

# Foxground and Berry Bypass Periodic Construction Compliance Status Report

Report 8  
1 April 2018 – 30 September 2018



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### Details of Revision and Amendment:

#### Document Control

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The environmental management team will maintain, review and update this report on a six monthly basis.

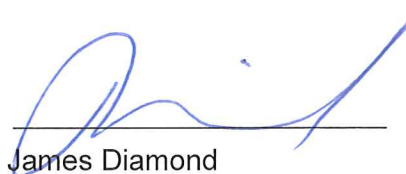
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5	DP&E endorsed Environmental Representative (ER)	2/11/2018	Toby Hobbs
6	Department of Planning & Environment	2/11/2018	Michael Young

Plan Approved By:



Tim Williams  
Project Director



James Diamond  
Environmental Manager

## Amendment

Each new revision to the report will be distributed to all registered copyholders with an instruction that the superseded copy be destroyed or marked as superseded.

The revision number is included at the end of the document number, which is noted on each page. When amendments occur, the document or relevant section will be reissued with the revision number updated accordingly.

The Project Manager or Environmental Manager will approve amendments by initial in the Approval column below.

The following provides a record of amendments made to this document:

Revision	Date	Description	Page	Prepared by	Approved
0	19/10/2018	Draft submitted to RMS & ER	All	James Diamond	James Diamond
1	31/10/2018	Address RMS & ER comments	All	James Diamond	James Diamond
2	2/11/2018	Final		James Diamond	James Diamond



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## Abbreviations

CEMP	Construction Environmental Management Plan
CPESC	Certified professional in erosion and sediment control
CTP	Compliance Tracking Program
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ER	Environmental Representative
DP&E	Department of Planning and Environment MCoA
NBN	National Broadband Network
NSW	New South Wales
POEO Act	Protection of the Environment Operations Act 1997
OoW	Office of Water
PPR	Preferred Project Report
SEPP	State Environmental Planning Policy
SoC	Statement of Commitments
SWTC	Scope of Work and Technical Criteria
TMP	Traffic Management Plan
RBL	Rating Background Level
ROL	Road Occupancy Licence
NCR	Non-conformance report

## 1 Introduction

The Foxground and Berry bypass has provided a four-lane divided highway (two lanes in each direction) with median separation for 11.6 kilometres of the Princes Highway between Toolijooa Road near Foxground and Schofields Lane south of Berry. The project crosses both Kiama and Shoalhaven local government areas.

Key design features include:

- Approximately 12.4 kilometres of new highway, including bypasses of the Foxground bends and the Berry township
- Interchanges at Toolijooa Road, Austral Park Road, Tindalls Lane and the northern and southern interchanges for Berry
- Junction arrangements at Schofields Lane and Gembrook Lane which enable both northbound and southbound access to the highway
- A cutting about 25 metres deep at Toolijooa Ridge, bypassing the Foxground bends
- Six lanes through the cutting at Toolijooa Ridge for a distance of 1.5 kilometres, providing two lanes and a climbing lane in each direction
- Three bridge crossings at Broughton Creek and a bridge at Berry
- An upgrade and extension of Austral Park Road
- A new roundabout at the junction of Woodhill Mountain Road and the existing Princes Highway
- A diversion of Town Creek into Bundewallah Creek
- Local road closure at North Street
- A two-way connection between Queen and Victoria streets and a southbound on-ramp south of Victoria Street
- New property accesses and access roads (left-in/left-out only for direct property access to the upgraded highway) and
- Wildlife crossings (rope bridges and underpasses) to maintain existing wildlife corridors.

Benefits associated with the Project include:

- Improving road safety on the Princes Highway and local road network
- Reducing total crashes on the Princes Highway in the project area by an estimated 64 per cent
- Improving road safety through less interaction between traffic and pedestrians in the town of Berry
- Improving the efficiency of the Princes Highway between Toolijooa Road and Schofields Lane
- Reducing travel time by an estimated seven (7) minutes
- Supporting regional and local economic development
- Improving flood immunity and

- Improving wildlife crossings.

The project was delivered through a 'design and construct' contract process. Fulton Hogan was appointed by RMS on 11 July 2014 to deliver the project.

Further details on the project background can be sourced from the project website at (<http://www.rms.nsw.gov.au/projects/south-coast/foxground-berry-bypass/index.html>)

## 1.1 Project environmental assessment and approval

The Foxground and Berry bypass, Princes Highway upgrade was approved by the NSW Minister for Planning and Infrastructure on 22 July 2013. The project has been assessed as a transitional project under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Minister's conditions of approval have been provided to Roads and Maritime Services to guide the detailed design, construction and operation of the project.

To facilitate the assessment and determination of the Project, an Environmental Assessment was developed and issued in November 2012. This assessment (and associated specialist studies) detailed the key environmental aspects of the project and recommended management and mitigation measures to mitigate environmental risks during construction and operation of the infrastructure. The Foxground and Berry bypass environmental assessment was exhibited for 34 days from Wednesday 14 November 2012 to Monday 17 December 2012 and a total of 254 submissions were received during the exhibition period.

A Submissions and Preferred Project Report (PPR) was developed and placed on public exhibition in response to the submissions received during the Environmental Assessment consultation period. This report responded to the main issues raised during the consultation period, described amendments made to the project design since the exhibition of the Environmental Assessment, and provided additional assessment of relevant environmental issues raised in the submissions and amendments made in the public consultation phase.

Both the Environmental Assessment and Submissions and Preferred Project Report were assessed by the NSW Department of Planning and Infrastructure.

In addition to the above approval, Fulton Hogan have also acquired an Environment Protection Licence (EPL) under the Protection of the Environment Operations Act 1997 (POEO Act) to facilitate construction activities. The EPL was issued 29 August 2014.

The Project Construction Environmental Management Plan (CEMP) and sub-plans were approved by the Department of Planning and Environment on 19 September 2014.

The Department of Planning and Environment approved the following project documents on 27 October: the Biodiversity Offset Strategy; the Ecological Monitoring Program; the Water Quality Monitoring Program; the Urban Design and Landscape Plan; and the Community Consultation Strategy.

Following the above approvals, RMS formally advised the Department of Planning and Environment that construction would commence on 28 October 2014 and the CEMP has been implemented since this date.

On 28 January 2015, the Department of Planning and Environment approved the modification of Condition C13. This modification removed the section which prohibited an increase to blasting limits application where a non-aboriginal heritage item existed.

On 9 March 2015, the Department of Planning and Environment approved increased blasting limits for the Toolijooa ridge earthworks cuts. A further approval to increase blasting limits at cut 3 and cut 4 on the FBB project was also approved.

Condition C4(e) of the project approval was modified by DP&E on 31 July 2015 to enable out-of-hours work as approved through the project Environmental Protection Licence. This modification was requested to streamline the out-of-hours works approval process without reducing the level of consideration required for out-of-hours work. Further, Condition C6 which previously detailed the Out of Hours work request process was removed as it was no longer required due to the modification to C4(e). The change was supported by NSW EPA, Kiama Municipal Council and Shoalhaven City Council.

One major consistency assessment has been completed on the project to date where the abutment B at Broughton Creek crossing 3 was designed to sit 34 metres closer to the creek in comparison to the concept design. This increase in construction footprint and scope also includes re-routing of an ephemeral drainage line into Broughton Creek. This consistency assessment was approved by RMS and the Project ER on 14 December 2015.

Condition C15 of the project approval was modified by DP&E on the 3 July 2017 to enable works within specified heritage sites after seeking written approval from the Secretary. In light of this approval from the Secretary was given on 3 July 2017 to work within heritage site G2B H25 to construct a residents driveway.

On 29 September 2017, the Department of Planning and Environment approved a modification to conditions C15 and C16 to align with the original project approval.

## 1.2 Purpose of this report

The purpose of this report is to provide a summary of the outcomes and actions obtained through the implementation of the project Compliance Tracking Program required under the Minister's Condition of Approval (MCoA) B29.

This compliance tracking report provides a review of compliance for the six month period between 1 April and 30 September 2018. A pre-operational compliance review was completed one month prior to operation of the project as required by Minister's Condition of Approval B29(c). Foxground and Berry Bypass Construction Compliance Report 6 (1 May 2017 – September 2017) fulfilled that requirement with commencement of the operational highway occurring on 31 October 2017.

Minister's Condition of Approval (MCoA) B29 states:

*“The Proponent shall develop and implement a Compliance Tracking Program to track compliance with the requirements of this approval. The Program shall be submitted to the Director General for approval prior to the commencement of construction and shall be applied during construction and for a minimum of one year following commencement of operation. The program shall include, but not necessarily be limited to:*

- (a) provisions for the notification of the Director General of the commencement of works prior to the commencement of construction and prior to the commencement of operation of the project (including prior to each stage, where works are being staged);*
- (b) provisions for periodic review of project compliance with the requirements of this approval and the documents listed under Condition A1, including the Statement of Commitments;*

- (c) *provisions for periodic reporting of compliance status against the requirements of this approval and the documents listed under Condition A1, including the Statement of Commitments, to the Director General including at least one month prior to the commencement of construction and operation of the project and at other intervals during the construction and operation, as identified in the Program;*
- (d) *a program for independent environmental auditing in accordance with /ISO 19011:2003 - Guidelines for Quality and/ or Environmental Management Systems Auditing;*
- (e) *mechanisms for reporting and recording incidents and actions taken in response to those incidents;*
- (f) *provisions for reporting environmental incidents to the Director General during construction and operation; and*
- (g) *procedures for rectifying any non-compliance identified.”*

During the reporting period the Foxground and Berry Bypass has been compliant to the conditions of approval. Appendix A of this report contains detailed information on the status and compliance of each specific condition for the Foxground and Berry Bypass.



## 2 Construction activities during reporting period

Project works are proceeding in accordance with the construction program. During the reporting period about 15% of the days were wet days. The total rainfall received on the project was significantly lower than the long term average. During this period production was complete with a high environmental focus on closing out temporary construction facilities with permanent landscaping.

To date the project is tracking at an overall 99% completion rate with minor outstanding works consisting of the decommissioning and rehabilitation of the remaining two site compounds and ongoing landscape maintenance. The alignment in its final configuration commenced operation on 31 October 2017.

### 2.1 Demolition and property adjustment

Demolition works are complete.

Property adjustments works have been completed and any unresolved matters have been taken up by RMS.

### 2.2 Utilities adjustments & diversions

FBB utilities and service adjustments are complete across the project.

### 2.3 Fencing

Boundary fencing is complete on the project.

### 2.4 Traffic

On 31 October 2017 the project saw the alignment in its full configuration and with an operational speed of 100km/h. The operational set-up ensured that major traffic was kept out of Berry which has made the township a safer place for visitors.

### 2.5 Drainage

All Drainage works have now been completed on the project.

### 2.6 Structures

The project includes the construction of 12 new bridges which cross creeks, floodplains, local roads and side roads. All 12 bridges have been completed.

There are six structural culverts on the project which provide connectivity for vehicles and wildlife under the new highway. All culverts have been completed.



**Figure 2-1: Fauna underpass complete with fauna furniture**

## 2.7 Roadworks

Works are complete on design earthworks and roadworks.

- Decommissioning of Toolijooa compound, Gate 19 compound, Gate 2 compound and part of the Austral Park compound has been completed;
- Austral Park and the Woodhill Mountain Road compounds are the last of the construction footprint remaining to be rehabilitated.

## 2.8 Landscaping

The project made good progress on landscaping works in the reporting period. With dry and windy conditions for the majority of the reporting period, focus on consistent watering of landscaped areas has helped the high survival rates through these tough conditions.

The key focus now that all permanent landscaping works have been completed is to ensure that the landscaping thrives via weed removal and general maintenance along the project.





**Figure 2-2: Permanent landscaping of Cut 6**



**Figure 2-3: Landscape maintenance of the garden beds south of the southern Berry interchange**

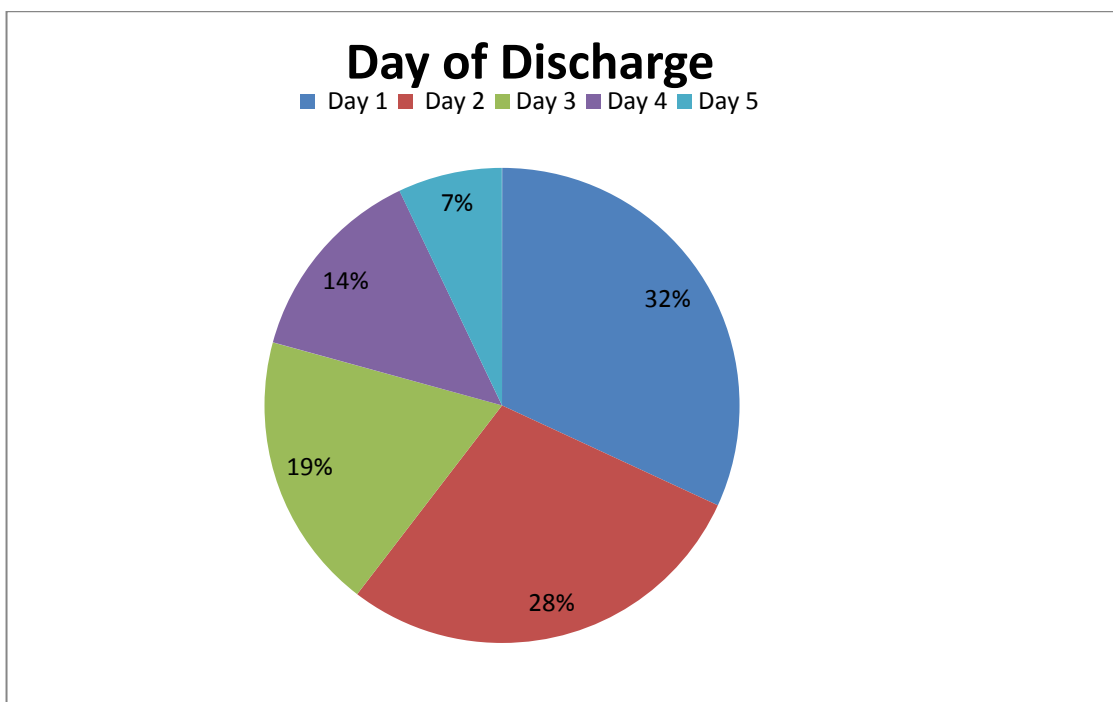
## 2.9 Sediment basins

The number of sediment basins on the project reflects construction progress. The risk footprint is continually decreasing as the works progress and areas are stabilised.

At the start of the reporting period there was 1 sediment basin in disturbed catchments. At the end of the reporting period there was still 1 sediment basin within disturbed catchments.

Since the start of construction until the end of this reporting period there has been an 99% reduction in the number sediment basins. This generally means that about 99% of the overall disturbed footprint of the project has now been rehabilitated.

With regard to sediment basin management, the project continues to work diligently at treating and discharging stored site water back into the environment as efficiently as possible. The table below illustrates the timeframe that sediment basins have been discharged.



**Figure 2-4: Sediment basin discharges in the five day period after rainfall**

## 2.10 Noise mound construction

Construction of the Berry noise mound (North Street) was prioritised in the construction program. The early construction of the noise mound reduces the potential acoustic and visual impacts of construction on both the residents of North Street and the wider community.

There are three earth mounds in the project design which provide visual screening and noise attenuation. All three noise mounds have been completed and landscaped as per the approved designed.

## 2.11 Temporary works

The project requires temporary works to allow for safe and efficient construction of the Foxground and Berry bypass.

The project is continuing the rehabilitation of all ancillary sites left on the project.



**Figure 2-5: Rehabilitation of Gate 19 ancillary facility complete**



### 3 Environmental management system overview

#### 3.1 Environmental Management System certification

The overall Environmental Management System (EMS) for the Project is described within the Construction Environmental Management Plan (CEMP) and relevant sub plans. The EMS for the Project has been prepared to comply with the requirements of AS/NZS ISO 14001 Environmental Management Systems.

The Fulton Hogan EMS is periodically audited by external auditors to ensure compliance with ISO 14001. The Fulton Hogan EMS was audited in February 2018 by an external auditor which resulted in the recertification of the system.

#### 3.2 Environmental management framework

The framework of the environmental management documents has been designed to comply with the requirements of ISO 14001 and to be consistent with the Guidelines for the Preparation of an EMP (DP&I 2004).

The CEMP comprises relevant sections from Fulton Hogan's Corporate Management System as well as a number of supporting documents (i.e. issue specific environmental sub plans) providing more detailed environmental management specifications.

#### 3.3 Construction Environmental Management Plan

The CEMP is the key management tool in relation to environmental performance during the design and construction phases. The CEMP outlines Fulton Hogan's approach to minimising and managing environmental risks associated with the construction phase of the project. The CEMP is a dynamic document that is reviewed and amended to incorporate additional requirements as required, including changes to the project team, organisational structure and responsibilities or as improvements to procedures and methodologies develop.

The CEMP has been prepared in accordance with a number of guidelines including:

- Guideline for the Preparation of Environmental Management Plans (DP&I, 2004);
- RMS Specification G36 – Environmental Protection (Management Systems);
- ISO 14001:2004 – Environmental Managements Systems; and
- ISO 19011:2003 – Guidelines for Quality and/or Environmental Management Systems Auditing.
- NSW Minister for Planning Conditions of Approval (MCoA);
- EA and PPR Statement of Commitments; and
- Environment Protection License (EPL) requirements.

The CEMP was approved by the Department of Planning and Environment in accordance with MCoA B35 on 6 June 2014.

Detailed environmental management sub plans have been prepared on key environmental elements identified for the Project through the environmental assessment and approval process. They document the aspects, impacts, safeguards and monitoring requirements for each key environmental element, nominate who is responsible for implementing controls and note the frequency/timing of implementation.

The CEMP and sub-plans were reviewed and endorsed by the Project ER in 2017, dates of revision for the plans are detailed in table 3-1. A periodic review of the CEMP and sub-plans will be undertaken in October 2018

Plan Name	DP&E Approval Date	Consistent with MCOA	Latest revision date
Construction Environmental Management Plan	06 June 2014	Yes	Rev H September 2017
Flora and Fauna Management Sub Plan	27 May 2014	Yes	Rev G May 2017
Heritage Management Sub Plan	13 May 2014	Yes	Rev F September 2017
Noise and Vibration Management Sub Plan	06 June 2014	Yes	Rev G September 2017
Soil and Water Quality Management Sub Plan	06 June 2014	Yes	Rev F September 2017
Air Quality Management Sub Plan	26 April 2014	Yes	Rev G September 2017
Construction Waste and Energy Management Sub Plan	29 April 2014	Yes	Rev H September 2017

**Table 3-1: CEMP and sub plans consistency with MCoA and ER review dates**

### 3.4 Compliance auditing

Regular auditing of the management system is completed during construction. Auditing includes:

- Internal compliance audits undertaken by Fulton Hogan
- External compliance audits undertaken by the Environmental Representative and RMS appointed auditors.

The intent of these audits is to identify opportunities for improvement and any system non-conformances during the course of construction so appropriate corrective actions can be implemented in a timely manner.

No regular audits have been undertaken during the reporting period as only very limited works were in progress that were associated with landscape maintenance and ancillary site decommissioning. EPL requirements and CEMP commitments were reviewed as part of onsite environmental inspections ensuring all works were conducted were compliant.

## 4 Environmental Performance

The project continued to implement and maintain a high standard of environmental controls during the reporting period. Controls were planned and executed to industry best practice standards.

The project's environmental performance is reviewed and measured by regional RMS, FBB ER, NSW EPA, NSW Department of Primary Industries - Fisheries and NSW Office of Water.

Regional RMS environmental staff reviewed the project 6 times in the reporting period. Those inspections gave the project numerous 'green' and no 'amber or red' ratings. According to the RMS assessment standards the green rating indicates the 'site demonstrates good environmental management with no action required to avoid environmental harm'.

EPA visited site on 19 June 2018 to review the site works and discuss the process of surrendering the project EPL. No issues were raised during the inspection and EPA were happy with the way the site was progressing in decommissioning former ancillary facilities.

Fulton Hogan held the last of the six monthly environmental review group meeting (ERG) on in September 2017.

No significant environmental issues or concerns were raised by any agencies during the reporting period and all works were conducted in accordance with EPL requirements and CEMP commitments.

### 4.1 Effectiveness of environmental controls

Effectiveness of environmental controls is evaluated by industry trained environmental engineers and scientists. Controls are planned prior to ground disturbance and installed before works start.

Environmental controls have been designed and installed in accordance with industry best environmental practice. External specialist consultants are engaged periodically to provide specialist reviews and audit the effectiveness of installed controls. In addition to this, all controls are inspected weekly as a minimum, during and after rainfall events.

Site controls are reviewed and reinforced in advance of predicted heavy rainfall events. Prior to long weekends and shutdown periods extra controls are installed to make sure they are suitable for the time that workers are offsite.

Maintenance of controls occurs regularly during construction. Maintenance ensures controls are functioning properly and are fit for purpose.

In the reporting period, all erosion and sediment controls performed well during adverse weather. This minimised potential impacts on receiving catchments and adjacent sensitive receivers.

### 4.2 Environmental initiatives

The Foxground and Berry bypass construction team has adopted a 'Beyond Compliance' approach to the project. The aspirational goal for the project team is to leave a community legacy built on 360 degrees of excellence. This philosophy promotes a positive culture of excellence whereby the project aims to exceed the contract and legal requirements to create a legacy that all associated with the project will be proud of.

The 'Beyond Compliance' strategy has led to the development of goals for each construction zone to achieve during the project.

## Environmental monitoring

The Foxground and Berry bypass is undertaking a range of environmental monitoring to review the environmental effects of the project. The results of these monitoring activities are used to establish trends and drive improvements.

These results of the monitoring programs are described in this section.

### 4.3 Water quality

In accordance with approval condition B16 the project has developed a Water Quality Monitoring Program has been developed and was approved 27 October 2014.

The approved '*Water Quality Monitoring. Surface Water Monitoring Plan*' (June 2014) sets out the requirements for surface water quality monitoring. As the project became operational at the end of October 2017 surface water quality monitoring moved into the operational phase of monitoring except for 2 monitoring sites which would monitoring any potential impacts from the Woodhill Mountain Road Compound. This process was agreed to by Fulton Hogan, RMS and the project ER.

In the reporting period Fulton Hogan undertook 1 surface water monitoring event:

- 8 June 2018 (event 32)

The report for this event is contained in Appendix B of this report.

In the reporting period Roads and Maritime undertook three post construction surface water monitoring events:

- 15 May 2018 (event 4)
- 7 to 8 June 2018 (event 5)
- 5 to 6 September 2018 (event 6)

The reports for these events are yet to be finalised.

In the reporting period Roads and Maritime undertook one groundwater monitoring event:

- 23 to 24 May 2018

The report for this event is contained in Appendix B of this report.

### 4.4 Flora and fauna

In accordance with approval condition B9 the project has developed an Ecological Monitoring Program (EcMP) approved on 27 October 2014.

The last ecological monitoring by Fulton Hogan was undertaken in during the last reporting period. Ecological monitoring post construction is being undertaken by RMS and monitoring events within this reporting period are as follows:

- Aquatic monitoring - 16-18 April 2018
- Aquatic monitoring - 5-7 June 2018
- Weed monitoring - 6 August 2018
- Aquatic monitoring - 25-27 September 2018



The Grey-headed Flying Fox (GHFF) camp situated at Broughton Mill Creek have naturally migrated away from the area during the reporting period. Prior to the natural migration, the GHFF colony was monitored and managed in accordance with the FFMP.

Fauna underpasses, aerial fauna crossings for arboreal mammals and fauna fencing along the alignment is complete.



**Figure 4-1: Rope bridge complete**

#### 4.5 Heritage

There were no unexpected finds on the project in the reporting period

#### 4.6 Air quality

Ambient air quality monitoring was undertaken in accordance with the Construction Air Quality Management Sub-plan. All results for the period had an average below the 4g/m<sup>2</sup>/month dust level. A review of the monthly air quality data showed that the project had no influence on the surrounding environment and inturn air quality monitoring ceased in February 2018 with the consultation between EPA, ER, RMS and Fulton Hogan.

#### 4.7 Noise and vibration

Due to the low noise nature of work carried out during the reporting period, Fulton Hogan deemed that noise monitoring would only result in readings of external influences and operational noise from the highway, therefore monitoring ceased in December 2017 with the consultation between EPA, ER, RMS and Fulton Hogan.

## 5 Community complaints

In accordance with MCoA B31, a complaint management system has been established on the project to document community consultation including enquiries or complaints during construction. The project information line, email address, postal address and website are now being monitored and managed by Roads and Maritime Services.

The telephone number, postal address and email address was published in newspapers circulating the local area before construction started and at project completion. The details are included on all project material published to the community and they are also available on the project website in accordance with MCoA B31.



**Figure 5.1 - Advert from South Coast Register – Friday 10 November 2017**

The project will continue to respond to and manage complaints made by stakeholders in accordance with AS-ISO 10002-2006 Complaints Handling. This system will be in place until eight weeks after the date of construction completion.

### 5.1 Number and types of complaints

During the reporting period 20 complaints were received. Of these, 19 were complaints or requests for information regarding operational noise. Only one complaint, received on 26 April 2018, was in relation to truck movements, however this was not related to the project.

### 5.2 Community engagement initiatives

Consultation with nearby residents about the remaining construction activities and property adjustments occurred between occurred during the reporting period.

## 6 Other compliance matters

### 6.1 Compliance Management

During the reporting period there were:

- No environmental non-conformances
- No overpressure non-conformances
- No overall non-conformances for the project against the conditions of approval and statement of commitments.

### 6.2 Internal and external environmental inspections

The project completes many inspections to assess environmental performance and identify improvements.

Those inspections have resulted in environmental management improvements across the project. The improvements included new erosion and sediment control installations, improved site mitigations and general site improvements.

Table 6-2 summarises the inspections completed on the project. The inspections completed are consistent with the requirements of the project documents.

Inspection type	Attendees	Number of inspections
Weekly	Fulton Hogan staff; environmental management	14
Wet weather	Fulton Hogan staff; environmental management	7
Environmental Representative	Toby Hobbs Fulton Hogan staff; environmental manager	6
Regional RMS	Michelle Toms RMS project staff Toby Hobbs Fulton Hogan staff; environmental manager	6
NSW EPA	Michael Heinze, Julian Thompson <b>Fulton Hogan staff; environmental staff, engineers, foreman and superintendents</b>	1
NSW DPI (Fisheries)	Allan Lugg, Jillian Reynolds <b>Fulton Hogan staff; environmental staff, engineers, foreman and superintendents</b>	Nil
NSW DPI (Crown Land and Water)	David Zerafa Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	Nil

**Table 6-2: Inspections**

## **Appendix A Project Approval Compliance Table**

FBB Compliance Tracking Table - 31st March 2018

MCoA – Ministers Conditions of Approval Section 75J of the Environmental Planning and Assessment Act 1979						
Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
<b>PART A - ADMINISTRATIVE CONDITIONS</b>						
<b>Terms of Approval</b>						
A1	The Proponent shall carry out the project generally in accordance with the: (a) Major Project Application MP10_0240; (b) Princes Highway upgrade – Foxground and Berry bypass - Environmental Assessment (Volumes 1-2), prepared by AECOM Australia Pty Ltd for Roads and Maritime Services and dated November 2012; (c) Princes Highway upgrade – Foxground and Berry bypass – Submissions Report, prepared by AECOM Australia Pty Ltd for Roads and Maritime Services and dated May 2013, including the revised Statement of Commitments contained therein; and (d) conditions of this approval.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), September 2017 Section 1.2 Tracked and reported bi-annually in the Compliance Tracking Reports.	Ongoing
A2	In the event of an inconsistency between: (a) the conditions of this approval and any document listed from condition A1(a) to A1(c) inclusive, the conditions of this approval shall prevail to the extent of the inconsistency; and (b) any document listed from condition A1(a) to A1(c) inclusive, and any other document listed from condition A1(a) to A1(c) inclusive, the most recent document shall prevail to the extent of the inconsistency.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), September 2017. Section 1.2 Tracked and reported bi-annually in the Compliance Tracking Reports.	Ongoing
A3	The Proponent shall comply with any reasonable requirement(s) of the Secretary of the NSW Department of Planning & Environment (DP&E) arising from the Department's assessment of: (a) any reports, plans or correspondence that are submitted in accordance with this approval; and (b) the implementation of any actions or measures contained within these reports, plans or correspondence.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), September 2017. Section 1.2 Tracked and reported bi-annually in the Compliance Tracking Reports.	Ongoing
A4	Subject to confidentiality, the Proponent shall make all documents required under this approval available for public inspection on request.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Community Consultation Strategy, January 2017	Ongoing
A5	The Proponent shall notify the Secretary of the NSW Department of Planning & Environment (DP&E) and other relevant government agencies of any incident with actual or potential significant off-site environmental impacts on people or the biophysical environment as soon as practicable and within 24 hours after the occurrence of the incident. The Proponent shall provide full written details of the incident to the Secretary of the NSW Department of Planning & Environment (DP&E) within seven days of the date on which the incident occurred. Note: Where an incident also requires reporting to the OEH and/or EPA the incident report prepared for the purposes of notifying the OEH and/or EPA would meet this requirement	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), September 2017. Section 1.2	Ongoing
A6	The Proponent shall meet the requirements of the Secretary of the NSW Department of Planning & Environment (DP&E) or relevant government agency (as determined by the Secretary of the NSW Department of Planning & Environment (DP&E)) to address the cause or impact of any incident, as it relates to this approval, reported in accordance with condition A5, within such period as the Secretary of the NSW Department of Planning & Environment (DP&E) may require.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), September 2017. Section 1.2	Ongoing
<b>Limits of Approval</b>						
A7	This approval shall lapse ten years after the date on which it is granted, unless construction works the subject of this project approval are physically commenced on or before that date.	Pre-construction, construction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), Section 1.2	Ongoing
<b>Statutory Requirements</b>						
A8	The Proponent shall ensure that all necessary licences, permits and approvals required for the development of the project are obtained and maintained as required throughout the life of the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such necessary licences, permits or approvals except as provided under section 75U of the Act. This shall include relevant certification requirements in accordance with section 109R of the Act.	Pre-construction, construction, and operation	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev G), Section 1.2	Ongoing
<b>Staging</b>						



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Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
A9	<p>The Proponent may elect to construct and/ or operate the project in stages. Where staging is proposed, the Proponent shall submit a Staging Report to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of the first proposed stage. The Staging Report shall provide details of:</p> <ul style="list-style-type: none"> <li>(a) how the project would be staged including general details of work activities associated with each stage and the general timing of when each stage would commence; and</li> <li>(b) details of the relevant conditions of approval, which would apply to each stage and how these shall be complied with across and between the stages of the project.</li> <li>(c) Where staging of the project is proposed, these conditions of approval are only required to be complied with at the relevant time and to the extent that they are relevant to the specific stage(s).</li> </ul> <p>The Proponent shall ensure that an updated Staging Report (or advice that no changes to staging are proposed) is submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of each stage, identifying any changes to the proposed staging or applicable conditions.</p> <p>The Proponent shall ensure that all plans, sub-plans and other management documents required by the conditions of this approval and relevant to each stage (as identified in the Staging Report) are submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) no later than one month prior to the commencement of the relevant stages, unless an alternative timeframe is agreed to by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>	Pre-construction, construction	RMS/Fulton Hogan	Compliant	<p>NA.</p> <p>No changes to staging are proposed from that already approved by DP&amp;E as part of the <i>Toolijooa Road Fill Works Stage of the Foxground and Berry bypass Project</i>.</p>	Complete
<b>PART B - PRIOR TO CONSTRUCTION</b>						
<b>Design</b>						
B1	<p>The proponent shall, in consultation with the relevant council/s, investigate the need for:</p> <ul style="list-style-type: none"> <li>(a) potential future on and off ramps at Woodhill Mountain Road; and</li> <li>(b) a potential future left turn lane onto the new highway from Toolijooa Road.</li> </ul> <p>The investigation shall be undertaken to the satisfaction of Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), and include consideration of the relevant environmental impacts (noise, flooding, heritage, biodiversity, traffic etc.) and consider any alternative options.</p>	Pre-construction	RMS	Compliant	<p>RMS consulted with both Kiama Municipal Council and Shoalhaven City Council regarding the future off ramps and left turn lane. A letter regarding B1 was sent to DP&amp;E on 30th September 2014. DP&amp;E advised of their satisfaction in addressing B1 in a letter dated 27th October 2014.</p>	Complete
B2	<p>The bridge piers at the Connollys Creek / Bundewallah Creek / Broughton Mill Creek crossing shall be located and designed in such a way to minimise visual impacts to Berry and the bridge piers at Broughton Creek crossing 3 are located and designed in such a way to minimise visual impacts to RMB 353 Princes Highway, Broughton Village. Evidence of how visual impacts have been minimised shall be provided to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of works that would influence the design of the bridge in this location.</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Compliance has been met through the development of the detailed Urban Design and Landscaping Plan 12 September 2014</p> <p>Evidence of how visual impacts have been minimised was provided to DP&amp;E on 30th September 2014.</p>	Complete
<b>Biodiversity - Mitigation Measures - Fauna and Waterways</b>						
B3	<p>The Proponent shall design (and implement) the fauna crossings identified in Table 5.1 of Volume 2 Appendix F of the document listed under condition A1(b), at the locations and in accordance with the minimum design principles identified in Table 5.1, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E)</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015</p> <p>As at March 2018, all fauna crossing have been completed generally in accordance with the Fauna Crossing Report</p>	Complete
B4	<p>Investigations into the design of fauna crossings identified in Table 5.1 of Appendix F of the document listed under condition A1(b) during detailed design shall be undertaken with the input of a suitably qualified and experienced ecologist and in consultation with OEH and DPI (Fishing and Aquaculture).</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015</p>	Complete
B5	<p>The Proponent shall prepare a report on the final design of fauna and/or waterway crossings identified in Table 5.1 of Appendix F of the document listed under condition A1(b), where the location of the crossing has changed and/or the crossing does not meet the minimum design principles identified in Table 5.1. The report shall be submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of construction of the relevant crossing, and shall demonstrate how the new location and/ or design would result in acceptable biodiversity outcomes. The report shall clearly identify how the fauna and/or waterway crossing will work in conjunction with complementary fauna exclusion fencing measures to be implemented for the project. The report shall be accompanied by evidence of consultation with OEH and DPI (Fishing and Aquaculture) in relation to the suitability of any changes to the location and/or crossing design.</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015</p>	Complete
B6	<p>The Proponent shall, in consultation with OEH and DPI (Fishing and Aquaculture), ensure that all waterway crossings are designed and constructed consistent with the principles of the Guidelines for Controlled Activities Watercourse Crossings (Department of Water and Energy, February 2008), Policy and Guidelines for Fish Friendly Waterway Crossings (NSW Fisheries, February 2004) and Policy and Guidelines for Design and Construction of Bridges, Roads, Causeways, Culverts and Similar Structures (NSW Fisheries 1999). Where multiple cell culverts are proposed for creek crossings, at least one cell shall be provided for fish passage, with an invert or bed level that mimics creek flows.</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Flora and Fauna Management Sub Plan (Rev G)</p> <p>The project used three temporary bridges and one temporary culvert to provide access across the three 'Class 1' waterways on the project.</p> <p>All temporary creek crossings have now been removed and embankments have been rehabilitated.</p>	Complete
<b>Biodiversity Offsets</b>						
B7	<p>The Proponent shall, in consultation with the OEH and DPI (Fishing and Aquaculture), develop a <b>Biodiversity Offset Strategy</b> that identifies the available options for offsetting the biodiversity impacts of the project in perpetuity, with consideration to the</p>	Pre-construction	RMS	Compliant	<p>Biodiversity Offset Strategy approved by DP&amp;E 27 October 2014</p>	Complete

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Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
	<p>Principles for the use of biodiversity offsets in NSW (OEH website <a href="http://www.environment.nsw.gov.au/biocertification/offsets.htm">http://www.environment.nsw.gov.au/biocertification/offsets.htm</a> dated 17 June 2011). Unless otherwise agreed to by the OEH and DPI (Fishing and Aquaculture), offsets shall be provided on a like-for-like basis and at a minimum ratio of 4:1 for areas of high conservation value (including EEC, salt marsh, and poorly conserved vegetation communities identified as being more than 75% cleared in the catchment management area) and 2:1 for the remainder of native vegetation areas (including threatened species habitat, mangroves, seagrass, and non-EEC riparian vegetation). The Strategy shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) the aims and objectives of the biodiversity offset strategy;</li> <li>(b) confirmation of the vegetation type/ habitat (in hectares) to be cleared and their condition, and the size of offsets required (in hectares);</li> <li>(c) details of the type of available offset measures that have been identified to compensate for the loss of threatened species and vulnerable and endangered ecological communities and/ or their habitats, and native vegetation (including mangroves, seagrasses, salt marsh and riparian vegetation). The measures shall achieve a neutral or net beneficial outcome for all the biodiversity values likely to be impacted directly or indirectly during both the construction and operation of the project;</li> <li>(d) the decision-making framework that would be used to select the final suite of offset measures to achieve the aims and objectives of the Strategy, including the ranking of offset measures;</li> <li>(e) a process for addressing and incorporating offset measures arising from changes in biodiversity impacts (where these changes are generally consistent with the biodiversity impacts identified for the project in the documents listed under condition A1), including: <ul style="list-style-type: none"> <li>(i) changes to the footprint due to detailed design;</li> <li>(ii) changes to predicted impacts as a result of changes to mitigation measures;</li> <li>(iii) the identification of additional species/ habitat through pre-clearance surveys and construction;</li> <li>(iv) addressing outcomes of the ecological monitoring program; and</li> <li>(v) additional impacts associated with the establishment of ancillary facilities; and</li> </ul> </li> <li>(f) options for the securing and management of biodiversity offsets in perpetuity.</li> </ul> <p>The Biodiversity Offset Strategy shall be submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) for approval no later than 6 weeks prior to the commencement of construction that would result in the disturbance of native vegetation, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>					
B8	<p>Within two years of the date of approval of the Biodiversity Offset Strategy, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Proponent shall prepare and submit a <b>Biodiversity Offset Package</b> for the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). The Package shall be developed in consultation with the OEH and DPI (Fishing and Aquaculture), and shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) details of the final suite of the biodiversity offset measures to be implemented for the project demonstrating how it achieves the requirements of the Biodiversity Offset Strategy (including specified offset ratios);</li> <li>(b) the final selected means of securing the biodiversity values of the Package in perpetuity, including ongoing management, maintenance and monitoring requirements; and</li> <li>(c) timing and responsibilities for the implementation of the provisions of the Package over time.</li> </ul> <p>The requirements of the Package shall be implemented by the responsible parties according to the timeframes set out in the Package, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>	Construction and operation	RMS	Compliant	The Biodiversity Offset Package was approved by DPE on the 3rd May 2017. All four BioBanking agreements are now lodged with OEH.	Ongoing
<b>Ecological Monitoring</b>						
B9	<p>The Proponent shall develop an <b>Ecological Monitoring Program</b> to monitor the effectiveness of the biodiversity mitigation measures implemented as part of the project. The program shall be developed by a suitably qualified and experienced ecologist in consultation with the OEH and DPI (Fishing and Aquaculture) and shall include but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) an adaptive monitoring program to assess the effectiveness of the mitigation measures identified in conditions B3 and B36(b) and allow amendment to the measures if necessary. The monitoring program shall nominate performance parameters and criteria against which effectiveness will be measured and include operational road kill surveys to assess the effectiveness of fauna crossings and exclusion fencing implemented as part of the project;</li> <li>(b) mechanisms for developing additional monitoring protocols to assess the effectiveness of any additional mitigation measures implemented to address additional impacts in the case of design amendments or unexpected threatened species finds during construction (where these additional impacts are generally consistent with the biodiversity impacts identified for the project in the documents listed under condition A1);</li> <li>(c) monitoring shall be undertaken during construction (for construction-related impacts) and from opening of the project to traffic (for operation/ ongoing impacts) until such time as the effectiveness of mitigation measures can be demonstrated to have been achieved over a minimum of three successive monitoring periods after opening of the project to traffic, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). The monitoring period may be reduced with the agreement of the Secretary of the NSW Department of Planning &amp; Environment</li> </ul>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Ecological Monitoring Program approved 27 October 2014</p> <p>Ecological monitoring is ongoing. Monitoring dates within the current reporting period were:</p> <ul style="list-style-type: none"> <li>- Aquatic monitoring - 16-18 April 2018</li> <li>- Aquatic monitoring - 5-7 June 2018</li> <li>- Weed monitoring - 6 August 2018</li> <li>- Aquatic monitoring - 25-27 September 2018</li> </ul>	Ongoing

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Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
	<p>(DP&amp;E) in consultation with the OEH and DPI (Fishing and Aquaculture), depending on the outcomes of the monitoring;</p> <p>(d) provision for the assessment of the data to identify changes to habitat usage and whether this can be directly attributed to the project;</p> <p>(e) details of contingency measures that would be implemented in the event of changes to habitat usage patterns directly attributable to the construction or operation of the project; and</p> <p>(f) provision for annual reporting of monitoring results to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) and the OEH and DPI (Fishing and Aquaculture), or as otherwise agreed by those agencies.</p> <p>The Program shall be submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) for approval no later than 6 weeks prior to the commencement of construction that would result in the disturbance of native vegetation (unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E)).</p>					
<b>Hydrology and Flooding</b>						
B10	The Proponent shall ensure, where feasible and reasonable, that the project is designed to not exceed the afflux and other flooding criteria within the vicinity of the project as identified or predicted in the documents listed under condition A1. New or duplicated drainage structures shall be designed to minimise changes to afflux and flooding to waterways that traverse the project alignment to the greatest extent practicable.	Pre-construction	RMS/Fulton Hogan	Compliant	Detailed Design - Flooding Report	Complete
B11	<p>The Proponent shall develop a <b>Hydrological Mitigation Report</b> for properties in the Broughton Creek, Town Creek, Bundewallah Creek and Shoalhaven floodplain areas where flood impacts are predicted to increase as a result of the project. The Report shall be based on detailed floor level survey and associated assessment of potentially flood affected properties in those areas. The Report shall:</p> <p>(a) identify properties in those areas likely to have an increased flooding impact and detail the predicted increased flooding impact;</p> <p>(b) identify mitigation measures to be implemented where increased flooding is predicted to adversely affect access, property or infrastructure;</p> <p>(c) identify measures to be implemented to minimise scour and dissipate energy at locations where flood velocities are predicted to increase as a result of the project and cause localised soil erosion and/or pasture damage;</p> <p>(d) be developed in consultation with the relevant council, NSW State Emergency Service and directly-affected property owners; and</p> <p>(e) identify operational and maintenance responsibilities for items (a) to (c) inclusive.</p> <p>The Proponent shall not commence construction of the project on or within those areas likely to alter flood conditions until such time as works identified in the hydrological mitigation report have been completed, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Hydrological Mitigation Report</p> <p>Detailed Design - Flooding Report</p> <p>Repeated attempts to gain agreement with the landowner have not been successful to date. Roads and Maritime are continuing efforts to resolve this issue.</p>	Ongoing
B12	Based on the mitigation measures identified in condition B11, the Proponent shall prepare a final schedule of feasible and reasonable flood mitigation measures proposed at each directly-affected property in consultation with the property owner. The schedule shall be provided to the relevant property owner(s) prior to the implementation/ construction of the mitigation works, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E). A copy of each schedule of flood mitigation measures shall be provided to the Department and the relevant council prior to the implementation/ construction of the mitigation measures on the property.	Pre-construction	RMS/Fulton Hogan	Compliant	Hydrological Mitigation Report (by RMS)	Complete
B13	In the event that the Proponent and the relevant property owner cannot agree on feasible and reasonable flood mitigation measures to be applied to a property within one month of the first consultation on the measures (as required under condition B10), the Proponent shall employ a suitably qualified and experienced independent hydrological engineer, who has been approved by the Secretary of the NSW Department of Planning & Environment (DP&E), for the purposes of this condition prior to the commencement of construction in the Broughton Creek, Town Creek, Bundewallah Creek and Shoalhaven floodplain areas affected by increased afflux from the project to advise and assist affected property owners in negotiating feasible and reasonable mitigation measures.	Pre-construction	RMS	Compliant	Mark Babister from WMA Engineers appointed and approved by DP&E	Complete
B14	The Proponent shall provide assistance to the relevant council and/ or NSW State Emergency Service, to assist in the preparation of any new or necessary update(s) to the relevant plans and documents in relation to flooding, to reflect changes in flooding levels, flows and characteristics as a result of the project.	Pre-construction	RMS/Fulton Hogan	Compliant	RMS have consulted local council and they have advised that no assistance is required	Complete
<b>Sedimentation, Erosion and Water</b>						
B15	Prior to the commencement of construction, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E), the Proponent shall in consultation with the EPA and NOW, undertake <b>groundwater modelling</b> on the concept design for the project, subject to the modelling being revised should the detailed design have a significantly different impact on groundwater than the concept design. The modelling shall be undertaken by a suitably qualified and experienced groundwater expert and assess the construction and operational impacts of the proposal on the groundwater resources, groundwater quality, groundwater hydrology and groundwater dependent ecosystems and provide details of contingency and management measures in the groundwater management strategy required under condition B36(d).	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Detailed Design - Geotechnical Design &amp; Interpretative Report</p> <p>RMS undertook groundwater modelling on the RMS Concept Design for the project. Since the detailed design will not have a significantly different impact on groundwater than the RMS Concept Design, no further groundwater modelling is required.</p>	Complete

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Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
B16	<p>The Proponent shall prepare and implement a <b>Water Quality Monitoring Program</b> to monitor the impacts of the project on surface and groundwater quality and resources and wetlands, during construction and operation. The Program shall be developed in consultation with the OEH, EPA, DPI (Fishing and Aquaculture) and NOW and shall include but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) identification of surface and groundwater quality monitoring locations (including watercourses, water bodies and SEPP14 wetlands) which are representative of the potential extent of impacts from the project;</li> <li>(b) the results of the groundwater modelling undertaken under condition B15;</li> <li>(c) identification of works and activities during construction and operation of the project, including emergencies and spill events, that have the potential to impact on surface water quality of potentially affected waterways;</li> <li>(d) development and presentation of parameters and standards against which any changes to water quality will be assessed, having regard to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (Australian and New Zealand Environment Conservation Council, 2000);</li> <li>(e) representative background monitoring of surface and groundwater quality parameters for a minimum of twelve months (considering seasonality) prior to the commencement of construction, to establish baseline water conditions, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E);</li> <li>(f) a minimum monitoring period of three years following the completion of construction or until the affected waterways and/ or groundwater resources are certified by an independent expert as being rehabilitated to an acceptable condition. The monitoring shall also confirm the establishment of operational water control measures (such as sedimentation basins and vegetation swales);</li> <li>(g) contingency and ameliorative measures in the event that adverse impacts to water quality are identified; and</li> <li>(h) reporting of the monitoring results to the Department, OEH, EPA and NOW.</li> </ul> <p>The Program shall be submitted to the Director-General for approval 6 months prior to the commencement of construction of the project, or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). A copy of the Program shall be submitted to the OEH, EPA, DPI (Fishing and Aquaculture) and NOW prior to its implementation.</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<p>Construction Soil and Water Quality Management Plan (Rev E) Appendix B - Water Quality Monitoring Program</p> <p>As the project became operational at the end of October 2017 surface water quality monitoring moved into the operational phase of monitoring except for 2 monitoring sites which would monitor any potential impacts from the Woodhill Mountain Road Compound. This process was agreed to by Fulton Hogan, Roads and Maritime and the project ER.</p> <p>Fulton Hogan undertook Surface water quality monitoring at the two sites related to WHMR compound on the following dates:</p> <ul style="list-style-type: none"> <li>- 8th June 2018 – Minor Event</li> </ul> <p>RMS undertook surface water quality monitoring on the following dates:</p> <ul style="list-style-type: none"> <li>- 15 May 2018</li> <li>- 7 to 8 June 2018</li> <li>- 5 to 6 September 2018</li> </ul> <p>RMS undertook groundwater monitoring on the following dates:</p> <ul style="list-style-type: none"> <li>- 23 to 24 May 2018</li> </ul> <p>Water quality monitoring results are provided in Appendix B of this report.</p>	Ongoing
<b>Heritage Impacts - Built and Landscape Heritage</b>						
B17	<p>Prior to pre-construction and construction impacts affecting 'Glen Devon' Federation Cottage (H11) and skid mounted work-site shed (H60), the Proponent shall carry out further historical research and investigate the options for relocation of these heritage items, in consultation with the department and the Heritage Council of NSW, to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p> <p>Additionally, for H11, the proponent shall:</p> <ul style="list-style-type: none"> <li>(a) undertake archaeological investigations in accordance with condition B20; and</li> <li>(b) provide for the preparation and implementation of a heritage interpretation plan.</li> </ul>	Prior to Pre-construction	RMS	Compliant	<p>Glen Devon Cultural Heritage Assessment was submitted to DP&amp;E on 16th July 2014 and was approved by DP&amp;E in a letter dated 10th September 2014.</p> <p>DP&amp;E was advised of the relocation outcome of Glen Devon in a letter dated 9th July 2015.</p> <p>The Glen Devon Heritage Interpretation Plan was submitted to DP&amp;E on 9th July 2015.</p>	Complete
B18	<p>Prior to the commencement of preconstruction and construction works in proximity to the following items G2B H11, H13, H15, H16, H17, H19, H21, H22, H23, H30, H45, H47, H53, H54, H55, H56, H62, H63, and the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape (SICPH CL), and G2B A13, A14, A39, TRACL and MFT12 the Proponent shall complete all archival recordings, including photographic recording. In addition detailed historical research shall be undertaken for the following items G2B H60 H61, H63, the SICPH CL and G2B A39.</p> <p>This work shall be undertaken by an experienced heritage consultant, in accordance with the guidelines issued by the Heritage Council of NSW. The areas containing these items shall be clearly identified and/or fenced until the completion of the archival recordings. Within 6 months of completing the above work, the Proponent shall submit a report containing the archival recordings and the historical research, where required, to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Heritage Council of NSW, the local Council and the local Historical Society.</p>	Prior to Pre-construction	RMS	Compliant	<p>Archival recording and detailed historic research complete. Reports were sent to the DP&amp;E independently of this Compliance Tracking Report.</p> <p>Reports relating to Non-Aboriginal heritage were submitted to DP&amp;E on 10th July 2015</p> <p>Reports relating to Aboriginal heritage were submitted to DP&amp;E on 22nd October 2015</p> <p>Reports were sent to the Heritage Council of NSW, the local Councils, and the local Historical Society during this reporting period.</p>	Complete
B19	<p>Prior to pre-construction and construction impacts affecting G2B H15, H19, H21, H22, H23, H30 and H55 the Proponent shall carry out further historical and physical archaeological investigations in relation to these road alignments, in consultation with the department and the Heritage Council of NSW, to the satisfaction of the Director-General. These investigations must:</p> <ul style="list-style-type: none"> <li>(a) undertake archaeological investigations in accordance with condition B22;</li> <li>(b) provide for the detailed analysis of any heritage items discovered during the investigations;</li> <li>(c) include management options for these heritage items (including options for relocation and display); and</li> <li>(d) if the findings of the investigations are significant, provide for the preparation and implementation of a heritage interpretation plan.</li> </ul>	Prior to Pre-construction	RMS	Compliant	<p>Historic and physical archaeological investigations complete.</p> <p>Report submitted to the DP&amp;E on 10th July 2015.</p>	Complete
<b>Archaeology (Aboriginal and non-Aboriginal)</b>						
B20	<p>Prior to the commencement of pre-construction and construction activities affecting Aboriginal site G2B PAD 1 the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) undertake archaeological investigation of this site using a methodology generally consistent with testing undertaken for</li> </ul>	Prior to Pre-construction	RMS	Compliant	<p>Archaeological investigations complete.</p> <p>Report submitted to the DP&amp;E on 22nd October 2015.</p>	Complete

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	<p>the Environmental Assessment, and prepared in consultation with the OEH (Aboriginal heritage) and the Aboriginal stakeholders; and</p> <p>(b) report on the results of the archaeological investigation, including recommendations (such as for further archaeological work), in consultation with the OEH and to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), and shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(i) consideration of measures to avoid or minimise disturbance to Aboriginal objects where objects of moderate to high significance are found to be present;</li> <li>(ii) where impacts cannot be avoided, recommendations for any further investigations under condition B21; and</li> <li>(iii) management and mitigation measures to ensure there are no additional impacts due to pre-construction and construction activities.</li> </ul>					
B21	<p>Prior to the commencement of pre-construction and construction activities affecting sites G2B A16, A18, A24, A29, A30, A31, A32, A33, A36, and G2B PAD1 the proponent shall:</p> <ul style="list-style-type: none"> <li>(a) develop a detailed salvage strategy, prepared in consultation with the OEH (Aboriginal heritage) and the Aboriginal stakeholders. The investigation program shall be prepared to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E); and</li> <li>(b) undertake any further archaeological excavation works recommended by the results of the Aboriginal archaeological investigation program.</li> </ul> <p>Within twelve months of completing the above work, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Proponent shall submit a report containing the findings of the excavations, including artefact analysis and Aboriginal Site Impacts Recording Forms (ASIR), and the identification of final storage location for all Aboriginal objects recovered (testing and salvage), prepared in consultation with the Aboriginal stakeholders, the OEH (Aboriginal heritage) and to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p> <p>Note: where archaeological testing has occurred as part of the Environmental Assessment and the results are included in the documents listed in condition A1(b) the sites tested must still form part of the final report prepared under condition B21(b).</p>	Prior to Pre-construction	RMS	Compliant	<p>Archaeological salvage works have been completed on behalf of RMS by the nominated project archaeologist Kelleher Nightingale Consulting, in accordance with the approved methodology.</p> <p>The salvage report was finalised and sent to DP&amp;E during this reporting period</p>	Complete
B22	<p>Prior to the commencement of pre-construction and construction activities affecting non-Aboriginal sites H11, H14, H19, H23, H28, H30, H48, H49, H53, and H55, the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) Undertake an Historic archaeological investigation program in accordance with the Heritage Council's Archaeological Assessments Guideline (1996) using a methodology prepared, in consultation with the OEH (Heritage Branch), and to the satisfaction of the Director-General. This work should be undertaken by an archaeological heritage consultant approved by the Director-General. The nomination for the Excavation Director shall demonstrate ability to comply with the Heritage Council's Criteria for the Assessment of Excavation Directors (July 2011).</li> <li>(b) Report on the results of the non-Aboriginal archaeological investigation program, including recommendations (such as for further archaeological work), in consultation with the Heritage Branch, OEH and to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), and shall include, but not necessarily be limited to: <ul style="list-style-type: none"> <li>(i) consideration of measures to avoid or minimise disturbance to archaeology, where archaeology of non-Aboriginal archaeological significance is found to be present;</li> <li>(ii) where impacts cannot be avoided, recommendations for any further investigations for archaeology of historical archaeological significance; and</li> <li>(iii) management and mitigation measures to ensure there are no additional impacts due to pre-construction and construction activities.</li> </ul> </li> <li>(c) Undertake any further archaeological excavation works recommended by the results of the non-Aboriginal archaeological investigation program.</li> </ul> <p>Within 12 months of completing the above work, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Proponent shall submit a report containing the findings of the excavations, including artefact analysis, and the identification of a final repository for finds, prepared in consultation with the OEH (Heritage branch) and to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p> <p>Note: where archaeological testing has occurred as part of the environmental assessment and the results are included in the documents listed in condition A1(b) the sites tested must still form part of the methodology and final report prepared for the non-Aboriginal archaeological investigation program.</p>	Prior to Pre-construction	RMS	Compliant	<p>Investigation and reporting is complete.</p> <p>Report submitted to the DP&amp;E on 10th July 2015.</p>	Complete
<b>Urban Design and Landscaping</b>						
B23	<p>The Proponent shall prepare and implement an <b>Urban Design and Landscape Plan</b> for the project. The Plan shall be prepared in consultation with the relevant council and shall present an integrated urban design for the project. The Plan shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) a principal goal of achieving the urban design objectives outlined in Section 2.2 Volume 2 Appendix I of the document referred to in Condition A1(b);</li> <li>(b) location of existing vegetation and proposed landscaping (including use of indigenous and endemic species where possible) and design features;</li> </ul>	Pre-construction	RMS	Compliant	<p>Urban Design and Landscape Plan approved by DP&amp;E 27 October 2017.</p> <p>Works to rehabilitate the project footprint in accordance with the UDLP are nearing completion. Significant progressive stabilisation was achieved throughout the phases of construction. Decommissioning and rehabilitation of 4 ancillary sites has been completed with 2 sites remaining.</p>	Ongoing

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	<p>(c) graphics such as sections, perspective views and sketches for key elements of the project (including, but not limited to built elements such as retaining walls, cuttings, embankments, bridges, and noise barriers);</p> <p>(d) a description of locations along the project corridor directly or indirectly impacted by the construction of the project (e.g. temporary ancillary facilities, access tracks, watercourse crossings, etc.) and details of the strategies to progressively rehabilitate regenerate and/ or revegetate the locations with the objective of promoting biodiversity outcomes and visual integration. Details of species to be replanted/ revegetated shall be provided, including their appropriateness to the area and considering existing vegetation and habitat for threatened species;</p> <p>(e) an assessment of the visual screening effects of existing vegetation and the proposed landscaping. Where residences and businesses have been identified as likely to experience high visual impact as a result of the project and high residual impacts are likely to remain, the Proponent shall in consultation with affected receptors, identify opportunities for providing at-receptor landscaping to further screen views of the project. Where agreed to with the landowner, these measures shall be implemented during the construction of the project;</p> <p>(f) take into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts;</p> <p>(g) specific details on the landscape treatments for the North Street corridor, Town Creek diversion and Town Park.</p> <p>(h) strategies for progressive landscaping of other environmental controls such as erosion and sedimentation controls, drainage and noise mitigation;</p> <p>(i) location and design treatments for any associated footpaths and cyclist elements, and other features such as seating, lighting (in accordance with AS 4282-1997 Control of the Obtrusive Effect of Outdoor Lighting), fencing, and signs;</p> <p>(j) evidence of consultation with the relevant council and community on the proposed urban design and landscape measures prior to its finalisation; and</p> <p>(k) monitoring and maintenance procedures for the vegetated built elements, rehabilitated vegetation and landscaping (including weed control) including performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail.</p> <p>The Plan shall be submitted for the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of construction, unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). The Plan may be submitted in stages to suit the staged construction program of the project.</p>					
<b>Signage Policy</b>						
B24	The Proponent shall prepare a <b>signage policy</b> which addresses the bypassed towns of Foxground and Berry, in consultation with the relevant council.	Operation	RMS/Fulton Hogan	Compliant	Foxground and Berry Bypass Signage Policy dated 20th September 2013	Complete
B25	The signage policy shall be consistent with the Guide: Signposting (RTA July 2007), Tourist Signposting guide (RMS and Destination NSW 2012) and provide information on the range of services available within Berry including advice on any parks that could be used as a rest area (and directional signage to these parks) and that that the route through the towns may be taken as an alternative to the highway.	Operation	RMS/Fulton Hogan	Compliant	Foxground and Berry Bypass Signage Policy dated 20th September 2013	Complete
<b>Property and Landuse</b>						
B26	The Proponent shall ensure that the project is designed to minimise land take impacts to surrounding properties (including agricultural properties) as far as feasible and reasonable, in consultation with the affected landowners. Where the viability of existing agricultural operations are identified to be impacted by the land requirements of the project, the Proponent shall as part of detailed design employ a suitably qualified and experienced independent agricultural specialist (that is approved by the Secretary of the NSW Department of Planning & Environment (DP&E) for the purpose of this condition), to assist in identifying alternative farming opportunities for the relevant properties.	Pre-construction	RMS	Compliant	During the project development no impacts were identified to the viability of existing agricultural operations. As such, engaging an independent agricultural specialist was not required.	Complete
B27	The proponent shall discuss Crown Land transfer options with DPI (Crown Lands) and Shoalhaven Council, for Crown land located along the length of the project between Tannery Road and the northern interchange, with a view to reaching a mutually acceptable outcome for all parties. Evidence of consultation shall be provided to the Secretary of the NSW Department of Planning & Environment (DP&E) prior to the commencement of construction, with an agreed outcome to be reached, and submitted to the Secretary of the NSW Department of Planning & Environment (DP&E), prior to the operation of the upgraded highway. In the event that a mutually acceptable agreement cannot be reached, the Secretary of the NSW Department of Planning & Environment (DP&E) must be advised in writing, to determine whether mediation may be required.	Pre-construction and construction		Compliant	Evidence of consultation was sent to DP&E on 26th September 2014. An outcome was provided to DP&E on 18th October 2017.	Complete
B28	The proponent shall, in consultation with Shoalhaven City Council, prepare a strategy for the use of the Council land adjacent the project at North Street (presently occupied by the Berry Riding Club) investigating options to minimise impacts on the riding club both during construction and operation of the project. The final option(s) shall be determined by the proponent prior to the commencement of construction of works in the vicinity of the riding club, in consultation with Shoalhaven City Council and to the satisfaction of the Secretary of the NSW Department of Planning & Environment (DP&E).	Pre-construction		Compliant	The strategy for the land between North Street and the Berry bypass has been progressed by Roads and Maritime and Shoalhaven City Council to the point where Council has exhibited a draft Berry District Park Masterplan. The Shoalhaven City Council sought community comment on the draft masterplan. Roads and Maritime, in consultation with Shoalhaven City Council, has ensured that the Foxground and Berry Bypass Project has allowed sufficient land opportunity between North Street and the Berry Bypass to meet the needs identified in the masterplan. Roads and	Complete

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					Maritime propose no further involvement in the masterplan development and a copy of the Council draft plan is available at the following link: <a href="http://shoalhaven.nsw.gov.au/My-Council/Current-Projects/Berry-District-Park">http://shoalhaven.nsw.gov.au/My-Council/Current-Projects/Berry-District-Park</a> Roads and Maritime received confirmation from DPE on 29th November 2017 that the requirements of Condition B28 have been met.	
<b>Compliance Tracking</b>						
B29	<p>The Proponent shall develop and implement a <b>Compliance Tracking Program</b> to track compliance with the requirements of this approval. The Program shall be submitted to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) for approval prior to the commencement of construction and relate to both the construction and operational phases of the project, and include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) provisions for the notification of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) of the commencement of works prior to the commencement of construction and prior to the commencement of operation of the project (including prior to each stage, where works are being staged);</li> <li>(b) provisions for periodic review of project compliance with the requirements of this approval and the documents listed under condition A1, including the Statement of Commitments;</li> <li>(c) provisions for periodic reporting of compliance status against the requirements of this approval and the documents listed under condition A1, including the Statement of Commitments, to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) including at least one month prior to the commencement of construction and operation of the project and at other intervals during the construction and operation, as identified in the Program;</li> <li>(d) a program for independent environmental auditing in accordance with ISO 19011:2003 - Guidelines for Quality and/ or Environmental Management Systems Auditing;</li> <li>(e) mechanisms for reporting and recording incidents and actions taken in response to those incidents;</li> <li>(f) provisions for reporting environmental incidents to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) during construction and operation; and</li> <li>(g) procedures for rectifying any non-compliance identified during environmental auditing, review of compliance or incident management.</li> </ul>	Pre-construction, Construction, Operation	RMS/Fulton Hogan	Compliant	Compliance Tracking Program , Revision B 5 September 2014 Construction Environmental Management Plan (Rev G), Section 8.3 Notification prior to the commencement of operation was sent to the Secretary on 3rd October 2017	Ongoing
<b>Community Information and Involvement - Provision of Electronic Information</b>						
B30	<p>Prior to the commencement of construction, the Proponent shall establish and maintain a new <b>website</b>, or dedicated pages within an existing website, for the provision of electronic information associated with the project. The Proponent shall, subject to confidentiality, publish and maintain up-to-date information on the website or dedicated pages including, but not necessarily limited to:</p> <ul style="list-style-type: none"> <li>(a) information on the current implementation status of the project;</li> <li>(b) a copy of the documents referred to under condition A1 of this approval, and any documentation supporting modifications to this approval that may be granted from time to time;</li> <li>(c) a copy of this approval and any future modification to this approval;</li> <li>(d) a copy of each relevant environmental approval, licence or permit required and obtained in relation to the project;</li> <li>(e) a copy of each current strategy, plan, program or other document required under this approval; and</li> <li>(f) the outcomes of compliance tracking in accordance with the requirements of condition B29.</li> </ul>	Pre-construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy, (Rev 3) Section 7.2 Website: <a href="http://www.rms.nsw.gov.au/projects/south-coast/foxground-berry-bypass/index.html">http://www.rms.nsw.gov.au/projects/south-coast/foxground-berry-bypass/index.html</a> Periodic revisions and amendments of relevant documentation will be made as required.	Ongoing
<b>Complaints and Enquiries Procedure</b>						
B31	<p>Prior to the commencement of construction, the Proponent shall ensure that the following are available for community complaints and enquiries during the construction period:</p> <ul style="list-style-type: none"> <li>(a) a telephone number on which complaints and enquiries about construction and operation activities may be registered;</li> <li>(b) a postal address to which written complaints and enquiries may be sent; and</li> <li>(c) an email address to which electronic complaints and enquiries may be transmitted.</li> </ul> <p>The telephone number, the postal address and the email address shall be published in a newspaper circulating in the local area prior to the commencement of construction and prior to the commencement of project operation. The above details shall also be provided on the website (or dedicated pages) required by this approval.</p>	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy, (Rev 3) sections 7.2 and 8.2	Ongoing
B32	<p>The Proponent shall prepare and implement a <b>Construction Complaints Management System</b> consistent with AS 4269 Complaints Handling prior to the commencement of construction activities and must maintain the System for the duration of construction activities.</p> <p>Information on all complaints received, including the means by which they were addressed and whether resolution was reached and whether mediation was required or used, shall be maintained by the Proponent and included in a complaints register. The information contained within the System shall be made available to the Secretary of the NSW Department of Planning &amp;</p>	Pre-construction, Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy, (Rev 3) Sections 8.1 and 8.2	Ongoing



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Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
	Environment (DP&E) on request.					
<b>Community Involvement</b>						
B33	<p>The Proponent shall prepare and implement a <b>Community Communication Strategy</b> for the project. This Strategy shall be designed to provide mechanisms to facilitate communication between the Proponent, the Contractor, the Environmental Representative, the relevant council and the local community (broader and local stakeholders) on the construction and environmental management of the project. The Strategy shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) identification of stakeholders to be consulted as part of the Strategy, including affected and adjoining landowners;</li> <li>(b) procedures and mechanisms for the regular distribution of information to stakeholders on the progress of the project and matters associated with environmental management;</li> <li>(c) procedures and mechanisms through which stakeholders can discuss or provide feedback to the Proponent and/ or Environmental Representative in relation to the environmental management and delivery of the project;</li> <li>(d) procedures and mechanisms through which the Proponent can respond to enquiries or feedback from stakeholders in relation to the environmental management and delivery of the project; and</li> <li>(e) procedures and mechanisms that would be implemented to resolve issues/ disputes that may arise between parties on the matters relating to environmental management and the delivery of the project. This may include the use of an appropriately qualified and experienced independent mediator.</li> </ul> <p>Key issues that should be addressed in the Community Communication Strategy should include (but not necessarily be limited to):</p> <ul style="list-style-type: none"> <li>(i) traffic management (including property access, pedestrian access);</li> <li>(ii) landscaping/urban design matters;</li> <li>(iii) construction activities; and</li> <li>(iv) noise and vibration mitigation and management.</li> </ul> <p>The Proponent shall maintain and implement the Strategy throughout construction of the project. The Strategy shall be approved by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) prior to the commencement of construction, or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>	Pre-construction	RMS/Fulton Hogan	Compliant	<ul style="list-style-type: none"> <li>a) Community Communication Strategy, 27 October 2015 Section 5.2</li> <li>b) Community Communication Strategy, 27 October 2015 Section 7.2 and Appendix E</li> <li>c) Community Communication Strategy, 27 October 2015 Section 8.2</li> <li>d) Community Communication Strategy, 27 October 2015 Section 8.2</li> <li>e) Community Communication Strategy, 27 October 2015 Sections 4.1 and 8.2.</li> </ul> <p>Community Communication Strategy Appendix C</p> <ul style="list-style-type: none"> <li>i) Community Communication Strategy, 27 October 2015 Sections 4.1, 7.2 and 13.</li> <li>ii) Community Communication Strategy Sections 3.4, 7.2 and 7.5.</li> <li>iii) Community Communication Strategy Sections 3.4, 7.2 and 7.5.</li> <li>iv) Community Communication Strategy Sections 3.4, 7.2 and 7.5.</li> </ul>	Ongoing
<b>Environmental Management - Environmental Representative</b>						
B34	<p>Prior to the commencement of construction of the project, or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Proponent shall nominate for the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) a suitably qualified and experienced <b>Environment Representative(s)</b> that is independent of the design (including preparation of documentation referred to in condition A1), and construction personnel. The Proponent shall employ the Environmental Representative(s) for the duration of construction, or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). The Environment Representative(s) shall:</p> <ul style="list-style-type: none"> <li>(a) be the principal point of advice in relation to the environmental performance of the project;</li> <li>(b) be consulted in responding to the community concerning the environmental performance of the project where the resolution of points of conflict between the Proponent and the community is required;</li> <li>(c) monitor the implementation of environmental management plans and monitoring programs required under this approval;</li> <li>(d) monitor the outcome of environmental management plans and advise the Proponent upon the achievement of project environmental outcomes;</li> <li>(e) have responsibility for considering and advising the Proponent on matters specified in the conditions of this approval, and other licences and approvals related to the environmental performance and impacts of the project;</li> <li>(f) ensure that environmental auditing is undertaken in accordance with the requirements of condition B29 and the project's Environmental Management System(s);</li> <li>(g) be given the authority to approve/ reject minor amendments to the Construction Environment Management Plan. What constitutes a "minor" amendment shall be clearly explained in the Construction Environment Management Plan required under condition B35; and</li> <li>(h) be given the authority and independence to require reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.</li> </ul>	Pre-construction, construction	RMS/Fulton Hogan	Compliant	Vantage Environmental (Toby Hobbs) has been appointed by RMS as the Environmental Representative on the Foxground and Berry Bypass.	Complete
<b>Construction Environmental Management Plan</b>						
B35	<p>The Proponent shall prepare and (following approval) implement a <b>Construction Environmental Management Plan</b> for the project. The Plan shall outline the environmental management practices and procedures that are to be followed during construction, and shall be prepared in consultation with the relevant agencies and in accordance with the Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources, 2004). The Plan shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(a) a description of activities to be undertaken during construction of the project or stages of construction, as relevant;</li> <li>(b) statutory and other obligations that the Proponent is required to fulfil during construction including approvals,</li> </ul>	Preconstruction	RMS/Fulton Hogan	Compliant	<p>Construction Environmental Management Plan (Rev H)</p> <p>A periodic review was undertaken of the CEMP and sub plans in September 2017 and endorsed by the ER on 25th September 2017. A periodic review of the CEMP is scheduled for October 2018</p>	Ongoing

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	<p>consultations and agreements required from agencies and key legislation and policies. Evidence of consultation with relevant agencies shall be included identifying how issues raised by these agencies have been addressed in the Plan;</p> <p>(c) a description of the roles and responsibilities for relevant employees involved in the construction of the project including relevant training and induction provisions for ensuring that employees, including contractors and sub-contractors are aware of their environmental and compliance obligations under these conditions of approval;</p> <p>(d) identification of ancillary facility site locations, including an assessment against the location criteria outlined in condition C32;</p> <p>(e) an environmental risk analysis to identify the key environmental performance issues associated with the construction phase and details of how environmental performance would be monitored and managed to meet acceptable outcomes including what actions will be taken to address identified potential adverse environmental impacts (including any impacts arising from the staging of the construction of the project and/ or concurrent construction works with adjacent Princes Highway Upgrade projects, as relevant). In particular, the following environmental performance issues shall be addressed in the Plan:</p> <ul style="list-style-type: none"> <li>(i) measures to monitor and manage dust emissions including dust from stockpiles, blasting, traffic on unsealed public roads and materials tracking from construction sites onto public roads;</li> <li>(ii) measures to minimise hydrology impacts, including measures to stabilise bed and bank structures as required,</li> <li>(iii) measures to monitor and manage impacts associated with the construction and operation of ancillary facilities,</li> <li>(iv) measures for the handling, treatment and management of contaminated materials,</li> <li>(v) measures to monitor and manage waste generated during construction including but not necessarily limited to: general procedures for waste classification, handling, reuse, and disposal; use of secondary waste material in construction wherever feasible and reasonable; procedures for dealing with green waste including timber and mulch from clearing activities; and measures for reducing demand on water resources (including the potential for reuse of treated water from sediment control basins);</li> <li>(vi) measures to monitor and manage spoil, fill and materials stockpile sites including details of how spoil, fill or material would be handled, stockpiled, reused and disposed and a stockpile management protocol detailing locational criteria that would guide the placement of stockpiles and management measures that would be implemented to avoid/ minimise amenity impacts to surrounding residents and environmental risks (including to surrounding water courses). Stockpile sites that affect heritage, threatened species, populations or endangered ecological communities require the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), in consultation with the OEH;</li> <li>(vii) measures to monitor and manage hazard and risks including emergency management; and</li> <li>(viii) the issues identified in condition B36;</li> </ul> <p>(f) details of community involvement and complaints handling procedures during construction, consistent with the requirements of conditions B30 to B33;</p> <p>(g) details of compliance and incident management consistent with the requirements of condition B29; and</p> <p>(h) procedures for the periodic review and update of the Construction Environmental Management Plan and sub-plans required under condition B35 and B36 respectively, as necessary (including where minor changes can be approved by the Environmental Representative).</p> <p>The Plan shall be submitted for the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) no later than one month prior to the commencement of construction, or within such period otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E). Construction works shall not commence until written approval has been received from the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>					
B36	<p>As part of the Construction Environment Management Plan for the project required under condition B35, the Proponent shall prepare and implement the following sub plan(s):</p> <p>(a) a <b>Construction Traffic Management Sub-plan</b>, prepared in accordance with the Roads and Maritime Service's QA Specification G10 – Control of Traffic and Traffic Control at Work Sites Manual (2003) to manage disruptions to traffic movements as a result of construction traffic associated with the project. The sub-plan shall be developed in consultation with the relevant council and shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(i) identification of construction traffic routes and quantification of construction traffic volumes (including heavy vehicle/ spoil haulage) on these routes;</li> <li>(ii) details of vehicle movements for construction sites and site compounds including parking, dedicated vehicle turning areas, and ingress and egress points;</li> <li>(iii) details of potential impacts to traffic on the existing highway, the 'Sandtrack', and associated local roads, including, intersection level of service and potential disruptions to pedestrians, public transport, parking, cyclists and property access</li> <li>(iv) details of temporary and interim traffic arrangements to address potential impacts;</li> </ul>	Preconstruction	RMS/Fulton Hogan	Compliant	<ul style="list-style-type: none"> <li>(a) Construction Traffic Management Plan (Rev 3) and Appendices</li> <li>(b) Flora and Fauna Management Sub Plan (Rev G) and Appendices.</li> <li>(c) Noise and Vibration Management Sub Plan (Rev G) and Appendices</li> <li>(d) Soil and Water Quality Management Sub Plan (Rev F) and Appendices</li> <li>(e) Heritage Management Sub Plan (Rev F) and Appendices</li> </ul>	Ongoing

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	<p>(v) details of evidence based mitigation measures to address potential impacts on the 'Sandtrack';</p> <p>(vi) a response procedure for dealing with traffic incidents; and</p> <p>(vii) mechanism for the monitoring, review and amendment of this sub-plan.</p> <p>(b) a <b>Construction Flora and Fauna Management Sub-plan</b> to detail how construction impacts on ecology will be minimised and managed. The sub-plan shall be developed in consultation with the OEH and DPI (Fishing and Aquaculture) and shall include, but not necessarily be limited to:</p> <p>(i) details of pre-construction surveys undertaken by a suitably qualified and experienced ecologist to verify the construction boundaries/ footprint of the project based on detailed design and to confirm the vegetation to be cleared as part of the project (including tree hollows, threatened flora and fauna species and riparian vegetation);</p> <p>(ii) updated sensitive area/ vegetation maps based on (i) above and previous survey work;</p> <p>(iii) details of general work practices and mitigation measures to be implemented during construction to minimise impacts on native fauna and native vegetation (particularly threatened species and EECs) not proposed to be cleared as part of the project, including, but not necessarily limited to: fencing of sensitive areas, a protocol for the removal and relocation of fauna during clearing, engagement of a suitably qualified and experienced ecologist to identify locations where they would be present and to oversee clearing activities and facilitate fauna rescues and re-location, clearing timing with consideration to breeding periods, measures for maintaining existing habitat features (such as bush rock and tree branches etc), seed harvesting and appropriate topsoil management, construction worker education, weed management (including controls to prevent the introduction or spread of <i>Phytophthora cinnamomi</i>), erosion and sediment control and progressive re-vegetation;</p> <p>(iv) specific procedures to deal with EEC/ threatened species anticipated to be encountered within the project corridor including re-location, translocation and/or management and protection measures;</p> <p>(v) a procedure for dealing with unexpected EEC/threatened species identified during construction including cessation of work and notification of the OEH, determination of appropriate mitigation measures in consultation with the OEH (including relevant re-location measures) and update of ecological monitoring and/ or biodiversity offset requirements consistent with conditions B7 and B8; and</p> <p>(vi) mechanism for the monitoring, review and amendment of this sub-plan;</p> <p>(c) a <b>Construction Noise and Vibration Management Sub-plan</b> to detail how construction noise and vibration impacts will be minimised and managed. The sub-plan shall be developed in consultation with the EPA and include, but not necessarily be limited to:</p> <p>(i) identification of nearest sensitive receptors and relevant construction noise and vibration goals applicable to the project;</p> <p>(ii) identification of key noise and/or vibration generating construction activities (based on representative construction scenarios, including at ancillary facilities) that have the potential to impact on surrounding sensitive receivers including expected noise/ vibration levels;</p> <p>(iii) identification of feasible and reasonable measures proposed to be implemented to minimise construction noise and vibration impacts (including construction traffic noise impacts);</p> <p>(iv) procedures for dealing with out-of-hour works in accordance with condition C4 and C6, including procedures for notifying the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) concerning complaints received in relation to the extended hours approved under condition C4(e);</p> <p>(v) procedures and mitigation measures to ensure relevant vibration and blasting criteria are achieved, including a suitable blast program, applicable buffer distances for vibration intensive works, use of low-vibration generating equipment/ vibration dampeners or alternative construction methodology, and pre- and post-construction dilapidation surveys of sensitive structures where blasting and/ or vibration is likely to result in damage to buildings and structures (including surveys being undertaken immediately following a monitored exceedance of the criteria);</p> <p>(vi) procedures for notifying sensitive receivers of construction activities that are likely to affect their noise and vibration amenity, as well as procedures for dealing with and responding to noise complaints; and</p> <p>(vii) a program for construction noise and vibration monitoring clearly indicating monitoring frequency, location, how the results of this monitoring would be recorded and, procedures to be followed where significant exceedances of relevant noise and vibration goals are detected;</p> <p>(d) a <b>Construction Soil and Water Quality Management Sub-plan</b> to manage surface and groundwater impacts during construction of the project. The sub-plan shall be developed in consultation with the OEH, EPA, DPI (Fishing and Aquaculture) and NOW and include, but not necessarily be limited to:</p> <p>(i) identification of potential sources of erosion and sedimentation, and water pollution (including those resulting</p>					

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	<p>from maintenance activities);</p> <ul style="list-style-type: none"> <li>(ii) details of how construction activities would be managed and mitigated to minimise erosion and sedimentation consistent with condition C20;</li> <li>(iii) where construction activities have the potential to impact on waterways or wetlands (through direct disturbance such as construction of waterway crossings or works in close proximity to waterways or wetlands), site specific mitigation measures to be implemented to minimise water quality, riparian and stream hydrology impacts as far as practicable, including measures to stabilise bed and/ or bank structures where feasible and reasonable, and to rehabilitate affected riparian vegetation to existing or better condition. The timing of rehabilitation of the waterways shall be identified in the sub-plan;</li> <li>(iv) a contingency plan, consistent with the Acid Sulphate Soils Manual, to deal with the unexpected discovery of actual or potential acid sulphate soils, including procedures for the investigation, handling, treatment and management of such soils and water seepage;</li> <li>(v) a tannin leachate management protocol to manage the stockpiling of mulch and use of cleared vegetation and mulch filters for erosion and sediment control;</li> <li>(vi) construction water quality monitoring requirements consistent with condition B16; and</li> <li>(vii) a groundwater management strategy, including (but not necessarily limited to):               <ul style="list-style-type: none"> <li>i. description and identification of groundwater resources (including depths of the water table and water quality) potentially affected by the project based on baseline groundwater monitoring undertaken in accordance with condition B15;</li> <li>ii. identification of surrounding licensed bores, dams or other water supplies and groundwater dependant ecosystems and potential groundwater risks associated with the construction of the project on these groundwater users and ecosystems;</li> <li>iii. measures to manage identified impacts on water table, flow regimes and quality and to groundwater users and ecosystems;</li> <li>iv. groundwater inflow control, handling, treatment and disposal methods; and</li> <li>v. a detailed monitoring plan to identify monitoring methods, locations, frequency, duration and analysis requirements; and</li> </ul> </li> </ul> <p>(e) a <b>Construction Heritage Management Sub-plan</b> to detail how construction impacts on Aboriginal and non-Aboriginal heritage will be avoided, minimised and managed. The sub-plan shall be prepared by an appropriately qualified heritage consultant(s) and be developed in consultation with the Heritage Council of NSW, the OEH (Aboriginal heritage), and registered Aboriginal stakeholders (for Aboriginal heritage), and include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>(i) In relation to Aboriginal Heritage:           <ul style="list-style-type: none"> <li>i. details of management measures and strategies for protection, salvage, and/or conservation of sites and items that will be directly or indirectly impacted during construction (including further archaeological investigations, salvage measures and/ or measures to protect unaffected sites during construction works in the vicinity);</li> <li>ii. procedures for dealing with previously unidentified Aboriginal objects (excluding human remains) including cessation of works in the vicinity, assessment of the significance of the item(s) and determination of appropriate mitigation measures including when works can re-commence by a suitably qualified archaeologist in consultation with the department, OEH and registered Aboriginal stakeholders and assessment of the consistency of any new Aboriginal heritage impacts against the approved impacts of the project, and notification to the OEH, in accordance with section 89A of the National Parks and Wildlife Act 1974, and the department;</li> <li>iii. procedures for dealing with human remains, including cessation of works in the vicinity and notification of the department, NSW Police Force, OEH and registered Aboriginal stakeholders and not recommencing any works in the area unless authorised by the department and/ or the NSW Police Force); and</li> <li>iv. induction processes (identification, protection) for construction personnel (including procedures for keeping records of inductions) and procedures for ongoing Aboriginal consultation and involvement; and</li> </ul> </li> <li>(ii) In relation to non-Aboriginal Heritage:           <ul style="list-style-type: none"> <li>i. details of management measures and strategies for protection, excavation, archival recording and/or conservation of heritage items that will be directly or indirectly impacted during construction (including measures to protect unaffected items during construction works in the vicinity);</li> <li>ii. procedures for dealing with previously unidentified items of heritage significance, including cessation of works in the vicinity, assessment of the significance of the item(s) and determination of appropriate mitigation measures including when works can re-commence by a suitably qualified and experienced archaeologist in consultation with the department and the Heritage Council of NSW</li> </ul> </li> </ul>					

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	<p>and assessment of the consistency of any new non-Aboriginal heritage impacts against the approved impacts of the project and notification of the Heritage Council of NSW, in accordance with Section 146 of the NSW Heritage Act 1977, and the department;</p> <p>iii. procedures for dealing with human remains, including cessation of works in the vicinity and notification of the department, NSW Police Force, the Heritage Council of NSW and not recommending any works in the area unless authorised by the department, and/ or the NSW Police Force); and</p> <p>iv. heritage induction processes (identification, protection) for construction personnel (including procedures for keeping records of inductions).</p>					
<b>PART C - DURING CONSTRUCTION</b>						
<b>Biodiversity</b>						
C1	The Proponent shall employ feasible and reasonable measures to minimise the clearing of native vegetation during the construction of the project.	Construction	Fulton Hogan	Compliant	Flora and Fauna Management Sub Plan (Rev G) and Appendices: contains provisions for minimising clearing. Clearing of native vegetation was minimised during the construction phase of the project.	Completed
<b>Air Quality Impacts</b>						
C2	The Proponent shall employ feasible and reasonable measures (including cessation of relevant works, as appropriate) to ensure that the project is constructed in a manner that minimises dust generation, including wind-blown dust, traffic-generated dust, dust from stockpiles and material tracking from construction and ancillary facility sites onto public roads.	Construction	Fulton Hogan	Compliant	Air Quality Management Sub Plan (Rev G), September 2017 Measures to minimise dust including multiple types of soil binding agents were used during the construction phase of the project.	Completed
<b>Noise and Vibration Impacts - Construction Hours</b>						
C3	<p>The Proponent shall only undertake construction activities associated with the project during the following standard construction hours:</p> <p>(a) For the area south of Tindalls Lane (including Berry township)</p> <p>(i) 7:00am to 6:00pm Mondays to Fridays, inclusive; and</p> <p>(ii) 8:00am to 1:00pm Saturdays; and</p> <p>(iii) at no time on Sundays or public holidays.</p>	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G), September 2017	Ongoing
C4	<p>Works outside of the standard construction hours identified in condition C3 may be undertaken in the following circumstances:</p> <p>(a) works that generate noise that is:</p> <p>(i) LAeq (15 minute) noise levels no more than 5dB(A) above rating background level at any residence in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009); and</p> <p>(ii) LAeq (15 minute) noise levels no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) at other sensitive receivers; or</p> <p>(b) where a negotiated agreement has been reached with affected receivers, where the prescribed noise levels cannot be achieved; or</p> <p>(c) for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or</p> <p>(d) for the area between Toolijooa Road and Tindalls Lane, encompassing Toolijooa cut, Broughton Creek floodplain and major bridge works (outside of Berry township) low noise impact activities and works as follows:</p> <p>(i) between 6:00am and 7:00am Monday to Friday; and</p> <p>(ii) between 6:00pm and 7:00pm Monday to Friday; and</p> <p>(iii) 1:00pm and 5:00pm on Saturdays; and</p> <p>(iv) at no time after 6pm on a day preceding a public holiday long weekend; and</p> <p>(e) where it is required in an emergency to avoid injury or the loss of life, property and/or to prevent environmental harm; or</p> <p>(f) works approved through an EPL, including for works identified in an out of hours procedure.</p>	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G) Appendix E  Additional approved out of hour's works have been completed and are compliant to the requirements of the individual supplementary approval.  Condition C4 was modified by DP&E 31 July 2015 to allow for the NSW EPA to consider and approve Out of Hours Work (OOHW) in accordance with the Project Environmental Protection Licence (EPL)	Ongoing
C5	<p>Except as expressly permitted by an Environment Protection Licence issued for the project, high noise impact activities and works shall only be undertaken:</p> <p>(a) between the hours of 8:00am to 6:00pm Mondays to Fridays;</p> <p>(b) between the hours of 8:00am to 1:00pm Saturdays; and</p> <p>(c) in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.</p> <p>For the purposes of this condition 'continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing any of the work the subject of this condition.</p>	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G), September 2017, Chapter 7	Ongoing
C6	Construction activities (Out of Hours work) may be allowed to occur outside the construction hours specified in condition C3 with the prior written approval of the Secretary of the NSW Department of Planning & Environment (DP&E). Requests for Out of	Construction	Fulton Hogan	N/A	Condition C6 deleted by DP&E in accordance with the Modification	N/A



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	<p>Hours approval will be considered for construction activities which cannot be undertaken during the construction hours specified in condition C3 for technical or other justifiable reasons and will be considered on a case by case or activity specific basis. Request for Out of Hours work must be accompanied by:</p> <p>(a) details of the nature and need for activities to be conducted during the varied construction hours;</p> <p>(b) written evidence to the EPA and the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) that activities undertaken during the varied construction hours are justified, appropriate consultation with potentially affected receivers and notification of the relevant Council has been undertaken, issues raised have been addressed, and all feasible and reasonable mitigation measures have been put in place; and</p> <p>(c) evidence of consultation with the EPA on the proposed variation in standard construction hours.</p> <p>Despite the above, Out of Hours work may also occur in accordance with an approved Construction Environment Management Plan or Construction Noise and Vibration Management Sub-plan for this project, where that plan provides a process for considering the above on a case by case or activity specific basis by the Proponent, including factors (a) to (c) above.</p>				of 31 July 2015	
C7	<p>Blasting associated with the project shall only be undertaken during the following hours:</p> <p>(a) 9:00am to 5:00pm, Mondays to Fridays, inclusive;</p> <p>(b) 9:00am to 1:00pm on Saturdays; and</p> <p>(c) at no time on Sundays or public holidays.</p> <p>This condition does not apply in the event of a direction from the NSW Police Force or other relevant authority for safety or emergency reasons to avoid loss of life, property loss and/or to prevent environmental harm.</p>	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G), September 2017, Appendix D. Blasting was completed in July 2016. No further blasting is proposed.	Complete
<b>Construction Noise and Vibration Goals</b>						
C8	The Proponent shall implement feasible and reasonable noise mitigation measures with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) during construction activities. Any activities that could exceed the construction noise management levels shall be identified and managed in accordance with the Construction Noise and Vibration Management Sub-plan required under condition B36.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G) Section 4.1 and Chapter 7 No exceedances were observed in the reporting period. Noise is reported monthly in EPL reports and publically available on the Fulton Hogan website. <a href="http://www.fultonhogan.com/news-resources/management-plans-reporting/foxground-berry-bypass-nsw/">(http://www.fultonhogan.com/news-resources/management-plans-reporting/foxground-berry-bypass-nsw/)</a> The project is now in operational phase	Complete
C9	The Proponent shall implement all feasible and reasonable mitigation measures with the aim of achieving the following construction vibration goals:	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G), September 2017, Section 4.2 and Chapter 7 No further vibration activities will be undertaken	Complete
C10	The Proponent shall ensure that airblast overpressure generated by blasting associated with the project does not exceed the criteria specified in Table 1 when measured at the most affected residence or other sensitive receiver.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev G) Section 4.2, Chapter 7 and Appendix D Blasting is complete.	Complete
	<b>Table 1 - Airblast overpressure criteria:</b>					
	<table border="1"> <thead> <tr> <th>Airblast overpressure (dB(Lin Peak))</th> <th>Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td>125</td> <td>5% of total number of blasts over a 12 month period</td> </tr> <tr> <td>135</td> <td>0%</td> </tr> </tbody> </table>					
Airblast overpressure (dB(Lin Peak))	Allowable exceedance					
125	5% of total number of blasts over a 12 month period					
135	0%					

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C11	<p>The Proponent shall ensure that ground vibration generated by blasting associated with the project does not exceed the criteria specified in Table 2 when measured at the most affected residence or other sensitive receiver.</p> <p><b>Table 2 – Peak particle velocity criteria</b></p> <table border="1"> <thead> <tr> <th>Receiver</th> <th>Peak particle velocity (mm/s)</th> <th>Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Residence on privately owned land</td> <td>5</td> <td>5% of total number of blasts over a 12 month period</td> </tr> <tr> <td>10</td> <td>0%</td> </tr> <tr> <td>Non-Aboriginal Heritage Item</td> <td>3</td> <td>0%</td> </tr> </tbody> </table>	Receiver	Peak particle velocity (mm/s)	Allowable exceedance	Residence on privately owned land	5	5% of total number of blasts over a 12 month period	10	0%	Non-Aboriginal Heritage Item	3	0%	Construction	Fulton Hogan	Compliant	<p>Noise and Vibration Management Sub Plan (Rev G) Section 4.3, Chapter 7 and Appendix D</p> <p>Blasting was completed in this reporting period and no further blasting is required</p>	Complete
Receiver	Peak particle velocity (mm/s)	Allowable exceedance															
Residence on privately owned land	5	5% of total number of blasts over a 12 month period															
	10	0%															
Non-Aboriginal Heritage Item	3	0%															
C12	To ensure that the criteria specified in conditions C10 and C11 are satisfied at the most affected residence or other sensitive receiver, blasting trials shall be undertaken prior to the commencement of the project's blasting program, with results from the trial blasts used to determine site specific blast design to satisfy the relevant criteria.	Construction	Fulton Hogan	Compliant	<p>Noise and Vibration Management Sub Plan (Rev G) Section 4.3, Chapter 7 and Appendix D</p> <p>Blasting was completed in this reporting period and no further blasting is required</p>	Complete											
C13	<p>C13. The blasting criteria identified in conditions C10 and/or C11 may be exceeded where the Proponent has written approval from the Director General. In obtaining the Director General's approval for any such exceedance the Proponent shall submit to the Director General:</p> <p>(a) a written agreement from the EPA and the relevant landowner to exceed the criteria;</p> <p>(b) details of the proposed blasting program and justification for the proposed increase to blasting criteria including alternatives considered (where relevant);</p> <p>(c) an assessment of the environmental impacts of the increased blast limits on the surrounding environment and most affected residences or other sensitive receivers including, but not limited to noise, vibration and air quality and any risk to surrounding utilities, services or other structures;</p> <p>(d) in relation to any identified non-Aboriginal heritage items in the vicinity of blasting works, an assessment of heritage impacts;</p> <p>(e) details of the blast management, mitigation and monitoring procedures to be implemented;</p> <p>(f) details of consultation undertaken (including clear identification of proposed blast limits and potential property impacts) and agreement reached with the relevant landowners and EPA (including a copy of the agreement in relation to increased blasting limits).</p> <p>Unless otherwise agreed by the Director General, the following exclusions apply to the application of this condition:</p> <p>(a) any agreements reached may be terminated by the landowner at any time should concerns about the increased blasting limits be unresolved; and</p> <p>(b) the blasting limit agreed to under any agreement can at no time exceed a maximum Peak Particle Velocity vibration level of 25 mm/s or maximum Airblast Overpressure level of 125 dBL.</p>	Construction	Fulton Hogan	Compliant	<p>Noise and Vibration Management Sub Plan (Rev G) Section 4.3, Chapter 7 and Appendix D</p> <p>Modification to C13 was approved on 28th January 2015</p> <p>Blasting was completed in this reporting period and no further blasting is required</p>	Complete											
<b>Operational Noise Mitigation Review</b>																	
C14	<p>Unless otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), within 6 months of commencing construction, the Proponent shall, in consultation with the EPA, prepare and submit for the approval of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), a review of the operational noise mitigation measures proposed to be implemented for the project. The review shall:</p> <p>(a) confirm the operational noise predictions of the project based on detailed design. This operational noise assessment shall be based on an appropriately calibrated noise model (which has incorporated additional noise monitoring, where necessary for calibration purposes);</p> <p>(b) review the suitability of the operational noise mitigation measures identified in the documents listed under condition A1 to achieve the criteria outlined in the <i>Road Noise Policy</i> (DECCW, 2011), based on the operational noise performance of the project predicted under (a) above; and</p> <p>(c) where necessary, investigate additional feasible and reasonable noise mitigation measures to achieve the criteria outlined in the <i>Road Noise Policy</i> (DECCW, 2011).</p>	Construction	RMS/Fulton Hogan	Compliant	Operational Noise Management Design Report Rev 3 dated 16 March 2015. Approved by DP&E on 12th June 2015	Complete											

**Heritage Impacts**

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C15	This approval does not allow the Proponent to destroy, modify or otherwise physically affect human remains as part of the project.	Construction	RMS/Fulton Hogan	Compliant	Heritage Management Sub Plan (Rev F), September 2017, Chapter 5 and Appendix A Modification of C15 was approved on 29th September 2017	Ongoing
C16	The Proponent shall not destroy, modify or otherwise physically affect Aboriginal sites A3, A20, A37 – A39, and MFT 13-23 and non-Aboriginal sites H25, H26, H51, H52, H58, and H59.	Construction	RMS/Fulton Hogan	Compliant	Heritage Management Sub Plan (Rev F), September 2017, Chapter 5 Modification of C16 was approved on 29th September 2017	Ongoing
C17	Identified impacts to heritage (both Aboriginal and non-Aboriginal), shall be minimised to the greatest extent practicable through both detailed design and construction, particularly with regard to Aboriginal sites A13, A14, A18 and TRACL, and historic sites H13, H20, H54, H62, H63 and the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape. Where impacts are unavoidable, works shall be undertaken in accordance with the actions to manage heritage construction impacts required by condition B36(e) and under the guidance of an appropriately qualified heritage specialist.	Construction	RMS/Fulton Hogan	Compliant	Heritage Management Sub Plan (Rev F), September 2017, Chapter 5 Detailed design of the Foxground and Berry Bypass Urban Design and Landscaping Plan 20 November 2015	Ongoing
C18	The proponent shall not destroy, modify or otherwise physically affect any heritage items outside the approved project footprint, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E) in accordance with Condition C32 of this project approval.	Construction	RMS/Fulton Hogan	Compliant	CEMP Section 3.7 and Appendix A5 Heritage Management Sub Plan (Rev F), September 2017, Chapter 5	Ongoing
C19	The measures to protect Aboriginal or historic heritage sites near or adjacent to the project during construction shall be detailed in the Heritage Management Sub-plan required under condition B36(e).	Construction	RMS/Fulton Hogan	Compliant	Heritage Management Sub Plan (Rev F), September 2017, Chapter 5	Ongoing
<b>Sedimentation, Erosion and Water</b>						
C20	Soil and water management measures consistent with <i>Managing Urban Stormwater - Soils and Construction Volumes 1 and 2, 4th Edition</i> (Landcom, 2004) and <i>Managing Urban Stormwater Soils And Construction Vols 2A and 2D Main Road Construction</i> (Department of Environment and Climate Change, 2008) shall be employed during the construction of the project for erosion and sediment control.	Construction	RMS/Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev F), September 2017, Section 2.2 and Chapter 5	Ongoing
C21	Where available, and of appropriate chemical and biological quality, the Proponent shall use stormwater, recycled water or other water sources in preference to potable water for construction activities, including concrete mixing and dust control.	Construction	RMS/Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev F), September 2017, Chapter 5	Ongoing
C22	All surface water and groundwater must be adequately treated prior to entering the stormwater system to protect the receiving water source quality.	Construction	RMS/Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev F), September 2017, Chapter 5	Ongoing
<b>Property and Landuse</b>						
C23	The Proponent shall construct the project in a manner that minimises impacts to private properties and other public or private structures (such as dams, fences, utilities, services etc.) along the project corridor. In the event that construction of the project results in direct or indirect damage to such property or structure, the Proponent shall arrange and fund repair of the damage to a standard comparable to that in existence prior to the damage occurring, unless otherwise agreed by the relevant property or utility owner.	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy Appendices C and E. Noise and Vibration Management Sub Plan (Rev G), September 2017, Chapter 7 Dilapidation Reports have been completed	Ongoing
C24	Access to private property shall be maintained during construction unless otherwise agreed with the property owner in advance. A landowner's access that is physically affected by the Project shall be reinstated to meet at least equivalent standard and/or relevant road safety standards, in consultation with the property owner.	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy Sections 3.4 and 7.2	Ongoing
C25	Any damage caused to property as a result of the project shall be rectified or the property owner compensated, within a reasonable timeframe, with the costs borne by the Proponent. This condition is not intended to limit any claims that the property owner may have against the Proponent.	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy Section 7.2	Ongoing
C26	The Proponent shall, in consultation with relevant property owners, construct the project in a manner that minimises intrusion and disruption to agricultural operations/ activities in surrounding properties (e.g. stock access, access to farm dams etc.), unless otherwise agreed by the relevant property owner.	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy Section 7.2	Ongoing
<b>Traffic Impacts</b>						
C27	The roads likely to be used by the project's heavy construction vehicles shall be identified in the Construction Traffic Management Sub-plan required under condition B36(a). (a) Road dilapidation reports shall be prepared for local roads likely to be used by the project's construction traffic, and a copy of the report(s) shall be provided to the relevant council, prior to use by the project's heavy construction vehicles. Any damage resulting from the use of the identified local roads by the project's heavy construction vehicles, aside from that resulting from normal wear and tear, shall be repaired at the cost of the Proponent, unless otherwise agreed by the relevant council. (b) A road dilapidation report shall be prepared for the 'Sandtrack' and a copy of the report shall be provided to the relevant council, prior to commencement of construction. Should monitoring in accordance with Condition B36(a) reveal higher	Pre-construction	RMS/Fulton Hogan	Compliant	Construction Traffic Management Plan (Rev 3) Section 2 A road dilapidation report for the 'Sandtrack' prior to operation was sent to Shoalhaven and Kiama councils, and submitted to DPE on 30th October 2017. The report outlined that the 'Sandtrack' did not receive higher than anticipated traffic volumes and therefore consultation with council is not required.	Complete

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	than anticipated volumes of traffic (as defined in the document referred to in Condition A1(b)) resulting in a higher rate of deterioration in the condition of local road infrastructure, consultation with the relevant Council shall be undertaken to determine mitigation measures in accordance with condition B36(a). A report shall be prepared and submitted to the Secretary of the NSW Department of Planning & Environment (DP&E) at 12 months and 24 months after commencement of construction, and prior to operation, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E).					
<b>Waste Management</b>						
C28	The Proponent shall not cause, permit or allow waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.	Construction	RMS/Fulton Hogan	Compliant	Waste and Energy Management Sub Plan (Rev H), Chapters 4 and 5	Ongoing
C29	The Proponent shall maximise the reuse and/or recycling of waste materials generated on site as far as practicable, to minimise the need for treatment or disposal of those materials off site.	Construction	RMS/Fulton Hogan	Compliant	Waste and Energy Management Sub Plan (Rev H), Chapters 4 and 5	Ongoing
C30	The Proponent shall ensure that liquid and/or non-liquid waste generated on the site is assessed and classified in accordance with Waste Classification Guidelines (Department of Environment and Climate Change, 2008) and where removed from the site is directed to a waste management facility lawfully permitted to accept the materials.	Construction	RMS/Fulton Hogan	Compliant	Waste and Energy Management Sub Plan (Rev H), Chapters 4 and 5	Ongoing
<b>Hazards and Risks</b>						
C31	The Proponent shall store and handle dangerous goods, as defined by the Australian Dangerous Goods Code, strictly in accordance with: (a) relevant Australian Standards; (b) for liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and (c) the Environment Protection Manual for Authorised Officers: Bunding and Spill Management, Technical Bulletin (Environment Protection Authority, 1997). In the event of an inconsistency between the requirements listed from (a) to (c) above, the most stringent requirement shall prevail to the extent of the inconsistency.	Pre-construction, Construction	RMS/Fulton Hogan	Compliant	Project Work Health and Safety Management Plan Section 8.4 Soil and Water Quality Management Sub Plan (Rev F), September 2017, Section 5.11	Ongoing
<b>Ancillary Facilities</b>						
C32	Unless otherwise approved by the Secretary of the NSW Department of Planning & Environment (DP&E) in accordance with this condition, the sites for ancillary facilities (except stockpiles) associated with the construction of the project shall: (a) be located more than 50 metres from a waterway; (b) have ready access to the road network or direct access to the construction corridor; (c) not require native vegetation clearing beyond that already required by the project; (d) be sited on relatively level land; (e) be separated from the nearest residences by at least 200 metres (or at least 300 metres for a temporary batching plant); (f) not unreasonably affect the land use of adjacent properties; (g) be above the 20 ARI flood level unless a contingency plan to manage flooding is prepared and implemented; (h) provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours; and (i) not impact on heritage items beyond those already impacted by project (including identified Aboriginal cultural value and archaeological sensitivity).	Pre-construction and Construction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Section 2.4 and Appendix A5 As the project risk footprint is reduced, the project team continue to rehabilitate areas formerly used as ancillary facilities Currently only 2 ancillary facilities remain in use	Ongoing
C33	Ancillary sites that do not meet the criteria set out under condition C32 of this approval shall be approved by the Secretary of the NSW Department of Planning & Environment (DP&E) prior to establishment. In obtaining this approval, the Proponent shall assess the ancillary facility against the criteria set out under condition C32 of this approval to demonstrate how the potential environmental impacts can be mitigated and managed to acceptable standards. Such assessment(s) can be submitted separately or as part of the Construction Environmental Management Plan required under B35 of this approval. The assessment shall include, but not necessarily be limited to: (a) a description of the ancillary facility, its components and the surrounding environment; (b) details on the activities to be carried out at the facility, including the hours of use and the storage of dangerous and hazardous goods; (c) an assessment of the environmental impacts on the site and the surrounding environment, including, but not limited to noise, vibration, air quality, traffic access, flora and fauna, heritage and light spill; (d) details on the mitigation, monitoring and management procedures specific to the ancillary facility that would be implemented to minimise the environmental impacts or, where this is not possible, feasible and reasonable measures to offset these impacts and an assessment of the adequacy of the mitigation or offsetting measures. This shall include consideration of restrictions on the hours of use or exclusion of certain activities;	Pre-construction and Construction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Section 2.4 and Appendix A5 Operation and construction of sites D and H was approved 15 January 2015 subject to the implementation of Ancillary facilities assessment for proposed ancillary facilities at Broughton Creek (Site D) and Austral Park Road (Site H): Foxground and Berry Bypass, November 2014. No further ancillary facilities will be required	Complete

MCoA – Ministers Conditions of Approval Section 75J of the Environmental Planning and Assessment Act 1979

Ref	Condition Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
	<p>(e) details on the timing for the completion of activities at the ancillary facility and how the site will be decommissioned (including any necessary rehabilitation); and</p> <p>(f) demonstrated overall consistency with the approved project.</p> <p>The Proponent shall demonstrate to the satisfaction of the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) that there will be no significant adverse impact from that facility's construction or operation.</p>					
C34	<p>The Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E)'s approval is not required for minor ancillary facilities (e.g. lunch sheds, office sheds, and portable toilet facilities, etc.) that do not comply with the criteria set out in condition C32 of this approval and which:</p> <p>(a) are located within an active construction zone within the approved project footprint; and</p> <p>(b) have been assessed by the Environmental Representative to have:</p> <p>(i) minimal amenity impacts to surrounding residences, with consideration to matters such as noise and vibration impacts, traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts, and</p> <p>(ii) (minimal environmental impact in respect to waste management, and no impacts on flora and fauna, soil and water, and heritage beyond those approved for the project; and</p> <p>(c) have environmental and amenity impacts that can be managed through the implementation of environmental measures detailed in a Construction Environment Management Plan for the project.</p>	Construction	RMS/Fulton Hogan	Compliant	<p>Construction Environmental Management Plan (Rev H), Section 2.4 and Appendix A5</p> <p>No further minor ancillary facilities will be required</p>	Complete
<b>PART D - PRIOR TO OPERATIONS</b>						
<b>Operational Environmental Management System</b>						
D1	<p>Prior to the commencement of operation, the Proponent shall incorporate the project into its existing environmental management systems.</p>	Construction	RMS	Compliant	<p>The new highway is being managed in accordance with RMS' existing operation systems.</p>	Ongoing
<b>PART E - DURING OPERATIONS</b>						
<b>Operational Noise</b>						
E1	<p>Within 12 months of the commencement of operation of the project, or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E), the Proponent shall undertake operational noise monitoring to compare actual noise performance of the project against noise performance predicted in the review of noise mitigation measures required by condition C14, and prepare an <b>Operational Noise Report</b> to document this monitoring. The Report shall include, but not necessarily be limited to:</p> <p>(a) noise monitoring to assess compliance with the operational noise levels predicted in the review of operational noise mitigation measures required under condition C14 and documents specified under condition A1 of this approval;</p> <p>(b) a review of the operational noise levels in terms of criteria and noise goals established in the Environmental Criteria for Road Traffic Noise (EPA, 1999);</p> <p>(c) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which project noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers;</p> <p>(d) details of any complaints and enquiries received in relation to operational noise generated by the project between the date of commencement of operation and the date the report was prepared;</p> <p>(e) any required recalibrations of the noise model taking into consideration factors such as actual traffic numbers and proportions;</p> <p>(f) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures; and</p> <p>(g) identification of additional feasible and reasonable measures to those identified in the review of noise mitigation measures required by condition C14, that would be implemented with the objective of meeting the criteria outlined in the Environmental Criteria for Road Traffic Noise (EPA, 1999), when these measures would be implemented and how their effectiveness would be measured and reported to the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) and the EPA.</p> <p>The Proponent shall provide the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E) and the EPA with a copy of the Operational Noise Report within 60 days of completing the operational noise monitoring referred to in (a) above or as otherwise agreed by the Secretary of the NSW Department of Planning &amp; Environment (DP&amp;E).</p>	Operation	RMS	Compliant	<p>Operational noise monitoring has been completed and the report is currently in draft.</p>	Ongoing



Table 1: Revised statement of commitments (May 2013)

SoC – Revised statement of commitments (May 2013)						
No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
<b>Environmental management</b>						
EM1	The head contractor for the project will have an Environmental Management System (EMS).	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H) and Sub-plans	Ongoing
EM2	Environmental management plans will be developed and implemented by suitably qualified and experienced personnel and will incorporate as a minimum the mitigation and management measures in the environmental assessment.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H) and Sub-plans	Ongoing
EM3	Environmentally sensitive areas (such as native vegetation, river flat eucalypt forest and cultural heritage) within the construction site boundary will be marked on sensitive area maps, demarcated and signposted where necessary. Maps will be made available during all on-site inductions to construction personnel.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Appendix A6	Ongoing
EM4	All construction personnel will receive training regarding environmental management.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Chapter 5	Ongoing
<b>Community consultation</b>						
CC1	<p>The community will be kept informed with measures such as:</p> <ul style="list-style-type: none"> <li>- Letter box drops, media releases and community updates.</li> <li>- An internet site established and maintained for the duration of the project.</li> <li>- Variable message signs.</li> <li>- The project office.</li> <li>- Email to registered stakeholders.</li> <li>- Targeted consultation with affected individuals or groups.</li> </ul> <p>Information to be provided will include:</p> <ul style="list-style-type: none"> <li>- Changes to access and traffic conditions.</li> <li>- A detail of future works programs.</li> <li>- General construction progress.</li> </ul>	Pre-construction and construction	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2	Ongoing
CC2	<p>Communication management will include:</p> <ul style="list-style-type: none"> <li>- A 24 hour toll-free contact telephone number.</li> <li>- Directions on how to register a complaint or make an inquiry.</li> <li>- Acknowledgement of complaints within 24 hours.</li> <li>- A complaint recording and tracking system.</li> </ul>	Pre-construction and construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Sections 8.1 and 8.2	Ongoing
<b>Traffic and transport</b>						
TT1	Construction vehicle movements and works programs will incorporate traffic control measures to minimise traffic and transport impacts on local roads and the existing highway.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Traffic Management Plan (Rev3), Chapter 3	Ongoing
TT2	Road safety on 'the Sandtrack' will be monitored during construction. Should additional road safety issues be identified appropriate road safety measures will be implemented where reasonable and feasible, in consultation with Kiama Municipal Council and Shoalhaven City Council.	Construction	RMS	Compliant	Construction Traffic Management Plan (Rev3), Chapter 2	Complete
TT3	Traffic levels and operational performance will be monitored during peak periods, at approximately 6 and 12 months following completion of the project.	Operation	RMS	Compliant	Traffic was monitored over the peak holiday period of Easter 2018. No delays or impacts were experienced on the network within the project area. General operational performance has indicated a travel time saving of between 5 to 10 minutes on pre-build travel times.	Ongoing
<b>Noise and vibration</b>						
NV1	Mitigation and management measures, such as noise barriers, pre-dilapidation surveys and monitoring, will be used to minimise construction noise and vibration at sensitive receivers.	Construction	Fulton Hogan	Compliant	Construction Noise and Vibration Management Sub-plan (Rev G), Chapter 7 and Section 8.3	Ongoing
NV2	If required due to ground conditions, impact piling ('driven piles') will be conducted during standard working hours.	Construction	Fulton Hogan	Compliant	There are no driven piles on the project.	Complete

SoC – Revised statement of commitments (May 2013)						
No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
NV3	Reasonable and feasible mitigation measures, such as noise barriers in the vicinity of North Street and Huntingdale Park Road and architectural treatments, will be developed and implemented to meet the noise criteria applicable to the project in consultation with the sensitive receiver.	Pre-construction	Fulton Hogan	Compliant	Noise barriers on North street have been constructed as a priority to limit potential noise effects on neighbouring residents. Post construction noise monitoring will identify the need for any additional reasonable and feasible treatments	Ongoing
NV4	Operational noise monitoring will be undertaken approximately one year after project opening, in accordance with RMS' Environmental Noise Management Manual (RTA, 2001). If monitoring indicates a clear trend that traffic noise levels exceed those predicted, further feasible and reasonable measures will be investigated in consultation with a qualified and experienced acoustic specialist and affected property owners.	Construction and Operation	Fulton Hogan	Compliant	Operational noise monitoring has been completed and the report is currently in draft.	Ongoing
NV5	The feasibility of constructing noise protection on the western side of Mark Radium Park will be investigated.	Pre-construction and construction	Fulton Hogan	Compliant	The Detailed Design Report: Operational Noise Management (Final design) (March 2015), Section 6.4 assessed the acoustic performance of a potential noise barrier at Mark Radium Park and found construction of a barrier was not reasonable or feasible.	Complete
<b>Biodiversity</b>						
BD1	Areas of vegetation identified to be retained will be managed as environmentally sensitive areas.	Pre-construction	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5	Complete
BD2	Pre-clearing fauna surveys, clearing procedures, including staged clearing where there are hollow trees, and methods to control noxious and environmental weeds and pests will be developed and implemented prior to clearing activities, in consultation with a suitably qualified and experienced ecologist.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5, Appendices A and F	Complete
BD3	Natural and artificial habitat features, such as bat roost and nest boxes, will be installed to replace hollow-bearing trees that are removed.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5, Appendices A	Complete
BD4	A fauna monitoring program will be developed in consultation with OEH. This program will allow the assessment of the effectiveness of fauna mitigation measures including nest boxes, bat roost boxes, fauna underpasses, rope bridges and fauna fencing.	Pre-construction, construction and operation	RMS	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5, Appendix A Ecological Monitoring Program.	Complete
BD5	Soil that has been stripped, stockpiled and/or reinstated as part of the construction works will be appropriately managed to maintain available seed bank.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5, Appendix A Construction Soil and Water Quality Management Sub-plan (Rev D), Appendix F	Complete
BD6	Fauna mitigation structures, such as fauna underpasses, fauna overpasses and fauna fencing will be provided where reasonable and feasible. These structures will be designed to assist the safe passage of fauna underneath or over the highway.	Pre-construction, construction and operation	Fulton Hogan	In progress	Fauna Crossings Report (CoA B5).	Complete
BD7	Vegetation will be retained, where practicable, under bridges, at temporary creek crossing sites, adjacent to ancillary sites and in the vicinity of rope bridges.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5 and Appendix A. Landscape Drawings	Complete
BD8	Permanent and temporary waterway crossings will be designed and constructed in accordance with the fish classification of each waterway.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Flora and Fauna Management Sub-plan (Rev G), Chapter 5	Complete
BD9	A biodiversity offset package will be developed in consultation with the biodiversity offset strategy and in consultation with OEH and DTIRIS. The area of restoration or offsetting would be guided by a simulated assessment of the project impacts and potential offsets using the Bio Banking Assessment Methodology with a minimum of 2:1 for riparian vegetation.	Pre-construction and construction	RMS	Compliant	The Biodiversity Offset Package was approved by DPE on the 3rd May 2017. All four BioBanking agreements are now lodged with OEH.	Ongoing
<b>Surface water and groundwater</b>						
SG1	Water quality measures such as water quality basins, swales or bioretention systems at sensitive receiving environments will be designed and installed to respond to the project water quality design criteria.	Pre-construction and construction	Fulton Hogan	Design compliant; installation in progress.	Construction Soil and Water Quality Management Sub-plan (Rev F), Chapter 5 Detailed Design – Drainage Report	Complete
SG2	A design and revegetation strategy for the Town Creek diversion will be developed during detailed design and will include measures to: Maintain flushing efficiency. Mitigate erosion risk at the connection with Bundewallah Creek. The design of the diversion will be finalised in consultation with directly affected landowners. The Town Creek diversion will be	Pre-construction and construction	Fulton Hogan	Compliant	Detailed Design – Drainage Report Urban Design and Landscape Plan, March 2016	Complete

SoC – Revised statement of commitments (May 2013)						
No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
	stabilised to mitigate erosion risk prior to operation.					
SG3	Permanent losses to farm dam catchments and inflows will be identified during detailed design. Mitigation strategies will be developed in consultation with affected landowners and implemented where reasonable and feasible.	Pre-construction	RMS/ Fulton Hogan	Compliant	Detailed Design – Drainage Report	Complete
SG4	Drinking water drawn from Broughton Creek will be maintained through measures identified in commitment AQ1. In the event that water drawn from Broughton Creek does not meet existing drinking water quality standards, an appropriate source of potable water will be made available to affected residents, following consultation.	Construction	Fulton Hogan	Compliant	Construction Air Quality Management Sub-plan (Rev G), Chapter 5 Residents have been consulted directly during construction about upcoming and ongoing construction activities. Sensitive water receivers are managed through targeted site works and the implementation of specific erosion and sediment controls.	Complete
SG5	RMS will consult with landholders along the existing Town Creek alignment, below the proposed diversion, to confirm that there are no Basic Landholder Rights (under the Water Management Act 2000) to access water for domestic or stock purposes.	Pre-construction	RMS	Compliant	RMS consulted with landowners and confirmed no Basic Landholder Rights exist along the Town Creek alignment.	Complete
SG6	Waterway structures will be designed to maintain existing flow regimes, where practicable.	Pre-construction	Fulton Hogan	Compliant	Detailed Design – Drainage Report	Complete
SG7	Detailed design will seek to minimise increases in peak flood levels in the 1 in 100 year flood event.	Pre-construction	Fulton Hogan	Compliant	Detailed Design – Drainage Report	Complete
SG8	Changes to flood impacts on property will be identified as part of detailed design. Where increased flood impacts to structures, such as residences, are identified, mitigation measures will be proposed and implemented where reasonable and feasible.	Pre-construction and construction	Fulton Hogan	Compliant	Hydrological Mitigation Report Detailed Design - Flooding Report Repeated attempts to gain agreement with the landowner have not been successful to date. Roads and Maritime are continuing efforts to resolve this issue.	Ongoing
SG9	Impacts on stream channel structure diversion will be minimised during detailed design. Measures to be considered may include culvert sizing, energy dissipation measures, scour protection and other design features to control flow intensity and direction.	Pre-construction	Fulton Hogan	Compliant	Detailed Design – Drainage Report	Complete
SG10	Groundwater monitoring of water levels and water quality will be undertaken. Where levels and/or quality indicate that the project is potentially having an adverse impact, mitigation measures will be considered and implemented where reasonable and feasible.	Construction	Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev F), Appendix B	Ongoing
SG11	Water efficient work practices, such as water reuse and recycling for road construction and revegetation irrigation will be implemented, where feasible. In the event that surface water from watercourses or groundwater is required to supply water to the project, a site specific impact assessment will be carried out in consultation with the NSW Office of Water and potentially affected stakeholders.	Construction	Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev F), September 2017, Chapter 5	Complete
<b>Landscape character and visual amenity</b>						
VL1	The detailed design will be developed with reference to the minimum reference design requirements and the findings of the CM+ Urban Design Study for the following project components: All bridges within the project, with consideration of the Bridge Aesthetics Design Guidelines (RTA 2003). Embankments across Broughton Creek west of Toolijooa Ridge. Noise attenuation measures barriers along the length of the project.	Pre-construction	Fulton Hogan	Compliant	Urban Design and Landscape Plan, March 2016 Detailed Design - Structures Report	Complete
VL2	Councils and the local community will be engaged during detailed design to receive feedback on an urban and landscape design strategy for the project and the integration of existing pedestrian access and mobility plans for Berry.	Pre-construction	Fulton Hogan	Compliant	Completed during detailed design Detailed Design - Roads Report	Complete
VL3	To respect the rural and historic character of Foxground and Berry, noise barriers and bridges will be designed using forms, materials, colour and texture that are sensitive to the area, that complement the existing rural character and, where possible and desirable, that recede into the landscape. Planting and revegetation will be used to help blend the project into its setting and screen and visually soften built elements.	Pre-construction	Fulton Hogan	Compliant	Urban Design and Landscape Plan, March 2016 Native plant stock has been incorporated into the landscape plantings throughout the rural setting to integrate the project with the surrounding landscape character.	Complete
VL4	Landscaping treatments will include native plant species endemic to the local area and where practicable, locally sourced seed and propagated plant stock will be used to supplement the plant materials required for the project.	Pre-construction and construction	Fulton Hogan	Compliant	Urban Design and Landscape Plan, March 2016	Complete
VL5	A lighting strategy and design will be undertaken during detailed design to minimise the impacts of light spill. Detailed design will address mechanisms for reducing the impacts of headlight glare from vehicles travelling on the bridges at Berry and Broughton Creek	Pre-construction	Fulton Hogan	Compliant	Detailed Design - Signage, Linemarking & Road Furniture Report	Complete
<b>Aboriginal heritage</b>						
AH1	Aboriginal sites identified to be conserved will be managed as environmentally sensitive areas.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Chapter 5 Construction Environmental Management Plan (Rev H), Appendix A6	Complete

SoC – Revised statement of commitments (May 2013)						
No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
AH2	Disturbance to the natural soil profile of G2B A13 and G2B A14 will be avoided, where practicable.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Chapter 5 Alignment Report	Complete
AH3	Conduct a program of archaeological salvage at sites G2B A16, G2B A18, G2B A24, G2B A29, G2B A30, G2B A31, G2B A32, G2B A32, G2B A33, G2B A36, and G2B PAD1.	Construction	RMS	Compliant	Archaeological salvage works have been completed on behalf of RMS by the nominated project archaeologist, Kelleher Nightingale Consulting.	Complete
AH4	If any skeletal remains or unknown Aboriginal objects or places are encountered, works that would potentially impact the find will stop immediately. Works will not re-commence until appropriate clearance has been received.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Chapter 5 and Appendix A	Ongoing
AH5	All construction personnel will receive training in the management of Aboriginal cultural materials, including legal obligations, the application of protocols and the recognition of Aboriginal cultural materials.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Section 6.2	Complete
<b>Non-Aboriginal heritage</b>						
NA1	Mitigation (archival record, test/salvage excavation) will be completed for impacted heritage items.	Pre-construction and construction	RMS	Compliant	Archival recording and detailed historic research complete.	Complete
NA2	An archival recording of Glen Devon (G2B H11) and its grounds will be conducted prior to the commencement of construction	Pre-construction and construction	RMS	Compliant	Archival recording complete	Complete
NA3	Non-Aboriginal sites identified to be conserved will be managed as environmentally sensitive areas.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Chapter 5	Complete
NA4	If any unknown non-Aboriginal heritage items are encountered, all works that would potentially impact the find will stop immediately. Works will not recommence until appropriate clearance has been received.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Heritage Management Sub-plan (Rev F), Chapter 5 and Appendix A	Ongoing
NA5	An archival record will be prepared for any directly impacted heritage item. Copies will be kept in RMS' library and distributed to the Kiama library and Shoalhaven library (Nowra branch).	Pre-construction and construction (as relevant)	RMS	Compliant	Archival recording completed. Copies to be sent to Kiama and Shoalhaven libraries.	Complete
<b>Land use and property</b>						
P1	Negotiation for all property acquisitions will be in accordance with RMS' Land Acquisition Information Guide (RTA, 2011). Compensation assessment will be in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.	Pre-construction	RMS	Compliant	Complete	Complete
P2	Property access will be maintained during construction. If temporary or alternative access is required, it will be provided in consultation with the affected landowner/s.	Construction.	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2	Complete
P3	Affected property owners will be consulted during detailed design regarding long term access requirements via underpasses.	Pre-construction and construction	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2	Complete
<b>Socio-economic</b>						
SE1	Negotiations for property acquisition will include consideration of property adjustments, where required, to maintain farm management practices.	Pre-construction	RMS	Compliant	Complete	Complete
SE2	Stock refuge will be maintained at Broughton Creek bridge 2 and will be determined during detailed design in consultation with landowners.	Pre-construction	RMS/ Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2 Detailed Design – Alignment Report	Complete
SE3	Appropriate destination signage will be provided near to interchanges.	Operation	Fulton Hogan	N/A at this stage – relates to operation.	Construction Traffic Management Plan (Rev3), Sections 16.3.1 & 16.3.2 Detailed Design - Signage, Linemarking & Road Furniture Report	Complete
SE4	Consultation with Shoalhaven City Council will continue through detailed design and construction regarding assistance towards the development of strategies to address the continued economic viability of Berry.	Pre-construction and construction	RMS	Compliant	Ongoing via support of the Berry Strategic Plan via the Berry Forum, recognised by SCC as the official consultative community body – ref: <a href="http://berryforum.org.au/strategic-plan/">http://berryforum.org.au/strategic-plan/</a>	Complete
SE5	Access to recreational facilities will be maintained during construction and operation of the project, where practicable, including consideration of assistance to the relocation of the Berry equestrian centre during construction.	Pre-construction, construction and operation	RMS/ Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2	Complete
SE6	Access to local creeks, including access to the existing Broughton Creek bridge will be maintained during construction and operation to provide access for recreational fishers, where safe and practicable.	Pre-construction, construction and	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2 Detailed Design - Drainage Report	Complete

SoC – Revised statement of commitments (May 2013)						
No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
		operation				
<b>Soil and water quality</b>						
SW1	Management measures will be designed, installed and maintained to minimise erosion and sedimentation from construction activities.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Chapter 5	Ongoing
SW2	A soil conservation specialist will be engaged to provide advice on erosion and sedimentation control.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Chapter 5 SEEC have been engaged as the nominated soil conservationist	Complete
SW3	Stabilisation of exposed areas will be undertaken progressively.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Chapter 5	Ongoing
SW4	Monitoring of water quality upstream and downstream of the project site will be undertaken before and during construction.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Appendix B As the project became operational at the end of October 2017 surface water quality monitoring moved into the operational phase of monitoring except for 2 monitoring sites which would monitor any potential impacts from the Woodhill Mountain Road Compound. This process was agreed to by Fulton Hogan, RMS and the project ER. Fulton Hogan undertook Surface water quality monitoring on the following dates: - 8th June 2018 – Minor Event RMS undertook surface water quality monitoring on the following dates: - 15 May 2018 - 7 to 8 June 2018 - 5 to 6 September 2018 RMS undertook groundwater monitoring on the following dates: - 23 to 24 May 2018 Water quality monitoring results are provided in Appendix B of this report.	Ongoing
SW5	Areas of ASS to be avoided will be fenced and signposted as exclusion zones before and during any works in the vicinity.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Appendix E	Complete
SW6	Exposed ASS will be neutralised and surface run-on will be minimised. Any acid runoff or acid material will be contained and treated.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Appendix E	Complete
SW7	Targeted soil contamination investigations will be undertaken during detailed design, if required. A remedial action plan will be developed if contamination is found to pose unacceptable risks to the environment and human health.	Pre-construction, construction and operation	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Appendix C Detailed Design - Geotechnical Report No contamination identified	Complete
<b>Air quality</b>						
AQ1	Standard dust and emission control measures will be implemented to manage construction air quality impacts at sensitive receivers.	Construction	Fulton Hogan	Compliant	Construction Air Quality Management Sub-plan (Rev G), Chapter 5	Complete
AQ2	Monitoring will be undertaken to assess the effectiveness of the air quality environmental management measures. Where required, additional feasible and reasonable environmental management measures will be used.	Construction	Fulton Hogan	Compliant	Construction Air Quality Management Sub-plan (Rev G), Section 6.3	Complete
<b>Hazards and risks</b>						

## SoC – Revised statement of commitments (May 2013)

No.	Commitment Requirement	Phase	Responsibility	Compliance status	Compliance notes	Close out
HR1	Spills will be contained immediately. Bunded areas within the construction site and ancillary facilities, or other areas where suitable containment measures are in place to prevent discharge into watercourses, will be used for storage of potentially hazardous and/or contaminating materials and activities.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Chapter 5	Ongoing
HR2	Not used.	NA	NA	NA	NA	NA
HR3	Protection measures for the eastern gas pipeline and suitable construction methods when working in the vicinity of the pipeline will be implemented in consultation with Jemena (Eastern Gas Pipeline).	Pre-construction and construction	Fulton Hogan	Compliant	Detailed Design - Signage, Linemarking & Road Furniture Report	Complete
HR4	Permanent water quality basins, swales or other appropriate controls will be designed during the detailed design phase to protect waterways from spills.	Pre-construction and operation	Fulton Hogan	Compliant	Detailed Design – Drainage Report	Complete
<b>Waste and management</b>						
SM1	Not used.	NA	NA	NA	NA	NA
SM2	The waste minimisation hierarchy principles of avoid, reduce, reuse, recycle or dispose will apply to all aspects of the project.	Construction	Fulton Hogan	Compliant	Construction Waste and Energy Management Plan (Rev H), Chapters 4 and 5	Ongoing
<b>Greenhouse gas emissions</b>						
GG1	Energy efficient work practices will be implemented, including consideration of: Energy efficient design of site buildings. Design of site compounds and the batch plant to minimise unnecessary vehicle movement. Regular servicing of site plant and equipment. Training of construction personnel in energy efficient plant operation. The use of accredited GreenPower. Use of locally sourced materials where available and of suitable quality.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Waste and Energy Management Plan (Rev H), Chapters 4 and 5	Ongoing
<b>Ancillary facilities</b>						
AF1	Ancillary facilities (excluding temporary stockpiles) not identified in the environmental assessment will be located in areas: More than 50 metres from waterways for the active area of the ancillary facility. Where there is no significant clearing of native vegetation beyond that already required for the project. That minimise impact on amenity of the closest sensitive receiver (unless a negotiated agreement is in place). On relatively level ground.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Section 2.4 and Appendix A5	Ongoing
AF2	Ancillary chemical storage facilities will be located above the 1 in 100 year flood level unless otherwise identified the construction environmental management plan.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev H), Section 2.4 and Appendix A5	Ongoing
AF3	Temporary stockpiles will be located in areas: Of low ecological and heritage conservation significance. At least 50 metres from waterways. Outside the 10 year ARI floodplain. On relatively level ground.	Pre-construction and construction	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev F), Appendix F	Ongoing



## **Appendix B    Groundwater and Surface Water Quality Monitoring Results**

# Surface Water Monitoring

Construction Event 32

Monitoring event triggered after 15mm of rainfall was received in 24 hours. This event was of low significance and did not trigger the full suite of analysis as 50mm of rainfall was not received within 24 hours.

Date of Monitoring: 8<sup>th</sup> June 2018

Rainfall Monitoring is shown below.

Berry Masonic Hall	
Date:	Rainfall Received:
06/06/2018	3.8mm
07/06/2018	16.4mm

## Scope and Limitations

Due to the stage of the project, monitoring of construction impacts have been significantly reduced to the main compound catchment (SW06 – SW07). The other locations are now considered to be under operational conditions and are now monitored by RMS. This report presents the information collected during the monitoring event with some discussion on field observations and results with respect to upstream vs downstream conditions.

## Field Programme

Surface water sampling was undertaken at all surface locations where flow conditions allowed a representative sample to be taken. This monthly water sampling event was conducted in accordance with the sampling program and protocols provided in:

- 2014, Foxground to Berry Bypass Water Quality Management - Surface Water and Groundwater Sampling Protocol, prepared for Roads and Maritime Services
- 2014, Foxground to Berry Bypass Water Quality Management - Surface Water Quality Management Plan, prepared for Roads and Maritime Services
- 2014, Princes Highway Upgrade – Foxground to Berry Bypass Project, Final Interpretive Water Monitoring Report, prepared for Roads and Maritime Services.

Field parameters were measured during sampling including temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), and reduction-oxidation potential (redox), and are provided in Table B1, Attachment B. Field sheets including photos are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for:

- Total suspended solids.

## Weather Monitoring

The project has one manual gauge as well as using the Bureau of Meteorology to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses this weather data. The locations of the rainfall gauges are:

- Berry Masonic Hall, Berry

During the construction phase, minor events are classified as at least 15 mm of rainfall in 24 hours and major events are classified as at least 50 mm of rainfall in 24 hours.

## Surface water sampling results

Results for the water quality monitoring event are located as attachments at the end of this document, they are:

- Attachment A, Location maps
- Attachment B, Tabulated results
- Attachment C, Field sheets, Field photos
- Attachment D, Laboratory results

## Surface water locations

The upstream location represents the 'reference' (un-impacted) site while the down-stream locations represent the 'test' sites (potentially impacted sites during construction and operation). By comparing upstream water quality with down-stream water quality potential impacts from construction are assessed.

**Table 1 Surface water locations within specific surface water bodies**

<b>Surface water</b>	<b>Upstream of Alignment (reference site)</b>	<b>Downstream of Alignment (test site)</b>
Connelly's Creek and Bundewallah Creek and Broughton Mill Creek	SW06	SW07

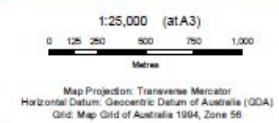
## Results summary

The monitoring for this rainfall event was triggered by 15mm of rainfall received in 24 hours. The total event volume 35mm across the project over 6 days. This monitoring event has affected the flow conditions for all catchments across the project given previous rainfall during the month.

In the projects current state there is a reduced risk in site runoff effecting the surrounding catchment due to the completed nature and reduction in construction footprint. Consequently, there were no observed construction impacts as a result of this rainfall event.

Connelly's Creek and Bundewallah Creek and Broughton Mill Creek: Showed no impacts from construction. Both Creek's had medium to high flows. Upstream and downstream monitoring location show very low turbidity levels and laboratory results confirmed this with low TSS levels. DO levels were lower at the upstream monitoring location due to low creek levels and low flow.

Attachment A, Location maps



LEGEND	
	Surface Water Sampling Locations
	Bury to Foxground upgrade alignment
	Roads
	Waterways
	Lakes and dams
	Railways

Fulton Hogan Pty Ltd  
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

lightweight@ghd.com.au Sydney Projects\2104306\GIS\Map\Bx\2015\_24306\_2001\_SurfaceWaterSamplingLocations.mxd  
© 2015 While GHD has taken care to ensure the accuracy of this product, GHD and DATA CUSTODIAN make no representations or warranties about the accuracy, completeness or suitability for any particular purpose. GHD and DATA CUSTODIAN accept no liability of any kind, whether in contract, tort or otherwise, for any expenses, losses, damage and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.  
Data Source: NSW Department of Lands, DTDB and DCDG - 2012. Created by: mwilmer

Attachment B, Tabulated results

No.	Date	Time	Temperature	pH	ORP	Conductivity	Turbidity	Dissolved Oxygen
SW06	8/06/2018	10:00 am	14.84 °C	5.25	191 mV	0.206 mS/cm	0 NTU	5.89 mg/L
SW07	21/03/2018	10:45 am	13.15 °C	5.64	233 mV	0.133 mS/cm	1.5 NTU	7.57 mg/L



Attachment C, Field photos, Field sheets



*SW06 – Bundewallah Creek, upstream of works*



*SW07 – Broughton Mill Creek, downstream of works*





# FOXGROUND AND BERRY BYPASS SURFACE WATER SAMPLING RECORD

SITE: SW 6  
DATE: 8.06.2018 TIME: 10am  
SAMPLING OFFICERS: Jones  
SAMPLING METHOD (ie grab, bucket): GRAB  
DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of compound on  
Bundenallah ck

### ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast  
VEGETATION: \_\_\_\_\_  
SLOPE: Gentle  
EROSION: N/A  
OTHER: > 15mm rainfall

### FIELD MEASUREMENTS

TEMPERATURE (OC): 14.84°C  
CONDUCTIVITY (uS/cm): 0.206 mS/cm  
pH: 5.25  
DO (mg/L & %): 5.89 mg/L  $\beta$  60.1%  
REDOX (mV): 191  
TURBIDITY (NTU): 0

### FLOW OBSERVATIONS

FLOW: low flow  
COLOUR: clear water  
OTHER: \_\_\_\_\_

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
<u>SW6</u>	<u>1</u>	<u>ESKY &amp; ICE</u>	<u>-</u>	<u>-</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FIELD SUPERVISOR Jones CHECKED (SIGN & DATE) [Signature]  
8/6/18

**FOXGROUND AND BERRY BYPASS  
SURFACE WATER SAMPLING RECORD**

SITE: SW 7  
 DATE: 8-06-2018 TIME: 10:45  
 SAMPLING OFFICERS: James  
 SAMPLING METHOD (ie grab, bucket): GRAB  
 DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of Compound area behind Berry Bowling Club

**ENVIRONMENTAL OBSERVATIONS**

WEATHER: Overcast  
 VEGETATION: Pasture  
 SLOPE: Gentle  
 EROSION: Nil  
 OTHER: low water level, >15mm rainfall

**FIELD MEASUREMENTS**

TEMPERATURE (OC): 13.15 °C  
 CONDUCTIVITY (uS/cm): 0.133 mS/cm  
 pH: 5.64  
 DO (mg/L & %): 7.57 mg/L & 74.5%  
 REDOX (mV): 233  
 TURBIDITY (NTU): 1.5

**FLOW OBSERVATIONS**

FLOW: Very low flow  
 COLOUR: Tannin affect  
 OTHER: \_\_\_\_\_

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
<u>SW7</u>	<u>1</u>	<u>ESKY &amp; ICE</u>	<u>—</u>	
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FIELD SUPERVISOR James CHECKED (SIGN & DATE) [Signature]  
P.G. 18

## Attachment D, Laboratory results

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW1802391**  
**Client** : **FULTON HOGAN PTY LTD**  
**Contact** : **MR JAMES DIAMOND**  
**Address** : **LEVEL1 3 - 90 BOURKE ROAD**  
**ALEXANDRIA NSW, AUSTRALIA 2015**  
  
**Telephone** : **+61 02 8346 9400**  
**Project** : **Foxground and Berry Bypass**  
**Order number** :  
**C-O-C number** : **----**  
**Sampler** : **JAMES DIAMOND**  
**Site** : **----**  
**Quote number** : **EN/222/17**  
**No. of samples received** : **2**  
**No. of samples analysed** : **2**

**Page** : 1 of 2  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Glenn Davies  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
4/13 Geary Pl, North Nowra 2541  
Australia NSW  
**Telephone** : 02 42253125  
**Date Samples Received** : 08-Jun-2018 12:50  
**Date Analysis Commenced** : 14-Jun-2018  
**Issue Date** : 15-Jun-2018 15:46



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW



### 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
  - ∅ = ALS is not NATA accredited for these tests.
  - ~ = Indicates an estimated value.

### Analytical Results

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

Client sample ID

				SW6	SW7	----	----	----
Client sampling date / time				08-Jun-2018 00:00	08-Jun-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EW1802391-001	EW1802391-002	-----	-----	-----
				Result	Result	---	---	---
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	----	----



3 September 2018

Ryan Whiddon  
Roads and Maritime Services  
PO Box 477  
Wollongong NSW 2500

Our ref: 23/16261  
Rev 0

Dear Ryan,

## **Groundwater Monitoring – Post Construction Interim Monitoring Report Event 1**

### **1 Introduction**

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) - Water Monitoring Project Brief (*Contract No. 17.0000303651.0922*), GHD completed a bi-annual round of groundwater quality monitoring at locations adjacent to the FBB post-construction alignment.

This report documents the first groundwater sampling event (Event 1) undertaken since the completion of construction and operation of the bypass from October 2017. Limitations are provided in Section 5.

GHD was able to monitor six wells at locations MW01, MW04, MW09, MW10, MW12 and MW16, which are located downgradient of the new road alignment. This sampling event did not include the up-gradient monitoring well locations, which were monitored on a temporary basis during construction works.

Groundwater pressure loggers were installed at MW03, MW08, MW13 and MW16. During construction, these locations had loggers installed to capture predicted drawdown impacts. A long-term historical look at changing elevation at these locations will provide a better understanding of any permanent groundwater impacts caused by the road construction. A barometric pressure gauge was installed on well MW08, which is used to filter barometric effects from the data.

This letter report documents the findings of the first groundwater monitoring event (Event 1) undertaken since the commencement of operation of FBB.

This bi-annual groundwater sampling event was conducted in accordance with the sampling program and protocols provided in:

- GHD 2014, Foxground to Berry Bypass Water Quality Management - Surface Water and Groundwater Sampling Protocol, prepared for Roads and Maritime Services.
- GHD 2016, Foxground to Berry Bypass Water Quality Management - Surface Water Quality Management Plan, prepared for Roads and Maritime Services
- GHD 2014, Princes Highway Upgrade – Foxground to Berry Bypass Project, Final Interpretive Water Monitoring Report, prepared for Roads and Maritime Services.

## **2 Project Objectives**

The objective of the project is to satisfy the Conditions of Approval for FBB. The Conditions of Approval include the monitoring of groundwater parameters along the alignment for a period of three years or until certification can eventually be achieved before the required three years.

## **3 Interim reporting Objectives**

The objective of this monitoring event and interim reporting is to collect and assess groundwater catchments intersecting the FBB alignment to assist in their eventual certification. It is not intended for this interim report to conclude with respect to the overall project objectives. The purpose of interim reports is to provide a summary of activities, ensure data integrity throughout the program and identify opportunity to change the monitoring program based on results through the review process.

## **4 Field Program**

To meet the above objectives groundwater sampling was undertaken at the groundwater wells located down gradient of the alignment on 23<sup>rd</sup> and 24<sup>th</sup> May and for well MW10 on 8<sup>th</sup> June 2018. For sampling locations within the context of the FBB alignment refer to Figure 1, Attachment A. Certification of groundwater as not impacted has not occurred; therefore, down gradient locations were monitored during this event.

The following scope of work was undertaken:

- Prior to sampling groundwater, standing water levels were measured and the wells were purged.
- Measuring field parameters during the monitoring event including temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), and reduction-oxidation potential (redox), and are provided in Table B1, Attachment B. Field sheets are provided in Attachment G.
- Groundwater samples were submitted to a NATA certified testing laboratory (ALS) and analysed for Total recoverable hydrocarbons (TRH), benzene, toluene, ethyl-benzene, xylene and naphthalene (BTEXN) and dissolved heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn).
- Preparation of this interim letter report which includes:
  - summary of sampling activities and results of this current monitoring round
  - make general comments of field and laboratory results relative to the previous round and adopted assessment criteria.



## 5 Summary of monitoring events

Table 1 below summaries monitoring events that have been completed by GHD as part of post-construction water quality monitoring for FBB to date.

**Table 1 Summary of monitoring events post-construction**

Date of Monitoring Round	Groundwater	Surface Water	Report reference
14 February 2018		X	Event 1 (Minor Event 1), dated 27 May 2018
26 February 2018		X	Event 2 (Major Event 1), dated 28 May 2018
22 March 2018		X	Event 3 (Minor Event 2), dated 28 May 2018
15 May 2018		X	Event 4 (Minor Event 3), dated 31 August 2018
23-24 May 2018	X		Groundwater Event 1, dated 3 September 2018
07-08 June 2018		X	Event 5 (Minor Event 4), date TBC

## 6 Results

This section presents control charts and discusses results in respect to exceedances of criteria or inconsistencies in the groundwater results for Event 1 in accordance with:

- The limitations provided in Section 9.
- GHD 2016, Foxground to Berry Bypass Water Quality Management - Surface Water Quality Management Plan, prepared for Roads and Maritime Services.
- GHD 2014, Princes Highway Upgrade – Foxground to Berry Bypass Project, Final Interpretive Water Monitoring Report, prepared for Roads and Maritime Services.

### 6.1 Control charts

Post-construction data has been compared against baseline data in the control charts to understand what changes may be occurring following the construction of the FBB. Final 80<sup>th</sup> percentile data and median data from baseline monitoring has been used for pH and electrical conductivity (EC). Metals results for Nickel, Copper, Arsenic and Zinc have been graphed with pre-construction and construction data to provide a better understanding of past trends at each location sampled. Metals results are unable to be depicted on control charts as concentrations are usually zero or very low. 80<sup>th</sup> Percentile and median data will become more accurate with more sampling events.

A review of Event 1 Groundwater charts is provided in Section 7.

### 6.2 Groundwater Elevation

The rainfall within Broughton Creek catchment and the groundwater elevations within monitoring wells are presented in Figure 2, Attachment A. This information was obtained from the WaterNSW website (<https://realtimedata.waternsw.com.au/water.stm>).

Data loggers were successfully installed in groundwater wells MW03, MW08, MW13 and MW16. A record of installation is provided in field sheets in Attachment G. A barometer was also installed at MW08 to assist with configuring the data against background pressure. Temperature and pressure will be recorded and interpreted to indicate changing groundwater depth through time. The logger data interpreted since construction for these groundwater wells is provided in Figure 3, Attachment A. Post-construction logger information will be collected and interpreted during Event 2, the second groundwater monitoring event.

The recorded groundwater levels (refer to Figure 2), indicate the majority of wells are relatively stable. Previously, groundwater elevations at MW01 stabilised during construction at a higher elevation than that recorded during baseline monitoring. The specific cause of the variability within MW01 is unknown at this stage although the data suggests no impact has occurred from construction. Groundwater within MW01 appears to have stabilised at a higher level during construction and has recently decreased likely due to low rainfall across the aquifer. The current dataset and monitoring frequency is unable to confirm the cause of the water level variation. Locations MW04, MW10, MW12 and MW16 have remained relatively stable throughout pre-construction and construction. Results recorded during this event in these locations are consistent with past elevation data recorded.

The manually recorded groundwater elevations for all wells monitored, including those with data loggers installed are presented in Table 2 below.

**Table 2 Manual groundwater observations for monitoring Event 1 Post-construction**

Well ID	Well Depth (m)	Well Elevation (m AHD)	Groundwater Elevation (m btoc)	Groundwater Elevation (m AHD)
MW01	22.880	51.99	10.01	41.98
MW03	21.800	102.93	17.714	85.22
MW04	7.658	80.01	3.221	76.79
MW07	30.000	58.61	-	-
MW08	9.875	28.59	3.441	25.15
MW09	10.050	32.34	6.482	25.86
MW10	14.840	32.30	11.372	20.93
MW11	36.100	60.09	-	-
MW12	10.632	24.39	7.872	16.52
MW13	14.800	49.94	9.708	40.23
MW16	10.755	22.82	2.259	20.56

Notes:

m btoc = metres below top of casing

m AHD = metres above Australian height datum

### **6.3 Groundwater monitoring QA/QC**

Sampling was completed as per the method outlined within the project WQMP. The water quality meter used during the groundwater monitoring event is certified every six months and between certification, calibrated before each event. Calibration certificate for the water quality meter is provided in Attachment E.

A field quality control and laboratory control assessment of the results from this monitoring round is provided in Attachment E.

One quality assurance field duplicate sample (QC1) slightly exceeded ANZECC (2000) Fresh Water 95% criterion for copper with a concentration of 0.002 mg/L. The corresponding primary sample for the duplicate (MW09) did not report an exceedance although did have a copper results of 0.001 mg/L. This result suggests some variability in copper concentrations can be expected.

Based on review of field and laboratory QA/QC, GHD considers the results are representative of the characteristics of material sampled and suitable for the purposes of assessing groundwater water quality.

## **7 Discussion of Results**

The field and laboratory analytical results are summarised Table B1 and B2 in Attachment B. The adopted assessment criteria are also included in these tables. Laboratory reports are included in Attachment C. Exceedances of assessment criteria in samples analysed are highlighted in these tables and exceedances reported for Event 1 are discussed in the following sections.

### **7.1 pH (field)**

Exceedances of assessment criteria in samples analysed in the field included:

- Lower trigger value exceedances occurred against the ADWG 2011 Aesthetic criteria and ANZECC 2000 – Lowland Rivers (NSW rivers) criteria for locations MW04, MW12 and MW16. However, these results were consistent with values recorded in baseline and construction monitoring program, as shown in control charts presented in Attachment F.

### **7.2 Electrical Conductivity (field)**

The following exceedances were identified for Electrical Conductivity (EC):

- All locations except MW04 EC concentrations exceeded ANZECC 2000 – Lowland Rivers (NSW Rivers).
- EC control charts for the sampling locations show all results are below the 80<sup>th</sup> percentile calculated during baseline monitoring for the same location. This suggests exceedances in criteria is consistent with baseline groundwater data and background EC levels.

### **7.3 TRH**

No TRH's were detected above Limit of Reporting (LOR) during this event. No oily sheen was observed within water purged from the wells using low flow techniques.

## **7.4 Heavy Metals**

The concentrations for dissolved heavy metals (with detectable concentrations) were plotted in time series to assess the changes before and after construction and identify any emergence of trends. Metals trend graphs have been included instead of control charts as the metals data generally have a high percentage of values below detection limits. This resulted in identified exceedances in the control charts that were associated with statistical issues rather than trends in the data. In addition, control charts were considered unsuitable given the limited detectable concentrations in up gradient wells and the limited amount of data for those wells. Time series graphs of the results were prepared for the following metals, which had concentrations above the laboratory reporting limit:

- Nickel
- Copper
- Arsenic
- Zinc.

The results graphs for Event 1 are presented in Attachment F and are summarised below.

### **7.4.1 Nickel**

No nickel exceedances against the selected criteria was detected during this groundwater monitoring event. Results for this event appear to be consistent with nickel concentrations reported as part of construction and pre-construction phases according to the metals trend graphs. Groundwater from locations MW16, MW12, MW09 and MW10 had reported nickel concentrations above the LOR.

### **7.4.2 Copper**

The following exceedances were reported:

- Groundwater from locations MW04 and MW09 (in duplicate QC1) exceeded the ANZECC 2000 freshwater 95% criterion 0.002 mg/L for copper.
- Copper concentrations in groundwater from location MW04 is the highest since monitoring began. The second monitoring event scheduled in six months' time will assist in understanding if this is an outlier or an emerging trend. Copper concentrations reported for remaining groundwater monitoring wells are generally consistent with baseline and construction data.

### **7.4.3 Arsenic**

No arsenic concentrations exceeded adopted assessment criteria this monitoring event. Groundwater from locations MW01 and MW09 reported detectable concentrations arsenic but below assessment criteria. Arsenic concentrations were consistent with those reported in the baseline and construction phases. Groundwater location MW01 reported higher arsenic concentrations during baseline monitoring which reduced during construction. Concentrations for post-construction Event 1 at MW01 are more consistent with those reported during the construction phase. This may indicate that the variability of arsenic concentrations is not attributable to construction activities.

#### **7.4.4 Zinc**

The following exceedances were reported for zinc at each groundwater monitoring well location:

- Zinc concentrations exceeded the ANZECC 2000 Freshwater 95% criterion for zinc.
- Zinc concentrations were above those reported during pre-construction, although are generally consistent construction phase concentrations. It is considered the variability observed in zinc concentrations may be associated with local geology and climatic conditions. Monitoring completed on up gradient wells during construction (construction groundwater monitoring Event 7, 8 and 9) concluded up gradient wells were just as variable and with similar concentrations to the associated down gradient wells.

## **8 Conclusion**

Monitoring data was successfully collected during the first bi-annual groundwater monitoring event for post-construction.

Concentrations for pH, EC, copper and zinc from locations MW01, MW04, MW09, MW12 and / or MW16 exceeded the adopted assessment criteria. However, these concentrations were generally consistent with baseline concentrations. Variability in zinc concentrations were observed and may be associated with the local geology and climatic conditions. However, this variability has been observed since groundwater monitoring commenced and is similar to zinc concentrations detected in up gradient wells sampled during construction.

Based on review of laboratory data and its usability, no changes to the monitoring program is recommended at this time.

It is recommended that that wells no longer is use and unlikely to be used in future should be decommissioned in accordance with Section 18 of the *Minimum Construction Requirements for Water Bores in Australia Ed. 2 (2003)*.

## 9 Limitations

This report has been prepared by GHD Pty Ltd (GHD) for Roads and Maritime Services (RMS) and may only be used and relied on by RMS for the purpose agreed between GHD and RMS as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than RMS 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. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Roads and Maritime Services 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.

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.

\* \* \*

We trust the information included in this letter is suitable for your current requirements. Please contact the undersigned if you have any questions or require further information.

Kind Regards,



**Jane Curran**

Environmental Scientist  
02 4424 4960

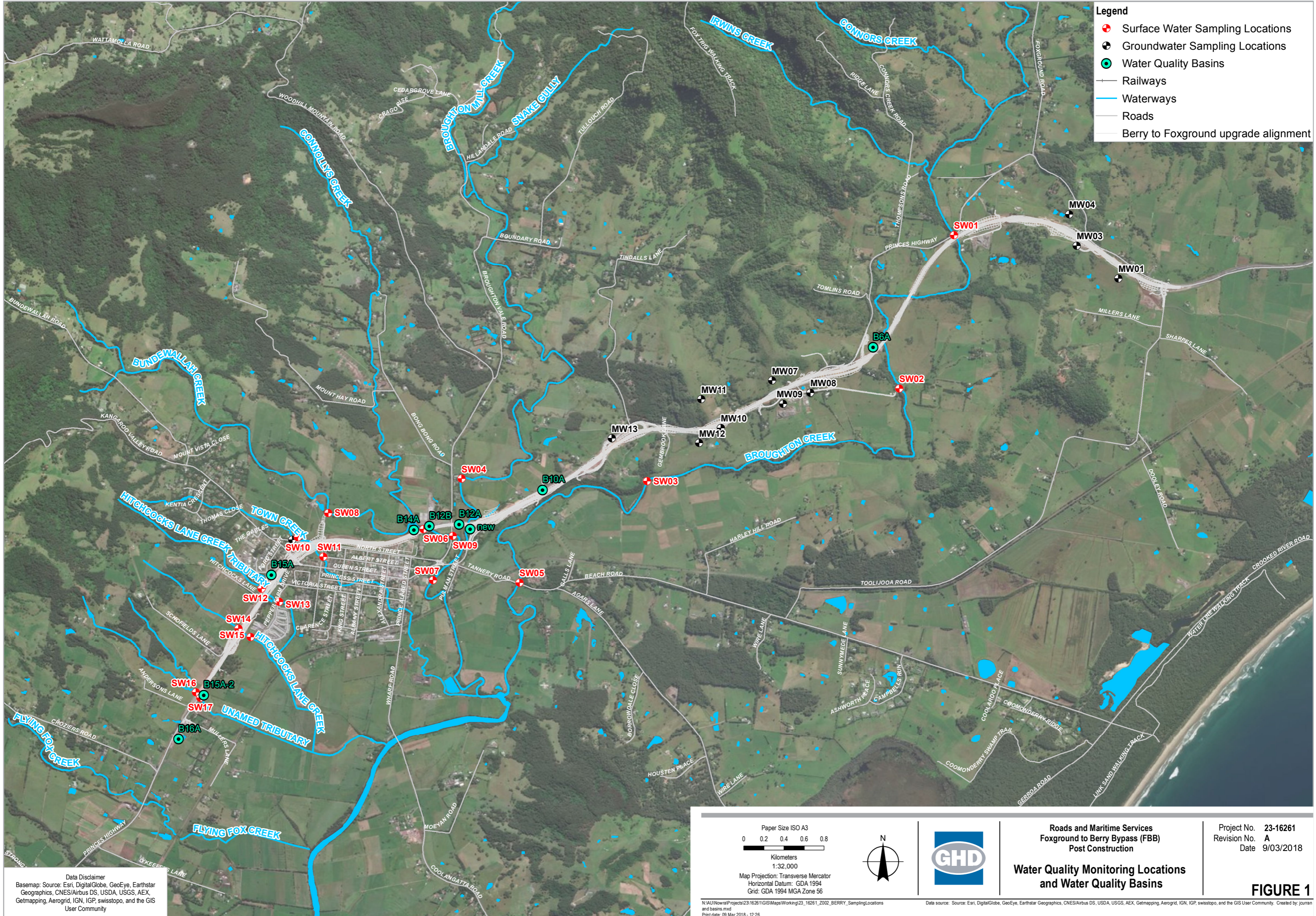
## Attachment A Figures

Figure 1: Groundwater Sampling Locations

Figure 2: Rainfall vs Groundwater Elevation in Monitoring Wells (manual data)

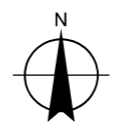
Figure 3: Rainfall vs Electronic Groundwater Elevation (data logger data)





- Legend**
- Surface Water Sampling Locations
  - ⊕ Groundwater Sampling Locations
  - Water Quality Basins
  - Railways
  - Waterways
  - Roads
  - Berry to Foxground upgrade alignment

Paper Size ISO A3  
 0 0.2 0.4 0.6 0.8  
 Kilometers  
 1:32,000  
 Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56



Roads and Maritime Services  
 Foxground to Berry Bypass (FBB)  
 Post Construction  
**Water Quality Monitoring Locations  
 and Water Quality Basins**

Project No. 23-16261  
 Revision No. A  
 Date 9/03/2018

**FIGURE 1**

**Data Disclaimer**  
 Basemap: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N:\AU\Nowra\Projects\23-16261\GIS\Maps\Working\23\_16261\_2002\_BERRY\_SamplingLocations and basins.mxd  
 Print date: 09 Mar 2018 - 12:26  
 Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Created by: jcurran





Figure 2: Foxground to Berry Bypass Groundwater and Rainfall Observations

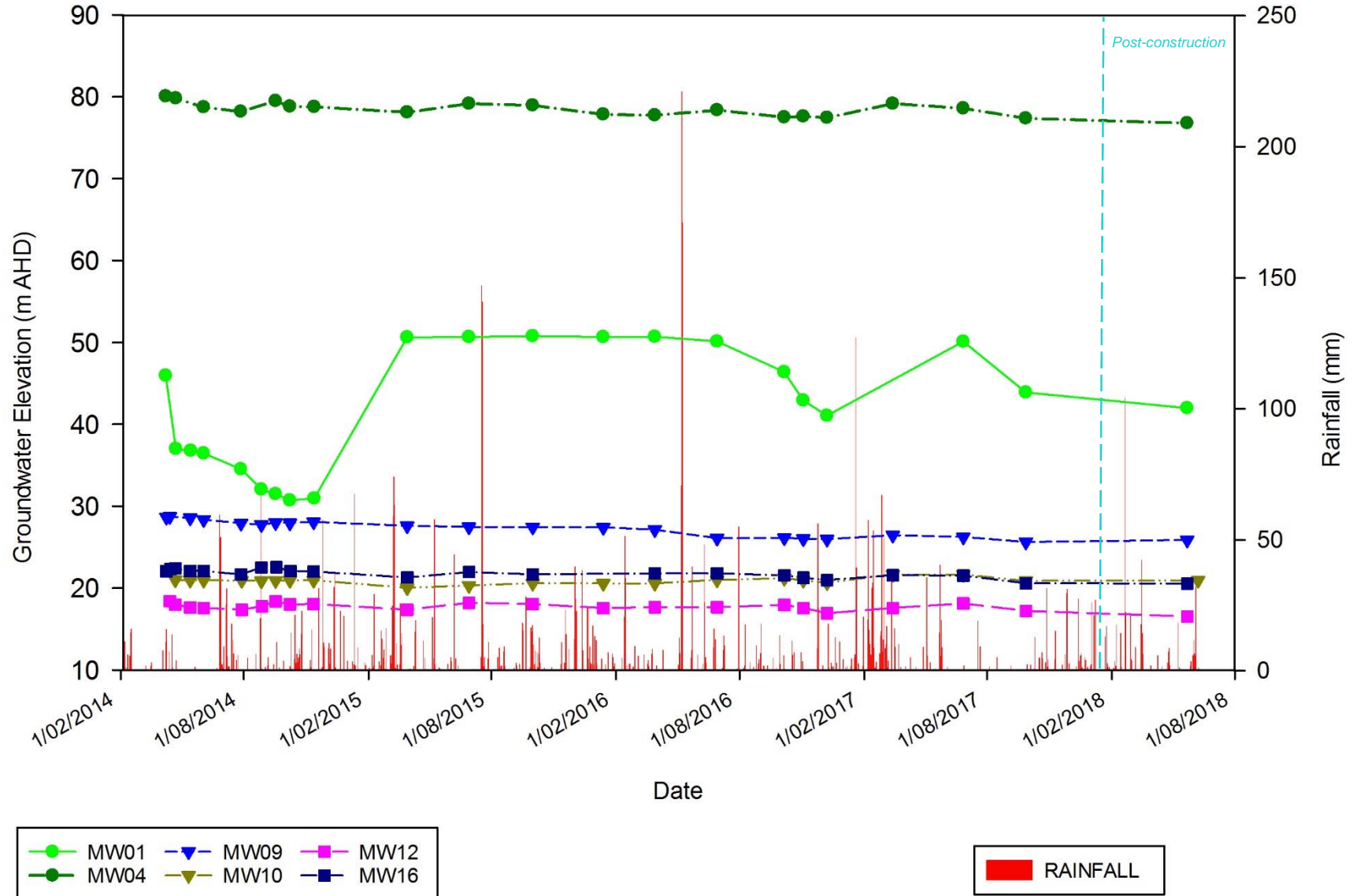
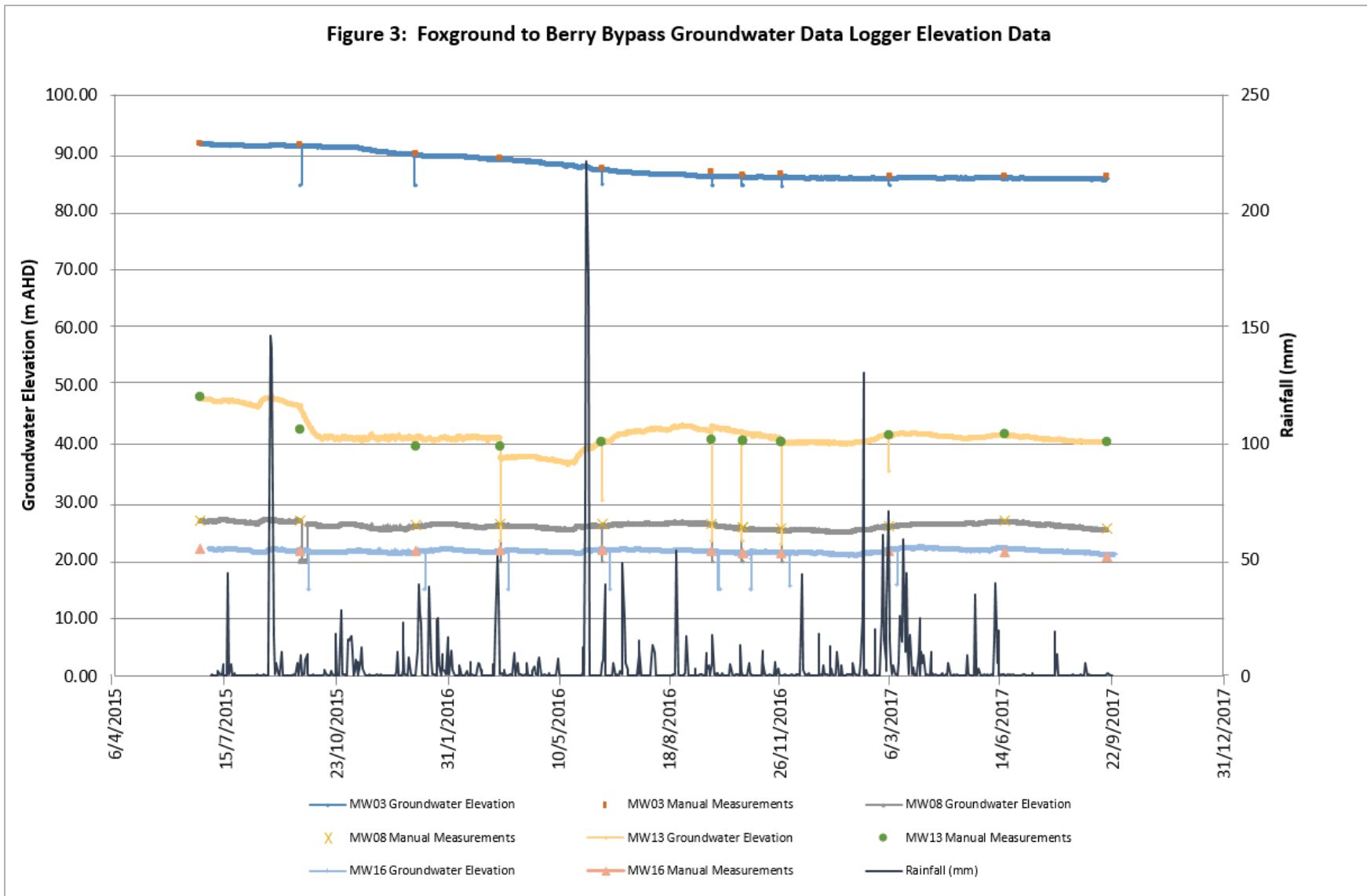


Figure 3: Foxground to Berry Bypass Groundwater Data Logger Elevation Data





## Attachment B Tabulated Results

Table B1: Event 1 – Field Parameters

Table B2: Event 1 – Analytical Results

Table B3: Event 1 – RPD Results



**Attachment B**  
**Table B1 - Field Results**  
**GW Post-construction Event 1**

RMS  
 FBB Post-construction WQM

				Field Parameters				
				pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	Redox (Field)	Temperature (Field)
				pH Units	µS/cm	mg/L	mV	°C
EQL								
<b>ADWG 2011 Aesthetic (v3.4 updated 2017)</b>				<b>6.5-8.5</b>				
ADWG 2011 Health (v3.4 updated 2017)								
ANZECC 2000 - Lowland Rivers (NSW rivers)				6.5-9	300			
ANZECC 2000 - Stock Watering								
ANZECC 2000 FW 95%								
SampleCode	Location Code	Sampled Date	Field ID					
MW01_23 May 18 -	MW01	23/05/2018	MW01	8.01	2732	7.81	84.5	17.5
MW04_23 May 18 -	MW04	23/05/2018	MW04	6.25	122	2.92	96.5	17.2
MW09_23 May 18 -	MW09	23/05/2018	MW09	7.28	1400	3	43.4	18.6
MW10_08 Jun 18 -	MW10	08/06/2018	MW10	6.59	2316	1.46	114.7	17.9
MW12_23 May 18 -	MW12	23/05/2018	MW12	5.71	326.8	2.54	170	16.8
MW16_23 May 18 -	MW16	23/05/2018	MW16	6.44	470	3.72	98	18.6
<b>Statistical Summary</b>								
Number of Results				6	6	6	6	6
Number of Detects				6	6	6	6	6
Minimum Concentration				5.71	122	1.46	43.4	16.8
Minimum Detect				5.71	122	1.46	43.4	16.8
Maximum Concentration				8.01	2732	7.81	170	18.6
Maximum Detect				8.01	2732	7.81	170	18.6
Average Concentration				6.7	1228	3.6	101	18
Median Concentration				6.515	935	2.96	97.25	17.7
Standard Deviation				0.81	1103	2.2	41	0.74
Number of Guideline Exceedances				3	5	0	0	0
Number of Guideline Exceedances(Detects Only)				3	5	0	0	0



**Attachment B  
Table B2 - Lab Results  
GW Post-construction Event 1**

	BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					Metals							PAHs	
	BTEX (Sum of Total) - Lab Calc	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	F1 (C6-C10 minus BTEXN)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (II+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	Naphthalene
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL	1	1	2	2	2	2	20	20	100	100	100	100	100	20	50	100	50	50	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.001	0.005	5
ADWG 2011 Aesthetic (v3.4 updated 2017)			25	3			20															1					3	
<b>ADWG 2011 Health (v3.4 updated 2017)</b>		<b>1</b>	<b>800</b>	<b>300</b>			<b>600</b>													<b>0.01</b>	<b>0.002</b>		<b>2</b>	<b>0.01</b>	<b>0.001</b>	<b>0.02</b>		
ANZECC 2000 - Lowland Rivers (NSW rivers)																												
ANZECC 2000 - Stock Watering																				0.5	0.01	1	1	0.1	0.002	1	20	
ANZECC 2000 FW 95%		950			350															0.013	0.0002	0.001	0.0014	0.0034	0.0006	0.011	0.008	16

Location Code	Sampled Date	Field ID	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	0.02	<5
MW10	08/06/2018	MW10	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	0.02	<5
MW10	08/06/2018	QA02	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.023	<5
MW01	23/05/2018	MW01	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	0.004	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.053	<5
MW04	23/05/2018	MW04	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	0.009	<0.001	<0.0001	<0.001	0.021	<5
MW09	23/05/2018	MW09	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	0.001	<0.0001	<0.001	0.001	<0.001	<0.0001	0.003	0.035	<5
MW09	23/05/2018	QC1	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	0.002	0.036	<5
MW12	23/05/2018	MW12	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.007	0.022	<5
MW16	23/05/2018	MW16	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	0.022	<5

Statistical Summary	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Results	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	5	8	0
Minimum Concentration	<1	<1	<2	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	0.02	<5	
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	0.001	ND	ND	0.001	0.02	ND	
Maximum Concentration	<1	<1	<2	<2	<2	<2	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	0.004	<0.0001	<0.001	0.009	<0.001	<0.0001	0.007	0.053	<5		
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	ND	0.009	ND	ND	0.007	0.053	ND		
Average Concentration	0.5	0.5	1	1	1	1	10	10	50	50	50	50	50	10	25	50	25	25	0.001	0.00005	0.0005	0.0018	0.0005	0.00005	0.0019	0.029	2.5		
Median Concentration	0.5	0.5	1	1	1	1	10	10	50	50	50	50	50	10	25	50	25	25	0.0005	0.00005	0.0005	0.0005	0.0005	0.00005	0.001	0.0225	2.5		
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0012	0	0	0.003	0	0	0.0022	0.012	0		
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	8	0		
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	8	0		





**Attachment B**  
**Table B3 - RPD QA/QC**  
**GW Post-construction Event 1**

Field Duplicates (water)  
 Filter: SDG in('ALSE-Sydney 13-Jun-18','ALSE- 24-May-18')

SDG Field ID Sampled Date/Time	ALSE-Sydney 13-Jun-18 MW10 8/06/2018 15:00	ALSE-Sydney 13-Jun-18 QA02 8/06/2018 15:00	RPD	ALSE- 24-May-18 MW09 23/05/2018 15:00	ALSE- 24-May-18 QC1 23/05/2018 15:00	RPD
--------------------------------------	--	--	-----	---	--	-----

Chem_Group	ChemName	Units	EQL						
BTEXN	BTEX (Sum of Total) - Lab Calc	µg/L	1	<1	<1	0	<1	<1	0
	Benzene	µg/L	1	<1	<1	0	<1	<1	0
	Toluene	µg/L	2	<2	<2	0	<2	<2	0
	Ethylbenzene	µg/L	2	<2	<2	0	<2	<2	0
	Xylene (o)	µg/L	2	<2	<2	0	<2	<2	0
	Xylene (m & p)	µg/L	2	<2	<2	0	<2	<2	0
	Xylene Total	µg/L	2	<2	<2	0	<2	<2	0
TRH - NEPM 2013	F1 (C6-C10 minus BTEXN)	µg/L	20	<20	<20	0	<20	<20	0
	C6-C10 Fraction	µg/L	20	<20	<20	0	<20	<20	0
	F2 (>C10-C16 minus Naphthalene)	µg/L	100	<100	<100	0	<100	<100	0
	>C10-C16 Fraction	µg/L	100	<100	<100	0	<100	<100	0
	F3 (>C16-C34 Fraction)	µg/L	100	<100	<100	0	<100	<100	0
	F4 (>C34-C40 Fraction)	µg/L	100	<100	<100	0	<100	<100	0
2013	>C10-C40 (Sum of Total)	µg/L	100	<100	<100	0	<100	<100	0
TRH - NEPM 1999	C6-C9 Fraction	µg/L	20	<20	<20	0	<20	<20	0
	C10-C14 Fraction	µg/L	50	<50	<50	0	<50	<50	0
	C15-C28 Fraction	µg/L	100	<100	<100	0	<100	<100	0
	C29-C36 Fraction	µg/L	50	<50	<50	0	<50	<50	0
	C10-C36 (Sum of Total)	µg/L	50	<50	<50	0	<50	<50	0
1999									
Metals	Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	0	0.001	<0.001	0
	Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0
	Chromium (III+VI) (Filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0
	Copper (Filtered)	mg/L	0.001	<0.001	<0.001	0	0.001	0.002	67
	Lead (Filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0
	Mercury (Filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0
	Nickel (Filtered)	mg/L	0.001	0.001	<0.001	0	0.003	0.002	40
	Zinc (Filtered)	mg/L	0.005	0.02	0.023	14	0.035	0.036	3
PAHs	Naphthalene	µg/L	5	<5	<5	0	<5	<5	0

\*RPDs have only been considered where a concentration is greater than 1 times the EQL.

\*\*High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 200 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL) )

\*\*\*Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

## Attachment C Laboratory Certificates

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW1802148**  
**Client** : **GHD PTY LTD**  
**Contact** : **MS JANE CURRAN**  
**Address** : **1/51 GRAHAM STREET**  
**NOWRA NSW, AUSTRALIA 2541**  
  
**Telephone** : **+61 02 9239 7100**  
**Project** : **FBB PC**  
**Order number** : **2316261**  
**C-O-C number** : **----**  
**Sampler** : **Jarrad Mawbey**  
**Site** : **----**  
**Quote number** : **EN/005/17**  
**No. of samples received** : **6**  
**No. of samples analysed** : **6**

**Page** : 1 of 7  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Glenn Davies  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
**4/13 Geary Pl, North Nowra 2541**  
**Australia NSW**  
**Telephone** : 02 42253125  
**Date Samples Received** : 24-May-2018 14:06  
**Date Analysis Commenced** : 28-May-2018  
**Issue Date** : 04-Jun-2018 08:43



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



## General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.  
LOR = Limit of reporting  
^ = This result is computed from individual analyte detections at or above the level of reporting  
ø = ALS is not NATA accredited for these tests.  
~ = Indicates an estimated value.



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW01	MW04	MW09	QC1	MW12
Client sampling date / time				23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	
Compound	CAS Number	LOR	Unit	EW1802148-001	EW1802148-002	EW1802148-003	EW1802148-004	EW1802148-005	
				Result	Result	Result	Result	Result	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L	0.004	<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	0.009	0.001	0.002	<0.001	
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.003	0.002	0.007	
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	0.053	0.021	0.035	0.036	0.022	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100	
<b>EP080: BTEXN</b>									
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	



## Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	MW01	MW04	MW09	QC1	MW12
Client sampling date / time				23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	23-May-2018 00:00	
Compound	CAS Number	LOR	Unit	EW1802148-001	EW1802148-002	EW1802148-003	EW1802148-004	EW1802148-005	
				Result	Result	Result	Result	Result	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	96.9	107	106	96.1	108	
Toluene-D8	2037-26-5	2	%	95.5	101	91.8	91.4	95.6	
4-Bromofluorobenzene	460-00-4	2	%	85.2	98.6	92.0	82.6	96.2	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID			MW16	----	----	----	----
Client sampling date / time		23-May-2018 00:00			----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1802148-006	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----	
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	<0.001	----	----	----	----	
Nickel	7440-02-0	0.001	mg/L	<b>0.001</b>	----	----	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----	
Zinc	7440-66-6	0.005	mg/L	<b>0.022</b>	----	----	----	----	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	----	----	----	----	
Toluene	108-88-3	2	µg/L	<2	----	----	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----	
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----	
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	



### Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	MW16	----	----	----	----
Client sampling date / time				23-May-2018 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1802148-006	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	119	----	----	----	----	
Toluene-D8	2037-26-5	2	%	94.8	----	----	----	----	
4-Bromofluorobenzene	460-00-4	2	%	94.1	----	----	----	----	



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

## QUALITY CONTROL REPORT

<b>Work Order</b>	: <b>EW1802148</b>	<b>Page</b>	: 1 of 5
<b>Client</b>	: <b>GHD PTY LTD</b>	<b>Laboratory</b>	: Environmental Division NSW South Coast
<b>Contact</b>	: MS JANE CURRAN	<b>Contact</b>	: Glenn Davies
<b>Address</b>	: 1/51 GRAHAM STREET NOWRA NSW, AUSTRALIA 2541	<b>Address</b>	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW
<b>Telephone</b>	: +61 02 9239 7100	<b>Telephone</b>	: 02 42253125
<b>Project</b>	: FBB PC	<b>Date Samples Received</b>	: 24-May-2018
<b>Order number</b>	: 2316261	<b>Date Analysis Commenced</b>	: 28-May-2018
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 04-Jun-2018
<b>Sampler</b>	: Jarrad Mawbey		
<b>Site</b>	: ----		
<b>Quote number</b>	: EN/005/17		
<b>No. of samples received</b>	: 6		
<b>No. of samples analysed</b>	: 6		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



## General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

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 (%)
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 1684184)</b>									
ES1815279-001	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	<0.001	<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	0.006	<0.005	0.00	No Limit
EW1802170-004	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	<0.001	<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	0.004	0.004	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 1684186)</b>									
ES1815320-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EW1802148-004	QC1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1686947)</b>									
EW1802148-001	MW01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EW1802148-002	MW04	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1686947)</b>									
EW1802148-001	MW01	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EW1802148-002	MW04	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
<b>EP080: BTEXN (QC Lot: 1686947)</b>									

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 Work Order : EW1802148  
 Client : GHD PTY LTD  
 Project : FBB PC



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 (%)
<b>EP080: BTEXN (QC Lot: 1686947) - continued</b>									
EW1802148-001	MW01	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
EW1802148-002	MW04	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: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1684184)</b>									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.5	85	114	
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.8	84	110	
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	92.6	85	111	
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.8	81	111	
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.2	83	111	
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.2	82	112	
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.9	81	117	
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1684186)</b>									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.4	83	105	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1676114)</b>									
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	87.6	76	116	
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	99.6	83	109	
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	92.7	75	113	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1686947)</b>									
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	93.8	75	127	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1676114)</b>									
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	86.2	76	114	
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	98.0	81	111	
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	94.1	77	119	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1686947)</b>									
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	91.2	75	127	
<b>EP080: BTEXN (QCLot: 1686947)</b>									
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	94.8	70	122	
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	99.8	69	123	
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	89.6	70	120	
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	88.4	69	121	
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	91.4	72	122	
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	102	70	120	

## 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	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1684184)</b>								
ES1815320-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	84.5	70	130	
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	85.8	70	130	
		EG020A-F: Chromium	7440-47-3	1 mg/L	85.7	70	130	
		EG020A-F: Copper	7440-50-8	1 mg/L	83.7	70	130	
		EG020A-F: Lead	7439-92-1	1 mg/L	72.8	70	130	
		EG020A-F: Nickel	7440-02-0	1 mg/L	86.4	70	130	
		EG020A-F: Zinc	7440-66-6	1 mg/L	83.7	70	130	
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1684186)</b>								
ES1815320-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	90.7	70	130	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1686947)</b>								
EW1802148-001	MW01	EP080: C6 - C9 Fraction	----	325 µg/L	71.1	70	130	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1686947)</b>								
EW1802148-001	MW01	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	72.2	70	130	
<b>EP080: BTEXN (QCLot: 1686947)</b>								
EW1802148-001	MW01	EP080: Benzene	71-43-2	25 µg/L	76.6	70	130	
		EP080: Toluene	108-88-3	25 µg/L	73.5	70	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	77.7	70	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	77.2	70	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	79.0	70	130	
EP080: Naphthalene	91-20-3	25 µg/L	91.4	70	130			

## QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EW1802148	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division NSW South Coast
Contact	: MS JANE CURRAN	Telephone	: 02 42253125
Project	: FBB PC	Date Samples Received	: 24-May-2018
Site	: ----	Issue Date	: 04-Jun-2018
Sampler	: Jarrad Mawbey	No. of samples received	: 6
Order number	: 2316261	No. of samples analysed	: 6

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 Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
<b>Laboratory Duplicates (DUP)</b>					
TRH - Semivolatle Fraction	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>					
TRH - Semivolatle Fraction	0	19	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			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
<b>EG020F: Dissolved Metals by ICP-MS</b>							
<b>Clear Plastic Bottle - Nitric Acid; Unspecified (EG020A-F)</b>							
MW01, MW09, MW12, MW04, QC1, MW16	23-May-2018	----	----	----	29-May-2018	19-Nov-2018	✓
<b>EG035F: Dissolved Mercury by FIMS</b>							
<b>Clear Plastic Bottle - Nitric Acid; Unspecified (EG035F)</b>							
MW01, MW09, MW12, MW04, QC1, MW16	23-May-2018	----	----	----	29-May-2018	06-Jun-2018	✓
<b>EP080/071: Total Petroleum Hydrocarbons</b>							
<b>Amber Glass Bottle - Unpreserved (EP071)</b>							
MW01, MW09, MW12, MW04, QC1, MW16	23-May-2018	28-May-2018	30-May-2018	✓	29-May-2018	07-Jul-2018	✓
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b>							
MW01, MW09, MW12, MW04, QC1, MW16	23-May-2018	31-May-2018	06-Jun-2018	✓	31-May-2018	06-Jun-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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
<b>Amber Glass Bottle - Unpreserved (EP071)</b>								
MW01, MW09, MW12,	MW04, QC1, MW16	23-May-2018	28-May-2018	30-May-2018	✓	29-May-2018	07-Jul-2018	✓
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b>								
MW01, MW09, MW12,	MW04, QC1, MW16	23-May-2018	31-May-2018	06-Jun-2018	✓	31-May-2018	06-Jun-2018	✓
<b>EP080: BTEXN</b>								
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b>								
MW01, MW09, MW12,	MW04, QC1, MW16	23-May-2018	31-May-2018	06-Jun-2018	✓	31-May-2018	06-Jun-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	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Mercury by FIMS	EG035F	2	12	16.67	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
TRH - Semivolatile Fraction	EP071	0	19	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
<b>Laboratory Control Samples (LCS)</b>							
Dissolved Mercury by FIMS	EG035F	1	12	8.33	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
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Method Blanks (MB)</b>							
Dissolved Mercury by FIMS	EG035F	1	12	8.33	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
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>							
Dissolved Mercury by FIMS	EG035F	1	12	8.33	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
TRH - Semivolatile Fraction	EP071	0	19	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
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 (SnCl <sub>2</sub> )(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 SnCl <sub>2</sub> 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)
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
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**

ALS Laboratory:  
please tick →

ADELAIDE 21 Burne Road Pooraka SA 5095  
Ph: 08 8359 0690 E: adelaide@alsglobal.com  
BRISBANE 32 Shand Street Stafford QLD 4053  
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com  
GLADSTONE 46 Callmondah Drive Clinton QLD 4680  
Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740  
Ph: 07 4944 0177 E: mackay@alsglobal.com  
MELBOURNE 2-4 Westall Road Springvale VIC 3171  
Ph: 03 8549 0600 E: samples.melbourne@alsglobal.com  
MUDGEE 27 Sydney Road Mudgee NSW 2850  
Ph: 02 6372 8735 E: mudgee.mel@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304  
Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com  
NOWRA 4/13 Geary Place North Nowra NSW 2541  
Ph: 024423 2083 E: nowra@alsglobal.com  
PERTH 10 Hod Way Malaga WA 6090  
Ph: 08 9200 7655 E: samples.perth@alsglobal.com

Environmental Division  
Wollongong  
Work Order Reference  
**EW1802148**



Telephone : 02 42253125

CLIENT: GHD	TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):	FOR LABORATOR Custody Seal Intact? Fires (or frozen) ice in Recept? Random Sample Tem Other comment:							
OFFICE: Nowra/Wollongong	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):								
PROJECT: FBB PC	ALS QUOTE NO.: SY/603/17B	COC SEQUENCE NUMBER (Circle)							
ORDER NUMBER: 2316261		COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>	1	2	3	4	5	6	7
1	2	3	4	5	6	7			
PROJECT MANAGER: Jane Curran	CONTACT PH: 0400450005	OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>	1	2	3	4	5	6	7
1	2	3	4	5	6	7			
SAMPLER: Jarad Mawbey	SAMPLER MOBILE:	RELINQUISHED BY: JARAD MAWBEY							
COC emailed to ALS? ( YES / NO)	EDD FORMAT (or default):	RECEIVED BY:							
Email Reports to jane.curran@ghd.com, ghdlabreports@ghd.com		DATE/TIME: 24/5/18 13:15							
Email Invoice to jane.curran@ghd.com, ghdlabreports@ghd.com		DATE/TIME: 24-5-18 13:15							

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <i>codes below</i>	(refer to) TOTAL CONTAINERS	W-05 (TRH/TEXN18 Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01	23/05/2018	w		4	X								metals field filtered
2	MW04	23/05/2018	w		4	X								
3	MW09	23/05/2018	w		4	X								
4	QC1	23/05/2018	w		4	X								
5	MW12	24/05/2018	w		4	X								
6	MW16	24/05/2018	w		4	X								
					TOTAL	24								

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

## CERTIFICATE OF ANALYSIS

<b>Work Order</b>	<b>: ES1817084</b>	<b>Page</b>	: 1 of 17
<b>Client</b>	<b>: GHD PTY LTD</b>	<b>Laboratory</b>	: Environmental Division Sydney
<b>Contact</b>	<b>: MS JANE CURRAN</b>	<b>Contact</b>	: Brenda Hong
<b>Address</b>	<b>: 1/51 GRAHAM STREET</b>	<b>Address</b>	<b>: 277-289 Woodpark Road Smithfield NSW Australia 2164</b>
	<b>NOWRA NSW, AUSTRALIA 2541</b>		
<b>Telephone</b>	<b>: +61 02 9239 7100</b>	<b>Telephone</b>	<b>: (02) 8784 8504</b>
<b>Project</b>	<b>: 2316261</b>	<b>Date Samples Received</b>	<b>: 13-Jun-2018 08:00</b>
<b>Order number</b>	<b>: 2316261</b>	<b>Date Analysis Commenced</b>	<b>: 13-Jun-2018</b>
<b>C-O-C number</b>	<b>: ----</b>	<b>Issue Date</b>	<b>: 19-Jun-2018 18:09</b>
<b>Sampler</b>	<b>: JANE CURRAN, RAY PIATEK, ROB WEBB</b>		
<b>Site</b>	<b>: ----</b>		
<b>Quote number</b>	<b>: SY/603/17 A</b>		
<b>No. of samples received</b>	<b>: 31</b>		
<b>No. of samples analysed</b>	<b>: 31</b>		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



## General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.  
LOR = Limit of reporting  
^ = This result is computed from individual analyte detections at or above the level of reporting  
ø = ALS is not NATA accredited for these tests.  
~ = Indicates an estimated value.



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW05	SW06
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-001	ES1817084-002	ES1817084-003	ES1817084-004	ES1817084-005	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	<5	8	35	22	<5	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	5.8	8.8	16.4	18.1	5.7	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	<0.001	<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	<0.005	<0.005	<0.005	0.005	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.30	0.34	0.44	0.26	0.49	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.4	0.7	0.7	0.3	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	0.6	0.7	1.1	1.0	0.8	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.04	0.06	0.14	0.14	0.10	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW05	SW06
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-001	ES1817084-002	ES1817084-003	ES1817084-004	ES1817084-005	
				Result	Result	Result	Result	Result	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>									
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100
<b>EP080: BTEXN</b>									
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				----	2	µg/L	<2	<2	<2
^ Sum of BTEX				----	1	µg/L	<1	<1	<1
Naphthalene				91-20-3	5	µg/L	<5	<5	<5
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4				17060-07-0	2	%	109	113	114
Toluene-D8				2037-26-5	2	%	104	106	102
4-Bromofluorobenzene				460-00-4	2	%	106	107	104



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW08	SW12_1	SW12_2	SW12_3	SW13_1
Client sampling date / time				07-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-006	ES1817084-007	ES1817084-008	ES1817084-009	ES1817084-010	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	<5	11	8	10	9	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	6.5	6.6	6.6	6.3	7.6	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	0.002	<0.001	0.001	<0.001	0.002	
Nickel	7440-02-0	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	
Zinc	7440-66-6	0.005	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.38	0.13	0.19	0.16	0.45	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.4	0.4	0.4	0.4	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	1.2	0.5	0.6	0.6	0.8	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.24	0.05	0.04	0.05	0.03	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW08	SW12_1	SW12_2	SW12_3	SW13_1	
Client sampling date / time				07-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00	08-Jun-2018 00:00		
Compound	CAS Number	LOR	Unit	ES1817084-006	ES1817084-007	ES1817084-008	ES1817084-009	ES1817084-010		
				Result	Result	Result	Result	Result		
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>										
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100	<100
<b>EP080: BTEXN</b>										
Benzene				71-43-2	1	µg/L	<1	<1	<1	<1
Toluene				108-88-3	2	µg/L	<2	<2	<2	<2
Ethylbenzene				100-41-4	2	µg/L	<2	<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	<2
^ Total Xylenes				----	2	µg/L	<2	<2	<2	<2
^ Sum of BTEX				----	1	µg/L	<1	<1	<1	<1
Naphthalene				91-20-3	5	µg/L	<5	<5	<5	<5
<b>EP080S: TPH(V)/BTEX Surrogates</b>										
1,2-Dichloroethane-D4				17060-07-0	2	%	112	113	110	110
Toluene-D8				2037-26-5	2	%	103	102	102	103
4-Bromofluorobenzene				460-00-4	2	%	104	104	102	104



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW13_2	SW13_3	SW14	QC1	SW16_1
Client sampling date / time				08-Jun-2018 00:00	08-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	08-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-011	ES1817084-012	ES1817084-013	ES1817084-014	ES1817084-015	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	10	12	6	10	26	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	7.3	7.1	8.2	7.8	2.7	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	0.002	0.002	0.006	0.006	<0.001	
Nickel	7440-02-0	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	
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.012	0.009	<0.005	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.44	0.44	1.58	1.64	0.06	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.3	0.6	0.6	0.4	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	0.7	0.7	2.2	2.2	0.5	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.04	0.03	0.04	0.05	0.12	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW13_2	SW13_3	SW14	QC1	SW16_1	
Client sampling date / time				08-Jun-2018 00:00	08-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	08-Jun-2018 00:00		
Compound	CAS Number	LOR	Unit	ES1817084-011	ES1817084-012	ES1817084-013	ES1817084-014	ES1817084-015		
				Result	Result	Result	Result	Result		
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>										
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100	<100
<b>EP080: BTEXN</b>										
Benzene				71-43-2	1	µg/L	<1	<1	<1	<1
Toluene				108-88-3	2	µg/L	<2	<2	<2	<2
Ethylbenzene				100-41-4	2	µg/L	<2	<2	<2	<2
meta- & para-Xylene				108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2
ortho-Xylene				95-47-6	2	µg/L	<2	<2	<2	<2
^ Total Xylenes				----	2	µg/L	<2	<2	<2	<2
^ Sum of BTEX				----	1	µg/L	<1	<1	<1	<1
Naphthalene				91-20-3	5	µg/L	<5	<5	<5	<5
<b>EP080S: TPH(V)/BTEX Surrogates</b>										
1,2-Dichloroethane-D4				17060-07-0	2	%	108	96.7	97.7	94.8
Toluene-D8				2037-26-5	2	%	97.4	112	112	113
4-Bromofluorobenzene				460-00-4	2	%	101	110	111	110



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW17_1	QC2	SW07_1	SW07_2	SW07_3
Client sampling date / time				08-Jun-2018 00:00	08-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-016	ES1817084-017	ES1817084-018	ES1817084-019	ES1817084-020	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	9	12	18	10	17	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	2.1	2.1	24.9	24.9	26.1	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	
Nickel	7440-02-0	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	
Zinc	7440-66-6	0.005	mg/L	0.011	0.013	0.007	<0.005	0.006	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.01	<0.01	0.36	0.36	0.36	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.1	0.1	0.4	0.6	0.4	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	0.1	0.1	0.8	1.0	0.8	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.01	0.01	0.07	0.10	0.07	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW17_1	QC2	SW07_1	SW07_2	SW07_3	
Client sampling date / time				08-Jun-2018 00:00	08-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00		
Compound	CAS Number	LOR	Unit	ES1817084-016	ES1817084-017	ES1817084-018	ES1817084-019	ES1817084-020		
				Result	Result	Result	Result	Result		
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>										
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100	<100
<b>EP080: BTEXN</b>										
Benzene				71-43-2	1	µg/L	<1	<1	<1	<1
Toluene				108-88-3	2	µg/L	<2	<2	<2	<2
Ethylbenzene				100-41-4	2	µg/L	<2	<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	<2
^ Total Xylenes				----	2	µg/L	<2	<2	<2	<2
^ Sum of BTEX				----	1	µg/L	<1	<1	<1	<1
Naphthalene				91-20-3	5	µg/L	<5	<5	<5	<5
<b>EP080S: TPH(V)/BTEX Surrogates</b>										
1,2-Dichloroethane-D4				17060-07-0	2	%	96.5	99.3	98.9	97.9
Toluene-D8				2037-26-5	2	%	109	113	111	114
4-Bromofluorobenzene				460-00-4	2	%	110	115	110	112



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW09_1	SW09_2	SW09_3	SW10_1	SW10_2
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-021	ES1817084-022	ES1817084-023	ES1817084-024	ES1817084-025	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	12	8	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	4.5	4.4	4.4	14.6	15.5	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	0.002	0.002	
Nickel	7440-02-0	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	
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.007	0.006	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.43	0.41	0.41	0.04	0.04	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.4	0.3	0.7	0.5	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	0.7	0.8	0.7	0.7	0.5	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.12	0.11	0.10	0.10	0.08	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW09_1	SW09_2	SW09_3	SW10_1	SW10_2	
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00		
Compound	CAS Number	LOR	Unit	ES1817084-021	ES1817084-022	ES1817084-023	ES1817084-024	ES1817084-025		
				Result	Result	Result	Result	Result		
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>										
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100	<100
<b>EP080: BTEXN</b>										
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	
^ Sum of BTEX				----	1	µg/L	<1	<1	<1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5		
<b>EP080S: TPH(V)/BTEX Surrogates</b>										
1,2-Dichloroethane-D4	17060-07-0	2	%	95.2	98.4	95.0	102	97.9		
Toluene-D8	2037-26-5	2	%	114	111	111	117	112		
4-Bromofluorobenzene	460-00-4	2	%	108	107	107	114	110		



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW10_3	SW11_1	SW11_2	SW11_3	MW10
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	08-Jun-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1817084-026	ES1817084-027	ES1817084-028	ES1817084-029	ES1817084-030	
				Result	Result	Result	Result	Result	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	10	45	30	72	----	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	16.5	27.3	27.6	25.4	----	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
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	0.002	0.003	0.003	0.003	<0.001	
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	0.002	0.002	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	0.007	0.018	0.017	0.062	0.020	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	2.29	2.32	2.09	----	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	1.4	1.4	1.6	----	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	0.6	3.7	3.7	3.7	----	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.08	0.08	0.05	0.08	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
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	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW10_3	SW11_1	SW11_2	SW11_3	MW10	
Client sampling date / time				07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	07-Jun-2018 00:00	08-Jun-2018 00:00		
Compound	CAS Number	LOR	Unit	ES1817084-026	ES1817084-027	ES1817084-028	ES1817084-029	ES1817084-030		
				Result	Result	Result	Result	Result		
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>										
^ >C10 - C40 Fraction (sum)				----	100	µg/L	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)				----	100	µg/L	<100	<100	<100	<100
<b>EP080: BTEXN</b>										
Benzene				71-43-2	1	µg/L	<1	<1	<1	<1
Toluene				108-88-3	2	µg/L	<2	<2	<2	<2
Ethylbenzene				100-41-4	2	µg/L	<2	<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	<2
^ Total Xylenes				----	2	µg/L	<2	<2	<2	<2
^ Sum of BTEX				----	1	µg/L	<1	<1	<1	<1
Naphthalene				91-20-3	5	µg/L	<5	<5	<5	<5
<b>EP080S: TPH(V)/BTEX Surrogates</b>										
1,2-Dichloroethane-D4				17060-07-0	2	%	100	96.7	90.4	96.6
Toluene-D8				2037-26-5	2	%	111	110	106	115
4-Bromofluorobenzene				460-00-4	2	%	110	107	102	110



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QA02	----	----	----	----
Client sampling date / time				08-Jun-2018 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES1817084-031	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----	
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	<0.001	----	----	----	----	
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----	
Zinc	7440-66-6	0.005	mg/L	<b>0.023</b>	----	----	----	----	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	----	----	----	----	
Toluene	108-88-3	2	µg/L	<2	----	----	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----	
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----	
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	



### Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	QA02	----	----	----	----
Client sampling date / time				08-Jun-2018 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1817084-031	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
<b>1,2-Dichloroethane-D4</b>	17060-07-0	2	%	<b>99.4</b>	----	----	----	----	----
<b>Toluene-D8</b>	2037-26-5	2	%	<b>108</b>	----	----	----	----	----
<b>4-Bromofluorobenzene</b>	460-00-4	2	%	<b>109</b>	----	----	----	----	----



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128



## QUALITY CONTROL REPORT

<b>Work Order</b>	: <b>ES1817084</b>	<b>Page</b>	: 1 of 10
<b>Client</b>	: <b>GHD PTY LTD</b>	<b>Laboratory</b>	: Environmental Division Sydney
<b>Contact</b>	: MS JANE CURRAN	<b>Contact</b>	: Brenda Hong
<b>Address</b>	: 1/51 GRAHAM STREET NOWRA NSW, AUSTRALIA 2541	<b>Address</b>	: 277-289 Woodpark Road Smithfield NSW Australia 2164
<b>Telephone</b>	: +61 02 9239 7100	<b>Telephone</b>	: (02) 8784 8504
<b>Project</b>	: 2316261	<b>Date Samples Received</b>	: 13-Jun-2018
<b>Order number</b>	: 2316261	<b>Date Analysis Commenced</b>	: 13-Jun-2018
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 19-Jun-2018
<b>Sampler</b>	: JANE CURRAN, RAY PIATEK, ROB WEBB		
<b>Site</b>	: ----		
<b>Quote number</b>	: SY/603/17 A		
<b>No. of samples received</b>	: 31		
<b>No. of samples analysed</b>	: 31		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



## General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

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 (%)
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1727011)</b>									
ES1816787-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	64	67	3.43	0% - 50%
ES1816814-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	58	62	6.24	0% - 50%
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1727012)</b>									
ES1817084-003	SW03	EA025H: Suspended Solids (SS)	----	5	mg/L	35	18	66.0	No Limit
ES1817084-022	SW09_2	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1729858)</b>									
ES1816980-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	6	5	18.2	No Limit
ES1817012-017	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1620	1770	8.50	0% - 20%
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1729859)</b>									
ES1817084-010	SW13_1	EA025H: Suspended Solids (SS)	----	5	mg/L	9	10	13.0	No Limit
<b>EA045: Turbidity (QC Lot: 1723727)</b>									
ES1817017-001	Anonymous	EA045: Turbidity	----	0.1	NTU	2.1	2.1	0.00	0% - 20%
ES1817084-001	SW01	EA045: Turbidity	----	0.1	NTU	5.8	5.9	0.00	0% - 20%
<b>EA045: Turbidity (QC Lot: 1723728)</b>									
ES1817084-012	SW13_3	EA045: Turbidity	----	0.1	NTU	7.1	7.1	0.00	0% - 20%
ES1817084-021	SW09_1	EA045: Turbidity	----	0.1	NTU	4.5	4.4	2.90	0% - 20%
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 1732354)</b>									
ES1817084-001	SW01	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



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 (%)
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 1732354) - continued</b>									
ES1817084-011	SW13_2	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	0.002	0.002	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
<b>EG020F: Dissolved Metals by ICP-MS (QC Lot: 1732357)</b>									
ES1817084-022	SW09_2	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
ES1817087-001	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	0.002	0.002	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
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 1732355)</b>									
ES1817084-003	SW03	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1817084-010	SW13_1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EG035F: Dissolved Mercury by FIMS (QC Lot: 1732356)</b>									
ES1817084-023	SW09_3	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1817084-030	MW10	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1731465)</b>									
ES1817084-001	SW01	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.30	0.30	0.00	0% - 20%
ES1817084-010	SW13_1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.45	0.44	0.00	0% - 20%
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1731466)</b>									
ES1817084-021	SW09_1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.43	0.43	0.00	0% - 20%
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1731461)</b>									
ES1816713-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.2	<0.2	0.00	No Limit
ES1817084-001	SW01	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.3	0.00	No Limit
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1731463)</b>									
ES1817084-010	SW13_1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.00	No Limit
ES1817084-021	SW09_1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.3	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 (%)	
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1731462)</b>										
ES1817084-001	SW01	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.04	0.04	0.00	No Limit	
ES1817084-010	SW13_1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00	No Limit	
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1731464)</b>										
ES1817084-021	SW09_1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.12	0.11	11.7	0% - 50%	
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1730170)</b>										
ES1817080-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit	
ES1817084-002	SW02	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit	
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1730171)</b>										
ES1817084-012	SW13_3	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit	
ES1817084-022	SW09_2	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1730170)</b>										
ES1817080-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit	
ES1817084-002	SW02	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1730171)</b>										
ES1817084-012	SW13_3	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit	
ES1817084-022	SW09_2	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit	
<b>EP080: BTEXN (QC Lot: 1730170)</b>										
ES1817080-002	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	2	µg/L	<2	<2	0.00	No Limit	
			106-42-3							
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit	
ES1817084-002	SW02	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit	
		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	2	µg/L	<2	<2	0.00	No Limit	
			106-42-3							
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			
<b>EP080: BTEXN (QC Lot: 1730171)</b>										
ES1817084-012	SW13_3	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	2	µg/L	<2	<2	0.00	No Limit	
			106-42-3							
		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: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1727011)</b>									
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	100	83	129	
				<5	1000 mg/L	102	82	110	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1727012)</b>									
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	108	83	129	
				<5	1000 mg/L	98.8	82	110	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1729858)</b>									
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	108	83	129	
				<5	1000 mg/L	90.1	82	110	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1729859)</b>									
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	83	129	
				<5	1000 mg/L	# 80.8	82	110	
<b>EA045: Turbidity (QCLot: 1723727)</b>									
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	98.0	91	105	
<b>EA045: Turbidity (QCLot: 1723728)</b>									
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	98.2	91	105	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1732354)</b>									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	91.6	85	114	
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	88.8	84	110	
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.6	85	111	
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	88.6	81	111	
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	87.5	83	111	
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.6	82	112	
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.7	81	117	
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1732357)</b>									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	91.4	85	114	
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	90.0	84	110	
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	90.6	85	111	
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	90.2	81	111	
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	89.1	83	111	
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	87.3	82	112	
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.8	81	117	
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1732355)</b>									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.1	83	105	





Sub-Matrix: WATER

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1732356)</b>									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.2	83	105	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1731465)</b>									
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91	113	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1731466)</b>									
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.1	91	113	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1731461)</b>									
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	85.3	69	101	
				<0.1	1 mg/L	86.9	70	118	
				<0.1	5 mg/L	91.6	74	118	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1731463)</b>									
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	86.2	69	101	
				<0.1	1 mg/L	87.8	70	118	
				<0.1	5 mg/L	89.0	74	118	
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1731462)</b>									
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	87.4	71	101	
				<0.01	0.442 mg/L	86.2	72	108	
				<0.01	1 mg/L	97.2	78	118	
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1731464)</b>									
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	87.4	71	101	
				<0.01	0.442 mg/L	85.7	72	108	
				<0.01	1 mg/L	92.6	78	118	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1724047)</b>									
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	90.7	76	116	
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	93.2	83	109	
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	93.4	75	113	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1724183)</b>									
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	107	76	116	
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	106	83	109	
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	80.5	75	113	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1730170)</b>									
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	98.2	75	127	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1730171)</b>									
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	106	75	127	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1724047)</b>									
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	90.2	76	114	
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	93.9	81	111	
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	85.2	77	119	



Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1724183)</b>								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	94.9	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	105	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	101	77	119
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1730170)</b>								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	100	75	127
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1730171)</b>								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	108	75	127
<b>EP080: BTEXN (QCLot: 1730170)</b>								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	102	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	106	70	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	104	69	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	105	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	107	70	120
<b>EP080: BTEXN (QCLot: 1730171)</b>								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	107	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	110	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	110	70	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	110	69	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	111	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	98.8	70	120

### 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**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Recovery Limits (%)	
					MS	Low	High
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1732354)</b>							
ES1817084-004	SW05	EG020A-F: Arsenic	7440-38-2	1 mg/L	90.1	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	94.2	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	95.3	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	93.7	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	100	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	94.6	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
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1732354) - continued</b>							
ES1817084-004	SW05	EG020A-F: Zinc	7440-66-6	1 mg/L	95.2	70	130
<b>EG020F: Dissolved Metals by ICP-MS (QCLot: 1732357)</b>							
ES1817084-024	SW10_1	EG020A-F: Arsenic	7440-38-2	1 mg/L	93.2	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	99.6	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	101	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	96.8	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	106	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	97.0	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	98.8	70	130
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1732355)</b>							
ES1817084-002	SW02	EG035F: Mercury	7439-97-6	0.01 mg/L	89.1	70	130
<b>EG035F: Dissolved Mercury by FIMS (QCLot: 1732356)</b>							
ES1817084-021	SW09_1	EG035F: Mercury	7439-97-6	0.01 mg/L	92.5	70	130
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1731465)</b>							
ES1817084-001	SW01	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	98.1	70	130
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1731466)</b>							
ES1817084-021	SW09_1	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	94.9	70	130
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1731461)</b>							
ES1816713-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	89.5	70	130
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1731463)</b>							
ES1817084-022	SW09_2	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	86.3	70	130
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1731462)</b>							
ES1817084-002	SW02	EK067G: Total Phosphorus as P	----	1 mg/L	93.1	70	130
<b>EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1731464)</b>							
ES1817084-022	SW09_2	EK067G: Total Phosphorus as P	----	1 mg/L	93.3	70	130
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1730170)</b>							
ES1817080-002	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	94.4	70	130
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1730171)</b>							
ES1817084-012	SW13_3	EP080: C6 - C9 Fraction	----	325 µg/L	96.6	70	130
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1730170)</b>							
ES1817080-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	95.6	70	130
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1730171)</b>							
ES1817084-012	SW13_3	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	98.7	70	130
<b>EP080: BTEXN (QCLot: 1730170)</b>							



Sub-Matrix: WATER

				Matrix Spike (MS) Report				
				Spike	Spike Recovery(%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
<b>EP080: BTEXN (QCLot: 1730170) - continued</b>								
ES1817080-002	Anonymous	EP080: Benzene	71-43-2	25 µg/L	107	70	130	
		EP080: Toluene	108-88-3	25 µg/L	105	70	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	111	70	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	109	70	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	113	70	130	
	EP080: Naphthalene	91-20-3	25 µg/L	119	70	130		
<b>EP080: BTEXN (QCLot: 1730171)</b>								
ES1817084-012	SW13_3	EP080: Benzene	71-43-2	25 µg/L	91.5	70	130	
		EP080: Toluene	108-88-3	25 µg/L	96.8	70	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	101	70	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	101	70	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70	130	
	EP080: Naphthalene	91-20-3	25 µg/L	96.5	70	130		



## QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1817084	Page	: 1 of 13
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS JANE CURRAN	Telephone	: (02) 8784 8504
Project	: 2316261	Date Samples Received	: 13-Jun-2018
Site	: ----	Issue Date	: 19-Jun-2018
Sampler	: JANE CURRAN, RAY PIATEK, ROB WEBB	No. of samples received	: 31
Order number	: 2316261	No. of samples analysed	: 31

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** Matrix Spike outliers occur.
- Laboratory Control 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
<b>Laboratory Control Spike (LCS) Recoveries</b>							
EA025: Total Suspended Solids dried at 104 ± 2°C	QC-1729859-003	----	Suspended Solids (SS)	----	80.8 %	82-110%	Recovery less than lower control limit

**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
<b>EA045: Turbidity</b>							
<b>Clear Plastic Bottle - Natural</b>							
SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	----	----	----	13-Jun-2018	09-Jun-2018	4
<b>Clear Plastic Bottle - Natural</b>							
SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	----	----	----	13-Jun-2018	10-Jun-2018	3
<b>EP080/071: Total Petroleum Hydrocarbons</b>							
<b>Amber Glass Bottle - Unpreserved</b>							
SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	SW09_2, SW10_1, SW10_3, SW11_2,	15-Jun-2018	14-Jun-2018	1	----	----	----
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>							
<b>Amber Glass Bottle - Unpreserved</b>							
SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	SW09_2, SW10_1, SW10_3, SW11_2,	15-Jun-2018	14-Jun-2018	1	----	----	----

**Outliers : Frequency of Quality Control Samples**





Matrix: WATER					
Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
<b>Laboratory Duplicates (DUP)</b>					
TRH - Semivolatile Fraction	0	40	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>					
TRH - Semivolatile Fraction	0	40	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			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
<b>Clear Plastic Bottle - Natural (EA025H)</b>								
SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	----	----	----	14-Jun-2018	14-Jun-2018	✓
<b>Clear Plastic Bottle - Natural (EA025H)</b>								
SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1	08-Jun-2018	----	----	----	15-Jun-2018	15-Jun-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	
<b>EA045: Turbidity</b>								
<b>Clear Plastic Bottle - Natural (EA045)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	----	----	----	13-Jun-2018	09-Jun-2018	*
<b>Clear Plastic Bottle - Natural (EA045)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	----	----	----	13-Jun-2018	10-Jun-2018	*
<b>EG020F: Dissolved Metals by ICP-MS</b>								
<b>Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	----	----	----	16-Jun-2018	04-Dec-2018	✓
<b>Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2, QA02	SW12_2, SW13_1, SW13_3, SW17_1, MW10,	08-Jun-2018	----	----	----	16-Jun-2018	05-Dec-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	
<b>EG035F: Dissolved Mercury by FIMS</b>								
<b>Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	----	----	----	16-Jun-2018	05-Jul-2018	✓
<b>Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2, QA02	SW12_2, SW13_1, SW13_3, SW17_1, MW10,	08-Jun-2018	----	----	----	16-Jun-2018	06-Jul-2018	✓
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
<b>Clear Plastic Bottle - Sulfuric Acid (EK059G)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	----	----	----	15-Jun-2018	05-Jul-2018	✓
<b>Clear Plastic Bottle - Sulfuric Acid (EK059G)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	----	----	----	15-Jun-2018	06-Jul-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	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>								
<b>Clear Plastic Bottle - Sulfuric Acid (EK061G)</b>								
SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	15-Jun-2018	05-Jul-2018	✓	15-Jun-2018	05-Jul-2018	✓
<b>Clear Plastic Bottle - Sulfuric Acid (EK061G)</b>								
SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	15-Jun-2018	06-Jul-2018	✓	15-Jun-2018	06-Jul-2018	✓
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>								
<b>Clear Plastic Bottle - Sulfuric Acid (EK067G)</b>								
SW01, SW03, SW06, SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	SW02, SW05, SW08, QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	15-Jun-2018	05-Jul-2018	✓	15-Jun-2018	05-Jul-2018	✓
<b>Clear Plastic Bottle - Sulfuric Acid (EK067G)</b>								
SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	15-Jun-2018	06-Jul-2018	✓	15-Jun-2018	06-Jul-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	
<b>EP080/071: Total Petroleum Hydrocarbons</b>								
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3	SW02, SW05, SW08, QC1, SW07_2,	07-Jun-2018	14-Jun-2018	14-Jun-2018	✔	16-Jun-2018	24-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	SW09_2, SW10_1, SW10_3, SW11_2,	07-Jun-2018	15-Jun-2018	14-Jun-2018	✖	16-Jun-2018	25-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	14-Jun-2018	15-Jun-2018	✔	16-Jun-2018	24-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> MW10,	QA02	08-Jun-2018	15-Jun-2018	15-Jun-2018	✔	16-Jun-2018	25-Jul-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	15-Jun-2018	21-Jun-2018	✔	15-Jun-2018	21-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW01, SW03, SW06,	SW02, SW05, SW08	07-Jun-2018	18-Jun-2018	21-Jun-2018	✔	18-Jun-2018	21-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW13_3, SW17_1, MW10,	SW16_1, QC2, QA02	08-Jun-2018	15-Jun-2018	22-Jun-2018	✔	15-Jun-2018	22-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW12_1, SW12_3, SW13_2	SW12_2, SW13_1,	08-Jun-2018	18-Jun-2018	22-Jun-2018	✔	18-Jun-2018	22-Jun-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	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>								
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW01, SW03, SW06, SW14, SW07_1, SW07_3	SW02, SW05, SW08, QC1, SW07_2,	07-Jun-2018	14-Jun-2018	14-Jun-2018	✔	16-Jun-2018	24-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	SW09_2, SW10_1, SW10_3, SW11_2,	07-Jun-2018	15-Jun-2018	14-Jun-2018	✖	16-Jun-2018	25-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> SW12_1, SW12_3, SW13_2, SW16_1, QC2	SW12_2, SW13_1, SW13_3, SW17_1,	08-Jun-2018	14-Jun-2018	15-Jun-2018	✔	16-Jun-2018	24-Jul-2018	✔
<b>Amber Glass Bottle - Unpreserved (EP071)</b> MW10,	QA02	08-Jun-2018	15-Jun-2018	15-Jun-2018	✔	16-Jun-2018	25-Jul-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	15-Jun-2018	21-Jun-2018	✔	15-Jun-2018	21-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW01, SW03, SW06,	SW02, SW05, SW08	07-Jun-2018	18-Jun-2018	21-Jun-2018	✔	18-Jun-2018	21-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW13_3, SW17_1, MW10,	SW16_1, QC2, QA02	08-Jun-2018	15-Jun-2018	22-Jun-2018	✔	15-Jun-2018	22-Jun-2018	✔
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW12_1, SW12_3, SW13_2	SW12_2, SW13_1,	08-Jun-2018	18-Jun-2018	22-Jun-2018	✔	18-Jun-2018	22-Jun-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	
<b>EP080: BTEXN</b>								
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW14, SW07_1, SW07_3, SW09_2, SW10_1, SW10_3, SW11_2,	QC1, SW07_2, SW09_1, SW09_3, SW10_2, SW11_1, SW11_3	07-Jun-2018	15-Jun-2018	21-Jun-2018	✓	15-Jun-2018	21-Jun-2018	✓
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW01, SW03, SW06,	SW02, SW05, SW08	07-Jun-2018	18-Jun-2018	21-Jun-2018	✓	18-Jun-2018	21-Jun-2018	✓
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW13_3, SW17_1, MW10,	SW16_1, QC2, QA02	08-Jun-2018	15-Jun-2018	22-Jun-2018	✓	15-Jun-2018	22-Jun-2018	✓
<b>Amber VOC Vial - Sulfuric Acid (EP080)</b> SW12_1, SW12_3, SW13_2	SW12_2, SW13_1,	08-Jun-2018	18-Jun-2018	22-Jun-2018	✓	18-Jun-2018	22-Jun-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	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Dissolved Mercury by FIMS	EG035F	4	38	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	38	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	29	10.34	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	7	69	10.14	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	29	10.34	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	40	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	4	38	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Laboratory Control Samples (LCS)</b>							
Dissolved Mercury by FIMS	EG035F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	29	6.90	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	8	69	11.59	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	6	40	15.00	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	6	29	20.69	15.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Method Blanks (MB)</b>							
Dissolved Mercury by FIMS	EG035F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	29	6.90	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	69	5.80	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	29	6.90	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>							
Dissolved Mercury by FIMS	EG035F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	29	6.90	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	29	6.90	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	40	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard

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 Project : 2316261



Matrix: **WATER**

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

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
<i>Analytical Methods</i>							
<b>Matrix Spikes (MS) - Continued</b>							
TRH Volatiles/BTEX	EP080	2	40	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)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 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 (SnCl <sub>2</sub> )(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 SnCl <sub>2</sub> 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)
Nitrite and Nitrate as N (NO <sub>x</sub> ) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO <sub>3</sub> - F. Combined oxidised Nitrogen (NO <sub>2</sub> +NO <sub>3</sub> ) 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 + No <sub>x</sub> ) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO <sub>3</sub> -. 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)
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

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<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
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.

## Attachment D Calibration certificates



AirMet Scientific P/L  
7-11 Ceylon Street  
Nunawading  
Victoria 3131, Australia

# Calibration Certificate

This document hereby certifies that this instrument detailed has been calibrated to the parameters listed below.

Certificate Print Date: 9 February, 2018  
Calibration Date: 8 February, 2018  
Next Calibration Due: 8 August, 2018

Call ID: 00214690  
Arrow Job Code: 227977

Customer:	GHD Pty Ltd	Type:	Water Meter
Model:	WATERMETER	Serial No:	13J100151
Description:	YSI Pro Plus Water Quality Meter		

Sensor	Serial No	Standard Solutions	Certified	Solution # (Bottle #)	Instrument Reading	Units
Dissolved Oxygen		0%		1612235007	0	%
EC		2.76 ms/cm		312321	2.76	ms/cm
Ph		pH 7.0		307926	7.02	pH
Ph		pH 4.0		307927	4.00	pH
Redox		231.58mV		305536/305538	231.6	mV
Temp		21.1°C		MultiTherm	21.1	°C

Completed by: Wentao Zhang	Signed: 
----------------------------	--

Australian Standard Alarm Levels



**CALIBRATION RECORD**

Instrument YSI Pro Plus  
 Serial Number 13J00151

Date	12/03/2018	22/03/2018	26/03/2018	10/04/2018	24/04/2018	11/05/2018	23/05/2018	6/06/2018
Time	12:45:00 PM	8:00:00 AM	10:00:00 AM	11:00:00 AM	1:00:00 PM	3:30:00 PM	11:00:00 AM	5:00:00 PM
Staff	JC, RW	RW, IL	RW	RW	RW, JC		JM	JC
<b>Conductivity (S. Conductance)</b>								
Temperature	24	23.1	22.7	23.5	21.7	18.2	22.3	16.7
Solution	2707	2655	2655	2707	2549	2400	2760	2338
Pre-calibration	2773	2517	2760	2877	2738	2788	2686	2414
Post-calibration	2664	2655	2769	2888	2742	2092	2742	1975
<b>pH 7</b>								
Temperature	24.2	23.2	22.4	23.8	21.7	18.2	22.3	16.7
Solution	7.01	7.01	7.01	7.02	7.01	7.02	7.01	7.04
Pre-calibration	7.07	7	7.07	7.02	7.04	7	7.06	7.01
Post-calibration	7.01	7	7.01	7	7.01	7.02	7.02	7.02
<b>pH 4</b>								
Temperature	24.2	23.2	22.5	23.7	21.6	18.2	22.3	16.8
Solution	4.01	4.01	4.00	4.01	4.01	4	4.01	4.00
Pre-calibration	4.00	4.00	4.00	4.01	4.01	4.03	4.03	4.00
Post-calibration	3.99	4.00	3.99	3.99	4.00	4	4.01	3.98
<b>ORP</b>								
Temperature	24.4	23.1	22.9	23.7	21.60	18.2	22.30	17.10
Solution	231.2	232.1	232.1	231.2	235.60	244.4	231.20	246.60
Pre-calibration	232	230.4	242.7	244.7	242.70	214.5	236.50	245.70
Post-calibration	231.2	234.6	215.7	232.3	220.30	244.4	232.00	246.60
<b>DO (air)</b>								
Temperature	21.1	18.7	18.8	20.6	18.50	18.5	22.30	15.70
Solution	100%	100%	100%	100%	100%	100%	100%?	100.00
Pre-calibration	100%	97.90%	98.60%	99.30%	97.60%	99.90%	97.20%	103.40
Post-calibration	9.01 mg/L	9.37 mg/L	9.14 mg/L	8.98 mg/L	9.29 mg/L	100	9.17mg/L	100.00
<b>Signed</b>	JC*	RW*	RW*	RW*	RW*	JC*	JM*	JC*

## Attachment E - Laboratory Quality Assurance and Quality Control Results

### *Field Program groundwater*

Intra-laboratory duplicate samples were collected and analysed as part of the groundwater sampling program and the relative percentage differences (RPD) were calculated. Intra-laboratory measures the reproducibility of measurements under a given set of conditions. The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs.

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

Where  $C_o$  = Analyte concentration of the original sample  
 $C_d$  = Analyte concentration of the duplicate sample

GHD adopts a nominal acceptance criterion of 30% RPD for field duplicates and splits for inorganics and a nominal acceptance criterion of 50% RPD for field duplicates and splits for organics; however it is noted that this may not always be achieved, particularly at low analyte concentrations. Groundwater QA/QC results are presented as Table B2, Attachment B. No RPD exceedances occurred.

One quality assurance field duplicate sample (QC1) slightly exceeded ANZECC (2000) Fresh Water 95% criterion for copper with a value of 0.002 mg/L. The parent sample for the duplicate (MW09) did not have an exceedance although did have a copper results of 0.001 mg/L. The results suggest the parent and quality assurance sample were not completely homogenous. Copper concentrations may have some variability.

### *Laboratory Program*

The NATA accredited laboratories utilised for this assessment (ALS) undertook their own quality assurance and quality control procedures for sample analysis. GHD has reviewed the internal laboratory control data provided within the laboratory reports, which are attached in the laboratory reports as Attachment C.

The laboratory provided the following summary of QA/QC Compliance Assessment:

- No method blank outliers occur
- No duplicate outliers occur
- No laboratory control outliers occur (one laboratory control spike outlier for Total Suspended Solids (TSS) exists for a surface water sample submitted with MW10.)
- No Matrix spike outliers exist
- For all regular sample matrices, no surrogate recovery outliers occur
- No analysis holding time outliers exist.

All samples were noted to be correctly preserved. The laboratory control spike outlier recorded for TSS within samples sent with MW10 suggests an error in the laboratory methodology. The 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. Given TSS was not an analyte for the groundwater monitoring event, it is not considered applicable to the interpretation of results in this report.

### ***Summary of Quality Assurance / Quality Control Results***

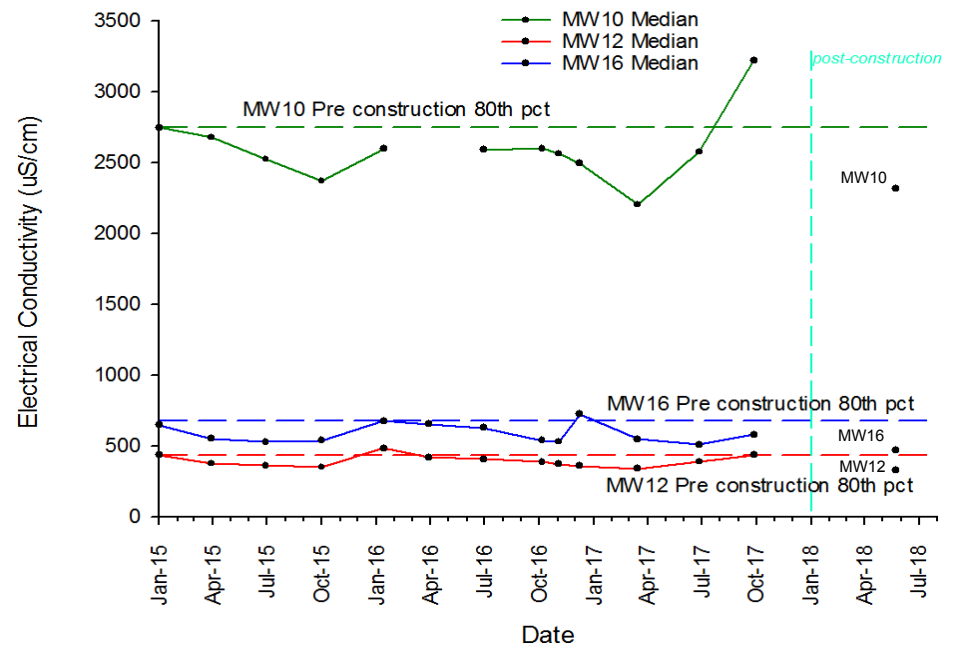
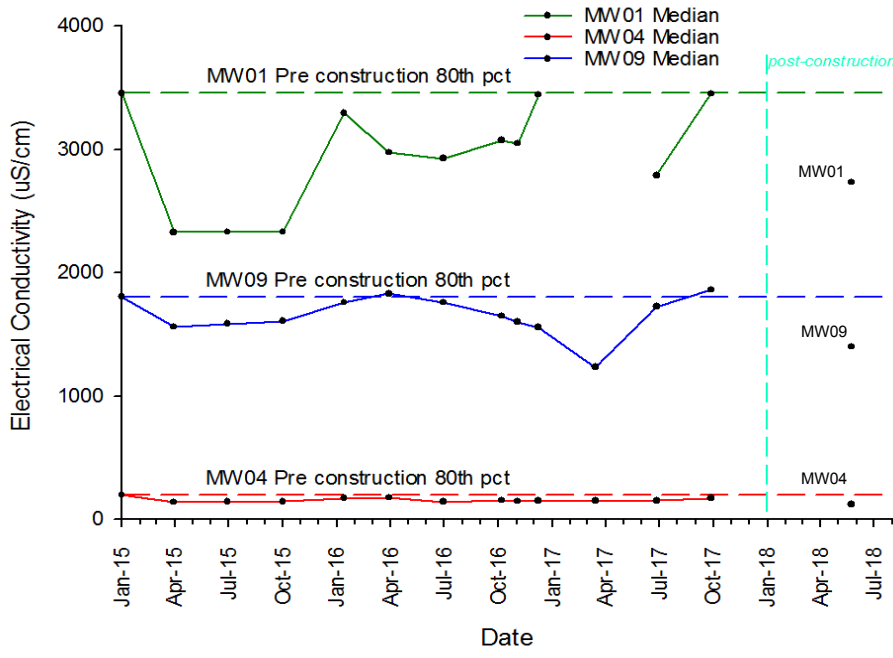
QA/QC results show that the samples collected have met the appropriate standards and therefore, the data was considered to be valid and of sufficient quality to meet the data quality objectives for the assessment.

## Attachment F – Control Charts and Metal Trend Graphs

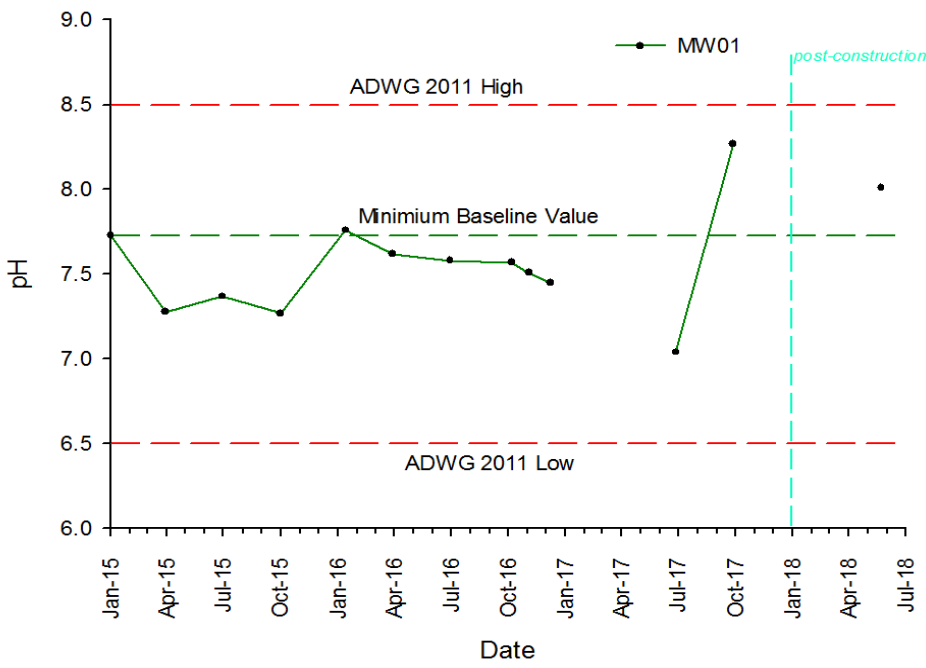


# Attachment F Control Charts GW Post-construction Event 1

## Electrical Conductivity

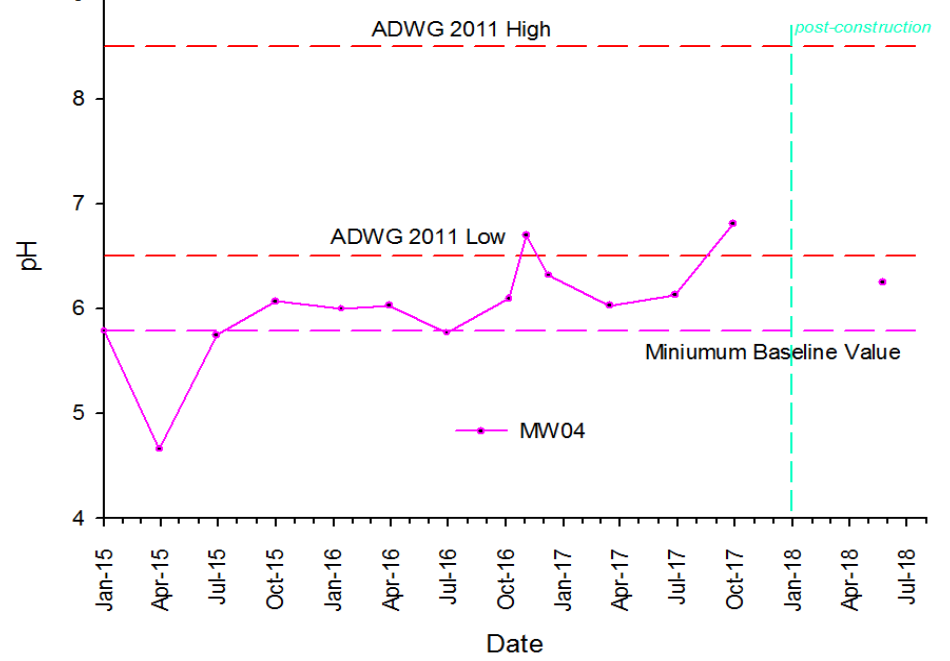


MW01

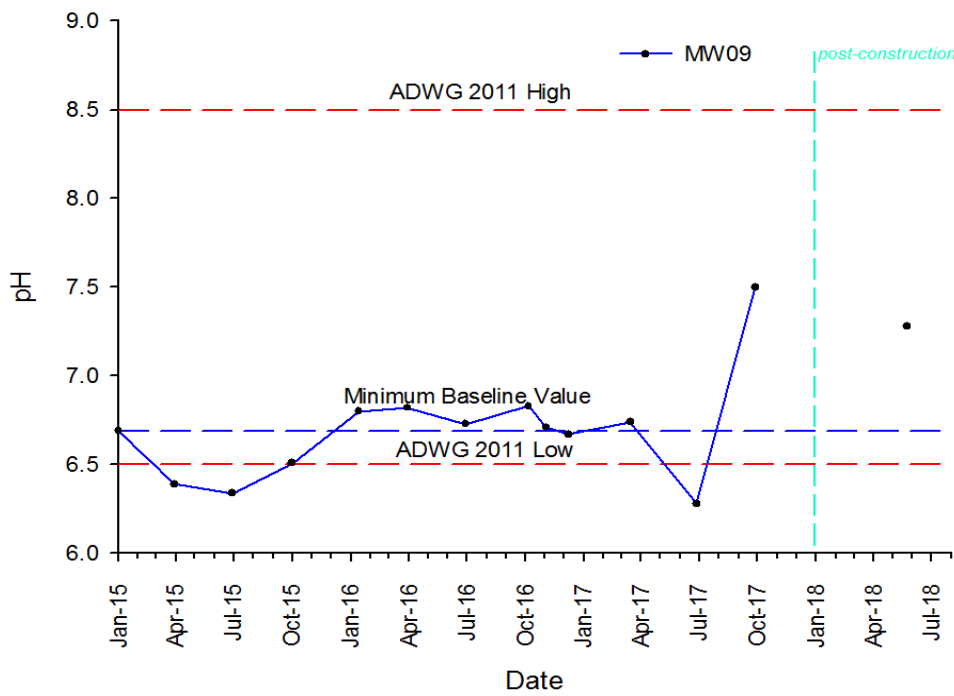


## pH

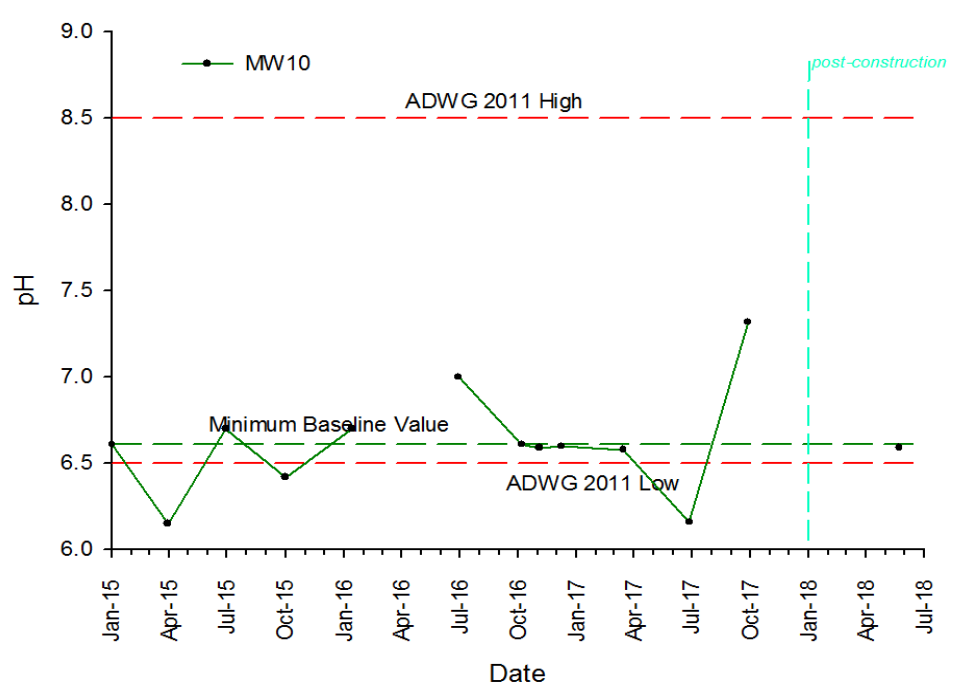
MW04



MW09



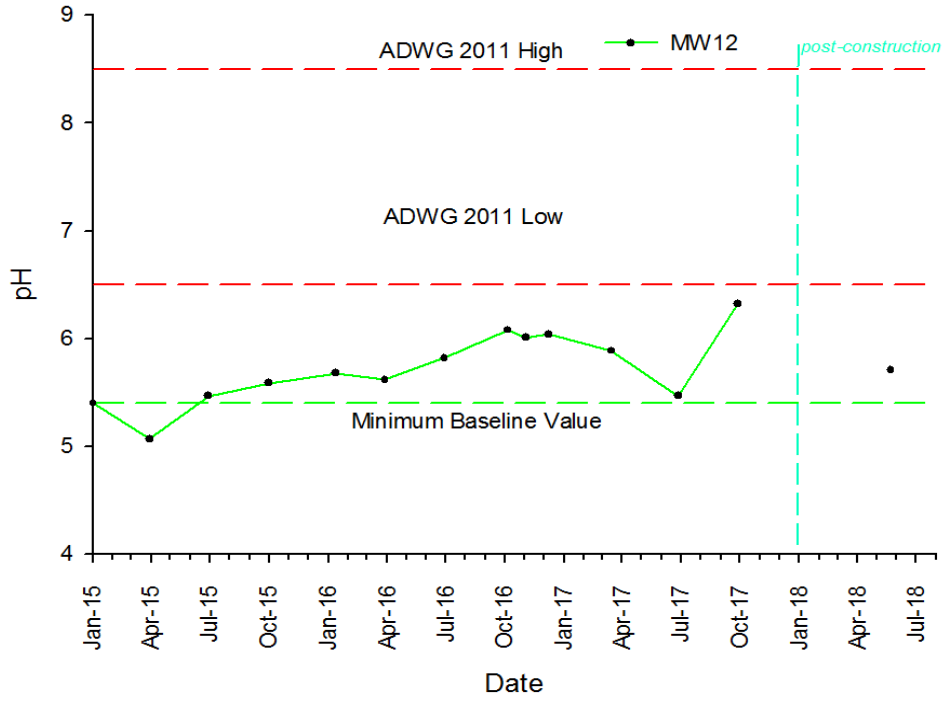
MW10



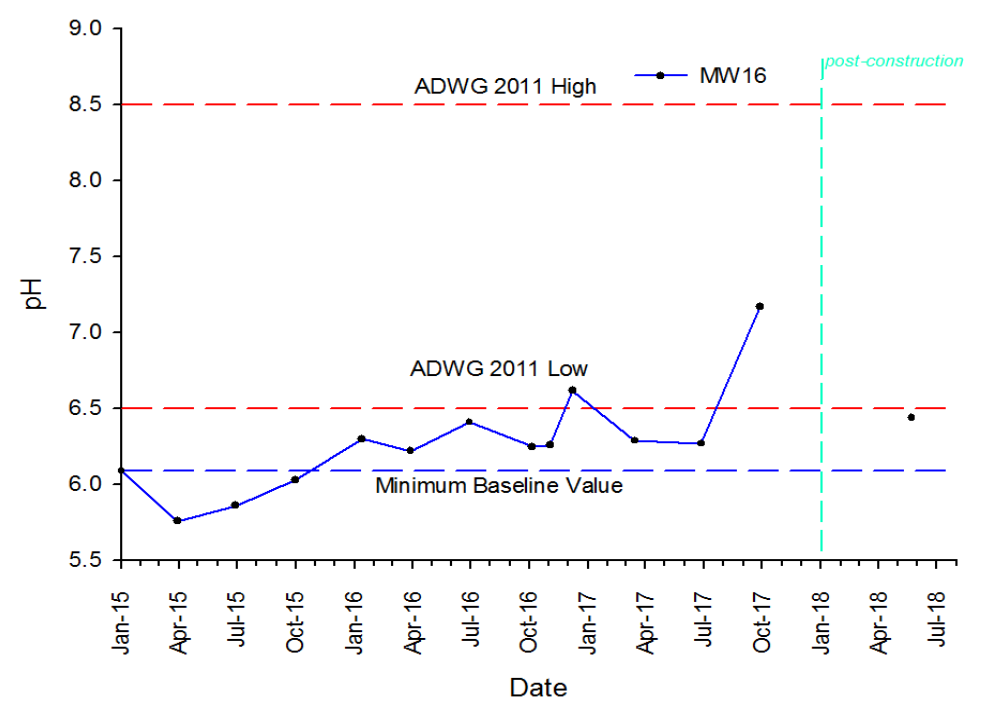


# Attachment F Control Charts GW Post-construction Event 1

### MW12



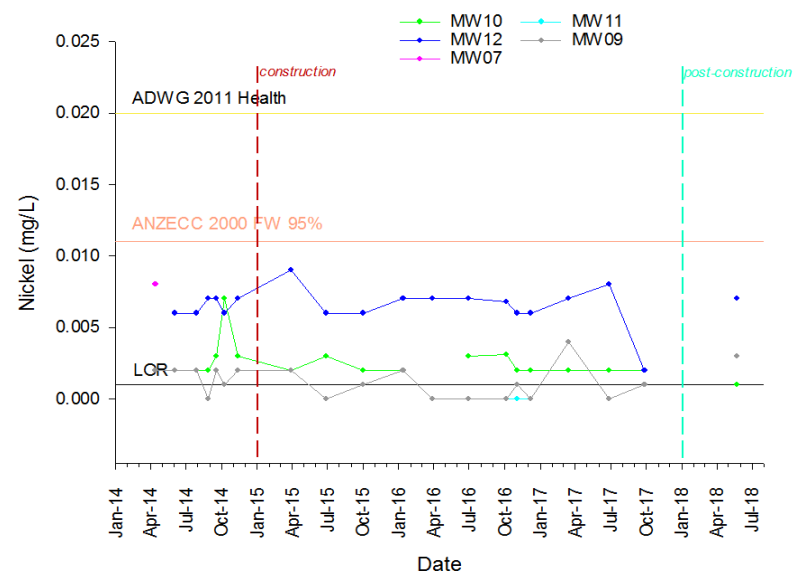
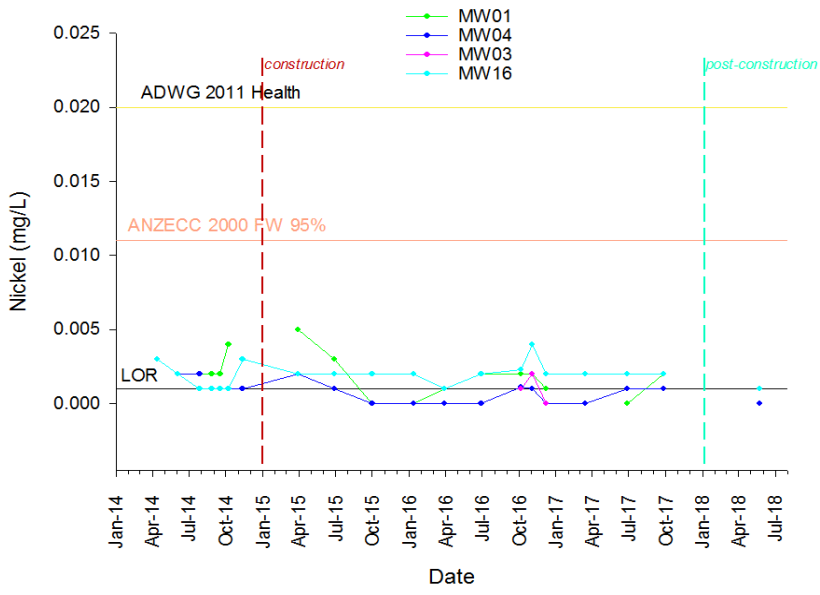
### MW16



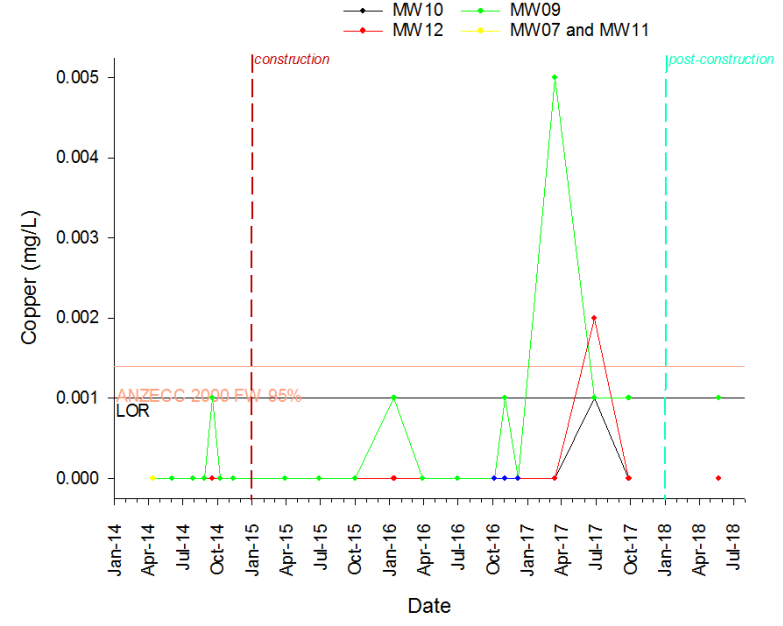
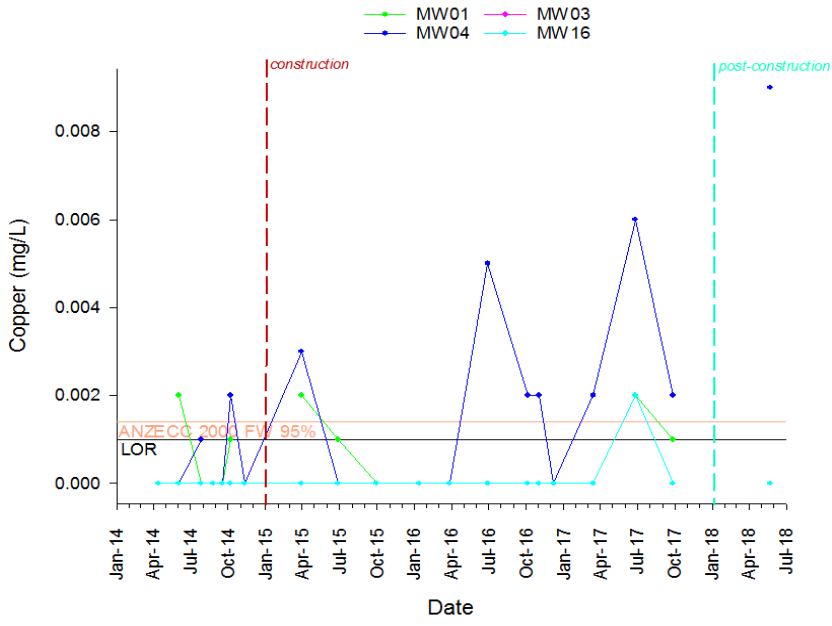


# Attachment F Metal Trend Graphs GW Post-construction Event 1

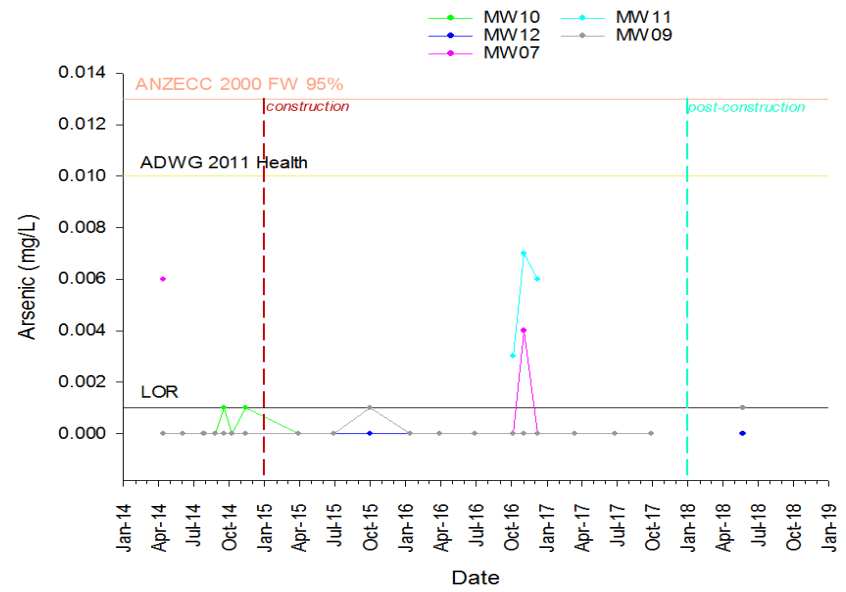
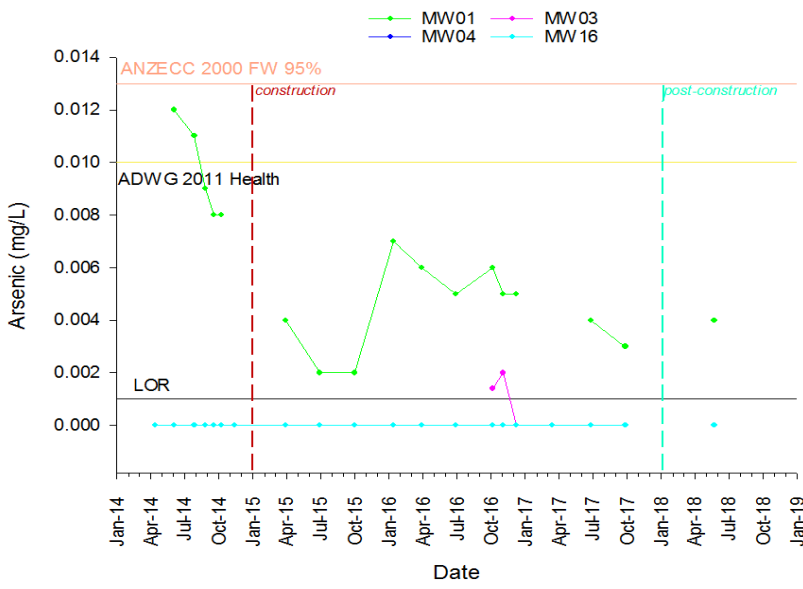
## Nickel



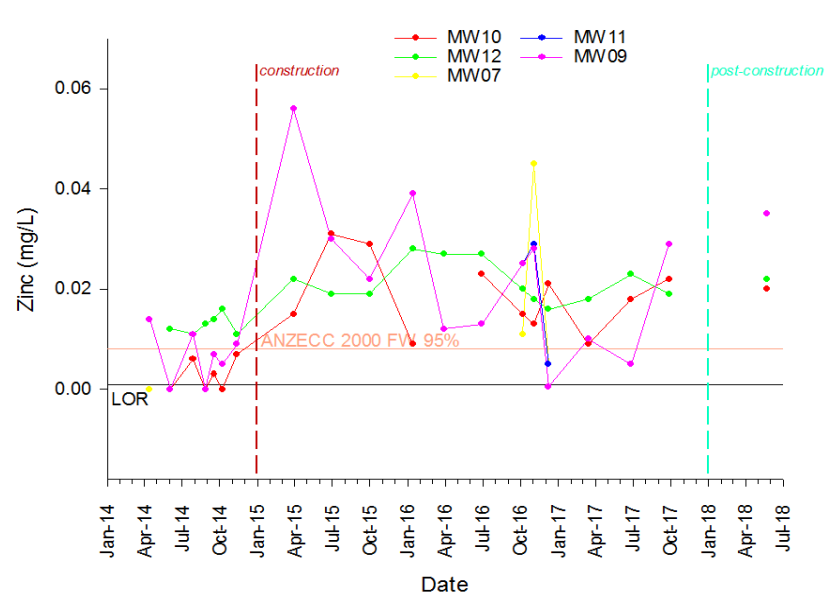
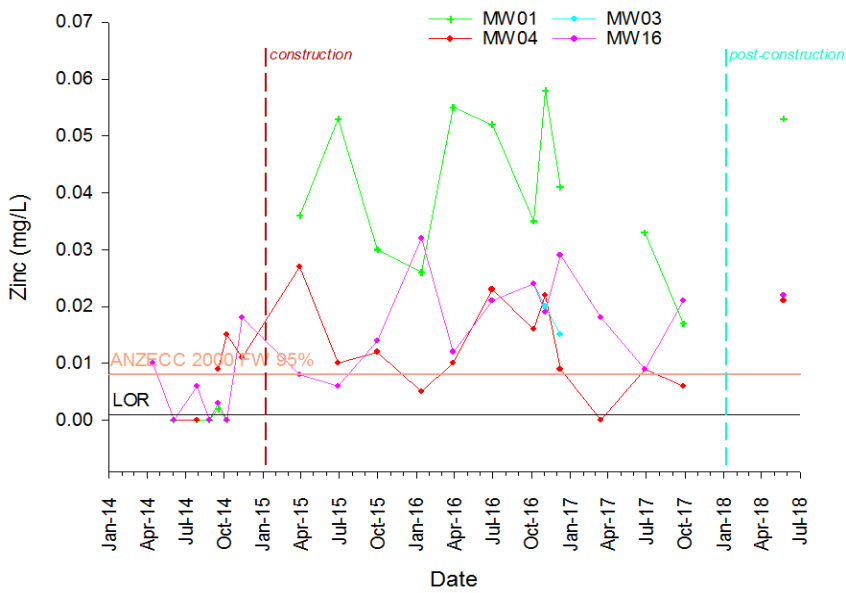
## Copper



## Arsenic



## Zinc





Attachment G    Field sheets

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



PROJECT DETAILS

Project Number: 23/16261

Project Name: Foxground to Berry Bypass

Client: RMS

Site: Foxground to Berry Bypass

Well Condition (i.e road box, locked etc): Road box

Depth to Water Table Pre-purge (from TOC): 10.01m

Depth of PSH (from TOC): N/A - NO PSH

Depth to Bottom of Casing (BOC) from TOC: -

Casing Stickup: 0.82m

Depth to Water Table Post - purge (from TOC): 10.62m

Borehole ID

MW01

Sample ID:

11

Date:

23/5/18

Sampler:

JNM

Purge Method: Low Flow

Sample Method: Low Flow

Casing Type: PVC

Well Diameter: 50mm

Calculated Bore Volume(L): -

QA Collected:

NO

FIELD PARAMETERS (RECORDED USING YSI Pro Plus)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
0930	0.5	10.05	683	1897	7.91	62.5	18.4	slightly cloudy, no odour or PSH.
0940	2.5	10.22	733	2711	7.91	67.0	18.0	"
0945	4.0	10.45	775	2751	7.98	78.4	17.7	Clear "
0950	6.0	10.51	784	2734	8.02	80.9	17.5	"
0955	8.5	10.59	782	2733	8.03	83.4	17.5	"
1000	10.0	10.62	781	2732	8.01	84.5	17.5	"
* STARTED			SAMPLING			*		

Post Sample Parameters

Number of Bottles: 1x Amber 1x Metals x 2 vials

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



PROJECT DETAILS

Project Number: 23/16261	Borehole ID: MW04
Project Name: Foxground to Berry Bypass	Sample ID: 11
Client: RMS	Date: 23/5/18
Site: Foxground to Berry Bypass	Sampler: JNM
Well Condition (i.e road box, locked etc): Road box	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 3.221	Sample Method: Low Flow
Depth of PSH (from TOC): N/A - NO PSH	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC: 7.658	Well Diameter: 50mm
Casing Stickup: 0.70	Calculated Bore Volume(L): $\frac{\pi}{4} \times 0.05^2 \times 7.658 \times 1000 \approx 16.86 \approx 17L$
Depth to Water Table Post - purge (from TOC): 4.28 m	QA Collected: NO

FIELD PARAMETERS (RECORDED USING YSI Pro Plus)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
12:45	0.5	3.22	3.65	110	7.16	65.6	17.6	CLEAR, NO ODOUR OR TST
12:50	2	3.66	3.22	116	7.04	91.8	17.4	"
12:55	4	3.92	3.08	117	6.87	92.6	17.6	"
13:00	6	4.14	3.02	121	6.30	97.4	17.3	"
13:05	8	4.38	2.98	122	6.24	97.5	17.3	"
13:10	10	4.47	2.94	121	6.26	96.8	17.2	"
13:20	12	4.55	2.92	122	6.25	96.5	17.2	"
		*STARTED SAMPLING*						

Post Sample Parameters

Number of Bottles: 1x Amber 1x Metals 82 Vials. Comments: Ants found in water column.

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



<b>PROJECT DETAILS</b>		Borehole ID
Project Number: 23/16261		MW09
Project Name: Foxground to Berry Bypass		Sample ID:
Client: RMS		Date: 23/5/18
Site: Foxground to Berry Bypass		Sampler: JNM.
Well Condition (i.e road box, locked etc): Road box		Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 6.482		Sample Method: Low Flow
Depth of PSH (from TOC): N/A		Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:		Well Diameter: 50mm
Casing Stickup: 0.55m		Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 6.85m		QA Collected: YES - QCI

FIELD PARAMETERS (RECORDED USING YSI Pro Plus)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
1450	2	6.58	3.25	1405	7.69	58.5	18.5	Slightly cloudy NO ODOUR NO PSH
1455	4	6.66	3.14	1404	7.40	44.0	18.6	"
1500	6	6.78	3.08	1399	7.34	42.0	18.7	"
1505	8	6.84	3.04	1401	7.31	43.4	18.7	"
1510	10	6.85	3.01	1402	7.29	43.2	18.6	"
1515	12	6.88	3.00	1400	7.28	43.4	18.6	"
* STARTED SAMPLING *								

Post Sample Parameters

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Number of Bottles: 2x Arbel 4x Metals 4x Vials  
 Comments: + Barometer installed at 0800 on the 24/5/18

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



PROJECT DETAILS

Project Number: 23/16261

Project Name: Foxground to Berry Bypass

Client: RMS

Site: Foxground to Berry Bypass

Well Condition (i.e road box, locked etc): Road box

Depth to Water Table Pre-purge (from TOC):

Depth of PSH (from TOC):

Depth to Bottom of Casing (BOC) from TOC:

Casing Stickup:

Depth to Water Table Post - purge (from TOC):

Borehole ID

Sample ID:

Date:

Sampler:

Purge Method: Low Flow

Sample Method: Low Flow

Casing Type: PVC

Well Diameter: 50mm

Calculated Bore Volume(L):

QA Collected:

FIELD PARAMETERS (RECORDED USING YSI Pro Plus)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
12.04	0.5	11.40	4.80	2275	6.71	121.2	17.9	slightly grey turbid no odour, no sheen.
12.07	1.5	11.40	3.29	2297	6.65	120.8	18.0	" "
12.09	2.5	11.42	1.90	2307	6.61	119.9	18.0	" "
12.13	4.5	11.43	0.71	2314	6.59	117.3	17.9	" "
12.15	6	11.425	0.69	2314	6.59	116.5	17.9	" "
12.17	7	11.425	0.91	2315	6.59	115.8	17.9	" "
12.19	8	11.44	1.31	2317	6.59	115.0	17.9	" "
12.21	9	11.44	1.46	2316	6.59	114.7	17.9	" "

Post Sample Parameters

Number of Bottles: 8  
 Comments: QA07 well was stuck up but was buried during construction. No only 0.08m above gravel  
 7m from road + blue arrow.

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



<b>PROJECT DETAILS</b>	Borehole ID
Project Number: 23/16261	MW12
Project Name: Foxground to Berry Bypass	Sample ID:
Client: RMS	Date: 24/5/18
Site: Foxground to Berry Bypass	Sampler: JNM
Well Condition (i.e road box, locked etc): Road box	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 7.872	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC: 10.632	Well Diameter: 50mm
Casing Stickup: 0.79	Calculated Bore Volume(L): 2.76
Depth to Water Table Post - purge (from TOC):	QA Collected: NO

**FIELD PARAMETERS (RECORDED USING YSI Pro Plus)**

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
0920	0.5	7.87	2.50	344.8	5.97	134.0	16.8	clear, no odour or PSH
0925	2.0	7.74	2.60	330.4	5.77	152.0	16.9	Slightly cloudy, //
0930	4.0	8.14	2.65	328.1	5.72	170.8	16.8	' '
0940	6.0	8.26	2.58	327.4	5.71	171.6	16.8	' '
0945	9.0	8.44	2.56	326.2	5.70	170.4	16.8	' '
0950	11.0	8.49	2.54	326.8	5.71	170.0	16.8	' '
								* STOPPED SAMPLING *
<b>Post Sample Parameters</b>								

Number of Bottles: 1x Amber 1x Metals 2x Vials	Comments:
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Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET



PROJECT DETAILS

Borehole ID

Project Number: 23/16261

MW16

Project Name: Foxground to Berry Bypass

Sample ID:

Client: RMS

Date:

24/5/18

Site: Foxground to Berry Bypass

Sampler:

JNM

Well Condition (i.e road box, locked etc): Road box

Purge Method: Low Flow

Depth to Water Table Pre-purge (from TOC): 2.259

Sample Method: Low Flow

Depth of PSH (from TOC): N/A - NO PSH

Casing Type: PVC

Depth to Bottom of Casing (BOC) from TOC: 10.755

Well Diameter: 50mm

Casing Stickup: 0.805

Calculated Bore Volume(L):

Depth to Water Table Post - purge (from TOC):

QA Collected:

NO

FIELD PARAMETERS (RECORDED USING YSI Pro Plus)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
11:05	1	2.31	5.16	476	6.39	188	18.2	Slightly cloudy, NO PSH NO OPA
11:10	2	2.38	5.29	474	6.55	147	18.8	"
11:20	4	2.54	5.08	477	6.51	112	18.7	"
11:25	6	2.68	4.99	472	6.47	1108	18.7	"
11:30	8	2.77	4.05	472	6.40	99.4	18.7	clear "
11:37	10	2.94	3.76	471	6.45	985	18.6	" "
11:38	10	2.92	3.72	470	6.44	980	18.6	" "
			* STARTED SAMPLING					

Post Sample Parameters

Number of Bottles: 1x Amber / 1x Metals  
2x Vials.

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)



Logger Installation details — FBB 2316261

Well ID	Mb to C to SWL	WELL DEPTH mb to c	Logger Install Depth mb to c
MW03	17.714	21.81m	20.78
PN: 2A21752			
SN: 21511005			

Logger installed at 11:18am 23/5/18. NB Max depth of logger 21.0m (hence install depth of 7m not achieved)

MW08

PN	Mb to c to SWL	WELL DEPTH	Logger Depth
2A21752	3.441	9.841	9.490m
SN: 21511013			

Logger installed at 13:53 23/5/18.

MW13

PN	Mb to c to SWL	WELL DEPTH	Logger Depth
2A21752	9.708	14.81m	14.14m
SN 21511012			

Logger installed at  $\approx$  4:05pm 23/5/18

MW16

PN	Mb to c to SWL	WELL DEPTH	Logger depth
2A21752	2.315	10.755	7.70m
SN 21511008			

Logger installed 11:45 24/5/18