayaraj**

Test date: **15/03/2018**

Next Test due: **11/09/2018**

Purging and Sampling Record

Bore ID: S1

Job Information

Client: DWM
Project: Pulverator
Proj. No.: 3218157
Sampler: CJP

Sampling Information

Sample Method: Grab
WQ Meter Type: FMV90
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: .... m
Date: 14/6/17
Ref.datum:
Bore Depth: .... m
Screen From: ....m To: .... m
Logic Check:
Time:
Stick Up: .... m
Bore Diam.: .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (uS.....)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
	1	10.7	8.29	464	13.06	75			clear good flow

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: S2

Job Information

Client: DWM
Project: Dulverton
Proj. No.: 32 18151
Sampler: CJP

Sampling Information

Sample Method: Grab
WQ Meter Type: TWMV 90
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: .... m
Logic Check:
Date: 14/6/17
Time:
Ref.datum:
Stick Up: .... m
Bore Depth: .... m
Bore Diam.: .... m
Screen From:...... ....m To:.......... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
		11.0	8.07	487	15.54	81			clear running water - low
									flow Canlino creek

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: 53

Job Information

Client: DWM

Project: Dulverton

Proj. No.: 321815I

Sampler: CJP

Sampling Information

Sample Method: Grab

WQ Meter Type: TPMV90

Flow Cell: Y / N

Pump Depth: ....m

WLevel Meter Type: Dip / Fox / Int.Fce / Gge

NAPL Check: ....

Bore Information

SWL: .... m

Logic Check: ....

Date: 14/6/17

Time: ....

Ref.datum: ....

Stick Up: .... m

Bore Depth: .... m

Bore Diam.: .... m

Screen From: ....m To: .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (uS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
		9.7	8.06	625	8.26	111			flowing wate ~7.5l/s
									clear. below culvert ~10m
									pooling around culvert

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: S4

Job Information

Client: DMM

Project: ....

....

Proj. No.: 3218151

Sampler: ....

Sampling Information

Sample Method: grab

WQ Meter Type: ....

Flow Cell: Y / N

Pump Depth: ....m

WLevel Meter Type: Dip / Fox / Int.Fce / Gge

NAPL Check: ....

Bore Information

SWL: .... m

Date: 14/6/17

Ref.datum: ....

Bore Depth: .... m

Screen From: ....m **To:**.......... m

Logic Check: ....

Time: ....

Stick Up: .... m

Bore Diam.: .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
		11.2	8.34	495	9.19	69			clear running water

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

Purging and Sampling Record

Bore ID: 56

Job Information

Client: DWM
Project: Dulverton
....
Proj. No.: 3218151
Sampler: ....

Sampling Information

Sample Method: grab
WQ Meter Type: ....
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: .... m
Logic Check: ....
Date: ....
Time: ....
Ref.datum: ....
Stick Up: .... m
Bore Depth: .... m
Bore Diam.: .... m
Screen From:...... ....m To:........... m

Time (...........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (uS.......)	Dis.Oxygen (..ppm.....)	Ox-Red Pt. (± mV)	SWL change (m)	(...........)	Comment: Colour, turbidity, sediment load, sheen, odour
		11.1	8.26	501	12.22	55			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: S7

Job Information

Client: DMM
Project: Dulverton
Proj. No.: 321815
Sampler: CJP

Sampling Information

Sample Method: grab
WQ Meter Type: FIM90
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: .... m
Date: 14/6/17
Ref.datum: ....
Bore Depth: .... m
Screen From: ....m To: .... m
Logic Check: ....
Time: ....
Stick Up: .... m
Bore Diam.: .... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (μS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
		10.5	7.92	1892	2.22	150			slight sheen on surface dark
									cloudy. No flow'.
									Taken from outlet point of
									stormwater pond

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: S9

Job Information

Client: DWM
Project: Dulverton
Proj. No.: 3218157
Sampler: CJP

Sampling Information

Sample Method: Grab
WQ Meter Type: FUMV90
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: [✓ Dip] / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: .... m
Logic Check: ....
Date: 14/06/17
Time: ....
Ref.datum: ....
Stick Up: .... m
Bore Depth: .... m
Bore Diam.: .... m
Screen From:...... ....m **To:**........... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
		11.2	8.33	533	7.93	151			Clear running water

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: Leachate 1

Job Information	*Sampling Information*	*Bore Information*	
Client:	**Sample Method:** grab	**SWL:** .... m	**Logic Check:** ....
Project: 3218157	**WQ Meter Type:**	**Date:** 14/06/17	**Time:** ....
....	**Flow Cell: Y / N** **Pump Depth:**..........m	**Ref.datum:**	**Stick Up:** .... m
Proj. No.:	**WLevel Meter Type:** Dip / Fox / Int.Fce / Gge	**Bore Depth:** .... m	**Bore Diam.:** .... m
Sampler:	**NAPL Check:**	**Screen From:**...... ....m	**To:**.......... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.mS...)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
	0.5	9.2	9.03	9.62	9.05	222			grabbed in green bottle and
									tilted at co? . black clear
									water from top

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: comp-leachate

Job Information

Client: DWM
Project: ……………………………………
……………………………………
Proj. No.: 3218151
Sampler: CJP

Sampling Information

Sample Method: ……………………………
WQ Meter Type: ……………………………
Flow Cell: Y / N **Pump Depth:**…………m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ……………………………

Bore Information

SWL: ………… m **Logic Check:** …………
Date: 14/6/17 **Time:** …………
Ref.datum: ………… **Stick Up:** ………… m
Bore Depth: ………… m **Bore Diam.:** ………… m
Screen From:…… ……m **To:**………… m

Time (………)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (mS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(………)	Comment: Colour, turbidity, sediment load, sheen, odour
Stable When:		*+/- 0.2 C*	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*			
		9.4	7.09	6.85	1.07	126			black, little obv. sediment

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Conditions:
Clear ☐
Overcast ☐
Rainfall:
low ☐
moderate ☐
high ☐

Wind:
Nill (0 km/h) ☐
Low (1 - 5 km/h) ☐
Moderate (5 - 15 km/h) ☐
Strong (> 15 km/h) ☐

Purging and Sampling Record

Bore ID: BH15

Job Information

Client: DMM
Project: ~~[illegible]~~ Dulverton
Proj. No.: 3218151
Sampler: CJP

Sampling Information

Sample Method: Waterra
WQ Meter Type: TPMV90
Flow Cell: Y / N
Pump Depth:..........m
WLevel Meter Type: [✓ Dip] / Fox / Int.Fce / Gge
NAPL Check: ....

Bore Information

SWL: 10.31 m
Date: 14/9/17
Ref.datum: TOC
Bore Depth: .... m
Screen From:...... ....m
Logic Check: ....
Time: ....
Stick Up: .... m
Bore Diam.: 50 m
To:.......... m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
	0.75	13	4.81	104	6.67	230			brown/orange cloudy wb.
	1.75	14	4.49	87.6	5.54	225			becoming clearer sediment
	4.00	14.3	4.47	87.6	5.92	209			
	5.00	14.5	4.55	88	5.74	201			little cloudy
	6.00	14.4	4.69	87	5.75	184			
	8.00	14.5	4.70	86	5.67	180	12.775		
	10.	14.5	4.71	85	5.70	175			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Water pooling inside standpipe b/n pvc and standpipe
water pooling on the ground 20 m nearby in a depression

Purging and Sampling Record

Bore ID: B21A

Job Information

Client: DWM
Project: Dulverton

Proj. No.: 3218157
Sampler:

Sampling Information

Sample Method: bailer
WQ Meter Type:
Flow Cell: Y / N
Pump Depth: m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: 24.93 m
Date: 14/6/17
Ref.datum:
Bore Depth: m
Screen From: m To: m
Logic Check:
Time:
Stick Up: m
Bore Diam.: m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (..........)	Dis.Oxygen (..........)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
									Very little water in box
									difficult to collect ion grab sample
									at first. Return next am to
									get nutrients + metals if pos
						15/6/14	25.08		Return next day - very little
									water - try 4 nutrient sample

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purging and Sampling Record

Bore ID: B16

Job Information

Client: DWM
Project: Dulverton
Proj. No.: 3218151
Sampler: SJR

Sampling Information

Sample Method:
WQ Meter Type: TPSMV90
Flow Cell: Y / N
Pump Depth: m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: 10.805 m
Date: 14/6/17
Ref.datum:
Bore Depth: 15.13 m
Screen From: m To: m
Logic Check:
Time:
Stick Up: m
Bore Diam.: 50 m

Time (.........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (uS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(.........)	Comment: Colour, turbidity, sediment load, sheen, odour
	1.0	13.0	8.04	542	7.74	66			Watterra inside - cannot
	3.0	13.5	7.58	549	8.57	55			Lots sediment - brown/orange reach
	5.0	13.6	7.49	547	7.91	47			becoming clearer Install new one?
	7.0	13.7	7.45	544	7.99	43			
	9.0	13.7	7.45	543	7.97	40			
	11:00	13.7	7.45	542	7.70	38			
				Sampled					

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

QA1 | 2

Purging and Sampling Record

Bore ID: B17

Job Information

Client: Dulverton
Project:
Proj. No.:
Sampler:

Sampling Information

Sample Method: Waterra
WQ Meter Type: FHMV90
Flow Cell: Y / N
Pump Depth: ....m
WLevel Meter Type: [✓ Dip] / Fox / Int.Fce / Gge
NAPL Check:

Bore Information

SWL: 9.51 m
Logic Check:
Date: 19/6/17
Time:
Ref.datum: Toc
Stick Up: m
Bore Depth: m
Bore Diam.: m
Screen From: ....m
To: m

Time (..........)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (uS)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL change (m)	(..........)	Comment: Colour, turbidity, sediment load, sheen, odour
	3	13.6	7.29	646	1.39	55			Water inside standpipe - b/n PVC + ~~ste~~ steel casing
	6	13.4	7.27	661	2.57	58			~10 cm below top
	9	13.4	7.26	645	2.75	58			~ 1.5 litre clean water out first -
	11	13.4	7.31	629	3.76	57			then orange cloudy + sediment
	13	13.5	7.28	364	2.45	56			
	14	13.4	7.27	615	1.89	55			
	16	13.4	7.27	616	1.72	55			
				Sampled					

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

3.2 Surface Water Monitoring Network

The main surface water feature near the landfill is Caroline Creek, which flows northwards through the northeastern corner of the site. Caroline Creek joins the Mersey River north of the Landfill. There are 10 sampling sites that sample Caroline Creek, including a background site (S9) and down-gradient sites (Refer to Table 5 below).

The landfill site has numerous stormwater drainage channels, which are also included in the surface water monitoring program. Refer to Figure 1 for location of the surface water sites.

Table 2 Summary of Surface Water Sites

Sample ID	Location and Purpose
✓ S1	Furthest downstream site of Caroline Creek. Provides water quality prior to entering the Mersey River
✓ S2	On Caroline Creek, approximately 500 metres downstream of the landfill
✓ S3 water flowing. where from? someone should follow this up	A small drainage line, which flows after high rainfall events. This monitors off water quality leaving the site to Caroline Creek
✓ S4	Caroline Creek culvert on the road between the railway and Tas Mushrooms. Monitoring down gradient Caroline Creek water quality as it passes adjacent the site
✓ S6	This was the listed as an historical background Caroline Creek site but due to proposed landfill expansion, a new background site has been added (S9).
map location wrong ✓ S7 no flowing water photos	This is a stormwater drainage line from sediment pond 1 at the northern site boundary
S8	This is a stormwater drainage line which monitors water quality of surface water leaving site
✓ S9	The background surface water site monitored at Caroline Creek
S10 no flowing water. drain damp but little water one pool of water at culvert but stagnant	Monitors stormwater coming from the composting site
SP1	No longer monitored. This is the stormwater pond that captures run off from the landfill areas which is then discharged off site
SP2	No longer monitored as SP1 and SP2 were joined together to form one stormwater pond.
✓ LP2	This was the onsite leachate pond which is now monitored by DWM through the site trade waste agreement
✓ CP1*	This is the stormwater/leachate pond for the composting site, this is no longer monitored through the EPN

*previously BS1

a lot of water around site - puddles, water pooling in drains etc but little flowing.

water flowing behind landfill on way to S9. smell nutrient rich

Appendix E – Laboratory Documentation

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EM1717302**
Client : **GHD PTY LTD**
Contact : MS CYNTHIA PALFREYMAN
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 8687 8000
Project : 3218559
Order number : 3218559
C-O-C number : ----
Sampler : SK
Site : Dulverton Surface and Groundwater sampling December 2017
Quote number : EN/005/17
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 4
Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9630
Date Samples Received : 15-Dec-2017 12:00
Date Analysis Commenced : 15-Dec-2017
Issue Date : 28-Dec-2017 13:16

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- Ionic Balance out of acceptable limits for sample #3 and #4 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

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

			Client sample ID	**SP3**	**S4**	**S6**	**S9**	**QC**
			Client sampling date / time	13-Dec-2017 14:25	13-Dec-2017 13:05	13-Dec-2017 13:45	13-Dec-2017 12:05	13-Dec-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1717302-001**	**EM1717302-002**	**EM1717302-003**	**EM1717302-004**	**EM1717302-005**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**7**	<5	<5	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**100**	**68**	**203**	**188**	**68**
Total Alkalinity as CaCO3	----	1	mg/L	**100**	**68**	**203**	**188**	**68**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**36**	**7**	**29**	**32**	**8**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**44**	**35**	**31**	**32**	**33**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**25**	**21**	**75**	**72**	**22**
Magnesium	7439-95-4	1	mg/L	**8**	**3**	**6**	**6**	**3**
Sodium	7440-23-5	1	mg/L	**16**	**14**	**13**	**12**	**13**
Potassium	7440-09-7	1	mg/L	**48**	<1	**1**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0001**	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.004**	<0.001	**0.001**	**0.002**	**0.001**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	**0.016**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.004**	**0.040**	**0.029**	**0.042**	**0.040**
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	<0.001	<0.001	**0.002**
Zinc	7440-66-6	0.005	mg/L	**0.008**	<0.005	**0.006**	**0.024**	<0.005
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.44**	**0.09**	**0.08**	**0.13**	**0.09**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	**0.01**	**0.01**	**0.01**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	**0.17**	**0.72**	**0.68**	**0.17**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.17**	**0.73**	**0.69**	**0.18**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**2.8**	<0.1	**0.5**	**0.2**	<0.1

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**SP3**	**S4**	**S6**	**S9**	**QC**
			Client sampling date / time	13-Dec-2017 14:25	13-Dec-2017 13:05	13-Dec-2017 13:45	13-Dec-2017 12:05	13-Dec-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1717302-001**	**EM1717302-002**	**EM1717302-003**	**EM1717302-004**	**EM1717302-005**
				Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**2.8**	**0.2**	**1.2**	**0.9**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.11**	<0.01	**0.25**	<0.01	**0.03**
EK071FG: Dissolved Reactive Phosphorus as P by DA								
Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**3.99**	**2.49**	**5.53**	**5.32**	**2.46**
Total Cations	----	0.01	meq/L	**3.83**	**1.90**	**4.83**	**4.61**	**1.91**
Ionic Balance	----	0.01	%	**2.04**	**----**	**6.82**	**7.21**	**----**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**10**	**4**	**4**	**3**	<2

QUALITY CONTROL REPORT

Work Order	: **EM1717302**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MS CYNTHIA PALFREYMAN	Contact	: Shirley LeCornu
Address	: 2 SALAMANCA SQUARE HOBART TAS, AUSTRALIA 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 8687 8000	Telephone	: +61-3-8549 9630
Project	: 3218559	Date Samples Received	: 15-Dec-2017
Order number	: 3218559	Date Analysis Commenced	: 15-Dec-2017
C-O-C number	: ----	Issue Date	: 28-Dec-2017
Sampler	: SK		
Site	: Dulverton Surface and Groundwater sampling December 2017		
Quote number	: EN/005/17		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1322670)									
EM1717250-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	66	70	6.26	0% - 50%
EM1717302-001	SP3	EA025H: Suspended Solids (SS)	----	5	mg/L	7	7	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 1322783)									
EM1717335-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	212	214	0.870	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	212	214	0.870	0% - 20%
EM1717307-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	187	189	0.739	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	187	189	0.739	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1326477)									
EM1717343-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	111	1.99	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	111	1.99	0% - 20%
EM1717279-016	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	637	631	0.975	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	637	631	0.975	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1321137)									
EM1717293-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	60	60	0.00	0% - 20%
EM1717302-001	SP3	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	36	36	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 1321140)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED045G: Chloride by Discrete Analyser (QC Lot: 1321140) - continued									
EM1717333-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	207	206	0.618	0% - 20%
EM1717302-001	SP3	ED045G: Chloride	16887-00-6	1	mg/L	44	42	4.92	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1320199)									
EM1717279-016	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	63	64	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	261	264	1.18	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1300	1310	1.22	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	32	32	0.00	0% - 20%
EM1717302-005	QC	ED093F: Calcium	7440-70-2	1	mg/L	22	21	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	13	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1320198)									
EM1717302-003	S6	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.029	0.030	0.00	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	<0.005	0.00	No Limit
EM1717279-012	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1322936)									
EM1717206-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.37	0.35	5.67	0% - 20%
EM1717262-004	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.13	0.12	0.00	0% - 50%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1322938)									
EM1717302-002	S4	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.09	0.09	0.00	No Limit
EM1717338-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.48	0.63	27.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1321138)									
EM1717293-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1717302-001	SP3	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1322937)									
EM1717293-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1717302-002	S4	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.17	0.16	0.00	0% - 50%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1324101)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1324101) - continued									
EM1717302-001	SP3	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.8	3.0	4.76	0% - 20%
EM1717307-004	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.0	1.9	8.87	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1324100)									
EM1717302-001	SP3	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.08	34.1	0% - 50%
EM1717307-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.02	96.8	No Limit
EK071FG: Dissolved Reactive Phosphorus as P by DA (QC Lot: 1321141)									
EM1717302-001	SP3	EK071FG: Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.00	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 1321139)									
EM1717302-001	SP3	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 1325082)									
EM1717268-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	2340	2540	8.19	0% - 20%
EM1717302-004	S9	EP030: Biochemical Oxygen Demand	----	2	mg/L	3	2	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 1325083)									
EM1717302-005	QC	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EM1717317-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	3	6	57.8	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

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

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1322670)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	90	109
				<5	1000 mg/L	98.7	90	109
ED037P: Alkalinity by PC Titrator (QCLot: 1322783)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	100	88	109
ED037P: Alkalinity by PC Titrator (QCLot: 1326477)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	100	88	109
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1321137)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	100 mg/L	94.8	92	115
ED045G: Chloride by Discrete Analyser (QCLot: 1321140)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	110	88	118
				<1	1000 mg/L	94.2	88	118
ED093F: Dissolved Major Cations (QCLot: 1320199)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	104	93	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	95.0	91	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.5	90	109
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.0	89	109
EG020F: Dissolved Metals by ICP-MS (QCLot: 1320198)								
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.9	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	85.7	83	103
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.4	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.7	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	90.8	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	82	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	99.5	85	109
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1322936)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	111	80	115
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1322938)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	112	80	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1321138)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	98.7	94	107
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1322937)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	114	89	114
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1324101)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1324101) - continued								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	99.7	70	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1324100)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	103	70	120
EK071FG: Dissolved Reactive Phosphorus as P by DA (QCLot: 1321141)								
EK071FG: Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	103	80	120
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1321139)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	94	108
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 1325082)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	103	81	115
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 1325083)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	102	81	115

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1321137)							
EM1717293-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	86.9	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 1321140)							
EM1717302-002	S4	ED045G: Chloride	16887-00-6	400 mg/L	101	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1320198)							
EM1717279-012	Anonymous	EG020A-F: Cadmium	7440-43-9	0.05 mg/L	101	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	87.8	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	94.9	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	91.0	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	88.1	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	99.4	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	102	75	131
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1322936)							
EM1717206-002	Anonymous	EK055G: Ammonia as N	7664-41-7	10 mg/L	100	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1322938)							
EM1717302-003	S6	EK055G: Ammonia as N	7664-41-7	1 mg/L	79.0	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1321138)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1321138) - continued							
EM1717293-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	95.6	80	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1322937)							
EM1717293-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	116	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1324101)							
EM1717302-002	S4	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	106	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1324100)							
EM1717302-002	S4	EK067G: Total Phosphorus as P	----	1 mg/L	94.1	70	130
EK071FG: Dissolved Reactive Phosphorus as P by DA (QCLot: 1321141)							
EM1717302-002	S4	EK071FG: Dissolved Reactive Phosphorus as P	----	0.5 mg/L	108	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1321139)							
EM1717302-002	S4	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	108	79	123

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1717302**	Page	: 1 of 8
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MS CYNTHIA PALFREYMAN	Telephone	: +61-3-8549 9630
Project	: 3218559	Date Samples Received	: 15-Dec-2017
Site	: Dulverton Surface and Groundwater sampling December 2017	Issue Date	: 28-Dec-2017
Sampler	: SK	No. of samples received	: 5
Order number	: 3218559	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Control Samples (LCS)					
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

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

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

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

Matrix: **WATER**

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

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	20-Dec-2017	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) SP3	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	27-Dec-2017	✓
Clear Plastic Bottle - Natural (ED037-P) S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**19-Dec-2017**	27-Dec-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	10-Jan-2018	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	10-Jan-2018	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	10-Jan-2018	✓

Matrix: **WATER**

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

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	11-Jun-2018	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	10-Jan-2018	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**15-Dec-2017**	15-Dec-2017	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**18-Dec-2017**	10-Jan-2018	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**19-Dec-2017**	10-Jan-2018	✓	**19-Dec-2017**	10-Jan-2018	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**19-Dec-2017**	10-Jan-2018	✓	**19-Dec-2017**	10-Jan-2018	✓
EK071FG: Dissolved Reactive Phosphorus as P by DA							
Clear Plastic Bottle - Natural (EK071FG) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**15-Dec-2017**	15-Dec-2017	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**15-Dec-2017**	15-Dec-2017	✓

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030) SP3, S4, S6, S9, QC	**13-Dec-2017**	**----**	----	----	**15-Dec-2017**	15-Dec-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type *Analytical Methods*	*Method*	*Count* *QC*	 *Regular*	*Rate (%)* ***Actual***	 ***Expected***	 *Evaluation*	*Quality Control Specification*
Method Blanks (MB) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Reactive Phosphorus as P by DA	EK071FG	WATER	In house: Referenced to APHA 4500-P F Water samples are filtered through a 0.45um filter prior to analysis. Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is achieved by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)

CHAIN OF CUSTODY RECORD

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23 Paterson St Launceston TAS 7250
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FREIGHT

Page 1 of 1

Job Number 3218559
GHD Office Launceston
Project Dulverton Surface and Groundwater sampling September 2017
GHD Project Manager Cynthia Palfreyman
GHD Contact Sam King 0418 530 446 sam.king@ghd.com
Requested Completion Date STT
Purchase Order Number 3218559

Laboratory: ALS Scoresby
Address: 2-4 Westall Road, Springvale VIC 3171
Laboratory Contact: Shirley LeCornu

PLEASE NOTE:
Sign white copy on receipt and release of samples. Samples are to be delivered to the Laboratory address.
On receipt of samples, the laboratory contact should sign the white copy and e-mail to GHD Contact.
On completion of analyses please return white copy with results.
Pink copy is returned to the sampler once the courier has signed for the samples.
Email results to the email address of the relevant GHD Office and cc GHD Project Manager and GHD Contact with the GHD Job Number in the email subject line.
Provide results in ESDAT compatible format.

						Container			**Analyses Required**				
	Sample ID	**Date**	**Time**	**Composite Sample**	**Sample Matrix** **S:** Soil **SL:** Sludge **W:** Water **A:** Air **GW:** Groundwater	**Preservative**	**Type** **J:** soil jar **B:** bag **V:** vial **G:** glass bottle **P:** plastic bottle	**Number of items**	**Volume (mL)**	BOD, TSS, Total P, Dissolved Free P	Metals (dissolved) - Cu, Zn, Cr, Mn, Ni, Pb, Cd	Total N, ammonia, nitrite, nitrate, total P, Orthophosphate	Major Ions (chloride, sulphate, sodium, potassium, magenesium, calcium), Bicarbonate alkalinity, carbonate alkalinity
1	SP3	13/12/2017	~~see label~~ 1425		W		P	6		X	X	X	X
2	S4	13/12/2017	~~see label~~ 1305		W		P	6		X	X	X	X
3	S6	13/12/2017	~~see label~~ 1345		W		P	6		X	X	X	X
4	S9	13/12/2017	~~see label~~ 1205		W		P	6		X	X	X	X
5	QC	13/12/2017	~~see label~~		W		P	6		X	X	X	X

Remarks

Environmental Division
Melbourne
Work Order Reference
EM1717302
Telephone : + 61-3-8549 9600

Sampled by:	Sam King	Date/Time:	13/12/2017	Relinquished by:	Sam King	Date/Time:	14/12/2017
Received by:		Date/Time:		Relinquished by:		Date/Time:	
Received by Courier:		Date/Time:		Relinquished by:		Date/Time:	
Received by Lab:		Date/Time:	15/12 12-00	Relinquished by:		Date/Time:	

Remarks:

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EM1707805**
Client : **GHD PTY LTD**
Contact : MS CYNTHIA PALFREYMAN
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 8687 8000
Project : 3218151
Order number : ----
C-O-C number : ----
Sampler : CF
Site : Dulverton
Quote number : EN/005/16
No. of samples received : 14
No. of samples analysed : 14

Page : 1 of 10
Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9630
Date Samples Received : 16-Jun-2017 11:10
Date Analysis Commenced : 16-Jun-2017
Issue Date : 26-Jun-2017 14:32

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- ED041G and ED045G: Results for EM1707805-009, 013 and 014 have been confirmed by re-preparation and re-analysis.
- EK067G: Total Phosphorus for EM1707808 #14 result has been confirmed by re-preparation and re-analysis.
- EK071G: Results for EM1707805-007 have been confirmed by re-preparation and re-analysis.
- ED041G: Sample EM1707805-012 has been diluted prior to analysis due to sample matrix. LORs have been raised accordingly.
- Samples were filtered through a 0.45um filter prior to the dissolved metals analysis.
- Ionic Balance out of acceptable limits for sample #3, #5 to #8 and #11 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			*Client sample ID*	**BH15**	**BH16**	**BH17**	**BH21A**	**----**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-001**	**EM1707805-002**	**EM1707805-003**	**EM1707805-004**	**--------**
				Result	Result	Result	Result	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**10**	**239**	**287**	**205**	----
Total Alkalinity as CaCO3	----	1	mg/L	**10**	**239**	**287**	**205**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2**	**6**	**17**	**226**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**19**	**22**	**24**	**64**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	**77**	**98**	**143**	----
Magnesium	7439-95-4	1	mg/L	<1	**4**	**4**	**10**	----
Sodium	7440-23-5	1	mg/L	**10**	**24**	**17**	**35**	----
Potassium	7440-09-7	1	mg/L	<1	<1	**2**	**2**	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0002**	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.010**	**0.003**	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	**0.026**	**0.005**	**0.006**	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.04**	**0.04**	**0.02**	**0.04**	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	**0.02**	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.16**	**0.25**	**0.33**	**0.08**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.16**	**0.25**	**0.35**	**0.08**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.7**	**0.4**	**3.4**	**0.3**	----

Analytical Results

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

			Client sample ID	**BH15**	**BH16**	**BH17**	**BH21A**	**----**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-001**	**EM1707805-002**	**EM1707805-003**	**EM1707805-004**	--------
				Result	Result	Result	Result	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.9**	**0.6**	**3.8**	**0.4**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.64**	**4.00**	**2.78**	**0.23**	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**0.78**	**5.52**	**6.76**	**10.6**	----
Total Cations	----	0.01	meq/L	**0.53**	**5.22**	**6.01**	**9.53**	----
Ionic Balance	----	0.01	%	**----**	**2.84**	**5.91**	**5.33**	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**5**	**5**	<2	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	----	----

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			*Client sample ID*	**BH15**	**BH16**	**BH17**	**BH21A**	**----**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-001**	**EM1707805-002**	**EM1707805-003**	**EM1707805-004**	**--------**
				Result	Result	Result	Result	----
EP080: BTEXN - Continued								
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**96.7**	**97.7**	**101**	----	----
Toluene-D8	2037-26-5	2	%	**99.1**	**95.7**	**105**	----	----
4-Bromofluorobenzene	460-00-4	2	%	**93.4**	**91.4**	**98.8**	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)	*Client sample ID*			**S1**	**S2**	**S3**	**S4**	**S6**
	Client sampling date / time			14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-005**	**EM1707805-006**	**EM1707805-007**	**EM1707805-008**	**EM1707805-009**
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**8.11**	**7.98**	**7.25**	**7.78**	**8.14**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**506**	**522**	**678**	**526**	**522**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**185**	**196**	**189**	**193**	**198**
Total Alkalinity as CaCO3	----	1	mg/L	**185**	**196**	**189**	**193**	**198**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**35**	**35**	**45**	**36**	**36**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**22**	**23**	**65**	**22**	**22**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**69**	**69**	**60**	**72**	**77**
Magnesium	7439-95-4	1	mg/L	**5**	**5**	**6**	**5**	**6**
Sodium	7440-23-5	1	mg/L	**14**	**13**	**37**	**13**	**13**
Potassium	7440-09-7	1	mg/L	<1	<1	**18**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.002**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.007**	<0.005	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.03**	**0.04**	**0.02**	**0.02**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**S1**	**S2**	**S3**	**S4**	**S6**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00
Compound	CAS Number	LOR	Unit	**EM1707805-005**	**EM1707805-006**	**EM1707805-007**	**EM1707805-008**	**EM1707805-009**
				Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.01**	**1.06**	**0.16**	**1.11**	**1.13**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.01**	**1.06**	**0.16**	**1.11**	**1.13**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	**0.6**	<0.1	**0.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.0**	**1.1**	**0.8**	**1.1**	**1.4**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	**0.09**	<0.01	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	**0.05**	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**5.04**	**5.29**	**6.55**	**5.23**	**5.33**
Total Cations	----	0.01	meq/L	**4.46**	**4.42**	**5.56**	**4.57**	**4.90**
Ionic Balance	----	0.01	%	**6.12**	**8.99**	**8.17**	**6.70**	**4.15**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**3**	**2**	**2**	**7**	**6**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S7**	**S9**	**Comp-leach**	**QA1**	**QA2**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-010**	**EM1707805-011**	**EM1707805-012**	**EM1707805-013**	**EM1707805-014**
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.39**	**8.11**	**6.99**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**2020**	**536**	**7170**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**266**	<5	**321**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**391**	**200**	**1900**	**246**	**236**
Total Alkalinity as CaCO3	----	1	mg/L	**391**	**200**	**1900**	**246**	**236**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	**36**	<5	**6**	**6**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**398**	**22**	**944**	**22**	**26**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**12**	**75**	**63**	**77**	**76**
Magnesium	7439-95-4	1	mg/L	**7**	**5**	**34**	**3**	**3**
Sodium	7440-23-5	1	mg/L	**185**	**13**	**648**	**24**	**24**
Potassium	7440-09-7	1	mg/L	**118**	<1	**645**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.010**	<0.001	**0.032**	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	**0.004**	<0.001	**0.010**	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.009**	<0.001	**0.017**	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	**0.005**	<0.005	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**11.6**	**0.04**	**218**	**0.02**	**0.04**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S7**	**S9**	**Comp-leach**	**QA1**	**QA2**
			Client sampling date / time	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00	14-Jun-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1707805-010**	**EM1707805-011**	**EM1707805-012**	**EM1707805-013**	**EM1707805-014**
				Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	**1.15**	<0.01	**0.25**	**0.25**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**1.15**	<0.01	**0.25**	**0.25**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**29.0**	**0.5**	**302**	**0.3**	**0.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**29.0**	**1.6**	**302**	**0.6**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**7.09**	<0.01	**97.2**	**4.55**	**1.27**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**5.08**	**0.02**	**74.2**	**0.04**	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**19.0**	**5.37**	**64.6**	**5.66**	**5.57**
Total Cations	----	0.01	meq/L	**12.2**	**4.72**	**50.6**	**5.13**	**5.08**
Ionic Balance	----	0.01	%	**21.7**	**6.41**	**12.1**	**4.89**	**4.60**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**68**	**4**	**1410**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

QUALITY CONTROL REPORT

Work Order : **EM1707805**

Client : **GHD PTY LTD**
Contact : MS CYNTHIA PALFREYMAN
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 8687 8000
Project : 3218151
Order number : ----
C-O-C number : ----
Sampler : CF
Site : Dulverton
Quote number : EN/005/16
No. of samples received : 14
No. of samples analysed : 14

Page : 1 of 10

Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171

Telephone : +61-3-8549 9630
Date Samples Received : 16-Jun-2017
Date Analysis Commenced : 16-Jun-2017
Issue Date : 26-Jun-2017

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 949431)									
EM1707805-005	S1	EA005: pH Value	----	0.01	pH Unit	8.11	8.13	0.246	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 951205)									
EM1707807-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	3600	3630	0.830	0% - 20%
EM1707803-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	16500	16500	0.00	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 950947)									
EM1707784-014	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	160	193	18.5	0% - 20%
EM1707805-009	S6	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 951204)									
EM1707801-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	487	493	1.21	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	487	493	1.21	0% - 20%
EM1707803-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	875	875	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	875	875	0.00	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 951206)									
EM1707807-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	191	192	0.840	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	191	192	0.840	0% - 20%
EM1707811-008	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	90	91	1.16	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 951206) - continued									
EM1707811-008	Anonymous	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	90	91	1.16	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 949001)									
EM1707805-010	S7	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
EM1707805-001	BH15	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 949002)									
EM1707805-009	S6	ED045G: Chloride	16887-00-6	1	mg/L	22	22	0.00	0% - 20%
EM1707805-001	BH15	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 949065)									
EM1707795-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	42	42	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	133	132	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	484	481	0.610	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	9	0.00	No Limit
EM1707798-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	76	74	2.24	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	142	140	1.20	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	419	419	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 949074)									
EM1707803-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	68	64	5.99	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	254	242	4.80	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	3860	3840	0.409	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	80	77	2.85	0% - 50%
EM1707805-008	S4	ED093F: Calcium	7440-70-2	1	mg/L	72	72	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	5	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	15	12.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 949064)									
EM1707819-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.010	0.011	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.024	0.025	0.00	No Limit
EM1707795-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.025	0.025	0.00	0% - 20%

Sub-Matrix: **WATER**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 949064) - continued									
EM1707795-001	Anonymous	EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.011	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 949073)									
EM1707803-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EM1707805-008	S4	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 949066)									
EM1707819-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1707795-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 949071)									
EM1707798-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1707801-008	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 949075)									
EM1707805-010	S7	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 951583)									
EM1707798-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.08	0.00	No Limit
EM1707805-005	S1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 949003)									
EM1707805-010	S7	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1707805-001	BH15	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 951582)									
EM1707796-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	5.17	5.18	0.207	0% - 20%
EM1707757-009	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.64	0.64	0.00	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 951584)									
EM1707805-011	S9	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.15	1.14	0.976	0% - 20%
EM1707805-005	S1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.01	1.01	0.00	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 951691)									
EM1707652-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	23.8	24.5	2.87	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 951691) - continued									
EM1707805-001	BH15	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.7	0.6	21.5	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 951693)									
EM1707805-012	Comp-leach	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	302	247	20.0	0% - 20%
EM1707807-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 951692)									
EM1707652-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	5.78	6.02	4.17	0% - 20%
EM1707805-001	BH15	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.64	0.57	10.8	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 951694)									
EM1707805-012	Comp-leach	EK067G: Total Phosphorus as P	----	0.01	mg/L	97.2	96.0	1.19	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 949000)									
EM1707805-010	S7	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	5.08	4.77	6.29	0% - 20%
EM1707805-001	BH15	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 949792)									
EM1707795-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	30	28	5.83	0% - 50%
EM1707805-001	BH15	EP030: Biochemical Oxygen Demand	----	2	mg/L	5	6	18.2	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 949459)									
EB1711867-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1707798-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 949459)									
EB1711867-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1707798-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 949459)									
EB1711867-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1707798-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 951205)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	80	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 950947)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	93.3	90	111
ED037P: Alkalinity by PC Titrator (QCLot: 951204)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	92.0	90	110
ED037P: Alkalinity by PC Titrator (QCLot: 951206)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	94.9	90	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 949001)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	111	92	115
				<1	100 mg/L	101	92	115
ED045G: Chloride by Discrete Analyser (QCLot: 949002)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	95.1	89	117
				<1	1000 mg/L	104	92	112
ED093F: Dissolved Major Cations (QCLot: 949065)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	108	92	108
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	105	92	108
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	89	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89	107
ED093F: Dissolved Major Cations (QCLot: 949074)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	105	92	108
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	101	92	108
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.4	89	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.7	89	107
EG020F: Dissolved Metals by ICP-MS (QCLot: 949064)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.6	94	108
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.2	86	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.4	86	110
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.1	87	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.7	87	109
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.7	87	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	87	107
EG020F: Dissolved Metals by ICP-MS (QCLot: 949073)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.2	94	108

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 949073) - continued								
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.4	86	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	86	110
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.6	87	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.5	87	109
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	92.4	87	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.4	87	107
EG035F: Dissolved Mercury by FIMS (QCLot: 949066)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.3	88	117
EG035F: Dissolved Mercury by FIMS (QCLot: 949071)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.8	88	117
EG035F: Dissolved Mercury by FIMS (QCLot: 949075)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.6	88	117
EK055G: Ammonia as N by Discrete Analyser (QCLot: 951583)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	96.7	80	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 949003)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	103	94	107
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 951582)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	108	89	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 951584)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	108	89	114
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 951691)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	80.3	70	117
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 951693)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	105	70	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 951692)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	88.7	70	120
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 951694)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	88.8	70	120
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 949000)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	107	94	108
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 949792)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	106	81	115
EP080/071: Total Petroleum Hydrocarbons (QCLot: 949043)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3368 µg/L	99.1	53	123
EP071: C15 - C28 Fraction	----	100	µg/L	<100	14735 µg/L	99.5	57	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	7856 µg/L	96.9	55	141

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 949459)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	89.4	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 949043)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5225 µg/L	97.4	54	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	19994 µg/L	96.2	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1449 µg/L	102	51	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 949459)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	84.7	65	125
EP080: BTEXN (QCLot: 949459)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	92.0	76	120
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	101	76	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	97.6	72	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	99.1	72	130
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	101	78	128
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	97.5	71	129

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 949001)							
EM1707805-002	BH16	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	94.8	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 949002)							
EM1707805-002	BH16	ED045G: Chloride	16887-00-6	400 mg/L	108	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 949064)							
EM1707795-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	102	85	131
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	100	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	97.8	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	94.3	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	95.7	75	133
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	97.0	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	98.8	75	131
EG020F: Dissolved Metals by ICP-MS (QCLot: 949073)							
EM1707803-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	96.1	85	131

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 949073) - continued							
EM1707803-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.05 mg/L	92.6	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	90.4	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	89.2	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	88.8	75	133
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	91.6	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	89.4	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 949066)							
EM1707795-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	90.4	70	120
EG035F: Dissolved Mercury by FIMS (QCLot: 949071)							
EM1707798-005	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	80.4	70	120
EG035F: Dissolved Mercury by FIMS (QCLot: 949075)							
EM1707805-011	S9	EG035F: Mercury	7439-97-6	0.01 mg/L	82.7	70	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 951583)							
EM1707798-002	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	110	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 949003)							
EM1707805-002	BH16	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	88.9	80	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 951582)							
EM1707757-010	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	106	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 951584)							
EM1707805-003	BH17	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	111	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 951691)							
EM1707704-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	83.8	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 951693)							
EM1707805-013	QA1	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	83.8	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 951692)							
EM1707704-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	# Not Determined	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 951694)							
EM1707805-013	QA1	EK067G: Total Phosphorus as P	----	1 mg/L	# Not Determined	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 949000)							
EM1707805-002	BH16	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	103	79	123
EP080/071: Total Petroleum Hydrocarbons (QCLot: 949459)							
EB1711867-002	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	52.0	43	125

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 949459)							
EB1711867-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	51.6	44	122
EP080: BTEXN (QCLot: 949459)							
EB1711867-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	76.7	68	130
		EP080: Toluene	108-88-3	20 µg/L	75.6	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order : **EM1707805**

Client : **GHD PTY LTD**
Contact : MS CYNTHIA PALFREYMAN
Project : 3218151
Site : Dulverton
Sampler : CF
Order number : ----

Page : 1 of 12

Laboratory : Environmental Division Melbourne
Telephone : +61-3-8549 9630
Date Samples Received : 16-Jun-2017
Issue Date : 26-Jun-2017
No. of samples received : 14
No. of samples analysed : 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Matrix Spike (MS) Recoveries							
EK067G: Total Phosphorus as P by Discrete Analyser	EM1707704--001	Anonymous	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK067G: Total Phosphorus as P by Discrete Analyser	EM1707805--013	QA1	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH							
Clear Plastic Bottle - Natural							
S1,	S2,	----	----	----	16-Jun-2017	14-Jun-2017	**2**
S3,	S4,						
S6,	S7,						
S9,	Comp-leach						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	9	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	9	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

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

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

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

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*

Matrix: **WATER**

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

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural (EA005) S1, S2, S3, S4, S6, S7, S9, Comp-leach	**14-Jun-2017**	**----**	----	----	**16-Jun-2017**	14-Jun-2017	✘
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P) S1, S2, S3, S4, S6, S7, S9, Comp-leach	**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	12-Jul-2017	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) S1, S2, S3, S4, S6, S7, S9, Comp-leach	**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	21-Jun-2017	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	28-Jun-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	12-Jul-2017	✓

Matrix: **WATER**

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

Method		***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*			***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
BH15,	BH16,	**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	12-Jul-2017	✓
BH17,	BH21A,							
S1,	S2,							
S3,	S4,							
S6,	S7,							
S9,	Comp-leach,							
QA1,	QA2							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)								
BH15,	BH16,	**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	12-Jul-2017	✓
BH17,	S1,							
S2,	S3,							
S4,	S7,							
S9,	Comp-leach							
Clear Plastic Bottle - Natural (ED093F)								
BH21A,	S6,	**14-Jun-2017**	**----**	----	----	**21-Jun-2017**	21-Jun-2017	✓
QA1,	QA2							
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)								
BH15,	BH16,	**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	11-Dec-2017	✓
BH17,	S1,							
S2,	S3,							
S4,	S7,							
S9,	Comp-leach							
Clear Plastic Bottle - Natural (EG020A-F)								
S6		**14-Jun-2017**	**----**	----	----	**19-Jun-2017**	11-Dec-2017	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)								
BH15,	BH16,	**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	12-Jul-2017	✓
BH17,	S1,							
S2,	S3,							
S4,	S7,							
S9,	Comp-leach							
Clear Plastic Bottle - Natural (EG035F)								
S6		**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	12-Jul-2017	✓

Matrix: **WATER**

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

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	12-Jul-2017	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**----**	----	----	**16-Jun-2017**	16-Jun-2017	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**----**	----	----	**20-Jun-2017**	12-Jul-2017	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BH15, BH16, BH17, BH21A, S1, S2, S3, S4, S6, S7, S9, Comp-leach, QA1, QA2	**14-Jun-2017**	**21-Jun-2017**	12-Jul-2017	✓	**21-Jun-2017**	12-Jul-2017	✓

Matrix: **WATER**

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

Method *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation*			*Analysis*		
			Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
BH15, BH17, S1, S3, S6, S9, QA1,	BH16, BH21A, S2, S4, S7, Comp-leach, QA2	**14-Jun-2017**	**21-Jun-2017**	12-Jul-2017	✓	**21-Jun-2017**	12-Jul-2017	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G)								
BH15, BH17, S1, S3, S6, S9, QA1,	BH16, BH21A, S2, S4, S7, Comp-leach, QA2	**14-Jun-2017**	**----**	----	----	**16-Jun-2017**	16-Jun-2017	✓
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
BH15, BH17, S2, S4, S7, Comp-leach	BH16, S1, S3, S6, S9,	**14-Jun-2017**	**----**	----	----	**16-Jun-2017**	16-Jun-2017	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
BH15, BH17	BH16,	**14-Jun-2017**	**16-Jun-2017**	21-Jun-2017	✓	**19-Jun-2017**	26-Jul-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
BH15, BH17	BH16,	**14-Jun-2017**	**16-Jun-2017**	28-Jun-2017	✓	**17-Jun-2017**	28-Jun-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
BH15, BH17	BH16,	**14-Jun-2017**	**16-Jun-2017**	21-Jun-2017	✓	**19-Jun-2017**	26-Jul-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
BH15, BH17	BH16,	**14-Jun-2017**	**16-Jun-2017**	28-Jun-2017	✓	**17-Jun-2017**	28-Jun-2017	✓

Matrix: **WATER**

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

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) BH15, BH16, BH17	**14-Jun-2017**	**16-Jun-2017**	28-Jun-2017	✓	**17-Jun-2017**	28-Jun-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	5	36	**13.89**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH	EA005	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	9	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	36	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type *Analytical Methods*	*Method*	*Count*		*Rate (%)*			*Quality Control Specification*
		QC	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	36	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	36	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	9	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	In house: Referenced to APHA 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (2013) Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the libarated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

CHAIN OF CUSTODY RECORD

GHD

Page ______ of ______

GHD Hobart
2 Salamanca Square, Hobart 7000
Telephone: 613 6210 0600 Facsimile: 613 6210 0601
Email: hbamail@ghd.com.au

GHD Launceston
102 Cameron Street, Launceston 7250
Telephone: 613 6332 5500 Facsimile: 613 6332 5555
Email: lstmail@ghd.com.au

GHD Burnie
10 Columnar Court, Burnie 7320
Telephone: 613 6432 7900 Facsimile: 613 6432 7901
Email: bwtmail@ghd.com.au

Job Number: 321815
GHD Office: Hobart
Project: Dulverton
GHD Project Manager: C. Palfreyman
GHD Contact:
Requested Completion Date:
Purchase Order Number:

Laboratory: ALS Melbourne
Address:
Laboratory Contact: Shirley Le Cornu

FREIGHT

PLEASE NOTE:
Sign white copy on receipt and release of samples.
Samples are to be delivered to the Laboratory Address.
On receipt of samples, the **laboratory contact should sign white copy** and fax to GHD Contact.
On completion of analyses please **return white copy with results.**
Yellow copy is retained by laboratory.
Pink copy is returned to the sampler once the courier has signed for the samples.
E-mail results to the e-mail address of the relevant GHD office and cc GHD Project Manager and GHD Contact with the GHD Job Number in the e-mail subject line.

Provide results in ESDAT compatible format

	Sample I.D.	Date	Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Container			Analyses Required														Remarks
							Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Number	Volume (mL)	Major ions (x8)	Nutrients (Total N, Total P)	reactive P, nitrate, nitrite, ammonia		Metals (8 suite)	BTEX	TRH		BOD	TSS	conductivity				
1	BH15	14/6/17			GW	10				✓	✓	✓		✓	✓	✓		✓						
2	BH16				GW					✓	✓	✓		✓	✓	✓		✓						
3	BH17				GW					✓	✓	✓		✓	✓	✓		✓						
4	BH21A				GW					✓	✓													if you can! only little water here
5	S1				W					✓	✓			✓				✓	✓	✓				
6	S2				W					✓	✓			✓				✓	✓	✓				
7	S3				W					✓	✓			✓				✓	✓	✓				
8	S4				W					✓	✓			✓				✓	✓	✓				
9	S6				W					✓	✓			✓				✓	✓	✓				
10	S7				W					✓	✓			✓				✓	✓	✓				
11	S9				W					✓	✓			✓				✓	✓	✓				
12	Comp-leach				W					✓	✓			✓				✓	✓	✓				

Sampled by: C. Palfreyman	Date/Time 14/6/17	Relinquished by: C. Palfreyman	
Received by: Isaac (ALS)	Date/Time 15/6/17 1110	Relinquished by:	Date/Time
Received by Courier: 2A1 ⑬	Date/Time	Relinquished by:	Date/Time
Received by Lab: 2A2 ⑭	Date/Time		

Remarks:

Environmental Division
Melbourne
Work Order Reference
EM1707805

Telephone : + 61-3-8549 9600

CHAIN OF CUSTODY RECORD

Page ______ of ______

GHD

GHD Hobart
2 Salamanca Square, Hobart 7000
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102 Cameron Street, Launceston 7250
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Email: lstmail@ghd.com.au

GHD Burnie
10 Columnar Court, Burnie 7320
Telephone: 613 6432 7900 Facsimile: 613 6432 7901
Email: bwtmail@ghd.com.au

Job Number: 321815
GHD Office: Hobart
Project: Dulverton
GHD Project Manager: C Palfreyman
GHD Contact:
Requested Completion Date:
Purchase Order Number:
Laboratory: ALS Melbourne
Address:
Laboratory Contact: Shirley Le Cornu

PLEASE NOTE:
Sign white copy on receipt and release of samples.
Samples are to be delivered to the Laboratory Address.
On receipt of samples, the **laboratory contact should sign white copy** and fax to GHD Contact.
On completion of analyses please **return white copy with results.**
Yellow copy is retained by laboratory.
Pink copy is returned to the sampler once the courier has signed for the samples.
E-mail results to the e-mail address of the relevant GHD office and cc GHD Project Manager and GHD Contact with the GHD Job Number in the e-mail subject line.

Provide results in ESDAT compatible format

Sample I.D.	Date	Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Container Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Container Number	Container Volume (mL)	Major ions (x8)	Nutrients (Total N, Total P)	reactive P, nitrate, nitrite, ammonia		Metals (8 suite)	BTEX	TRH		BOD	TSS	Conductivity					Remarks
BH15	14/6/17			GW	10				✓	✓	✓		✓	✓	✓		✓							
BH16				GW					✓	✓	✓		✓	✓	✓		✓							
BH17				GW					✓	✓			✓	✓	✓		✓							
BH21A				GW					✓	✓														if you can only take water [illegible]
S1				W					✓	✓			✓				✓	✓	✓					
S2				W					✓	✓			✓				✓	✓	✓					
S3				W					✓	✓			✓				✓	✓	✓					
S4				W					✓	✓			✓				✓	✓	✓					
S6				W					✓	✓			✓				✓	✓	✓					
S7				W					✓	✓			✓				✓	✓	✓					
S9				W					✓	✓			✓				✓	✓	✓					
Comp-Wach				W					✓	✓			✓				✓	✓	✓					

Sampled by: C Palfreyman — Date/Time: 14/6/17 — Relinquished by: C Palfreyman — Date/Time: 15/6/17
Received by: Karen (ALS) — Date/Time: 16/6/17 1110 — Relinquished by: — Date/Time:
Received by Courier: — Date/Time: — Relinquished by: — Date/Time:
Received by Lab: — Date/Time:
Remarks: ⑬ ⑭

Shirley LeCornu

From: Cynthia Palfreyman <Cynthia.Palfreyman@ghd.com>
Sent: Thursday, 15 June 2017 2:08 PM
To: Shirley LeCornu
Subject: Dulverton - 3218151 bottles coming

Hi Shirley,

Hope you had a good break.

I've just sent off some samples for Dulverton but I rushed the COCA, so this email is just to confirm (hopefully!) what is needed.

<u>BH15, BH16, BH17:</u>
Major ions (all 8) Ca Mg Na K, Cl SO_4 Carbonate + Bicarbonate.
Nutrients – total N, total p, ortho, nitrate, nitrite, ammonia
TRH
BTEX
Metals (x8 suite but must include lead, copper, chromium, arsenic)
BOD

<u>BH21A: (not much water in here so hopefully you can do the analysis)</u>
Major ions
Nutrients (as above)

S1- S9 and comp_leach:
Major ions
Nutrients (as above)
BOD
TSS
Conductivity
pH
Metals (x 8 suite)

<u>QA1/QA2:</u>
Major ions
nutrients

Thank you!

Regards

Cynthia Palfreyman
Senior Hydrogeologist

I am in the office Monday and Wednesday only

GHD

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1712490**	Page	: 1 of 17
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MS CYNTHIA PALFREYMAN	Contact	: Shirley LeCornu
Address	: 2 SALAMANCA SQUARE HOBART TAS, AUSTRALIA 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 8687 8000	Telephone	: +61-3-8549 9630
Project	: 3218559	Date Samples Received	: 13-Sep-2017 10:40
Order number	: 3218559	Date Analysis Commenced	: 14-Sep-2017
C-O-C number	: ----	Issue Date	: 21-Sep-2017 15:23
Sampler	: STUART HUGHES		
Site	: Dulverton Surface and Groundwater sampling September 2017		
Quote number	: EN/005/16		
No. of samples received	: 22		
No. of samples analysed	: 22		

ilac-MRA NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- EK057G: Results for EM1712490-012 and 013 have been confirmed by re-preparation and re-analysis.
- It has been noted that Nitrite as N is greater than Nitrite + Nitrate as N for samples EM1712490-012 and 013, however this difference is within the limits of experimental variation.
- Ionic Balance out of acceptable limits for sample #7 and #8 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- EG020F: EM1712490-009 & 022 Dissolved Zinc results have been confirmed by re-preparation and re-analysis

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S1**	**S2**	**S3**	**S4**	**S6**
			Client sampling date / time	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-001**	**EM1712490-002**	**EM1712490-003**	**EM1712490-004**	**EM1712490-005**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	**46**	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**182**	**185**	**245**	**196**	**199**
Total Alkalinity as CaCO3	----	1	mg/L	**182**	**185**	**245**	**196**	**199**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**33**	**26**	**24**	**36**	**35**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**30**	**22**	**32**	**22**	**23**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**71**	**74**	**87**	**79**	**80**
Magnesium	7439-95-4	1	mg/L	**6**	**6**	**8**	**6**	**6**
Sodium	7440-23-5	1	mg/L	**14**	**13**	**33**	**14**	**13**
Potassium	7440-09-7	1	mg/L	**1**	**1**	**12**	**1**	**1**
EG020F: Dissolved Metals by ICP-MS								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.003**	**0.043**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.006**	**0.006**	**0.451**	**0.006**	**0.004**
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	**0.002**	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.035**	<0.005	<0.005	<0.005
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.01**	**0.95**	**0.01**	**0.02**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	**0.01**	**0.04**	**0.01**	**0.01**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.92**	**1.13**	**0.17**	**1.06**	**1.13**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.93**	**1.14**	**0.21**	**1.07**	**1.14**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	**1.3**	<0.1	**0.2**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S1**	**S2**	**S3**	**S4**	**S6**
			Client sampling date / time	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-001**	**EM1712490-002**	**EM1712490-003**	**EM1712490-004**	**EM1712490-005**
				Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.9**	**1.1**	**1.5**	**1.1**	**1.3**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	**0.22**	<0.01	<0.01
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.01**	**0.24**	<0.01	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	**0.01**	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**5.17**	**4.86**	**6.30**	**5.29**	**5.35**
Total Cations	----	0.01	meq/L	**4.67**	**4.78**	**6.74**	**5.07**	**5.08**
Ionic Balance	----	0.01	%	**5.06**	**0.84**	**3.41**	**2.08**	**2.65**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	**3**	**10**	**5**	**2**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S7**	**S9**	**Leachate (compost)**	**B2**	**B3**
			Client sampling date / time	12-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00	11-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-006**	**EM1712490-007**	**EM1712490-008**	**EM1712490-009**	**EM1712490-010**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**134**	**9**	**526**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**111**	**194**	**1220**	**455**	**180**
Total Alkalinity as CaCO3	----	1	mg/L	**111**	**194**	**1220**	**455**	**180**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**14**	**33**	<10	**14**	**15**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**64**	**42**	**1070**	**764**	**23**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**12**	**77**	**117**	**156**	**66**
Magnesium	7439-95-4	1	mg/L	**6**	**6**	**52**	**14**	**4**
Sodium	7440-23-5	1	mg/L	**44**	**13**	**468**	**350**	**13**
Potassium	7440-09-7	1	mg/L	**30**	**1**	**496**	**64**	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	**0.001**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	<0.001	**0.008**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.001**	<0.001	**0.001**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.226**	**0.006**	**0.738**	**2.14**	**0.226**
Nickel	7440-02-0	0.001	mg/L	**0.004**	<0.001	**0.019**	**0.010**	**0.009**
Selenium	7782-49-2	0.01	mg/L	----	----	----	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.012**	**0.005**	**0.029**	**0.022**
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	----	----	----	**61.8**	**483**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	----	----	----	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**5.63**	**0.02**	**12.1**	**31.0**	**0.05**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S7**	**S9**	**Leachate (compost)**	**B2**	**B3**
			Client sampling date / time	12-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00	11-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-006**	**EM1712490-007**	**EM1712490-008**	**EM1712490-009**	**EM1712490-010**
				Result	Result	Result	Result	Result
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	**0.01**	**0.12**	<0.01	**0.02**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.13**	**1.01**	**0.58**	**0.01**	**0.01**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.14**	**1.02**	**0.70**	**0.01**	**0.03**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**7.5**	<0.1	**208**	**31.4**	**19.5**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**7.6**	**1.0**	**209**	**31.4**	**19.5**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**1.47**	<0.01	**66.5**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**2.49**	<0.01	**93.9**	**0.33**	**19.2**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.80**	<0.01	**58.3**	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**4.31**	**5.75**	**54.6**	**30.9**	**4.56**
Total Cations	----	0.01	meq/L	**3.77**	**4.93**	**43.2**	**25.8**	**4.19**
Ionic Balance	----	0.01	%	**6.69**	**7.69**	**11.7**	**9.05**	**4.22**
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	----	----	**13**	**6**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	**15**	**7**	**1750**	<2	<2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	----	**550**	<20	<20
C10 - C14 Fraction	----	50	µg/L	----	----	**2170**	<50	<50
C15 - C28 Fraction	----	100	µg/L	----	----	**3050**	**140**	<100
C29 - C36 Fraction	----	50	µg/L	----	----	**350**	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	----	----	**5570**	**140**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	----	----	**510**	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	----	----	**300**	<20	<20

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**S7**	**S9**	**Leachate (compost)**	**B2**	**B3**
			Client sampling date / time	12-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00	11-Sep-2017 00:00
Compound	CAS Number	LOR	Unit	**EM1712490-006**	**EM1712490-007**	**EM1712490-008**	**EM1712490-009**	**EM1712490-010**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C10 - C16 Fraction	----	100	µg/L	----	----	**2410**	<100	<100
>C16 - C34 Fraction	----	100	µg/L	----	----	**2990**	**150**	<100
>C34 - C40 Fraction	----	100	µg/L	----	----	**370**	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	----	----	**5770**	**150**	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	----	----	**2410**	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	----	<1	<1	<1
Toluene	108-88-3	2	µg/L	----	----	**213**	<2	<2
Ethylbenzene	100-41-4	2	µg/L	----	----	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	----	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	----	----	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	----	----	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	----	----	**213**	<1	<1
Naphthalene	91-20-3	5	µg/L	----	----	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	----	----	**106**	**105**	**101**
Toluene-D8	2037-26-5	2	%	----	----	**112**	**92.9**	**97.9**
4-Bromofluorobenzene	460-00-4	2	%	----	----	**117**	**105**	**98.4**

Analytical Results

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

			Client sample ID	**B4**	**B6**	**B7**	**B8**	**B9**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-011**	**EM1712490-012**	**EM1712490-013**	**EM1712490-014**	**EM1712490-015**
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**293**	**151**	**257**	**293**	**112**
Total Alkalinity as CaCO3	----	1	mg/L	**293**	**151**	**257**	**293**	**112**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**11**	**7**	**5**	**4**	**13**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**64**	**44**	**17**	**23**	**17**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**124**	**45**	**90**	**107**	**45**
Magnesium	7439-95-4	1	mg/L	**5**	**12**	**4**	**3**	**3**
Sodium	7440-23-5	1	mg/L	**32**	**22**	**10**	**17**	**11**
Potassium	7440-09-7	1	mg/L	<1	**1**	<1	**1**	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.158**	**0.104**	**0.005**	**0.092**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.005**	<0.001	<0.001	**0.002**	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.020**	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**36.8**	**7.33**	**2.62**	**32.1**	**2.44**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.08**	**0.07**	<0.01	**0.01**	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	**0.02**	**0.02**	**0.01**	**0.01**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B4**	**B6**	**B7**	**B8**	**B9**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-011**	**EM1712490-012**	**EM1712490-013**	**EM1712490-014**	**EM1712490-015**
				Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	**0.81**	**0.25**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.01**	<0.01	**0.01**	**0.82**	**0.26**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**0.1**	**0.2**	**1.5**	**0.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.3**	**0.1**	**0.2**	**2.3**	**0.7**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.28**	**0.09**	**0.35**	**1.14**	**0.12**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**7.89**	**4.40**	**5.72**	**6.59**	**2.99**
Total Cations	----	0.01	meq/L	**7.99**	**4.22**	**5.26**	**6.35**	**2.97**
Ionic Balance	----	0.01	%	**0.64**	**2.18**	**4.22**	**1.82**	**0.29**
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**2**	**3**	<1	<1	**4**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	<2	<2	<2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	**80**	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**80**	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	**150**	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	**150**	<100	<100	<100	<100

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B4**	**B6**	**B7**	**B8**	**B9**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	12-Sep-2017 00:00	13-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-011**	**EM1712490-012**	**EM1712490-013**	**EM1712490-014**	**EM1712490-015**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**106**	**101**	**94.4**	**99.8**	**102**
Toluene-D8	2037-26-5	2	%	**92.8**	**99.6**	**89.1**	**97.9**	**98.7**
4-Bromofluorobenzene	460-00-4	2	%	**100**	**106**	**102**	**109**	**108**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B11**	**B12**	**B14**	**B15**	**B16**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-016**	**EM1712490-017**	**EM1712490-018**	**EM1712490-019**	**EM1712490-020**
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	**272**	**21**	**8**	**271**
Total Alkalinity as CaCO3	----	1	mg/L	<1	**272**	**21**	**8**	**271**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**1**	**7**	**1**	<1	**6**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**195**	**39**	**117**	**24**	**26**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	**95**	**6**	**6**	**85**
Magnesium	7439-95-4	1	mg/L	**7**	**7**	**2**	<1	**4**
Sodium	7440-23-5	1	mg/L	**52**	**17**	**20**	**11**	**31**
Potassium	7440-09-7	1	mg/L	**1**	**2**	<1	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Copper	7440-50-8	0.001	mg/L	**0.031**	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.018**	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.056**	**0.053**	**0.014**	**0.006**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.013**	<0.001	**0.004**	**0.009**	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.045**	<0.005	**0.012**	**0.030**	<0.005
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**25.6**	**28.4**	**0.98**	**1.64**	**8.33**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.07**	**0.07**	**0.02**	**0.04**	**0.01**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	**0.02**	**0.01**	**0.01**	<0.01

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B11**	**B12**	**B14**	**B15**	**B16**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-016**	**EM1712490-017**	**EM1712490-018**	**EM1712490-019**	**EM1712490-020**
				Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.01**	<0.01	**1.70**	**0.09**	**0.33**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.02**	**1.71**	**0.10**	**0.33**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**1.4**	**0.3**	**0.2**	**0.5**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.2**	**1.4**	**2.0**	**0.3**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.07**	**0.49**	**0.03**	**0.09**	**0.42**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**5.52**	**6.68**	**3.74**	**0.84**	**6.27**
Total Cations	----	0.01	meq/L	**2.96**	**6.11**	**1.33**	**0.78**	**5.92**
Ionic Balance	----	0.01	%	**30.1**	**4.48**	**47.4**	**3.65**	**2.90**
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**2**	**2**	**2**	**2**	**1**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	<2	<2	<2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B11**	**B12**	**B14**	**B15**	**B16**
			Client sampling date / time	12-Sep-2017 00:00	11-Sep-2017 00:00	11-Sep-2017 00:00	13-Sep-2017 00:00	12-Sep-2017 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-016**	**EM1712490-017**	**EM1712490-018**	**EM1712490-019**	**EM1712490-020**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**98.8**	**101**	**96.0**	**98.7**	**112**
Toluene-D8	2037-26-5	2	%	**90.0**	**90.4**	**94.1**	**94.4**	**101**
4-Bromofluorobenzene	460-00-4	2	%	**108**	**97.1**	**98.7**	**104**	**104**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B17**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	13-Sep-2017 00:00	12-Sep-2017 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-021**	**EM1712490-022**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**300**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**300**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**16**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**28**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**108**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**4**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**18**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**2**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.002**	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.008**	**2.13**	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.012**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**36.7**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.01**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.03**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B17**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	13-Sep-2017 00:00	12-Sep-2017 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-021**	**EM1712490-022**	--------	--------	--------
				Result	Result	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.53**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.56**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**5.0**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**5.6**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**4.25**	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**7.12**	----	----	----	----
Total Cations	----	0.01	meq/L	**6.55**	----	----	----	----
Ionic Balance	----	0.01	%	**4.13**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**1**	**17**	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**B17**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	13-Sep-2017 00:00	12-Sep-2017 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1712490-021**	**EM1712490-022**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**96.9**	**109**	----	----	----
Toluene-D8	2037-26-5	2	%	**87.8**	**98.4**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**93.9**	**112**	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%)	
		Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

QUALITY CONTROL REPORT

Work Order : **EM1712490**

Page : 1 of 11

Client : **GHD PTY LTD**
Contact : MS CYNTHIA PALFREYMAN
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 8687 8000
Project : 3218559
Order number : 3218559
C-O-C number : ----
Sampler : STUART HUGHES
Site : Dulverton Surface and Groundwater sampling September 2017
Quote number : EN/005/16
No. of samples received : 22
No. of samples analysed : 22

Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9630
Date Samples Received : 13-Sep-2017
Date Analysis Commenced : 14-Sep-2017
Issue Date : 21-Sep-2017

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1115408)									
EM1712490-001	S1	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
EM1712517-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	50	58	15.7	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1118779)									
EM1712490-008	Leachate (compost)	EA025H: Suspended Solids (SS)	----	5	mg/L	526	490	7.09	0% - 20%
EM1712636-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 1115553)									
EM1712553-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	278	277	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	278	277	0.00	0% - 20%
EM1712553-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	358	356	0.428	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	358	356	0.428	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1121522)									
EM1712490-003	S3	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	245	247	0.843	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	245	247	0.843	0% - 20%
EM1712490-014	B8	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	293	294	0.467	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	293	294	0.467	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1115796)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1115796) - continued									
EM1712490-001	S1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	33	32	0.00	0% - 20%
EM1712490-010	B3	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	15	15	0.00	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1115800)									
EM1712627-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3010	3040	0.861	0% - 20%
EM1712490-021	B17	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	16	14	7.37	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 1115793)									
EM1712490-001	S1	ED045G: Chloride	16887-00-6	1	mg/L	30	28	5.54	0% - 20%
EM1712490-010	B3	ED045G: Chloride	16887-00-6	1	mg/L	23	22	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 1115798)									
EM1712627-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	587	692	16.5	0% - 20%
EM1712490-021	B17	ED045G: Chloride	16887-00-6	1	mg/L	28	29	5.61	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1115620)									
EM1712490-002	S2	ED093F: Calcium	7440-70-2	1	mg/L	74	74	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	13	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EM1712490-010	B3	ED093F: Calcium	7440-70-2	1	mg/L	66	66	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	14	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 1115622)									
EM1712588-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	71	71	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	128	131	2.02	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	944	965	2.13	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	13	13	0.00	0% - 50%
EM1712588-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	136	130	4.93	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	460	440	4.46	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2840	2730	3.87	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	11	10	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1115619)									
EM1712490-001	S1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1115619) - continued									
EM1712490-010	B3	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.226	0.229	1.39	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.009	0.009	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.022	0.024	11.9	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1115623)									
EM1712490-021	B17	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1712588-010	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.092	0.091	0.00	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.044	0.042	3.45	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.013	0.014	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1115599)									
EM1712490-009	B2	EG020A-T: Iron	7439-89-6	0.05	mg/L	61.8	62.5	1.20	0% - 20%
EM1712490-018	B14	EG020A-T: Iron	7439-89-6	0.05	mg/L	0.98	0.98	0.00	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1115621)									
EM1712490-009	B2	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1712490-018	B14	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 1115981)									
EM1712490-009	B2	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.00	No Limit
EM1712490-018	B14	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1115535)									
EM1712490-001	S1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.03	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1115535) - continued									
EM1712490-010	B3	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.09	63.1	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1115538)									
EM1712490-021	B17	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.00	No Limit
EM1712578-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.12	0.13	0.00	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1115794)									
EM1712490-001	S1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	0.00	No Limit
EM1712490-010	B3	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.01	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1115797)									
EM1712627-003	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.03	0.03	0.00	No Limit
EM1712490-021	B17	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.03	0.02	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1115536)									
EM1712490-001	S1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.93	0.99	6.42	0% - 20%
EM1712490-010	B3	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.03	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1115537)									
EM1712563-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	17.2	17.4	1.13	0% - 20%
EM1712490-021	B17	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.56	0.54	3.14	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1116228)									
EM1712490-010	B3	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	19.5	23.1	17.2	0% - 20%
EM1712490-001	S1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1116229)									
EM1712490-021	B17	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	5.0	7.0	33.6	0% - 50%
EM1712588-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.6	0.00	No Limit
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser (QC Lot: 1120174)									
EM1712490-001	S1	EK067FG: Filtered Total Phosphorus as P	----	0.01	mg/L	<0.01	0.03	96.4	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1116227)									
EM1712490-010	B3	EK067G: Total Phosphorus as P	----	0.01	mg/L	19.2	21.9	13.0	0% - 20%
EM1712490-001	S1	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1116230)									
EM1712490-021	B17	EK067G: Total Phosphorus as P	----	0.01	mg/L	4.25	4.42	3.86	0% - 20%
EM1712588-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.99	1.07	8.28	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 1115795)									
EM1712490-001	S1	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1712490-010	B3	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 1115799)									
EM1712490-021	B17	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.01	<0.01	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 1121638)									
EM1712490-009	B2	EP002: Dissolved Organic Carbon	----	1	mg/L	13	12	0.00	0% - 50%
EM1712490-018	B14	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 1114671)									
EM1712490-001	S1	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EM1712490-010	B3	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 1114672)									
EM1712490-021	B17	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EM1712564-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	7	8	13.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1115140)									
EM1712490-008	Leachate (compost)	EP080: C6 - C9 Fraction	----	20	µg/L	550	650	17.6	0% - 20%
EM1712490-018	B14	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1115140)									
EM1712490-008	Leachate (compost)	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	510	610	18.5	0% - 20%
EM1712490-018	B14	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1115140)									
EM1712490-008	Leachate (compost)	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	213	217	2.17	0% - 20%
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1712490-018	B14	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1115408)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	90	109
				<5	1000 mg/L	101	90	109
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1118779)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	90	109
				<5	1000 mg/L	101	90	109
ED037P: Alkalinity by PC Titrator (QCLot: 1115553)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.5	88	109
ED037P: Alkalinity by PC Titrator (QCLot: 1121522)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.4	88	109
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1115796)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.2	92	115
				<1	100 mg/L	96.0	92	115
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1115800)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	92.6	92	115
				<1	100 mg/L	97.5	92	115
ED045G: Chloride by Discrete Analyser (QCLot: 1115793)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	100	88	118
ED045G: Chloride by Discrete Analyser (QCLot: 1115798)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	115	88	118
				<1	1000 mg/L	102	88	118
ED093F: Dissolved Major Cations (QCLot: 1115620)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	101	93	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	101	91	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	90	109
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89	109
ED093F: Dissolved Major Cations (QCLot: 1115622)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	101	93	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	104	91	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	106	90	109
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	106	89	109
EG020F: Dissolved Metals by ICP-MS (QCLot: 1115619)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.8	91	107
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	89.0	84	104

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1115619) - continued								
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	86.0	83	103
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.0	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	90.2	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	89.4	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.4	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	90.2	82	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	95.5	85	109
EG020F: Dissolved Metals by ICP-MS (QCLot: 1115623)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.9	91	107
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	89.6	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.4	83	103
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	86.8	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	88.7	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	91.7	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	89.5	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	96.0	82	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	93.5	85	109
EG020T: Total Metals by ICP-MS (QCLot: 1115599)								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	103	80	120
EG035F: Dissolved Mercury by FIMS (QCLot: 1115621)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.2	81	114
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1115981)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	101	80	110
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1115535)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	101	80	115
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1115538)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	106	80	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1115794)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	102	94	107
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1115797)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	106	94	107
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1115536)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	106	89	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1115537)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	89	114
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1116228)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	90.7	70	117

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1116229)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	92.6	70	117
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser (QCLot: 1120174)								
EK067FG: Filtered Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	86.7	83	125
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1116227)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	92.0	70	120
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1116230)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	93.7	70	120
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1115795)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	103	94	108
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1115799)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	100	94	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 1121638)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	95.1	83	115
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 1114671)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	97.5	81	115
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 1114672)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	104	81	115
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1115140)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	114	67	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1116070)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3368 µg/L	100	53	123
EP071: C15 - C28 Fraction	----	100	µg/L	<100	14735 µg/L	106	57	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	7856 µg/L	101	55	141
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1115140)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	111	65	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1116070)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5225 µg/L	100	54	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	19994 µg/L	108	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1449 µg/L	107	51	137
EP080: BTEXN (QCLot: 1115140)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	100	76	120
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	106	76	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	108	72	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	116	72	130
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	115	78	128
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	100	71	129

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1115796)							
EM1712490-002	S2	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	92.1	70	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1115800)							
EM1712585-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	85.9	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 1115793)							
EM1712490-002	S2	ED045G: Chloride	16887-00-6	400 mg/L	92.8	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 1115798)							
EM1712585-004	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	102	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1115619)							
EM1712490-001	S1	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	89.9	85	131
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	85.3	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	82.3	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	83.6	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	86.1	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	84.2	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	86.2	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	90.2	75	131
EG020F: Dissolved Metals by ICP-MS (QCLot: 1115623)							
EM1712490-021	B17	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	94.9	85	131
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	95.0	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	91.5	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	90.3	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	90.8	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	90.4	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	93.2	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	98.4	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 1115621)							
EM1712490-010	B3	EG035F: Mercury	7439-97-6	0.01 mg/L	106	70	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1115981)							
EM1712490-010	B3	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	75.1	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1115535)							
EM1712490-002	S2	EK055G: Ammonia as N	7664-41-7	1 mg/L	99.9	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1115538)							
EM1712559-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	105	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1115794)							
EM1712490-002	S2	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	98.3	80	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1115797)							
EM1712585-004	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	101	80	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1115536)							
EM1712490-002	S2	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	88.7	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1115537)							
EM1712559-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1116228)							
EM1712490-002	S2	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	95.3	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1116229)							
EM1712508-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	80.7	70	130
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser (QCLot: 1120174)							
EM1712490-002	S2	EK067FG: Filtered Total Phosphorus as P	----	1 mg/L	111	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1116227)							
EM1712490-002	S2	EK067G: Total Phosphorus as P	----	1 mg/L	107	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1116230)							
EM1712508-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	93.8	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1115795)							
EM1712490-002	S2	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	104	79	123
EP002: Dissolved Organic Carbon (DOC) (QCLot: 1121638)							
EM1712490-010	B3	EP002: Dissolved Organic Carbon	----	100 mg/L	98.5	75	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1115140)							
EM1712490-009	B2	EP080: C6 - C9 Fraction	----	280 µg/L	70.0	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1115140)							
EM1712490-009	B2	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	69.7	44	122
EP080: BTEXN (QCLot: 1115140)							
EM1712490-009	B2	EP080: Benzene	71-43-2	20 µg/L	92.0	68	130
		EP080: Toluene	108-88-3	20 µg/L	89.0	72	132

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1712490**	Page	: 1 of 17
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MS CYNTHIA PALFREYMAN	Telephone	: +61-3-8549 9630
Project	: 3218559	Date Samples Received	: 13-Sep-2017
Site	: Dulverton Surface and Groundwater sampling September 2017	Issue Date	: 21-Sep-2017
Sampler	: STUART HUGHES	No. of samples received	: 22
Order number	: 3218559	No. of samples analysed	: 22

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Matrix Spike (MS) Recoveries							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EM1712559--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	----	----	----	15-Sep-2017	13-Sep-2017	**2**
EK071G: Reactive Phosphorus as P by discrete analyser						
Clear Plastic Bottle - Natural S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	----	----	----	15-Sep-2017	13-Sep-2017	**2**
EP030: Biochemical Oxygen Demand (BOD)						
Clear Plastic Bottle - Natural S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	----	----	----	14-Sep-2017	13-Sep-2017	**1**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)					
Chloride by Discrete Analyser	3	40	7.50	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					

Matrix: **WATER**

Quality Control Sample Type Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Matrix Spikes (MS) - Continued					
Reactive Phosphorus as P-By Discrete Analyser	1	21	4.76	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

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

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

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

Matrix: **WATER**

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

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	*Due for extraction*	*Evaluation*	*Analysis* ***Date analysed***	*Due for analysis*	*Evaluation*
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) S1, S2, S3, S4, S6	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	18-Sep-2017	✓
Clear Plastic Bottle - Natural (EA025H) S7, S9	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	19-Sep-2017	✓
Clear Plastic Bottle - Natural (EA025H) Leachate (compost)	**13-Sep-2017**	**----**	----	----	**18-Sep-2017**	20-Sep-2017	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) S1	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	25-Sep-2017	✓
Clear Plastic Bottle - Natural (ED037-P) S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**19-Sep-2017**	25-Sep-2017	✓
Clear Plastic Bottle - Natural (ED037-P) B2	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	26-Sep-2017	✓
Clear Plastic Bottle - Natural (ED037-P) S7, S9, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**19-Sep-2017**	26-Sep-2017	✓
Clear Plastic Bottle - Natural (ED037-P) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**19-Sep-2017**	27-Sep-2017	✓

Matrix: **WATER**

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

Method	Sample Date	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**19-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Natural (ED041G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**19-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Natural (ED041G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**19-Sep-2017**	11-Oct-2017	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**19-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Natural (ED045G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**19-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Natural (ED045G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**19-Sep-2017**	11-Oct-2017	✓

Matrix: **WATER**

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

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**18-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**18-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**18-Sep-2017**	11-Oct-2017	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	10-Mar-2018	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) S7, S9, B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	11-Mar-2018	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**15-Sep-2017**	12-Mar-2018	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020A-T) B9	**13-Sep-2017**	**15-Sep-2017**	12-Mar-2018	✓	**15-Sep-2017**	12-Mar-2018	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	10-Mar-2018	✓	**15-Sep-2017**	10-Mar-2018	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) B2, B4, B8, B11, B16	**12-Sep-2017**	**15-Sep-2017**	11-Mar-2018	✓	**15-Sep-2017**	11-Mar-2018	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) B15, B17	**13-Sep-2017**	**15-Sep-2017**	12-Mar-2018	✓	**15-Sep-2017**	12-Mar-2018	✓

Matrix: **WATER**

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

Method **Container** / Client Sample ID(s)	**Sample Date**	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) B9, B15, B17	**13-Sep-2017**	**----**	----	----	**15-Sep-2017**	11-Oct-2017	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF) B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	25-Sep-2017	✓
Opaque plastic bottle - NaOH (EK026SF) B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	26-Sep-2017	✓
Opaque plastic bottle - NaOH (EK026SF) B9, B15, B17	**13-Sep-2017**	**----**	----	----	**15-Sep-2017**	27-Sep-2017	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**15-Sep-2017**	11-Oct-2017	✓

Matrix: **WATER**

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

Method	**Sample Date**	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		**Date extracted**	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	13-Sep-2017	✗
Clear Plastic Bottle - Natural (EK057G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**14-Sep-2017**	14-Sep-2017	✓
Clear Plastic Bottle - Natural (EK057G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**14-Sep-2017**	15-Sep-2017	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**15-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**15-Sep-2017**	11-Oct-2017	✓

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**18-Sep-2017**	09-Oct-2017	✓	**18-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**18-Sep-2017**	10-Oct-2017	✓	**18-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**18-Sep-2017**	11-Oct-2017	✓	**18-Sep-2017**	11-Oct-2017	✓
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067FG) S1, S2, S3, S4, S6	**11-Sep-2017**	**19-Sep-2017**	09-Oct-2017	✓	**19-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK067FG) S7, S9	**12-Sep-2017**	**19-Sep-2017**	10-Oct-2017	✓	**19-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK067FG) Leachate (compost)	**13-Sep-2017**	**19-Sep-2017**	11-Oct-2017	✓	**19-Sep-2017**	11-Oct-2017	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**18-Sep-2017**	09-Oct-2017	✓	**18-Sep-2017**	09-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**18-Sep-2017**	10-Oct-2017	✓	**18-Sep-2017**	10-Oct-2017	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**18-Sep-2017**	11-Oct-2017	✓	**18-Sep-2017**	11-Oct-2017	✓

Matrix: **WATER**

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

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**15-Sep-2017**	13-Sep-2017	✘
Clear Plastic Bottle - Natural (EK071G) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**14-Sep-2017**	14-Sep-2017	✓
Clear Plastic Bottle - Natural (EK071G) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**14-Sep-2017**	15-Sep-2017	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**19-Sep-2017**	09-Oct-2017	✓
Amber DOC Filtered- Sulfuric Preserved (EP002) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**----**	----	----	**19-Sep-2017**	10-Oct-2017	✓
Amber DOC Filtered- Sulfuric Preserved (EP002) B9, B15, B17	**13-Sep-2017**	**----**	----	----	**19-Sep-2017**	11-Oct-2017	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030) S1, S2, S3, S4, S6, B3, B6, B7, B12, B14	**11-Sep-2017**	**----**	----	----	**14-Sep-2017**	13-Sep-2017	✘
Clear Plastic Bottle - Natural (EP030) S7, S9, B2, B4, B8, B11, B16	**12-Sep-2017**	**----**	----	----	**14-Sep-2017**	14-Sep-2017	✓
Clear Plastic Bottle - Natural (EP030) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**----**	----	----	**14-Sep-2017**	15-Sep-2017	✓

Matrix: **WATER**

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

Method	**Sample Date**	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		**Date extracted**	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	18-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber Glass Bottle - Unpreserved (EP071) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**15-Sep-2017**	19-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber Glass Bottle - Unpreserved (EP071) Leachate (compost), B15, B17	**13-Sep-2017**	**15-Sep-2017**	20-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	25-Sep-2017	✓	**15-Sep-2017**	25-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**15-Sep-2017**	26-Sep-2017	✓	**15-Sep-2017**	26-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**15-Sep-2017**	27-Sep-2017	✓	**15-Sep-2017**	27-Sep-2017	✓
Soil Glass Jar - Unpreserved (EP071) B9	**13-Sep-2017**	**15-Sep-2017**	20-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓

Matrix: **WATER**

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

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	18-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber Glass Bottle - Unpreserved (EP071) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**15-Sep-2017**	19-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber Glass Bottle - Unpreserved (EP071) Leachate (compost), B15, B17	**13-Sep-2017**	**15-Sep-2017**	20-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	25-Sep-2017	✓	**15-Sep-2017**	25-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**15-Sep-2017**	26-Sep-2017	✓	**15-Sep-2017**	26-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**15-Sep-2017**	27-Sep-2017	✓	**15-Sep-2017**	27-Sep-2017	✓
Soil Glass Jar - Unpreserved (EP071) B9	**13-Sep-2017**	**15-Sep-2017**	20-Sep-2017	✓	**18-Sep-2017**	25-Oct-2017	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) B3, B6, B7, B12, B14	**11-Sep-2017**	**15-Sep-2017**	25-Sep-2017	✓	**15-Sep-2017**	25-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) B2, B4, B8, B11, B16, QC1	**12-Sep-2017**	**15-Sep-2017**	26-Sep-2017	✓	**15-Sep-2017**	26-Sep-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080) Leachate (compost), B9, B15, B17	**13-Sep-2017**	**15-Sep-2017**	27-Sep-2017	✓	**15-Sep-2017**	27-Sep-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Filtered Total Phosphorus as P By Discrete Analy	EK067FG	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	16	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	40	**7.50**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Filtered Total Phosphorus as P By Discrete Analy	EK067FG	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Filtered Total Phosphorus as P By Discrete Analy	EK067FG	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Filtered Total Phosphorus as P By Discrete Analy	EK067FG	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	21	**4.76**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	18	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
TRH - Semivolatile Fraction	EP071	0	16	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C / ASTM D7511. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Filtered Total Phosphorus as P By Discrete Analy	EK067FG	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a filtered sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM (2013) Schedule B(3) . Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
TKN/TP (filtered) Digestion	EK061F/EK067F	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

FREIGHT

Samples received without CoC

Environmental Division
Melbourne
Work Order Reference
EM1712490

Telephone : + 61-3-8549 9600

ENT / SENDER: GHD HOBART
OJECT: 3218559
NTACT NAME:
NTACT NUMBER:
RRIER: TAS FAST
NNOTE REFERENCE: 738999
MPLER: S. Hughes.
MBER OF SAMPLES/MATRIX: 4 ~~[illegible]~~ Bskin
ent services notified by: water

COC SEQUENCE NUMBER (Circle)
COC: - 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

SAMPLES RECEIVED BY: Marra Chui
DATE/TIME: 13/9. 10.40
ANALYSIS RECEIVED BY:
DATE/TIME:

Comments

	SAMPLE DETAILS				
LAB ID	SAMPLE ID	DATE	MATRIX	NUMBER OF CONTAINERS	Additional Information

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EM1805110**
Client : **GHD PTY LTD**
Contact : MR STUART HUGHES
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 6210 0600
Project : 3218559
Order number : 3218559
C-O-C number : ----
Sampler : SH/SK
Site : ----
Quote number : EN/005/17
No. of samples received : 8
No. of samples analysed : 8

Page : 1 of 11
Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9630
Date Samples Received : 23-Mar-2018 09:50
Date Analysis Commenced : 23-Mar-2018
Issue Date : 04-Apr-2018 17:30

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- EP002: DOC for EM1805110 #5 and #8 has been diluted prior to analysis due to sample matrix. LORs have been raised accordingly.
- It is recognised that TKN is less than ammonia for sample #1. However, the difference is within experimental variation of the methods. TKN and Ammonia results have been confirmed by re-analysis.
- ED037-P: EM1805108 #1 Poor duplicate precision for Carbonate Alkalinity as CaCO3 due to sample heterogeneity. Confirmed by re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- ED009x: samples required dilution due to sample matrix . LOR values have been adjusted accordingly.

Analytical Results

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

			Client sample ID	**B14**	**B11**	**B4**	**B2**	**B8**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-002**	**EM1805110-003**	**EM1805110-004**	**EM1805110-005**	**EM1805110-006**
				Result	Result	Result	Result	Result
ED009: Anions								
Bromide	24959-67-9	0.010	mg/L	**0.059**	**0.186**	**0.421**	**1.01**	**0.087**
Iodide	20461-54-5	0.010	mg/L	<0.100	<0.020	**0.146**	**0.432**	<0.050
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	<1	**261**	**414**	**304**
Total Alkalinity as CaCO3	----	1	mg/L	**21**	<1	**261**	**414**	**304**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2**	**1**	**2**	**7**	**11**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**24**	**95**	**518**	**762**	**22**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**6**	**1**	**253**	**159**	**109**
Magnesium	7439-95-4	1	mg/L	**1**	**6**	**11**	**14**	**3**
Sodium	7440-23-5	1	mg/L	**18**	**47**	**94**	**350**	**15**
Potassium	7440-09-7	1	mg/L	<1	<1	<1	**57**	**1**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.005**	**0.021**	<0.001	<0.001	**0.006**
Nickel	7440-02-0	0.001	mg/L	**0.004**	**0.012**	**0.002**	**0.009**	**0.004**
Lead	7439-92-1	0.001	mg/L	<0.001	**0.008**	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.016**	**0.071**	<0.005	<0.005	**0.019**
Manganese	7439-96-5	0.001	mg/L	**0.016**	**0.077**	**0.470**	**3.55**	**0.027**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**0.26**	**41.5**	**24.0**	**33.8**	**2.81**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.05**	**0.07**	**0.17**	**27.5**	**0.14**

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			Client sample ID	**B14**	**B11**	**B4**	**B2**	**B8**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-002**	**EM1805110-003**	**EM1805110-004**	**EM1805110-005**	**EM1805110-006**
				Result	Result	Result	Result	Result
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.92**	**0.01**	<0.01	**0.08**	**0.18**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.92**	**0.01**	<0.01	**0.08**	**0.18**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	**0.2**	**28.8**	**0.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.9**	<0.1	**0.2**	**28.9**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.37**	**0.10**	**0.15**	**0.18**	**0.16**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**0.02**
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**1.14**	**2.70**	**19.9**	**29.9**	**6.92**
Total Cations	----	0.01	meq/L	**1.16**	**2.59**	**17.6**	**25.8**	**6.36**
Ionic Balance	----	0.01	%	**1.15**	**2.13**	**6.00**	**7.44**	**4.21**
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**9**	**4**	<1	<10	**8**
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	<2	<2	<2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			*Client sample ID*	**B14**	**B11**	**B4**	**B2**	**B8**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-002**	**EM1805110-003**	**EM1805110-004**	**EM1805110-005**	**EM1805110-006**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**90.8**	**116**	**102**	**97.5**	**114**
Toluene-D8	2037-26-5	2	%	**117**	**75.2**	**102**	**109**	**114**
4-Bromofluorobenzene	460-00-4	2	%	**113**	**117**	**99.5**	**116**	**112**

Analytical Results

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

			Client sample ID	**B9**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-007**	**EM1805110-008**	--------	--------	--------
				Result	Result	----	----	----
ED009: Anions								
Bromide	24959-67-9	0.010	mg/L	**0.062**	**0.956**	----	----	----
Iodide	20461-54-5	0.010	mg/L	<0.020	**0.411**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**168**	**420**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**168**	**420**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**26**	**7**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**21**	**773**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**69**	**163**	----	----	----
Magnesium	7439-95-4	1	mg/L	**4**	**14**	----	----	----
Sodium	7440-23-5	1	mg/L	**11**	**355**	----	----	----
Potassium	7440-09-7	1	mg/L	<1	**58**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.006**	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.003**	**0.009**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.012**	<0.005	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.021**	**3.54**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**10.1**	**33.8**	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.07**	**28.2**	----	----	----

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			*Client sample ID*	**B9**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-007**	**EM1805110-008**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.56**	**0.08**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.56**	**0.08**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**29.8**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.9**	**29.9**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.43**	**0.26**	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**4.49**	**30.3**	----	----	----
Total Cations	----	0.01	meq/L	**4.25**	**26.2**	----	----	----
Ionic Balance	----	0.01	%	**2.74**	**7.31**	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**6**	<10	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			*Client sample ID*	**B9**	**QC1**	**----**	**----**	**----**
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-007**	**EM1805110-008**	--------	--------	--------
				Result	Result	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**102**	**118**	----	----	----
Toluene-D8	2037-26-5	2	%	**103**	**103**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**101**	**114**	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S9**	----	----	----	----
			Client sampling date / time	21-Mar-2018 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-001**	--------	--------	--------	--------
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**183**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**183**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**38**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**20**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**82**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**6**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**13**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**1**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.019**	----	----	----	----
Lead	7439-92-1	0.001	mg/L	**0.001**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.007**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.006**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.036**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.16**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.94**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.94**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.1**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**S9**	----	----	----	----
			Client sampling date / time	21-Mar-2018 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1805110-001**	--------	--------	--------	--------
				Result	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.0**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.68**	----	----	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA								
Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**5.01**	----	----	----	----
Total Cations	----	0.01	meq/L	**5.18**	----	----	----	----
Ionic Balance	----	0.01	%	**1.62**	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**

Compound	CAS Number	Recovery Limits (%)	
		Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

QUALITY CONTROL REPORT

Work Order : **EM1805110**

Client : **GHD PTY LTD**
Contact : MR STUART HUGHES
Address : 2 SALAMANCA SQUARE
HOBART TAS, AUSTRALIA 7000
Telephone : +61 03 6210 0600
Project : 3218559
Order number : 3218559
C-O-C number : ----
Sampler : SH/SK
Site : ----
Quote number : EN/005/17
No. of samples received : 8
No. of samples analysed : 8

Page : 1 of 9

Laboratory : Environmental Division Melbourne
Contact : Shirley LeCornu
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9630
Date Samples Received : 23-Mar-2018
Date Analysis Commenced : 23-Mar-2018
Issue Date : 04-Apr-2018

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Herman Lin	Laboratory Manager	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1525469)									
EM1805045-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	439	478	8.50	0% - 20%
EM1805098-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	552	608	9.74	0% - 20%
ED009: Anions (QC Lot: 1532272)									
EM1805097-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	0.403	0.406	0.742	0% - 20%
		ED009-X: Iodide	20461-54-5	0.01	mg/L	<0.010	<0.010	0.00	No Limit
EP1804046-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	<0.010	0.00	No Limit
		ED009-X: Iodide	20461-54-5	0.01	mg/L	<0.010	<0.010	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 1528395)									
EM1805110-001	S9	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	183	189	3.07	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	183	189	3.07	0% - 20%
EM1805108-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	52	# 71	30.6	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	361	347	3.84	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	413	418	1.27	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1519366)									
EM1805113-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	346	345	0.360	0% - 20%
EM1805110-001	S9	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	38	39	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 1519367)									
EM1805115-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1680	1680	0.571	0% - 20%
EM1805110-001	S9	ED045G: Chloride	16887-00-6	1	mg/L	20	20	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1522374)									
EM1805102-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	630	635	0.893	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 1522374) - continued									
EM1805102-002	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	377	380	0.917	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2370	2390	0.806	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	74	74	0.00	0% - 20%
EM1805108-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	83	81	3.05	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	324	317	2.24	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6330	6160	2.73	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	376	368	2.21	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1522376)									
EM1805102-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.009	0.009	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.608	0.613	0.781	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.004	0.005	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.012	0.013	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1805108-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.007	0.006	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1523045)									
EM1805027-026	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EM1805102-004	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	69.4	69.1	0.414	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 1523046)									
EM1805110-008	QC1	EG020A-T: Iron	7439-89-6	0.05	mg/L	33.8	33.8	0.130	0% - 20%
EM1805120-005	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	0.09	0.10	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1522375)									
EM1805102-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1805108-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 1522216)									
EM1805114-004	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.00	No Limit
EM1805111-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.007	0.007	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1523491)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1523491) - continued									
EM1805110-003	B11	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.07	0.06	20.7	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1519368)									
EM1805113-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1805110-001	S9	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1523489)									
EM1805088-032	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.01	0.00	No Limit
EM1805110-003	B11	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	<0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1526070)									
EM1805108-005	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.2	2.2	0.00	0% - 20%
EM1805118-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.3	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1526068)									
EM1805016-003	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	159	143	10.8	0% - 20%
EM1805108-005	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.38	0.35	7.56	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1526071)									
EM1805252-005	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.04	116	No Limit
EM1805118-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.02	0.04	86.7	No Limit
EK071FG: Dissolved Reactive Phosphorus as P by DA (QC Lot: 1519369)									
EM1805110-001	S9	EK071FG: Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.00	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 1519365)									
EM1805125-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EM1805110-001	S9	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 1532540)									
EM1805110-002	B14	EP002: Dissolved Organic Carbon	----	1	mg/L	9	9	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 1522982)									
EM1805110-001	S9	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EM1805120-004	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	12	10	18.3	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1521679)									
EM1805101-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1805134-012	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1521679)									
EM1805101-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1805134-012	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1521679)									
EM1805101-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	1	1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit

Sub-Matrix**: WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1521679) - continued									
EM1805101-001	Anonymous	EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1805134-012	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1525469)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	95.3	90	109
				<5	1000 mg/L	102	90	109
ED009: Anions (QCLot: 1532272)								
ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	2 mg/L	101	93	109
ED009-X: Iodide	20461-54-5	0.01	mg/L	<0.010	0.5 mg/L	100	79	123
ED037P: Alkalinity by PC Titrator (QCLot: 1528395)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	95.9	88	109
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1519366)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	92	115
				<1	100 mg/L	95.5	92	115
ED045G: Chloride by Discrete Analyser (QCLot: 1519367)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	106	88	118
				<1	1000 mg/L	98.0	88	118
ED093F: Dissolved Major Cations (QCLot: 1522374)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	5 mg/L	102	93	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	5 mg/L	104	91	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	90	109
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	101	89	109
EG020F: Dissolved Metals by ICP-MS (QCLot: 1522376)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	102	91	107
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.3	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.5	83	103
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.9	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.5	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.2	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.7	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	82	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	103	85	109
EG020T: Total Metals by ICP-MS (QCLot: 1523045)								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	98.0	80	120
EG020T: Total Metals by ICP-MS (QCLot: 1523046)								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	80	120
EG035F: Dissolved Mercury by FIMS (QCLot: 1522375)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1522375) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.9	81	114
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1522216)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	83.6	80	110
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1523491)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	99.4	80	115
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1519368)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.5	94	107
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1523489)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	89	114
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1526070)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	79.7	70	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1526068)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	93.8	70	120
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1526071)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	96.7	70	120
EK071FG: Dissolved Reactive Phosphorus as P by DA (QCLot: 1519369)								
EK071FG: Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	104	80	120
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1519365)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	104	94	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 1532540)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	99.7	83	115
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 1522982)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	101	81	115
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1521679)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	102	68	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1521842)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3368 µg/L	103	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	14735 µg/L	96.4	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	7856 µg/L	89.6	54	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1521679)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	119	66	123
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1521842)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5225 µg/L	97.8	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	19994 µg/L	91.7	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1449 µg/L	95.7	58	137
EP080: BTEXN (QCLot: 1521679)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1521679) - continued								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	110	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	96.1	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	109	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	96.2	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	114	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	93.0	74	124

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED009: Anions (QCLot: 1532272)							
EM1805097-001	Anonymous	ED009-X: Bromide	24959-67-9	1 mg/L	91.6	70	130
		ED009-X: Iodide	20461-54-5	1 mg/L	102	70	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1519366)							
EM1805110-002	B14	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	92.2	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 1519367)							
EM1805110-002	B14	ED045G: Chloride	16887-00-6	400 mg/L	98.5	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1522376)							
EM1805102-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	104	85	131
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	91.6	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	92.8	71	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	94.4	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	88.7	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	92.5	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	94.0	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	92.2	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 1522375)							
EM1805102-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	79.5	70	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1522216)							
EM1805110-003	B11	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	80.5	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1523491)							
EM1805110-001	S9	EK055G: Ammonia as N	7664-41-7	1 mg/L	80.1	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1519368)							
EM1805110-002	B14	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	95.6	80	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1523489)							
EM1805088-033	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	105	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1526070)							
EM1805118-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	105	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1526068)							
EM1805045-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	109	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1526071)							
EM1805118-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	102	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 1519365)							
EM1805110-002	B14	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	103	79	123
EP002: Dissolved Organic Carbon (DOC) (QCLot: 1532540)							
EM1805110-003	B11	EP002: Dissolved Organic Carbon	----	100 mg/L	107	75	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1521679)							
EM1805110-002	B14	EP080: C6 - C9 Fraction	----	280 µg/L	63.3	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1521679)							
EM1805110-002	B14	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	58.2	44	122
EP080: BTEXN (QCLot: 1521679)							
EM1805110-002	B14	EP080: Benzene	71-43-2	20 µg/L	85.0	68	130
		EP080: Toluene	108-88-3	20 µg/L	86.6	72	132

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1805110**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR STUART HUGHES	Telephone	: +61-3-8549 9630
Project	: 3218559	Date Samples Received	: 23-Mar-2018
Site	: ----	Issue Date	: 04-Apr-2018
Sampler	: SH/SK	No. of samples received	: 8
Order number	: 3218559	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Duplicate (DUP) RPDs							
ED037P: Alkalinity by PC Titrator	EM1805108--001	Anonymous	**Carbonate Alkalinity as CaCO3**	3812-32-6	30.6 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	14	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Dissolved Reactive Phosphorus as P by DA	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	28	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

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

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

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

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) S9	**21-Mar-2018**	**----**	----	----	**27-Mar-2018**	28-Mar-2018	✓
ED009: Anions							
Clear Plastic Bottle - Natural (ED009-X) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**29-Mar-2018**	18-Apr-2018	✓

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) S9, B11, B2, B9, B14, B4, B8, QC1	**21-Mar-2018**	**----**	----	----	**28-Mar-2018**	04-Apr-2018	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) S9, B11, B2, B9, B14, B4, B8, QC1	**21-Mar-2018**	**----**	----	----	**26-Mar-2018**	18-Apr-2018	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) S9, B11, B2, B9, B14, B4, B8, QC1	**21-Mar-2018**	**----**	----	----	**26-Mar-2018**	18-Apr-2018	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F) S9, B11, B2, B9, B14, B4, B8, QC1	**21-Mar-2018**	**----**	----	----	**26-Mar-2018**	18-Apr-2018	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) S9, B11, B2, B9, B14, B4, B8, QC1	**21-Mar-2018**	**----**	----	----	**27-Mar-2018**	17-Sep-2018	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) B14, B4, B8, QC1 B11, B2, B9,	**21-Mar-2018**	**26-Mar-2018**	17-Sep-2018	✓	**27-Mar-2018**	17-Sep-2018	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) B14, B4, B8, QC1 B11, B2, B9,	**21-Mar-2018**	**----**	----	----	**29-Mar-2018**	18-Apr-2018	✓

Matrix: **WATER**

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

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**26-Mar-2018**	04-Apr-2018	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**28-Mar-2018**	18-Apr-2018	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**23-Mar-2018**	23-Mar-2018	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**27-Mar-2018**	18-Apr-2018	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**28-Mar-2018**	18-Apr-2018	✓	**28-Mar-2018**	18-Apr-2018	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**28-Mar-2018**	18-Apr-2018	✓	**28-Mar-2018**	18-Apr-2018	✓
EK071FG: Dissolved Reactive Phosphorus as P by DA							
Clear Plastic Bottle - Natural (EK071FG) S9	**21-Mar-2018**	**----**	----	----	**23-Mar-2018**	23-Mar-2018	✓

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**23-Mar-2018**	23-Mar-2018	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**29-Mar-2018**	18-Apr-2018	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030) S9, B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**----**	----	----	**23-Mar-2018**	23-Mar-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**26-Mar-2018**	28-Mar-2018	✓	**28-Mar-2018**	05-May-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**26-Mar-2018**	04-Apr-2018	✓	**26-Mar-2018**	04-Apr-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**26-Mar-2018**	28-Mar-2018	✓	**28-Mar-2018**	05-May-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**26-Mar-2018**	04-Apr-2018	✓	**26-Mar-2018**	04-Apr-2018	✓

Matrix: **WATER**

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

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) B14, B11, B4, B2, B8, B9, QC1	**21-Mar-2018**	**26-Mar-2018**	04-Apr-2018	✓	**26-Mar-2018**	04-Apr-2018	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Reactive Phosphorus as P by DA	EK071FG	0	1	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	28	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C / ASTM D7511. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Reactive Phosphorus as P by DA	EK071FG	WATER	In house: Referenced to APHA 4500-P F Water samples are filtered through a 0.45um filter prior to analysis. Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is achieved by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM (2013) Schedule B(3) . Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

FREIGHT

CHAIN OF CUSTODY RECORD

GHD Launceston
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Job Number 3218559	**GHD Office** Hobart
Project Dulverton Surface and Groundwater sampling MARCH [redacted] 2018	
GHD Project Manager Stuart Hughes	**GHD Contact** Sam King 0418 530 446 sam.king@ghd.com
Requested Completion Date STT	**Purchase Order Number** 3218559

Laboratory: ALS Scoresby
Address: 2-4 Westall Road, Springvale VIC 3171
Laboratory Contact: Shirley LeCornu

PLEASE NOTE:
Sign white copy on receipt and release of samples. Samples are to be delivered to the Laboratory address.
On receipt of samples, the laboratory contact should sign the white copy and e-mail to GHD Contact.
On completion of analyses please return white copy with results.
Pink copy is returned to the sampler once the courier has signed for the samples.
Email results to the email address of the relevant GHD Office and cc GHD Project Manager and GHD Contact with the GHD Job Number in the email subject line.
Provide results in ESDAT compatible format.

							Container			**Analyses Required**															
							Type																		
	Sample ID	**Date**	**Time**	**Composite Sample**	**Sample Matrix** S: Soil SL: Sludge W: Water A: Air GW: Groundwater	**Preservative**	J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	**Number of items**	**Volume (mL)**	BOD, TSS, Total P, Dissolved Free P	Metals (dissolved) - Cu, Zn, Cr, Mn, Ni, Pb, Cd	Total N, ammonia, nitrite, nitrate, total P, Orthophosphate	Major Ions (chloride, sulphate, sodium, potassium, magenesium, calcium), Bicarbonate alkalinity, carbonate alkalinity	Total Fe	TPH	Cyanide, mercury, aersenic, selenium (dissolved)	Bromine/iodine	DOC,BOD							**Remarks**
1	S9	21/03/2018	see label		W		P	3		X	x	x	x												
2	~~B12~~ B14	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
3	B11	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
4	B4	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
5	B2	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
6	B8	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
7	B9	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
8	QC1	21/03/2018	see label		GW		P	8			x	x	x	x	x	x	x	x							
9	QQC1	21/03/2018	see label		GW		P	8			x	x			x	x	x	x							**Please fwd to ALS Sydney for analysis.**

Sampled by:	Sam King/Stuart Hughes	Date/Time:	21/03/2018	Relinquished by:	Stuart Hughes	Date/Time:	21/03/2018
Received by:		Date/Time:		Relinquished by:		Date/Time:	
Received by Courier:		Date/Time:		Relinquished by:		Date/Time:	
Received by Lab:	(AM)	Date/Time:	23/3 9:50	Relinquished by:		Date/Time:	

Remarks:

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Work Order Reference
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