Foxground and Berry Bypass
Construction Compliance Report

Report 3
1 November 2015 – 30 April 2016

Contents

Appendices

Details of Revision and Amendment:

Plan Control

The most current version of this report will be available on the Fulton Hogan database for all project personnel. Distribution of this report will be made through the Foxground and Berry Bypass project document control system 'iTwo'.

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

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4	RMS Environmental Representative	17 JUNE 2016	Graham Roche
5	DP&E endorsed Environmental Representative (ER)	17 JUNE 2016	Toby Hobbs
6	Department of Planning & Environment	JUNE 2016	Glenn Snow

Plan Approved By:

Matthew Saviana

Project Director

Shannon Chisholm

Community and Environment 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Each new revision to the report will be distributed to all registered copyholders with an instruction that the superseded copy be destroyed or marked as superseded.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
1	10 May 2016	Draft for internal review	All	Sam Leigh	
2	11 May 2016	Draft for Submission	All	Sam Leigh	S.C
3	25 May 2016	Review following ER Comments	8,10,12,15,26, 27, 28, 32	Sam Leigh	S.C

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 will provide 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 concept design features include:

- Approximately 11.6 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
- Proposed local road closure at North Street
- Victoria Street to remain open with 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 is being 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.

Table 1-1: Details additional approvals gained on the Foxground and Berry Bypass during the reporting period

Approval	Approved By	Date
Broughton Creek: Bridge No. 3	RMS, and Project ER	14 December 2015

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 which specifies:

B29 - Compliance tracking

This compliance tracking report provides a review of compliance for the six month period between 1 November 2015 and 30 April 2016.

"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 /SO 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 43% of the days were wet days. The total rainfall received was 25% lower than the long term average.

During the reporting period the project continued to operate at full capacity as weather and site conditions allowed.

2.1 Demolition and property adjustment

Demolition works are complete. Property adjustments works have started and are continuing in all zones. They will be completed consistent with the construction programme.

2.2 Utilities adjustments & diversions

FBB continued to construct vital utilities and service adjustments. The general construction progress for services is:

- Electrical service relocations are 90% complete
- Telecommunication service relocations are 95% complete
- Sewer and water relocations are 95% complete

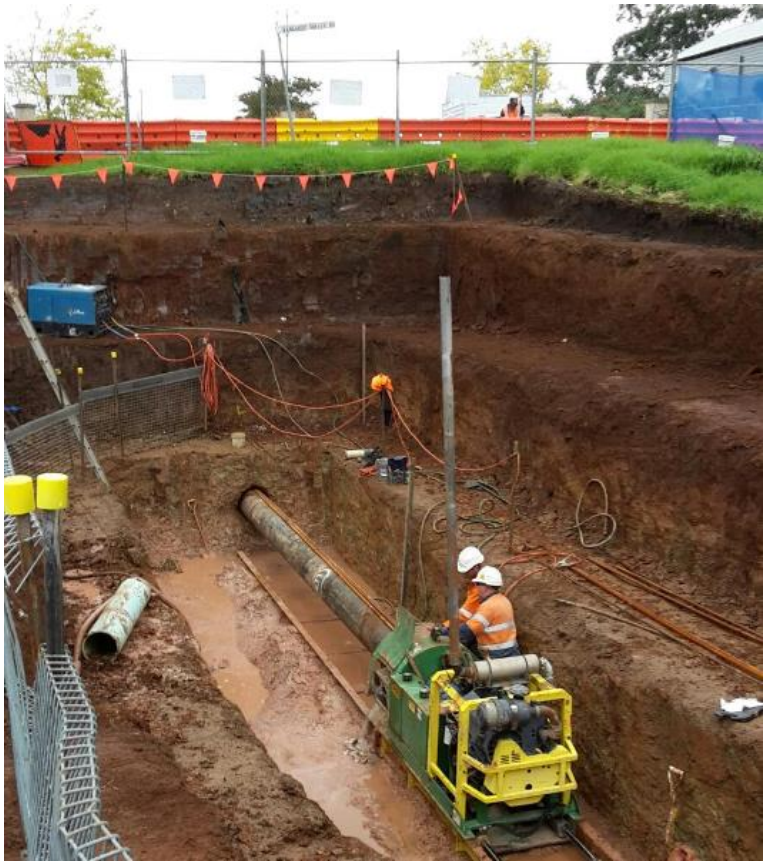


Figure 2-1: Under boring works for a new water main under Kangaroo Valley Road, Berry.

2.3 Fencing

Boundary fencing is mostly complete on the project. The exceptions are tie-in fencing to new property access points, fencing that is yet to be agreed under private property works and fauna fencing around fauna passage culverts.

Temporary fencing is maintained and installed around sensitive areas, heritage protection zones and maintained exclusion zones.

Figure 2-2: Temporary fencing during the construction of the new Hitchcocks lane connects to Huntingdale Park Drive, Berry.

2.4 Traffic

Traffic control is used to enable safe construction of the new highway. The project uses traffic control for:

- Heavy vehicle movements
- Road maintenance and construction of temporary pavements
- Installation of signage and shoulder closures
- Reductions of speed and intermittent stop/slow operations
- Lateral shifts are employed to minimise disturbance to road users and optimise safety for workers.

A summary of traffic management activities during the reporting period is detailed below:

- 9.1km of barriers installed. Concrete barriers are installed to decrease the amount of traffic control on the highway whilst protecting motorists and workers
- 35 construction access gates were installed and utilised
- The average travel time from Tannery Road to Toolijooa Road was 9:43 minutes

- 17 traffic switches were successfully completed and
- 287 traffic control plans were approved and implemented during the period.

Figure 2-3: Foxground and Berry bypass traffic controller managing traffic on Woodhill Mountain Road.

2.5 Drainage

Drainage works continued well with favourable weather conditions. A summary of progress is detailed below:

- Transverse drainage: 1,459m installed, which is about 71% complete
- Longitudinal drainage: 5,820m installed, which is about 45% complete
- Overall Drainage: 7,279m installed, which is about 48.5% complete.

2.6 Landscaping

The project is focused on a continual reduction of the risk footprint through early and active rehabilitation of the site. To date the project has re-vegetated over 248,000m² of the total disturbed footprint. This is about 40% of the total project area that has been rehabilitated.

In November 2015 a full time landscaping crew was committed to the project. They are supported full time onsite with a hydro-seeding truck that is solely for use on the project. This allows topsoil to be placed and then covered within a few hours. The results of this efficient system are excellent progressive rehabilitation, early native plant establishment and subsequent reduction in dust and erosion potential.

Planting started in April consistent with the project traffic switches. Native plants grown in local nurseries are planted in the areas shown on the landscaping plans. The planting will soften the infrastructure features, replace lost habitat and improve the amenity of the highway. Significant liaison between the local Landcare volunteer groups and the project has occurred during the period.

2.7 Sediment basins

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

In November 2015 the project had 62 sediment basins listed with the project environmental protection licence (EPL). In April 2016 the project had 48 sediment basins on the EPL, reflecting the projects commitment to progressive stabilisation and early landscaping.

The project frequently monitors erosion and sediment controls. Inspections are designed to continually improve erosion and sediment control performance. Inspections are conducted by a Certified Professional in Erosion and Sediment Control (CPESC). The CPESC ensures that progressive erosion and sediment control planning is effective and that site controls are maintained.

The project treated and discharged 311 sediment basins between 1 November 2015 and 30 April 2016. The approximate volume of captured and treated water was 155 million litres. Water quality discharged from sediment basins was good and exceeded the requirements of the environmental protection licence. The average total suspended solids analysed was 11mg/L and the average pH of all discharges was 7.1.

As well as achieving high standards of water quality, the project has also been able to achieve excellent treatment efficiency. 71% of sediment basin discharges were achieved in the first two days after the end of the rainfall event.

The positive outcomes in treatment efficiency and water quality are attributable to proactive catchment management, including:

- Specialist treatment equipment
- Sediment basin pre-treatment, applied at basin inlets in advance of rainfall events
- Dedicated trained environmental field crews for each zone of works
- Environmental crews are well resourced and are provided with specialist field based training
- Environmental field crews are trained to tertiary, diploma and certificate level in environmental management.

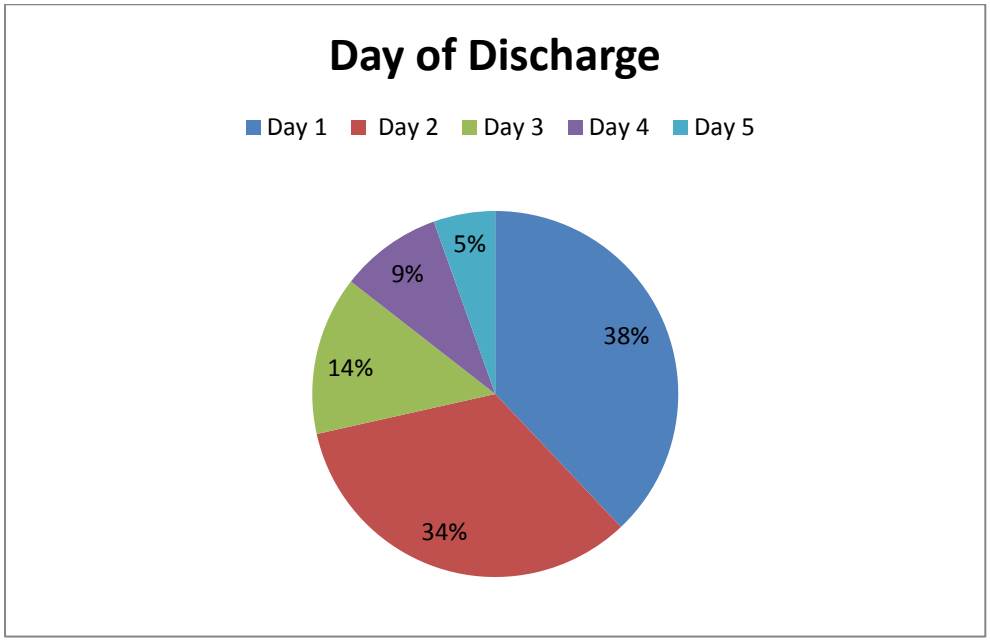


Table 2-1: Sediment basin discharges in the five day period after rainfall.

Figure 2-4: Rehabilitated area where a sediment basin was located.

2.8 Noise mound construction

Construction of the Berry noise mound has been prioritised in the construction program. The early noise mound construction reduces the potential acoustic and visual impacts of construction, both for the residents of North Street and the adjacent community.

Stabilised earth stockpiles have been established in several areas of the project to mitigate temporary impacts on adjacent residents. The installation of earth stockpiles at the Austral park crushing site has been effective in reducing noise impacts on the adjacent residents.

Figure 2-5: Earthworks continue behind the recently stabilised noise mound on North Street, Berry.

An additional noise mound which borders the project and private property adjacent Rawlings Lane started in November 2015. This new noise mound was designed in accordance with an Order of the NSW Land and Environment Court as an additional project requirement to reduce potential acoustic and visual impacts on the directly adjacent private property.

2.9 Temporary works

The project requires temporary works to allow for safe and efficient construction of the Foxground and Berry bypass. In the reporting period this included the use of temporary side roads, temporary services diversions, driveway accesses, light vehicle tracks and temporary bridges across Broughton creek.

Figure 2-6: Temporary access track to enable power line relocations.

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 is currently certified and the expiry date of the certification is 30 June 2017.

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 19 September 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 have been reviewed and the dates of revision for the plans are detailed in table 3-1.

Plan Name	DP&E Approval Date	Consistent with MCOA	Latest revision date
Construction Environmental Management Plan	06 June 2014	Yes	Rev F July 2015
Flora and Fauna Management Sub Plan	27 May 2014	Yes	Rev F Oct 2015
Heritage Management Sub Plan	13 May 2014	Yes	Rev E Oct 2015
Noise and Vibration Management Sub Plan	06 June 2014	Yes	Rev F Oct 2015
Soil and Water Quality Management Sub Plan	06 June 2014	Yes	Rev E Oct 2015
Air Quality Management Sub Plan	26 April 2014	Yes	Rev F Oct 2015

Construction Waste and Energy Management Sub Plan	29 April 2014	Yes	Rev E Oct 2015

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.

The project CPESC, Strategic Environmental and Engineering Consulting (SEEC) is also engaged to regularly conduct audits of site documentation and implementation of progressive erosion and sediment control plans in order to ensure high levels of site controls are maintained.

Table 3-2: Summary of external audits

Date	Auditor	Type	Outcomes	Status
October 2015	Vantage Environmental	Quarterly	1 OI Additional information sought and provided on agency consultation	Closed
February 2016	Vantage Environmental	Quarterly	1 CAR 1 OC 4 OI	Open

Table 3-3: Internal Audits

Date – Name	Auditor	Type	Outcomes	Status
Sediment basin audit	James Diamond	Field audit – bi annual	2 OI	Closed
PESCP audit	James Diamond, Sam Leigh, Jacob Cooper. Alyssa Burnus	8 March 2016	Reviewed plan accuracy and consistency. Multiple improvements completed	Closed
12 Jan 2016 – CEMP Compliance Audit	I.Kliger	Field and Records	Overall audit scare was 74%. Three actions were recommended - Include a written procedure in the CEMP to reflect how site inspections are completed on the project. - Ensure incidents are also entered in the FH	Open

			CAMS system. - Update the waste register	

*OC – Observation of concern, OI – Opportunity for improvement, CAR – Corrective action request, NCR – Non-conformance request.

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, EPA, NSW Department of Primary Industries - Fisheries and NSW Office of Water.

Regional RMS environmental staff reviewed the project 8 times in the reporting period. Those inspections gave the project five 'green' and three 'amber' 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'.

Fulton Hogan held the six monthly environmental review group meeting on 22 March 2016. Comments from the regulators were positive about the construction progress. Tidiness of the site was a common observation from the group. EPA noted that the project has received minimal complaints, especially considering its proximity to the town of Berry and complexity.

Progressive rehabilitation is an important part of limiting environmental effects. The project worked hard during the period to accelerate re-vegetation works in the construction program.

The project continues to achieve environmental best practice. This is particularly evident at works in and around waterways.

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 happens 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 of the project 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 leave a legacy that all associated with the project will be proud of.

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

The stage one goals have been completed and were described in the last compliance report.

Stage two 'Beyond Compliance' goals are:

1) Conduct a site trial of alternative flocculants with support from RMS and EPA.

- Undertake ecotoxicology testing on treated sediment basin water
- Assess the effectiveness of the flocculent
- Assess the effectiveness of the flocculent in a passive treatment system

2) Bridge to Bridge: Provide an area of rehabilitation on the western side of Broughton Creek. This will complement the community efforts in improving the creek on the eastern side. Planting is planned to start in mid-2016.
3) Landcare seed bank: provide areas of road corridor for Landcare to create seed banks. These areas will be safely accessible from local roads. The areas will be planted out with rich diversity by the community Landcare groups.
4) Final completion of the Bundewallah creek area. Installation of soft engineering features which include: salvaged plants, fish holes, pools and riffles and biodegradable matting.

5 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.

5.1 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.

In the reporting period there were five monitoring events after rainfall. All of the events were triggered by 15mm of rainfall in 24hours. No events were triggered by 50mm of rainfall within 24hours.

No monitoring was undertaken in April 2016 due to very dry conditions.

The general results of those monitoring events were:

Event 10, 22 October 2015. Monitoring was triggered by 15mm of rainfall in 24hours. Water quality was good across all sites with no evidence of construction impacts.

Event 11, 4 November 2015. Monitoring was triggered by 15mm of rainfall in 24hours. Ongoing rainfall during water sampling, the total for the event over ten days was 60mm. Water quality was good across all sites with no evidence of construction impacts.

Event 12, 17 December 2015. Monitoring was triggered by 15mm of rainfall in 24hours. One site showed about 10mg/L increase in downstream TSS. Site photos show the water to be the same colour and appearance. Turbidity readings were 5.9 NTU upstream and 6.1 NTU downstream. The elevated results are considered inconclusive. All other sites showed good water quality.

Event 13, 7 January 2016. Monitoring was triggered by 15mm of rainfall in 24hours. 105.2mm of rainfall received was received over five days. This monitoring event represents a significant rainfall event. Three sites were observed to be elevated.

SW05 was 20mg/L elevated from 5-8mg/L from the closest upstream site. This section of the creek is at the lower end of the monitored catchment it receives runoff from a variety of sources. The site photos don't show any colour typically associated with site water runoff. The elevated result could be a result of the wider catchment or the construction site.

SW13 measured 10mg/L downstream and <5mg/L upstream. The site did not show colour normally associated with construction runoff. The elevated result could be a result of the wider catchment or the construction site.

SW15 measured 22mg/L downstream and <5mg/L upstream. This creek is a meandering ephemeral waterway that is often dry. It was flowing at the time of monitoring. The site did not show colour normally associated with construction runoff. The elevated result could be a result of the wider catchment or the construction site.

Event 14, 3 February 2016. Monitoring was triggered by 15mm of rainfall in 24hours. Water quality was good across all sites with no evidence of construction impacts.

Event 15, 15 March 2016. Monitoring was triggered by 15mm of rainfall in 24hours. The total rainfall received about 90-100mm across the project. The monitoring followed a period of dry weather and several sites in the southern area of the project were not flowing. Water quality was good across all sites with no evidence of construction impacts.

5.2 Flora and fauna

During the reporting period the project ecologists carried out: pre clearing inspections, spotlighting, frog monitoring, hollow bearing tree inspections, two stage felling reviews and fauna rescues.

During the period the project employed a low impact clearing method which involved the use of specialist harvesting equipment. This equipment allows trees to be lowered to the ground evenly reducing the fall impacts on potential unknown fauna in trees.

The project engaged a snake rescue specialist to come to site and train staff on correct snake management. During summer snakes are active and several were observed close to the work area. The snake management training reiterated the importance of not handling or disturbing snakes.

Fauna rescues occurred during the monitoring period. Diligent and caring project team members stopped works to prevent fauna being injured. The animals were then safely relocated or left on their own accord to adjacent unaffected habitat areas.

Figure 5-1: FBB project engineer rescues a juvenile eastern long necked turtle from the construction area.

Figure 5-2: Local snake rescue specialist 'Dusty' gives construction workers a presentation on correct snake management.

5.3 Heritage

All archaeological salvage works are complete. The lithic analysis and interpretation report are completed and were submitted separate to this report.

Significant heritage sites neighbouring to the project alignment have been protected with clear signage and temporary fencing.

The Construction Heritage Management Plan Unexpected Finds Procedure was implemented after the discovery of animal bones during excavation on one occasion during the reporting period.

5.4 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/m² dust level. Two locations on one month measured a level higher then 4g/m². Results are graphed in table 5-1.

A variety of dust suppression techniques were used across the project these included but were not limited to: water carts, pre-wetting of materials prior to cartage, soil stabilisation polymers and dust bloc haul road polymers. Progressive rehabilitation is a project focus with continual reduction of the risk footprint throughout construction.

One additional dust monitoring gauge was installed between the Austral park crushing compound and the closest adjacent resident. This gauge measured a low 1.3g/m² month for the April period. This location will be continually monitored while crushing continues.

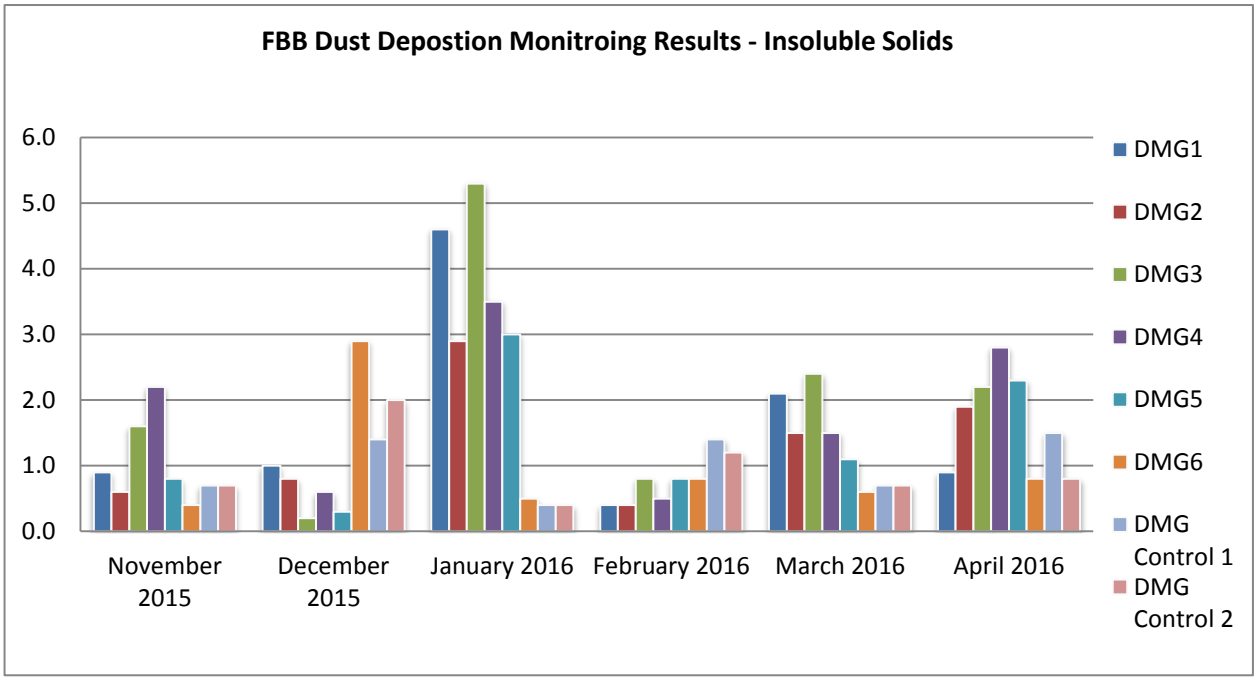


Table 5-1 FBB, ambient air quality monitoring results, insoluble solids measured in gm per m² per month. November 2015 to April 2016.

Figure 5-3: Water misting systems installed at the crushing compound site, Austral Park Rd, Broughton.

Figure 5-4: Visual wind socks give operators an indication of wind speed and direction.

Figure 5-5: Additional sprinklers were installed at Austral park crushing compound. The aim was to keep material wet and reduce the potential for dust.

5.5 Noise and vibration

Attended noise monitoring was undertaken during normal construction hours monthly and during approved out of hours works. The recorded levels were consistent with the anticipated levels as described in Appendix A of the approved Noise and Vibration Management Plan.

Attended vibration monitoring was conducted in response to community enquiries, on all occasions levels were within acceptable parameters. Those parameters are described in the approved Noise and Vibration Management Plan.

6 Community complaints

In accordance with MCoA B31, a complaint management system has been established on the project to address any community enquiries and complaints during the course of construction. There are four mechanisms that have been established to facilitate the lodgement of enquiries and complaints:

Table 7: Community contact information

Tool	Details
Project information line (24-hour toll free)	The project information line (1800 506 976) is a 24hour toll free telephone number allowing the community to contact the community relations team at all times when work is being carried out on site, including out of hours work. Outside of working hours, a recorded message with voicemail is available.
Email address	The email address (foxgroundandberrybypass@fultonhogan.com.au) is monitored by the community relations team for incoming emails during business days.
Postal address	The postal address (PO Box 353 Berry NSW 2524) is monitored by the project team for incoming letters.
Website	The RMS Foxground and Berry bypass project website (www.rms.nsw.gov.au/fbb) includes the contact tools and will be updated regularly to have the latest information about the project.

These tools will be in place until eight weeks after the date of construction completion.

The telephone number, postal address and email address was published in newspapers circulating the local area before construction started. These details are also available on the project website in accordance with MCoA B31.

The project will respond to and manage complaints made by stakeholders in accordance with AS-ISO 10002-2006 Complaints Handling (which has superseded AS 4269 Complaints Handling).

6.1 Number and types of complaints

During the reporting period, the community relations team logged 1,396 events, including telephone calls, meetings, emails, letters, door-knocks, and visits to the project display centre.

Of these events, six were registered as complaints relating to environmental management issues, with one confirmed as unrelated to the project. These are summarised in section 6.2 below.

6.2 Complaints management

November 2015

One complaint was received from North Street Berry. The compliant was in relation to noise, vibration and dust impacts from construction. The complainant met with the environmental manager who explained the controls the project was using to manage potential impacts.

December 2015

Two complaints were received in December. The first complaint was received on 10 December 2015 from North Street, Berry. The second complaint was on 15 December 2015 from North Street, Berry. Both complaints were in relation to dust.

The project ceased works when high winds and hot temperatures reduced the effectiveness of applied controls. Extra dust controls were put in place such as additional water carts, accelerating re-vegetation activities, a new high speed water cart filing point and the application of 'Dustbloc' polymer along the main works alignment.

January 2016

No complaints in January 2016

February 2016

Two complaints were received in February 2016. The first complaint was received on 3 February 2016 and the complaint was about blasting vibration levels. The project employed an independent structural engineering firm to review the structure and blast monitoring. The same resident also made a further complaint about a design change on the project. That design change was assessed in a major consistency assessment review. Details of that review were provided to the complainant.

The second complaint was received on 26 February 2016. It was about vibration impacts caused from blasting. An independent structural engineering firm was employed to assess the structure.

March 2016

No complaints were received in March 2016.

April 2016

One complaint was received on 11 April 2016. The complaint was about perceived vibration levels, additional monitoring did not indicate construction impacts. The complainant was consulted on the results of the vibration monitoring.

6.3 Community engagement initiatives

On-going consultation with directly impacted residents about upcoming works occurred between 1 November 2015 and 30 April 2016. The community display centre at 59 Woodhill Mountain Road remained open to the public during the reporting period.

Out of hours work consultation between 1 November 2015 and 30 April 2016 has included:

- Super-T girder installation across the project.
- Kangaroo Valley Road concrete pour.
- Highway side tracks and traffic changes at Toolijooa Road, Austral Park Road, near Gembrook Lane, north of Berry and near Andersons Lane.

The community relations team has managed a number of community presentations, site tours and sponsorship applications for many community interest groups, including the following:

- Presentations to the Berry Forum and "The Grange" retirement village.
- Site tours for TAFE students including OHS, Civil Construction, Surveyors and Aboriginal Site Officers.
- Sponsorship for Berry/Shoalhaven junior and senior Rugby League teams, Foxground Rural Fire Brigade, Berry preschool, Berry Rotary Club, local Oztag

team, support to Berry Men's Shed; Berry Landcare Group, Foxground Landcare Group, Shoalhaven Zoo and Berry Garden Club.

Fulton Hogan is also supporting indigenous employment opportunities on the project through the implementation of an Aboriginal Participation Plan.

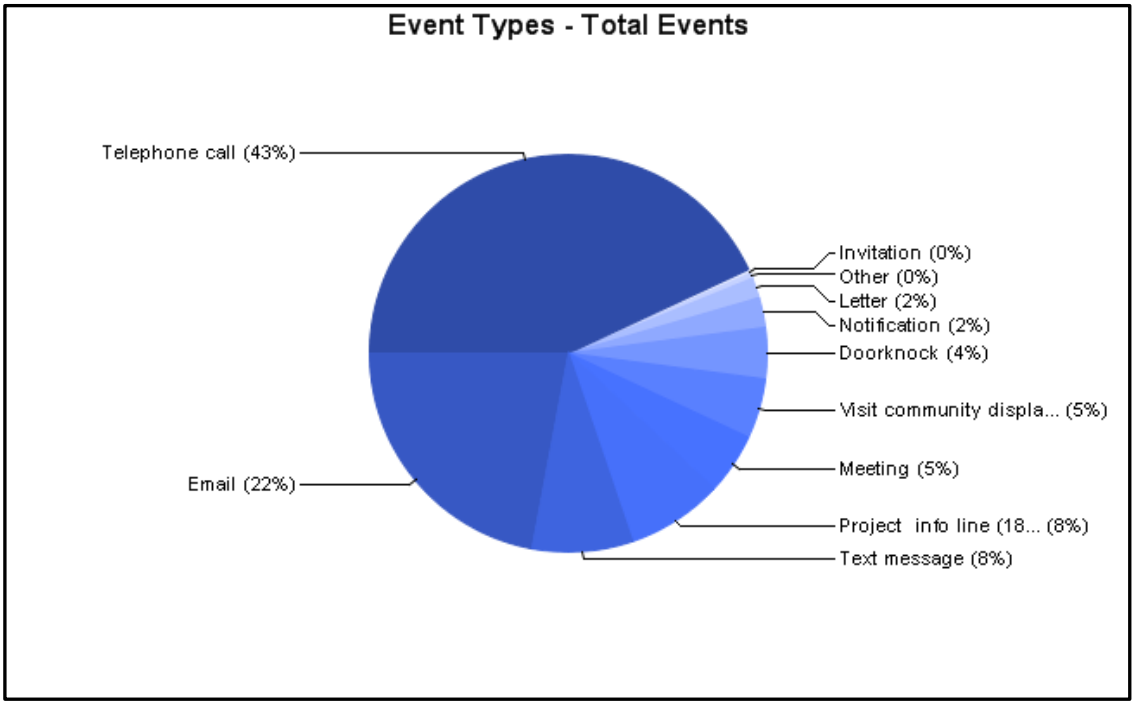
Our communications approach focuses on keeping the community and stakeholders informed about construction activities and program, traffic changes and measures in place to minimise construction impacts.

We have established relationships and maintain regular two-way communication with the community and stakeholders to effectively address and manage issues as they emerge during construction. All contact with community members and stakeholders is recorded in the community contact database, which is Consultation Manager.

Table 8: Complaints and enquiries received 1 November 2015 to 30 April 2016

Issues	Events	Stakeholders	
		distinct	total
***Information*	1011	708	1985
*** Enquiry*	336	164	343
Construction Activities	247	127	262
Out of Hours Work	226	93	305
Property access	199	56	205
Blasting	134	47	447
Property Adjustments	133	41	133
Traffic changes and traffic control	130	82	158
Communication Administration	128	57	130
Property damage	97	25	101
Other	520	772	1059
[No Issues]	15	9	15
Total Event search	**1396**	**766**	**2379**

Table 9: Complaints and enquiries received pie graph



7 Other compliance matters

7.1 Compliance Management

During the reporting period there were:

- Four events recorded as incidents see table 7-1 below
- No overpressure non-conformances see table 7-2 below
- No overall non-conformances for the project against the conditions of approval and statement of commitments table 7-3 below.

Table 7-1: Incidents

DATE	DESCRIPTION	CORRECTIVE ACTIONS	STATUS
10 Dec 2015	Bitac spill on the abutment of Broughton creek number two.	Re-train and engage the field crews on the proper storage of chemicals.	Closed
28 Jan 2016	Rigid hydraulic fuel spill at cut 6. Spill happened when a rock was flicked into a hydraulic line causing it to rupture.	Restock the spill kit. Ensure that tipping points are free of loose rocks.	Closed
9 Feb 2016	Side tipper fuel spill at the Austral park crushing area. Spill happened when tipper drove into a pile of material causing a line to rupture	Communicate the issue with truck drivers to prevent re-occurrence.	Closed
16 Feb 2016	Hydraulic hose burst on scraper	Upkeep of plant and plant pre-starts to be improved to prevent re-occurrence	Closed

Table 7-2: Overpressure Non- conformances

Date	Description	Corrective Actions	Status
	Nil		

Table 7-3: Non-conformances; Minister for Planning and Infrastructure's Conditions of Approval (22 July 2013) and Statements of commitments

Ref	Condition Short description	Details of non-compliance
	Nil	

7.2 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 7-4 summarises the inspections completed on the project. The inspections completed are consistent with the requirements of the project documents.

Table 7-4: Inspections

Inspection type	Attendees	Number of inspections
Weekly	Fulton Hogan staff; engineers, environmental, foreman, leading hands, labourers, superintendents, management	33
Wet weather	Fulton Hogan staff; engineers, environmental, foreman, leading hands, labourers, superintendents, management	20
Environmental Representative	Toby Hobbs Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	11
Regional RMS	Michelle Toms RMS project staff Toby Hobbs Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	8
NSW EPA	Michael Heinze, Julian Thompson Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	2
NSW DPI (Fisheries)	Allan Lugg, Jillian Reynolds Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	2
NOW (NSW Office of Water)	David Zerafa Fulton Hogan staff; environmental staff, engineers, foreman and superintendents	2
Kiama Municipal Council	David Pomery Weed Management Officer, Fulton Hogan environmental staff	1
Shoalhaven City Council	Scott Galbraith Weed Management Officer, Fulton Hogan environmental staff	2

Table 7-5: Environmental Review Group Meeting

Meeting Type	Attendees	Date
Environmental Review Group	Ron De Rooy (RMS), Graham Roche (RMS), David Ledlin (RMS) Michelle Toms (RMS), David Zerafa (DPI:NOW), Jillian Reynolds (DPI:NOW) Michael Spencer Fulton Hogan) Shannon Chisholm (Fulton Hogan) Sam Leigh (Fulton Hogan) James Diamond (Fulton Hogan) Jacob Cooper (Fulton Hogan) Glenn Snow (DP&E) Lauren Rose (DP&E) Julian Thompson (EPA) Michael Heinze (EPA) Jackie Taylor (OEH) Toby Hobbs (Vantage Environmental Management) Irina Kliger (FH) Matthew Saviana, close out meeting (FH), Paul House (OEH), Kevin Keays (FH).	22 March 2016

Appendix A Project Approval Compliance Table

Appendix A

Project Approval Compliance Table

Table 1: Minister for Planning and Infrastructure's Conditions of Approval (22 July 2013)

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**
	Administrative Conditions					
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 F), July 2015. 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 F), July 2015. 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 F), July 2015. 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, July 2015	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 F), July 2015. 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 F), July 2015. Section 1.2	Ongoing
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	Pre-construction,	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev F), July 2015. Section 1.2	Ongoing

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**
	physically commenced on or before that date.	construction				
STATUTORY REQUIREMENTS						
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 F), July 2015. Section 1.2	Ongoing
STAGING						
A9	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 & Environment (DP&E) prior to the commencement of the first proposed stage. The Staging Report shall provide details of: (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 (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. (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). 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 & Environment (DP&E) prior to the commencement of each stage, identifying any changes to the proposed staging or applicable conditions. 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 & Environment (DP&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 & Environment (DP&E).	Pre-construction, construction	RMS/Fulton Hogan	Compliant	NA. No changes to staging are proposed from that already approved by DP&E as part of the *Toolijooa Road Fill Works Stage of the Foxground and Berry bypass Project:*	Complete
PART B PRIOR TO CONSTRUCTION						
DESIGN						
B1	The proponent shall, in consultation with the relevant council/s, investigate the need for: (a) potential future on and off ramps at Woodhill Mountain Road; and (b) a potential future left turn lane onto the new highway from Toolijooa Road. The investigation shall be undertaken to the satisfaction of Secretary of the NSW Department of Planning & Environment (DP&E), and include consideration of the relevant environmental impacts (noise, flooding, heritage, biodiversity, traffic etc.) and consider any alternative options.	Pre-construction	RMS	Compliant	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&E on 30th September 2014. DP&E advised of their satisfaction in addressing B1 in a letter dated 27th October 2014.	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**
B2	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 & Environment (DP&E) prior to the commencement of works that would influence the design of the bridge in this location.	Pre-construction	RMS/Fulton Hogan	Compliant	Compliance has been met through the development of the detailed Urban Design and Landscaping Plan 12 September 2014 Evidence of how visual impacts have been minimised was provided to DP&E on 30th September 2014.	Complete
BIODIVERSITY						
Mitigation Measures – Fauna and Waterway Crossings						
B3	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 & Environment (DP&E)	Pre-construction	RMS/Fulton Hogan	Compliant	Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015 The above report was provided to Office and Environment and Heritage, and Department of Primary Industries (Fisheries) through the consultation period. Construction of fauna underpasses commenced in October 2015, the final completion of the fauna underpasses will be completed consistent with the main construction program. Installation of arboreal mammal fauna poles and rope ladders will occur in the next reporting period.	Ongoing
B4	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).	Pre-construction	RMS/Fulton Hogan	Compliant	Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015	Ongoing
B5	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 & Environment (DP&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.	Pre-construction	RMS/Fulton Hogan	Compliant	Princes Highway Foxground and Berry Bypass Fauna Crossings Report 20 November 2015	Ongoing
B6	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.	Pre-construction	RMS/Fulton Hogan	Compliant	Flora and Fauna Management Sub Plan (Rev E), September 2014 Temporary bridges over Broughton Creek 1 and 2 were installed in January 2015. Temporary bridge over Broughton Mill Creek was installed in March 2015. Bundewallah Creek diversion was built after consultation with NSW DPI and Fisheries. A temporary crossing was installed so that this crossing did not impede fish passage during construction.	Ongoing
Biodiversity Offsets						
B7	The Proponent shall, in consultation with the OEH and DPI (Fishing and Aquaculture), develop a **Biodiversity Offset Strategy** that identifies the available options for offsetting the biodiversity impacts of the project in perpetuity, with consideration to the Principles for the use of biodiversity offsets in NSW (OEH website http://www.environment.nsw.gov.au/biocertification/offsets.htm dated 17	Pre-construction	RMS	Compliant	Biodiversity Offset Strategy approved by DP&E 27 October 2014	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**
	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: (a) the aims and objectives of the biodiversity offset strategy; (b) confirmation of the vegetation type/ habitat (in hectares) to be cleared and their condition, and the size of offsets required (in hectares); (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; (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; (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: (i) changes to the footprint due to detailed design; (ii) (changes to predicted impacts as a result of changes to mitigation measures; (iii) the identification of additional species/ habitat through pre-clearance surveys and construction; (iv) addressing outcomes of the ecological monitoring program; and (v) additional impacts associated with the establishment of ancillary facilities; and (f) options for the securing and management of biodiversity offsets in perpetuity. The Biodiversity Offset Strategy shall be submitted to the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E).					
B8	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 & Environment (DP&E), the Proponent shall prepare and submit a **Biodiversity Offset Package** for the approval of the Secretary of the NSW Department of Planning & Environment (DP&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: (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);	Construction and operation	RMS	Compliant	Biodiversity Offset Strategy (by RMS). RMS has engaged a consultant to prepare the Biodiversity Offset Package. Potential properties are currently being assessed for suitability.	Ongoing

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) the final selected means of securing the biodiversity values of the Package in perpetuity, including ongoing management, maintenance and monitoring requirements; and (c) timing and responsibilities for the implementation of the provisions of the Package over time. 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 & Environment (DP&E).					
Ecological Monitoring						
B9	The Proponent shall develop an **Ecological Monitoring Program** 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: (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; (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); (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 & Environment (DP&E). The monitoring period may be reduced with the agreement of the Secretary of the NSW Department of Planning & Environment (DP&E) in consultation with the OEH and DPI (Fishing and Aquaculture), depending on the outcomes of the monitoring; (d) provision for the assessment of the data to identify changes to habitat usage and whether this can be directly attributed to the project; (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 (f) provision for annual reporting of monitoring results to the Secretary of the NSW Department of Planning & Environment (DP&E) and the OEH and DPI (Fishing and Aquaculture), or as otherwise agreed by those agencies. The Program shall be submitted to the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E)).	Pre-construction	RMS/Fulton Hogan	Compliant	Ecological Monitoring Program approved 27 October 2014 An administrative non-conformity was identified during the ER's audit February 2016. In summary it was determined that initial nest box monitoring was not completed within six months of the commencement of construction as per section 4.2 of the Nest Box Management Plan. The project in consultation with the project ecologist changed the monitoring timing to get more representative results. The NSW Office of Environment and Heritage (OEH) has been consulted on adaptive management of monitoring times to better suit the target species and has agreed that different timings can be used. An update to the Nest Box Management Plan will be submitted to DP&E for consideration separate to this report. Aquatic monitoring is required bi-annually and will be completed and reported on in 2016. Ecological monitoring will be reported on separate to this report. Monitoring dates were: Nest box monitoring - 9th – 13th November 2015 - 2nd December 2015 Aquatic monitoring - Session 1: 15 April 2015- 17 April 2015 - Session 2: 2 June 2015 – 3 June 2015 - Session 1: 14 October 2015 – 15 October 2015 - Session 2: 1 December 2015 - 2 December 2015 Weed monitoring - 7th September 2015	Ongoing

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**
HYDROLOGY AND FLOODING						
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	The Proponent shall develop a **Hydrological Mitigation Report** 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: (a) identify properties in those areas likely to have an increased flooding impact and detail the predicted increased flooding impact; (b) identify mitigation measures to be implemented where increased flooding is predicted to adversely affect access, property or infrastructure; (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; (d) be developed in consultation with the relevant council, NSW State Emergency Service and directly-affected property owners; and (e) identify operational and maintenance responsibilities for items (a) to (c) inclusive. 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 & Environment (DP&E).	Pre-construction	RMS/Fulton Hogan	Compliant	Hydrological Mitigation Report (by RMS) Detailed Design - Flooding Report 17 February 2015 Roads and Maritime Services requested construction commence prior to the completion of mitigation works at 29A Princes Highway, Berry. 9 March 2015 Department of Planning and Environment allowed that construction commence prior to the completion of the required flood mitigation works. Subject to regular updates being provided. The DP&E was advised in a letter dated 15th June 2015 that the mitigation works at property 76 Woodhill Mountain Road had not been completed at the request of the land owner. An indemnity between 76 Woodhill Mountain Rd and Fulton Hogan exists, pending boundary resolution with neighbour. The most recent update was provided to DP&E in a letter dated 20 April 2016. The letter detailed the progress of the negotiations with the affected residents, including RMS making offers to purchase the properties at 29A Princes Hwy and 76 Woodhill Mountain Road.	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	Pre-construction	RMS/Fulton Hogan	Compliant	RMS have consulted local council and they have advised that no assistance is 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**
	a result of the project.					
SEDIMENTATION, EROSION AND WATER						
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 **groundwater modelling** 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	Detailed Design - Geotechnical Design & Interpretative Report 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.	Complete
B16	The Proponent shall prepare and implement a **Water Quality Monitoring Program** 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: (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; (b) the results of the groundwater modelling undertaken under condition B15; (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; (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); (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 & Environment (DP&E); (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); (g) contingency and ameliorative measures in the event that adverse impacts to water quality are identified; and (h) reporting of the monitoring results to the Department, OEH, EPA and NOW. 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 & Environment (DP&E). A copy of the Program shall be submitted to the OEH, EPA, DPI (Fishing and Aquaculture) and NOW prior to its implementation.	Pre-construction	RMS/Fulton Hogan	Compliant	Construction Soil and Water Quality Management Plan Appendix B - Water Quality Monitoring Program Surface water quality monitoring has commenced and the results are in full in appendix B of this report. Water quality monitoring dates; - 22 October 2015 - 4 November 2015 - 17 December 2015 - 7 January 2016 - 3 February 2016 - 15 March 2016 Ground water quality monitoring results are included in appendix C of this report. Ground water monitoring is required quarterly, monitoring dates in the reporting period; - 1 October 2015 - 2 March 2016	Ongoing

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HERITAGE IMPACTS						
Built and Landscape Heritage						
B17	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 & Environment (DP&E). Additionally, for H11, the proponent shall: (a) undertake archaeological investigations in accordance with condition B20; and (b) provide for the preparation and implementation of a heritage interpretation plan.	Prior to Pre-construction	RMS	Compliant	Glen Devon Cultural Heritage Assessment was submitted to DP&E on 16th July 2014 and was approved by DP&E in a letter dated 10th September 2014. DP&E was advised of the relocation outcome of Glen Devon in a letter dated 9th July 2015. The Glen Devon Heritage Interpretation Plan was submitted to DP&E on 9th July 2015.	Complete
B18	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. 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 & Environment (DP&E), the Heritage Council of NSW, the local Council and the local Historical Society.	Prior to Pre-construction	RMS	Compliant	Archival recording and detailed historic research complete. Reports were sent to the DP&E independently of this Compliance Tracking Report. Reports relating to Non-Aboriginal heritage were submitted to DP&E on 10th July 2015 Reports relating to Aboriginal heritage were submitted to DP&E on 22nd October 2015 Reports were sent to the Heritage Council of NSW, the local Councils, and the local Historical Society during this reporting period.	Ongoing
B19	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: (a) undertake archaeological investigations in accordance with condition B22; (b) provide for the detailed analysis of any heritage items discovered during the investigations; (c) include management options for these heritage items (including options for relocation and display); and (d) if the findings of the investigations are significant, provide for the preparation and implementation of a heritage interpretation plan.	Prior to Pre-construction	RMS	Compliant	Historic and physical archaeological investigations complete. Report submitted to the DP&E on 10th July 2015.	Complete
Archaeology (Aboriginal and non-Aboriginal)						
B20	Prior to the commencement of pre-construction and construction activities affecting Aboriginal site G2B PAD 1 the Proponent shall: (a) undertake archaeological investigation of this site using a methodology generally consistent with testing undertaken for the Environmental Assessment, and prepared in consultation with the OEH (Aboriginal heritage) and the Aboriginal stakeholders; and (b) report on the results of the archaeological investigation, including recommendations (such as for further archaeological	Prior to Pre-construction	RMS	Compliant	Archaeological investigations complete. Report submitted to the DP&E on 22nd October 2015.	Complete

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	work), in consultation with the OEH and to the satisfaction of the Secretary of the NSW Department of Planning & Environment (DP&E), and shall include, but not necessarily be limited to: (i) consideration of measures to avoid or minimise disturbance to Aboriginal objects where objects of moderate to high significance are found to be present; (ii) where impacts cannot be avoided, recommendations for any further investigations under condition B21; and (iii) management and mitigation measures to ensure there are no additional impacts due to pre-construction and construction activities.					
B21	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: (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 & Environment (DP&E); and (b) undertake any further archaeological excavation works recommended by the results of the Aboriginal archaeological investigation program. Within twelve months of completing the above work, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E). 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).	Prior to Pre-construction	RMS	Compliant	Archaeological salvage works have been completed on behalf of RMS by the nominated project archaeologist Kelleher Nightingale Consulting, in accordance with the approved methodology. The salvage report was finalised and sent to DP&E during this reporting period	Complete
B22	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: (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). (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 & Environment (DP&E), and shall include, but not necessarily be limited to: (i) consideration of measures to avoid or minimise disturbance to archaeology, where archaeology of non-Aboriginal archaeological significance is found	Prior to Pre-construction	RMS	Compliant	Investigation and reporting is complete. Report submitted to the DP&E on 10th July 2015.	Complete

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	to be present; (ii) where impacts cannot be avoided, recommendations for any further investigations for archaeology of historical archaeological significance; and (iii) management and mitigation measures to ensure there are no additional impacts due to pre-construction and construction activities. (c) Undertake any further archaeological excavation works recommended by the results of the non-Aboriginal archaeological investigation program. Within 12 months of completing the above work, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E). 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.					
URBAN DESIGN AND LANDSCAPING						
B23	The Proponent shall prepare and implement an **Urban Design and Landscape Plan** 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: (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); (b) location of existing vegetation and proposed landscaping (including use of indigenous and endemic species where possible) and design features; (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); (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; (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;	Pre-construction	RMS	Compliant	Urban Design and Landscape Plan approved by DP&E. Works to rehabilitate the project footprint have commenced and will be ongoing throughout the phases of construction. The DP&E has requested additional information in the letter 27 October 2014 as follows; 1. RMS providing details of landscape rehabilitation of temporary access tracks and ancillary facilities in post IFC Landscape drawings; 2. RMS submitting the Fauna Crossings Report to the Department prior to the construction of any fauna crossings as part of landscaping of the project, in accordance with Condition B5 of the project approval; 3. RMS providing the final Town Park development plan to the Department, once available following negotiation with RMS and Shoalhaven City Council, as part of the Urban Design and Landscape Plan; 4. A detailed monitoring plan including monitoring periods, frequency and duration being provided in the Contractors Maintenance Management Plan; and 5. A copy of the updated Urban Design and Landscape Plan shall be provided to the Department;	Ongoing

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	(f) take into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts; (g) specific details on the landscape treatments for the North Street corridor, Town Creek diversion and Town Park. (h) strategies for progressive landscaping of other environmental controls such as erosion and sedimentation controls, drainage and noise mitigation; (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; (j) evidence of consultation with the relevant council and community on the proposed urban design and landscape measures prior to its finalisation; and (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. The Plan shall be submitted for the approval of the Secretary of the NSW Department of Planning & Environment (DP&E) prior to the commencement of construction, unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E). The Plan may be submitted in stages to suit the staged construction program of the project.					
SIGNAGE POLICY						
B24	The Proponent shall prepare a **signage policy** which addresses the bypassed towns of Foxground and Berry, in consultation with the relevant council.	Operation	RMS/Fulton Hogan	Compliant	Construction Traffic Management Plan Sections 16.3.1 and 16.3.2	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	Construction Traffic Management Plan 16.3.4	Complete
PROPERTY AND LANDUSE						
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	Pre-construction and construction		Compliant	Evidence of consultation was sent to DP&E on 26th September 2014. An outcome will be provided to DP&E prior to operation.	Ongoing

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	Secretary of the NSW Department of Planning & Environment (DP&E) must be advised in writing, to determine whether mediation may be required.					
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 was approved by DP&E in a letter dated 27th Oct 2014. The final option is still being determined by Shoalhaven City Council. The draft Berry Masterplan was provided to DP&E in a meeting on 18th Nov 2015.	Ongoing
COMPLIANCE TRACKING						
B29	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 Secretary of the NSW Department of Planning & Environment (DP&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: (a) provisions for the notification of the Secretary of the NSW Department of Planning & Environment (DP&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); (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 Secretary of the NSW Department of Planning & Environment (DP&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; (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 Secretary of the NSW Department of Planning & Environment (DP&E) during construction and operation; and (g) procedures for rectifying any non-compliance identified during environmental auditing, review of compliance or incident management.	Pre-construction, Construction, Operation	RMS/Fulton Hogan	Compliant	Compliance Tracking Program , Revision B 5 September 2014 Construction Environmental Management Plan (Rev F), July 2015, Section 8.3	Complete
COMMUNITY INFORMATION AND INVOLVEMENT						
Provision of Electronic Information						
B30	Prior to the commencement of construction, the Proponent shall establish and maintain a new **website**, 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: (a) information on the current implementation status of the project; (b) a copy of the documents referred to under condition A1 of this	Pre-construction	RMS/Fulton Hogan	Compliant	Community communication strategy, 27 October 2015, Section 7.2 Website: http://www.rms.nsw.gov.au/projects/south-coast/foxground-berry-bypass/index.html Periodic revisions and amendments of relevant documentation will be made as required.	Ongoing

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	approval, and any documentation supporting modifications to this approval that may be granted from time to time; (c) a copy of this approval and any future modification to this approval; (d) a copy of each relevant environmental approval, licence or permit required and obtained in relation to the project; (e) a copy of each current strategy, plan, program or other document required under this approval; and (f) the outcomes of compliance tracking in accordance with the requirements of condition B29.					
Complaints and Enquiries Procedure						
B31	Prior to the commencement of construction, the Proponent shall ensure that the following are available for community complaints and enquiries during the construction period: (a) a telephone number on which complaints and enquiries about construction and operation activities may be registered; (b) a postal address to which written complaints and enquiries may be sent; and (c) an email address to which electronic complaints and enquiries may be transmitted. 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.	Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy, 27 October 2015, sections 7.2 and 8.2	Ongoing
B32	The Proponent shall prepare and implement a **Construction Complaints Management System** consistent with AS 4269 Complaints Handling prior to the commencement of construction activities and must maintain the System for the duration of construction activities. 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 & Environment (DP&E) on request.	Pre-construction, Construction	RMS/Fulton Hogan	Compliant	Community Communication Strategy, 27 October 2015, Sections 8.1 and 8.2	Ongoing
Community Involvement						
B33	The Proponent shall prepare and implement a **Community Communication Strategy** 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: (a) identification of stakeholders to be consulted as part of the Strategy, including affected and adjoining landowners; (b) procedures and mechanisms for the regular distribution of information to stakeholders on the progress of the project and matters associated with environmental management; (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; (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 (e) procedures and mechanisms that would be implemented to	Pre-construction	RMS/Fulton Hogan	Compliant	a) Community Communication Strategy, 27 October 2015 Section 5.2 b) Community Communication Strategy, 27 October 2015 Section 7.2 and Appendix E c) Community Communication Strategy, 27 October 2015 Section 8.2 d) Community Communication Strategy, 27 October 2015 Section 8.2 e) Community Communication Strategy, 27 October 2015 Sections 4.1 and 8.2.	Ongoing

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	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. Key issues that should be addressed in the Community Communication Strategy should include (but not necessarily be limited to): (i) traffic management (including property access, pedestrian access); (ii) landscaping/urban design matters; (iii) construction activities; and (iv) noise and vibration mitigation and management. 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 & Environment (DP&E) prior to the commencement of construction, or as otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E).				Community Communication Strategy Appendix C i) Community Communication Strategy, 27 October 2015 Sections 4.1, 7.2 and 13. ii) Community Communication Strategy Sections 3.4, 7.2 and 7.5. iii) Community Communication Strategy Sections 3.4, 7.2 and 7.5. iv) Community Communication Strategy Sections 3.4, 7.2 and 7.5.	
ENVIRONMENTAL MANAGEMENT						
Environmental Representative						
B34	Prior to the commencement of construction of the project, or as otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E), the Proponent shall nominate for the approval of the Secretary of the NSW Department of Planning & Environment (DP&E) a suitably qualified and experienced **Environment Representative**(s) 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 & Environment (DP&E). The Environment Representative(s) shall: (a) be the principal point of advice in relation to the environmental performance of the project; (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; (c) monitor the implementation of environmental management plans and monitoring programs required under this approval; (d) monitor the outcome of environmental management plans and advise the Proponent upon the achievement of project environmental outcomes; (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; (f) ensure that environmental auditing is undertaken in accordance with the requirements of condition B29 and the project's Environmental Management System(s); (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 (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	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

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	likely to occur.					
Construction Environmental Management Plan						
B35	The Proponent shall prepare and (following approval) implement a **Construction Environmental Management Plan** 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: (a) a description of activities to be undertaken during construction of the project or stages of construction, as relevant; (b) statutory and other obligations that the Proponent is required to fulfil during construction including approvals, 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; (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; (d) identification of ancillary facility site locations, including an assessment against the location criteria outlined in condition C32; (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: (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; (ii) measures to minimise hydrology impacts, including measures to stabilise bed and bank structures as required, (iii) measures to monitor and manage impacts associated with the construction and operation of ancillary facilities, (iv) measures for the handling, treatment and management of contaminated materials, (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	Preconstruction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan (Rev F), July 2015, Appendices and Sub Plans were updated and reviewed by the project ER from July to October 2015.	Ongoing

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	basins); (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 & Environment (DP&E), in consultation with the OEH; (vii) measures to monitor and manage hazard and risks including emergency management; and (viii) the issues identified in condition B36; (f) details of community involvement and complaints handling procedures during construction, consistent with the requirements of conditions B30 to B33; (g) details of compliance and incident management consistent with the requirements of condition B29; and (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). The Plan shall be submitted for the approval of the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E). Construction works shall not commence until written approval has been received from the Secretary of the NSW Department of Planning & Environment (DP&E).					
B36	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): (a) a **Construction Traffic Management Sub-plan**, 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: (i) identification of construction traffic routes and quantification of construction traffic volumes (including heavy vehicle/ spoil haulage) on these routes; (ii) details of vehicle movements for construction sites and site compounds including parking, dedicated vehicle turning areas, and ingress and egress points; (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 (iv) details of temporary and interim traffic	Preconstruction	RMS/Fulton Hogan	Compliant	a) Construction Traffic Management Plan and Appendices b) Flora and Fauna Management Sub Plan (Rev F), October 2015 and Appendices c) Noise and Vibration Management Sub Plan (Rev), October 2015 and Appendices d) Soil and Water Quality Management Sub Plan (Rev E), October 2015 and Appendices e) Heritage Management Sub Plan (Rev E), October 2015 and Appendices The approval of the CEMP and sub plans issued by the DP&E on 19 September 2014 was subject to the following requirements: 1. RMS shall advise the Department in writing of the qualifications and experience of the Project Ecologist, once appointed; *Complete.* 2. RMS shall provide an updated Flora and Fauna Management Sub Plan to the Department following completion of pre-construction surveys, including proposed management measures to address any threatened flora species identified during these surveys. *The Flora and Fauna Management Plan has been periodically revised with the last updated issued on 26 October 2015. No additional threatened species were identified during pre-clearing surveys, as such no additional management measures have been implemented.* 3. RMS shall develop a work method statement for conducting a trial blast as a part of the detailed planning, taking into account the process for safe execution of the works, including appropriate exclusion zones for safety purposes and in accordance with vibration limits for sensitive receivers; and *Complete*	Ongoing

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	arrangements to address potential impacts; (v) details of evidence based mitigation measures to address potential impacts on the 'Sandtrack'; (vi) a response procedure for dealing with traffic incidents; and (vii) mechanism for the monitoring, review and amendment of this sub-plan. (b) a **Construction Flora and Fauna Management Sub-plan** 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: (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); (ii) updated sensitive area/ vegetation maps based on (i) above and previous survey work; (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 Phytophthora cinnamomi), erosion and sediment control and progressive re-vegetation; (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; (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 (vi) mechanism for the monitoring, review and amendment of this sub-plan; (c) a **Construction Noise and Vibration Management Sub-plan** to detail how construction noise and vibration impacts will be				4. RMS shall develop an area-specific Works in Waterways work method statement prior to the commencement of works in waterways, as per the Soil and Water Quality Management Plan. *Complete.*	

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	minimised and managed. The sub-plan shall be developed in consultation with the EPA and include, but not necessarily be limited to: (i) identification of nearest sensitive receptors and relevant construction noise and vibration goals applicable to the project; (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; (iii) identification of feasible and reasonable measures proposed to be implemented to minimise construction noise and vibration impacts (including construction traffic noise impacts); (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 & Environment (DP&E) concerning complaints received in relation to the extended hours approved under condition C4(e); (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); (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 (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; (d) a **Construction Soil and Water Quality Management Sub-plan** 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: (i) identification of potential sources of erosion and sedimentation, and water pollution (including those resulting from maintenance activities); (ii) details of how construction activities would be managed and mitigated to minimise erosion and sedimentation consistent with condition C20; (iii) where construction activities have the potential to impact on waterways or wetlands (through direct					

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	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; (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; (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; (vi) construction water quality monitoring requirements consistent with condition B16; and (vii) a groundwater management strategy, including (but not necessarily limited to): 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; 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; iii. measures to manage identified impacts on water table, flow regimes and quality and to groundwater users and ecosystems; iv. groundwater inflow control, handling, treatment and disposal methods; and v. a detailed monitoring plan to identify monitoring methods, locations, frequency, duration and analysis requirements; and (e) a **Construction Heritage Management Sub-plan** 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: (i) In relation to Aboriginal Heritage: i. details of management measures and strategies for protection, salvage, and/or					

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	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); 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; 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 iv. induction processes (identification, protection) for construction personnel (including procedures for keeping records of inductions) and procedures for ongoing Aboriginal consultation and involvement; and (ii) In relation to non-Aboriginal Heritage: 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); 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 and assessment of the consistency of any new non-Aboriginal heritage impacts					

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	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; 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 recommencing any works in the area unless authorised by the department, and/ or the NSW Police Force); and iv. heritage induction processes (identification, protection) for construction personnel (including procedures for keeping records of inductions).					
PART C DURING CONSTRUCTION						
BIODIVERSITY						
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	a) Flora and Fauna Management Sub Plan (Rev F), October 2015 and Appendices: contains provisions for minimising clearing. Clearing has been minimised. The design was modified to reduce clearing in several locations.	Ongoing
AIR QUALITY IMPACTS						
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 F), October 2015	Ongoing
NOISE AND VIBRATION IMPACTS						
Construction Hours						
C3	The Proponent shall only undertake construction activities associated with the project during the following standard construction hours: (a) For the area south of Tindalls Lane (including Berry township) (i) 7:00am to 6:00pm Mondays to Fridays, inclusive; and (ii) 8:00am to 1:00pm Saturdays; and (iii) at no time on Sundays or public holidays.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev F), October 2015	Ongoing
C4	Works outside of the standard construction hours identified in condition C3 may be undertaken in the following circumstances: (a) works that generate noise that is: (i) no more than 5 dB(A) above rating background level at any residence; or (ii) (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 land uses; or	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev F), October 2015, 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

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	(b) for delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or (c) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or (d) For the area between Toolijooa Road and Tindalls Lane, encompassing Toolijooa cut, Broughton Creek floodplain and major bridge works (outside of Berry township): (i) between 6:00am and 7:00am Monday to Friday; and (ii) between 6:00pm and 7:00pm Monday to Friday; and (iii) 1:00pm and 5:00pm on Saturdays; and (iv) at no time after 6pm on a day preceding a public holiday long weekend. (e)					
C5	Except as expressly permitted by an Environment Protection Licence issued for the project, high noise impact activities and works shall only be undertaken: (a) between the hours of 8:00am to 6:00pm Mondays to Fridays; (b) between the hours of 8:00am to 1:00pm Saturdays; and (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. 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.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev F), October 2015, Chapter 7 Respite periods are effected onsite	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 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:~~ ~~(a) details of the nature and need for activities to be conducted during the varied construction hours;~~ ~~(b) written evidence to the EPA and the Secretary of the NSW Department of Planning & Environment (DP&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~~ ~~(c) evidence of consultation with the EPA on the proposed variation in standard construction hours.~~ ~~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.~~	Construction	Fulton Hogan	N/A	Condition C6 deleted by DP&E in accordance with the Modification of 31 July 2015	N/A
C7	Blasting associated with the project shall only be undertaken during the following hours: (a) 9:00am to 5:00pm, Mondays to Fridays, inclusive; (b) 9:00am to 1:00pm on Saturdays; and (c) at no time on Sundays or public holidays.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev F), October 2015, Appendix D	Ongoing

<table>
<tr><th colspan="7">MCoA – Ministers Conditions of Approval Section 75J of the Environmental Planning and Assessment Act 1979</th></tr>
<tr><th>Ref</th><th>Condition Requirement</th><th>Phase</th><th>Responsibility</th><th>Compliance status</th><th>Compliance notes</th><th>Close out</th></tr>
<tr><td></td><td>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.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Construction Noise and Vibration Goals</td></tr>
<tr><td>C8</td><td>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.</td><td>Construction</td><td>Fulton Hogan</td><td>Compliant</td><td>Noise and Vibration Management Sub Plan (Rev F), October 2015, 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.
(http://www.fultonhogan.com/news-resources/management-plans-reporting/foxground-berry-bypass-nsw/)</td><td>Ongoing</td></tr>
<tr><td>C9</td><td>The Proponent shall implement all feasible and reasonable mitigation measures with the aim of achieving the following construction vibration goals:
(a) for structural damage to heritage structures, the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures;
(b) for damage to other buildings and/or structures, the vibration limits set out in the British Standard BS 7385-1:1990 – Evaluation and measurement for vibration in buildings. Guide for measurement of vibration and evaluation of their effects on buildings; and
(c) for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006).</td><td>Construction</td><td>Fulton Hogan</td><td>Compliant</td><td>Noise and Vibration Management Sub Plan (Rev F), October 2015, Section 4.2 and Chapter 7</td><td>Ongoing</td></tr>
<tr><td>C10</td><td>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.
Table 1 - Airblast overpressure criteria:
<table>
<tr><th>Airblast overpressure (dB(Lin Peak))</th><th>Allowable exceedance</th></tr>
<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>
</table>
For Cut 2 only
<table>
<tr><th>Airblast Overpressure ($dB_{(Lin\ Peak)}$)</th><th>Allowable Exceedence</th></tr>
<tr><td>125</td><td>20% of total number of blasts over a 12 month period</td></tr>
<tr><td>135</td><td>0%</td></tr>
</table></td><td>Construction</td><td>Fulton Hogan</td><td>Compliant</td><td>Noise and Vibration Management Sub Plan (Rev F), October 2015, Section 4.2, Chapter 7 and Appendix D

Blasting has commenced in Cut 2, Cut 3, and Cut 4 on the project. There were no blasting non-conformances on the project during the reporting period.</td><td>Ongoing</td></tr>
<tr><td>C11</td><td>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.</td><td>Construction</td><td>Fulton Hogan</td><td>Compliant</td><td>Noise and Vibration Management Sub Plan (Rev F), October 2015, Section 4.3, Chapter 7 and Appendix D

Blasting has commenced. All peak particle vibration monitoring has been complaint in all blast monitoring locations during the reporting period.</td><td>Ongoing</td></tr>
</table>

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	Table 2 – Peak particle velocity criteria **Receiver** / **Peak particle velocity (mm/s)** / **Allowable exceedance** Residence on privately owned land: **20** — 5% of total number of blasts over a 12 month period **25** — 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	Noise and Vibration Management Sub Plan (Rev F), October 2015, Section 4.3, Chapter 7 and Appendix D Full blasting operations have commenced and will continue into the next reporting period.	Ongoing
C13	The blasting criteria identified in conditions C10 and/or C1 1 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: (a) a written agreement from the EPA and the relevant landowner to exceed the criteria; (b) details of the proposed blasting program and justification for the proposed increase to blasting criteria including alternatives considered (where relevant); (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; (d) in relation to any identified non-Aboriginal heritage items in the vicinity of blasting works, an assessment of heritage impacts; (e) details of the blast management, mitigation and monitoring procedures to be implemented; (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). Unless otherwise agreed by the Director General, the following exclusions apply to the application of this condition: (a) any agreements reached may be terminated by the landowner at any time should concerns about the increased blasting limits be unresolved; and (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.	Construction	Fulton Hogan	Compliant	Noise and Vibration Management Sub Plan (Rev F), October 2015, Section 4.3, Chapter 7 and Appendix D Modification to C13 was approved on 28th January 2015 FBB received revised blasting criteria for cut 2, 3 and 4. Blasting has commenced.	Ongoing

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Operational Noise Mitigation Review						
C14	Unless otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E), a review of the operational noise mitigation measures proposed to be implemented for the project. The review shall: (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); (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 *Road Noise Policy* (DECCW, 2011), based on the operational noise performance of the project predicted under (a) above; and (c) where necessary, investigate additional feasible and reasonable noise mitigation measures to achieve the criteria outlined in the Road Noise Policy (DECCW, 2011).	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						
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 E), October 2015, Chapter 5 and Appendix A	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 E), October 2015, Chapter 5	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 E), October 2015, 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 E), October 2015, 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 E), October 2015, Chapter 5	Ongoing
SEDIMENTATION, EROSION AND WATER						
C20	Soil and water management measures consistent with *Managing Urban Stormwater - Soils and Construction Volumes 1 and 2, 4th Edition* (Landcom, 2004) and *Managing Urban Stormwater Soils And Construction Vols 2A and 2D Main Road Construction* (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 E), October 2015, 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 E), October 2015, Chapter 5	Ongoing

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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 E), October 2015, Chapter 5	Ongoing
PROPERTY AND LANDUSE						
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 F), October 2015, Chapter 7 Dilapidation Reports have been undertaken	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
TRAFFIC IMPACTS						
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 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).	Pre-construction	RMS/Fulton Hogan	Compliant	Construction Traffic Management Plan Section 2 A Road dilapidation report for the Sandtrack (12 months after commencement of construction) was submitted to DP&E during this reporting period	Ongoing
WASTE MANAGEMENT						
C28	The Proponent shall not cause, permit or allow waste generated outside	Construction	RMS/Fulton Hogan	Compliant	Waste and Energy Management Sub Plan (Rev E), October 2015, Chapters 4 and 5	Ongoing

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**
	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.					
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 E), October 2015, 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 E), October 2015, Chapters 4 and 5	Ongoing
HAZARDS AND RISKS						
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 E), October 2015, Section 5.11	Ongoing
ANCILLARY FACILITIES						
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 Section 2.4 and Appendix A5 The project ancillary sites are all in use and the first demobilisation will be in the next reporting period.	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	Pre-construction and Construction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan 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*	Ongoing

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**
	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; (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 (f) demonstrated overall consistency with the approved project. The Proponent shall demonstrate to the satisfaction of the Secretary of the NSW Department of Planning & Environment (DP&E) that there will be no significant adverse impact from that facility's construction or operation.					
C34	The Secretary of the NSW Department of Planning & Environment (DP&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: (a) are located within an active construction zone within the approved project footprint; and (b) have been assessed by the Environmental Representative to have: (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 (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 (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.	Construction	RMS/Fulton Hogan	Compliant	Construction Environmental Management Plan Section 2.4 and Appendix A5	Ongoing
PART D PRIOR TO OPERATIONS						
OPERATIONAL ENVIRONMENT MANAGEMENT SYSTEM						
D1	Prior to the commencement of operation, the Proponent shall incorporate the project into its existing environmental management systems.	Construction	RMS/Fulton Hogan	Compliant	Will be completed prior to operation as required.	Ongoing
PART E DURING OPERATIONS						
OPERATIONAL NOISE						
E1	Within 12 months of the commencement of operation of the project, or as otherwise agreed by the Secretary of the NSW Department of Planning & Environment (DP&E), the Proponent shall undertake operational noise	Operation	RMS/Fulton Hogan	Compliant	RMS will comply with this Condition post construction to validate real operational monitoring data against the Operational Noise Management Design Report and Appendices A, C and D revision 4 16 March 2015	Ongoing

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**
	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 **Operational Noise Report** to document this monitoring The Report shall include, but not necessarily be limited to: (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; (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); (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; (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; (e) any required recalibrations of the noise model taking into consideration factors such as actual traffic numbers and proportions; (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 (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 & Environment (DP&E) and the EPA. The Proponent shall provide the Secretary of the NSW Department of Planning & Environment (DP&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 & Environment (DP&E).					

Table 2: Revised statement of commitments (May 2013)

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
Environmental management						
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 F) 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 F) 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 F), 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 F), Chapter 5	Ongoing
Community consultation						
CC1	The community will be kept informed with measures such as: Letter box drops, media releases and community updates. An internet site established and maintained for the duration of the project. Variable message signs. The project office. Email to registered stakeholders. Targeted consultation with affected individuals or groups. Information to be provided will include: Changes to access and traffic conditions. A detail of future works programs. General construction progress.	Pre-construction and construction	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2	Ongoing
CC2	Communication management will include: A 24 hour toll-free contact telephone number. Directions on how to register a complaint or make an inquiry. Acknowledgement of complaints within 24 hours. A complaint recording and tracking system.	Pre-construction and construction	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Sections 8.1 and 8.2	Ongoing
Traffic and transport						
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	Ongoing
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	NA at this stage – relates to operation.	Nil.	Ongoing
Noise and vibration						
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 E), Chapter 7 and Section 8.3	Ongoing

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
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
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.	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	NA at this stage – relates to operation.	Nil.	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	Tender Submission Documents	Complete
Biodiversity						
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 E), Chapter 5	Ongoing
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 E), Chapter 5, Appendices A and F	Ongoing
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 E), Chapter 5, Appendices A	Ongoing
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 E), 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 E), Chapter 5, Appendix A Construction Soil and Water Quality Management Sub-plan (Rev D), Appendix F	Ongoing
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).	Ongoing
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 E), Chapter 5 and Appendix A. Landscape Drawings	Ongoing
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 E), Chapter 5	Ongoing
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	Biodiversity Offset Strategy (by RMS). RMS has engaged a consultant to prepare the Biodiversity Offset Package. Potential properties are currently being assessed for suitability.	Ongoing
Surface water and groundwater						
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 D), Chapter 5 Detailed Design – Drainage Report	Ongoing
SG2	A design and revegetation strategy for the Town Creek diversion will be	Pre-construction	Fulton Hogan	Compliant	Detailed Design – Drainage Report	Ongoing

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
	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 stabilised to mitigate erosion risk prior to operation.	and construction			Urban Design and Landscape Plan (Rev 5)	
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 E), 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. Any waters drawn from Broughton Creek will be done in consultation with Department of Primary industries (Office of Water) and environmental flows will be maintained	Ongoing
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 (by RMS) Detailed Design - Flooding Report 17 February 2015 Roads and Maritime Services requested construction commence prior to the completion of mitigation works at 29A Princes Highway, Berry. 9 March 2015 Department of Planning and Environment allowed that construction commence prior to the completion of the required flood mitigation works subject to regular updates being provided. The DP&E was advised in a letter dated 15th June 2015 that the mitigation works at property 76 Woodhill Mountain Road had not been completed at the request of the land owner. An indemnity between 76 Woodhill Mountain Rd and Fulton Hogan exists, pending boundary resolution with neighbour. The most recent update was provided to DP&E in a letter dated 20 April 2016. The letter detailed the progress of the negotiations with the affected residents, including RMS making offers to purchase the properties at 29A Princes Hwy and 76 Woodhill Mountain Road.	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 E), October 2015, 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	Construction	Fulton Hogan	Compliant	Soil and Water Quality Management Sub Plan (Rev E), October 2015, Chapter 5	Ongoing

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
	of Water and potentially affected stakeholders.					
Landscape character and visual amenity						
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 (Rev 5) 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 (Rev 5) In the reporting period the gently graded earth noise mound on North street has been revegetated and planting beds were prepared for plants. Native plant stock has been incorporated into the landscape plantings throughout the rural setting to integrate the project with the surrounding landscape character.	Ongoing
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 (Rev 5)	Ongoing
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
Aboriginal heritage						
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 E), Chapter 5 Construction Environmental Management Plan (Rev E), Appendix A6	Ongoing
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 E), Chapter 5 Alignment Report	Ongoing
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. Note: The report for these works will be completed in the fourth quarter of 2015.	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 E), 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 E), Section 6.2	Ongoing
Non-Aboriginal heritage						
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 E), Chapter 5	Ongoing

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
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 E), 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.	Ongoing
Land use and property						
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	Ongoing
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	Ongoing
Socio-economic						
SE1	Negotiations for property acquisition will include consideration of property adjustments, where required, to maintain farm management practices.	Pre-construction	RMS	Compliant		Ongoing
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	NA 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	Ongoing
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	Ongoing
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	Ongoing
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 operation	Fulton Hogan	Compliant	Community Communication Strategy (Rev 3), Section 7.2 Detailed Design - Drainage Report	Ongoing
Soil and water quality						
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 E), 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 E), Chapter 5 SEEC have been engaged as the nominated soil conservationist and have attended the project throughout high risk phases and at a minimum of every two weeks	Ongoing
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 E), Chapter 5	Ongoing
SW4	Monitoring of water quality upstream and downstream of the project site will be undertaken before and during construction.	Pre-construction,	Fulton Hogan	Compliant	Construction Soil and Water Quality Management Sub-plan (Rev E), Appendix B Water quality monitoring results are attached in Appendix B of this report	Ongoing

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
		construction and operation				
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 E), Appendix E	Ongoing
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 E), Appendix E	Ongoing
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 E), Appendix C Detailed Design - Geotechnical Report No contamination identified	Complete
Air quality						
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 E), Chapter 5	Ongoing
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 E), Section 6.3	Ongoing
Hazards and risks						
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 E), 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 Gas protection slab works completed as early works during this reporting period	Ongoing
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
Waste and management						
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 E), Chapters 4 and 5	Ongoing
Greenhouse gas emissions						
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 E), Chapters 4 and 5	Ongoing
Ancillary facilities						

SoC – Revised statement of commitments (May 2013)						
No.	**Commitment Requirement**	**Phase**	**Responsibility**	**Compliance status**	**Compliance notes**	**Close out**
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 D), 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 F), 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 E), Appendix F	Ongoing

Appendix B Water quality monitoring results

Surface Water Monitoring

Construction Event 10

Monitoring event after more than 15mm of rain in twenty four hours

Date of Monitoring: 22 October 2015

Rainfall received: 27mm

1. Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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.

2. 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 are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for the schedule of minor suite analysis of:

- Turbidity.
- Total suspended solids.

3. Weather Monitoring

The project has three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa

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

4. 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
- Attachment D, Laboratory results
- Attachment E, ~~Field photographs.~~ none taken

4.1 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

Surface water	Upstream of Alignment	Downstream of Alignment (test
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

5. Results summary

During this rainfall event moderate consistent rainfall was received across two days, rainfall was continuing at the time of the sampling event. Results for each waterway are detailed below:

Broughton Creek: Showed no impacts from construction

Connelly's Creek, Broughton Mill Creek and Bundewallah Creek: Showed no impacts from construction

Town Creek: Showed no impacts from construction

Hitchcocks Lane Creek Tributary: Showed no impacts from construction

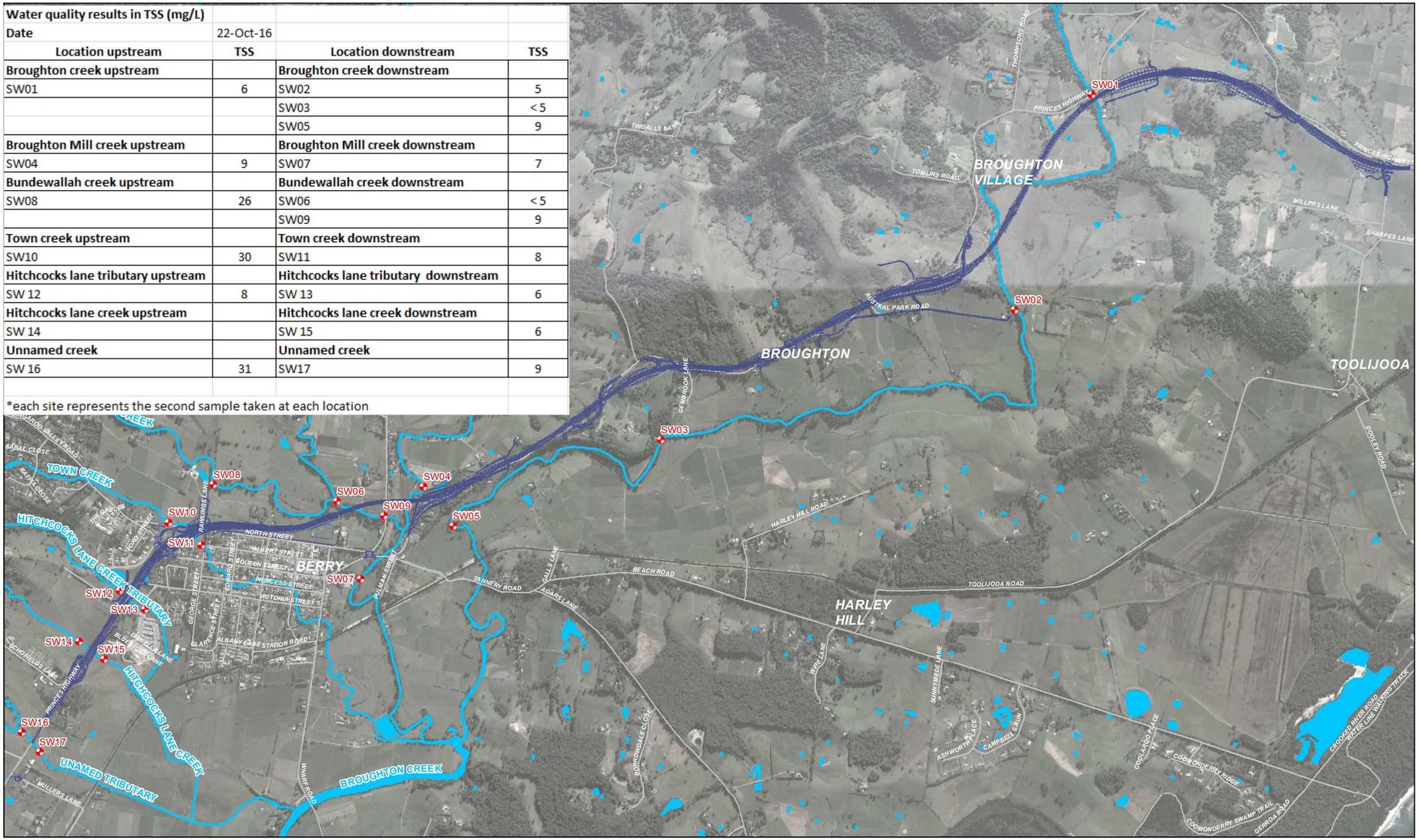
Hitchcocks Lane Creek: Showed no impacts from construction

Unnamed Tributary: Showed no impacts from construction

Attachment A: Location maps

Water quality results in TSS (mg/L)			
Date	22-Oct-16		
Location upstream	TSS	Location downstream	TSS
Broughton creek upstream		**Broughton creek downstream**	
SW01	6	SW02	5
		SW03	< 5
		SW05	9
Broughton Mill creek upstream		**Broughton Mill creek downstream**	
SW04	9	SW07	7
Bundewallah creek upstream		**Bundewallah creek downstream**	
SW08	26	SW06	< 5
		SW09	9
Town creek upstream		**Town creek downstream**	
SW10	30	SW11	8
Hitchcocks lane tributary upstream		**Hitchcocks lane tributary downstream**	
SW 12	8	SW 13	6
Hitchcocks lane creek upstream		**Hitchcocks lane creek downstream**	
SW 14		SW 15	6
Unnamed creek		**Unnamed creek**	
SW 16	31	SW17	9

*each site represents the second sample taken at each location



1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Fulton Hogan Pty Ltd
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

\\ghdnet\ghd\AU\Sydney\Projects\21\24306\GIS\Maps\MXD\21_24306_Z001_SurfaceWatersamplingLocations.mxd

Data Source: NSW Department of Lands: DTDB and DCDB - 2012. Created by: mweber

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results

LOCATION	Temperature (*C)	pH (pH)	ORP (mV)	Conductivity (ms/cm)	Dissolved Oxygen (mg/L)
SW1_1	16.4	6.29	359	0.199	7.08
SW1_2	16.47	6.52	385	0.181	5.63
SW1_3	16.38	6.55	399	0.169	4.77
SW2_1	16.68	6.61	395	0.158	7.08
SW2_2	16.72	6.66	402	0.158	5.84
SW2_3	16.72	6.71	406	0.158	5.76
SW3_1	16.96	6.59	408	0.17	6.59
SW3_2	16.96	6.63	402	0.17	6.02
SW3_3	17	6.69	399	0.17	6.02
SW4_1	14.35	6.76	409	0.178	6.18
SW4_2	14.33	6.53	414	0.178	5.49
SW4_3	14.34	6.48	411	0.179	5.62
SW5_1	16.02	6.8	401	0.141	5
SW5_2	16.26	6.79	406	0.14	4.3
SW5_3	16.33	6.79	407	0.14	4.24
SW6_1	16.94	7.06	370	0.173	6.59
SW6_2	17.01	6.83	369	0.172	5.19
SW6_3	17.02	6.81	369	0.172	4.88
SW7_1	14.31	6.67	390	0.18	6.94
SW7_2	14.29	6.59	380	0.181	6.3
SW7_3	14.28	6.62	379	0.181	6.07
SW8_1	14.78	6.67	409	0.176	7.55
SW8_2	14.78	6.64	410	0.176	7.13
SW8_3	14.78	6.62	411	0.176	7.03
SW9_1	14.83	7.12	319	0.183	6.79
SW9_2	14.88	7.28	294	0.185	6.56
SW9_3	14.88	7.32	304	0.183	6.76
SW10_1	15.86	6.79	395	0.148	4.73
SW10_2	15.86	6.81	398	0.148	3.91
SW10_3	15.95	6.81	400	0.148	3.61
SW11_1	12.02	7.14	263	0.214	2.04
SW11_2	11.98	7.12	257	0.215	1.5
SW11_3	12.02	7.11	265	0.215	1.21
SW12_1	13.43	7.45	164	0.464	2.89
SW12_2	13.55	7.58	158	0.463	2.15
SW12_3	13.61	7.74	152	0.463	1.95
SW13_1	14.2	8.19	192	0.507	6
SW13_2	14.22	8.36	189	0.505	5.64
SW13_3	14.24	8.36	188	0.528	5.57
SW14_1					
SW14_2					
SW14_3					
SW15_1	12.41	7.59	240	0.944	4.5
SW15_2	12.67	7.79	239	0.942	4.56
SW15_3	12.78	7.94	236	0.953	4.24
SW16_1	12.44	7.37	247	0.189	6.47
SW16_2	12.69	7.88	171	0.192	6.1
SW16_3	12.64	7.8	177	0.192	6.43
SW17_1	12.6	8.3	291	0.217	7.32
SW17_2	12.62	7.98	310	0.216	7.63
SW17_3	12.62	7.56	336	0.216	6.91

Attachment C: Field Sheets

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 22-10-2015

PROJECT NAME: FBB

TIME: 13:10

CLIENT:

SAMPLING OFFICERS: JD / JC

SITE: SW1

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: upstream of works.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast → Raining (Showers)

VEGETATION: Ripiria

SLOPE: Gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe print out

CONDUCTIVITY (uS/cm):

pH:

DO (ppm):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low flow

COLOUR: Clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW1-1	1	Ice	N/A	
-2	1	"	N/A	
-3	1	"	N/A	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 22·10·2015

PROJECT NAME: FBB TIME: 13:30

CLIENT: _____ SAMPLING OFFICERS: SD / JC

SITE: SW2

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Weir crossing

ENVIRONMENTAL OBSERVATIONS

WEATHER Overcast

VEGETATION Riparian

SLOPE Gentle

EROSION N/A - Concrete weir

OTHER _____

FIELD MEASUREMENTS

TEMPERATURE (°C) See probe print out

CONDUCTIVITY (uS/cm) _____

pH _____

DO (ppm) _____

REDOX (mV) _____

FLOW OBSERVATIONS

FLOW Low flow

COLOUR Clear water

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW2-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 22:10:2015

PROJECT NAME: FBB TIME: 13:55

CLIENT: _____ SAMPLING OFFICERS: SD/SC

SITE: SW3

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Downstream of Works. Below rapids after bend

ENVIRONMENTAL OBSERVATIONS

WEATHER Overcast

VEGETATION Ripirian

SLOPE None / minimal

EROSION N/A

OTHER _____

FIELD MEASUREMENTS

TEMPERATURE (°C) See probe print out

CONDUCTIVITY (uS/cm) _____

pH _____

DO (ppm) _____

REDOX (mV) _____

FLOW OBSERVATIONS

FLOW low flow

COLOUR clear water

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW 3-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 22-10-2015

PROJECT NAME: FBB TIME: 15:00

CLIENT: _____ SAMPLING OFFICERS: SD / SC

SITE: SW4

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Deep channel upstream of works

ENVIRONMENTAL OBSERVATIONS

WEATHER Overcast

VEGETATION Ripirian

SLOPE Gentle

EROSION N/A

OTHER _____

FIELD MEASUREMENTS

TEMPERATURE (^{o}C) See probe print out

CONDUCTIVITY (uS/cm) _____

pH _____

DO (ppm) _____

REDOX (mV) _____

FLOW OBSERVATIONS

FLOW low flow

COLOUR Clear

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW4-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 22-10-2015

PROJECT NAME: FBB

TIME: 15:30

CLIENT:

SAMPLING OFFICERS: JD/SC

SITE: SW5

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Ripirian. Edge of paddock

SLOPE: Gentle in creek. Downstream banks steep

EROSION: N/A

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe print out

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW: Low flow

COLOUR: Clear water

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW5-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 22.10.2015

PROJECT NAME: FBB TIME: 14:20

CLIENT: _____ SAMPLING OFFICERS: JC/JC

SITE: SW6

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Upstream of Works at Bundewallah Ck

ENVIRONMENTAL OBSERVATIONS

WEATHER Overcast

VEGETATION Ripirian

SLOPE Gentle

EROSION N/A

OTHER _____

FIELD MEASUREMENTS

TEMPERATURE (°C) See probe print out

CONDUCTIVITY (uS/cm) _____

pH _____

DO (ppm) _____

REDOX (mV) _____

FLOW OBSERVATIONS

FLOW low flow

COLOUR clear water

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW6 - 1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB

CLIENT:

SITE: SW7

DATE: 22-10-2015

TIME: [redacted] 15:45

SAMPLING OFFICERS: JD / JC

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Deep & wide channel below bowling club

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Ripirian

SLOPE: Gentle

EROSION: N/A

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe print out

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW: low flow

COLOUR: tannin & slightly turbid

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW7_1	1	Ice	N/A	
7_2	1			
-3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 22 - 10 - 2015

PROJECT NAME: FBB

TIME: 16 : ~~20~~

CLIENT:

SAMPLING OFFICERS: JD / SC

SITE: SW8

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Town Cle & Bundewallah connection pt

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast - Showers

VEGETATION: Riparian

SLOPE: Gentle

EROSION: N/A

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe printout

CONDUCTIVITY (uS/cm):

pH:

DO (ppm):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: low to medium flow

COLOUR: tannin & ~~slightly~~ turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW8 - 1	1	Ice	N/A	
- 2	1			
- 3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	22-10-2015
PROJECT NAME:	FBB	TIME:	16:40
CLIENT:		SAMPLING OFFICERS:	JD / JC
SITE:	SW9		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	Grab		
DETAILED SAMPLE LOCATION DESCRIPTION	Constricted channel below WAIMR Bridge		

ENVIRONMENTAL OBSERVATIONS

WEATHER	Overcast
VEGETATION	Riparian
SLOPE	Medium in creek, banks steep
EROSION	N/A
OTHER	

FIELD MEASUREMENTS

TEMPERATURE (°C)	See probe printout
CONDUCTIVITY (uS/cm)	
pH	
DO (ppm)	
REDOX (mV)	

FLOW OBSERVATIONS

FLOW	Low - Medium flow
COLOUR	Tannin
OTHER	

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW9 - 1	1	Ice	N/A	
- 2	1			
- 3	1			

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 22.10.2015

PROJECT NAME: FBB

TIME: 16:00

CLIENT:

SAMPLING OFFICERS: JD / JC

SITE: SW10

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Narrow channel into desilting basin on Town Ck

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture grass

SLOPE: Gentle

EROSION: ☑ Yes

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe print out

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW: low flow

COLOUR: Slightly turbid

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW10-1	1	Icc	N/A	
10-2	1			
10-3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	23.10.2015
PROJECT NAME:	FBB	TIME:	8:20 am
CLIENT:		SAMPLING OFFICERS:	JD / JC
SITE:	SW11		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	Grab		
DETAILED SAMPLE LOCATION DESCRIPTION	Old Town Ck channel off George St		

ENVIRONMENTAL OBSERVATIONS

WEATHER	Clear & Sunny
VEGETATION	Weeds & grasses
SLOPE	Gentle
EROSION	N/A
OTHER	

FIELD MEASUREMENTS

TEMPERATURE (°C)	See probe print out
CONDUCTIVITY (uS/cm)	
pH	
DO (ppm)	
REDOX (mV)	

FLOW OBSERVATIONS

FLOW	No flow → Stagnate
COLOUR	Tannins
OTHER	Lot of Algae growth

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW11-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 23-10-2015

PROJECT NAME: FBB

TIME: 10:30am

CLIENT:

SAMPLING OFFICERS: SD / SC

SITE: SW12

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of works @ boundary fence

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: Pasture grass & weeds

SLOPE: Flat

EROSION: N/A

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe print out

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW: No/low flow - Stagnate water

COLOUR: Brown

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW12-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 23-10-2015

PROJECT NAME: FBB TIME: 9am

CLIENT: _____ SAMPLING OFFICERS: JD / JC

SITE: SW13

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Culvet outlet @ Arbour complex

ENVIRONMENTAL OBSERVATIONS

WEATHER Fine & sunny

VEGETATION Riparian & Eucalpts

SLOPE Gentle

EROSION Exposed banks minimal erosion

OTHER _____

FIELD MEASUREMENTS

TEMPERATURE (°C) See probe print out

CONDUCTIVITY (uS/cm) _____

pH _____

DO (ppm) _____

REDOX (mV) _____

FLOW OBSERVATIONS

FLOW Low flow

COLOUR Clear water

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW13-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 23-10-2015

PROJECT NAME: FBB

TIME: 10am

CLIENT:

SAMPLING OFFICERS: JO / JC

SITE: SW14

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Pasture ~~grass~~ area upstream of works

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: Pasture grass & macrophytes

SLOPE: very gentle

EROSION: N/A

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C): No water to measure

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW: No flow (No water)

COLOUR

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
	N/A	N/A		

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	23.10.2015
PROJECT NAME:	FBB	TIME:	8:35
CLIENT:		SAMPLING OFFICERS:	JD / JC
SITE:	SW15		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	Grab		
DETAILED SAMPLE LOCATION DESCRIPTION	Ephemeral drainage line below Bupa		

ENVIRONMENTAL OBSERVATIONS

WEATHER	Sunny
VEGETATION	Pasture grass & blackberry & reeds
SLOPE	Low
EROSION	N/A
OTHER	

FIELD MEASUREMENTS

TEMPERATURE (°C)	See probe printout
CONDUCTIVITY (uS/cm)	
pH	
DO (ppm)	
REDOX (mV)	

FLOW OBSERVATIONS

FLOW	Low - Medium flow
COLOUR	Tanning
OTHER	

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW15-1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB

CLIENT:

SITE: SW16

DATE: 23.10.2015

TIME: 9:40

SAMPLING OFFICERS: JD / JC

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: upstream of work @ boundary fence

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: Pasture grass, reeds, macrophytes

SLOPE: Gentle to moderater

EROSION: N/A

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (°C): See probe printout

CONDUCTIVITY (uS/cm):

pH:

DO (ppm):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: low to medium flow

COLOUR: clear water then turbid after cow walks through it

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW16 -1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	23-10-2015
PROJECT NAME:	FBB	TIME:	9:20
CLIENT:		SAMPLING OFFICERS:	JD / JC
SITE:	SW17		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	Grab		
DETAILED SAMPLE LOCATION DESCRIPTION	Downstream of work @ boundary fence		

ENVIRONMENTAL OBSERVATIONS

WEATHER	Sunny
VEGETATION	Ripirain & pasture
SLOPE	Creek moderate slope, bank steep
EROSION	N/A
OTHER	

FIELD MEASUREMENTS

TEMPERATURE (°C)	See probe print out
CONDUCTIVITY (uS/cm)	
pH	
DO (ppm)	
REDOX (mV)	

FLOW OBSERVATIONS

FLOW	Low flow
COLOUR	Slightly turbid
OTHER	

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW17_1	1	Ice	N/A	
-2	1			
-3	1			

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1512284**	Page	: 1 of 12
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR JAMES DIAMOND	Contact	: Glenn Davies
Address	: Level 3 - 61 Dunning Ave ROSEBERRY NSW, AUSTRALIA 2018	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
E-mail	: james.diamond@fultonhogan.com.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 8346 9400	Telephone	: 02 42253125
Facsimile	: +61 02 8346 9444	Facsimile	: W 02 42253128 N 02 44232083
Project	: Foxground and Berry Bypass	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 23-Oct-2015 16:30
C-O-C number	: ----	Date Analysis Commenced	: 26-Oct-2015
Sampler	: JAMES DIAMOND	Issue Date	: 30-Oct-2015 15:04
Site	: ----		
		No. of samples received	: 48
Quote number	: ----	No. of samples analysed	: 48

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics

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.

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW1_1	SW1_2	SW1_3	SW2_1	SW2_2
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	CAS Number	LOR	Unit	EW1512284-001	EW1512284-002	EW1512284-003	EW1512284-004	EW1512284-005
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	<5	**6**	**6**	**5**	**6**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW2_3	SW3_1	SW3_2	SW3_3	SW4_1
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-006**	**EW1512284-007**	**EW1512284-008**	**EW1512284-009**	**EW1512284-010**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**7**	**6**	<5	<5	**5**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW4_2	SW4_3	SW5_1	SW5_2	SW5_3
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-011**	**EW1512284-012**	**EW1512284-013**	**EW1512284-014**	**EW1512284-015**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	<5	**9**	**6**	**9**	**6**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW6_1	SW6_2	SW6_3	SW7_1	SW7_2
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	CAS Number	LOR	Unit	EW1512284-016	EW1512284-017	EW1512284-018	EW1512284-019	EW1512284-020
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	<5	<5	<5	**8**	**7**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW7_3	SW8_1	SW8_2	SW8_3	SW9_1
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-021**	**EW1512284-022**	**EW1512284-023**	**EW1512284-024**	**EW1512284-025**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**9**	**32**	**26**	**31**	**12**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW9_2	SW9_3	SW10_1	SW10_2	SW10_3
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-026**	**EW1512284-027**	**EW1512284-028**	**EW1512284-029**	**EW1512284-030**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**9**	**9**	**38**	**30**	**32**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW11_1	SW11_2	SW11_3	SW12_1	SW12_2
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	CAS Number	LOR	Unit	EW1512284-031	EW1512284-032	EW1512284-033	EW1512284-034	EW1512284-035
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**6**	**8**	**46**	**10**	**8**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW12_3	SW13_1	SW13_2	SW13_3	SW16_1
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	CAS Number	LOR	Unit	EW1512284-036	EW1512284-037	EW1512284-038	EW1512284-039	EW1512284-040
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**8**	**5**	**6**	**6**	**6**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW16_2	SW16_3	SW15_1	SW15_2	SW15_3
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-041**	**EW1512284-042**	**EW1512284-043**	**EW1512284-044**	**EW1512284-045**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**52**	**31**	**22**	**6**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW17_1**	**SW17_2**	**SW17_3**	**----**	**----**
			Client sampling date / time	[22-Oct-2015]	[22-Oct-2015]	[22-Oct-2015]	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512284-046**	**EW1512284-047**	**EW1512284-048**	**--------**	**--------**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
^ **Suspended Solids (SS)**	----	5	mg/L	**10**	**9**	**8**	**----**	**----**

Attachment E: Field Photos – None Taken

Surface Water Monitoring

Construction Event 11

Monitoring event after more than 15mm of rain in twenty four hours

Date of Monitoring: 4 November 2015

Rainfall received: 28mm (rainfall continuing total for rainfall event 51.8mm)

1. Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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.

2. 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 are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for the schedule of minor suite analysis of:

- Total suspended solids.

3. Weather Monitoring

The project has three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa,

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

4. 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,~~ not taken due to probe failure
- Attachment C, Field sheets,
- Attachment D, Laboratory results,
- Attachment E, Field photographs.

4.1 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

Surface water	**Upstream of Alignment**	**Downstream of Alignment (test**
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

5. Results summary

Monitoring was triggered by 15mm of rainfall in 24hours. Ongoing rainfall during water sampling, the total for the event over ten days was 60mm. Water quality was good across all sites with no evidence of construction impacts.

Broughton Creek: Showed no impacts from construction

Connelly's Creek, Broughton Mill Creek and Bundewallah Creek: Showed no impacts from construction

Town Creek: Showed no impacts from construction

Hitchcocks Lane Creek Tributary: Showed no impacts from construction

Hitchcocks Lane Creek: Showed no impacts from construction

Unnamed Tributary: Showed no impacts from construction

Attachment A: Location Map

Water quality results in TSS (mg/L)			
Date	4-Nov-16		
Location upstream	**mg/L**	**Location downstream**	**mg/L**
Broughton creek upstream		**Broughton creek downstream**	
SW01	< 5	SW02	< 5
		SW03	< 5
		SW05	< 5
Broughton Mill creek upstream		**Broughton Mill creek downstream**	
SW04	< 5	SW07	< 5
Bundewallah creek upstream		**Bundewallah creek downstream**	
SW08	6	SW06	< 5
		SW09	< 5
Town creek upstream		**Town creek downstream**	
SW10	< 5	SW11	NF
Hitchcocks lane tributary upstream		**Hitchcocks lane tributary downstream**	
SW 12	9	SW 13	6
Hitchcocks lane creek upstream		**Hitchcocks lane creek downstream**	
SW 14	NF	SW 15	14
Unnamed creek		**Unnamed creek**	
SW 16	< 5	SW17	< 5
The second sample taken at each site is represented in the above table			

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Fulton Hogan Pty Ltd
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results – None Taken Probe fail

Attachment C: Field Sheets

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB

CLIENT:

SITE: SW1

DATE: 4.11.15

TIME: 8:00

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of work, upstream of existing Broughton Ck private Hiway bridge.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Light rain ~25mm + received in previous 24 hours.

VEGETATION: Riparian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (°C)	13.5	13.3	13.4 PROBE
CONDUCTIVITY (uS/cm)	.16 mS	.115	.112 MALFUNCTION
pH	5.17	5.1	5.1
DO (ppm) (mg/L)	~~13~~	13	13
REDOX (mV)	323 ORP mV	317	319
Turb		9.3	9.0

FLOW OBSERVATIONS

FLOW: Slightly elevated

COLOUR: tannins

OTHER: Washed algae & other particulates evident

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW1 A	1	Esky-Ice	D.11	
B	1	↓	↓	
C	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB - Minor works

CLIENT:

SITE: SW2

DATE: 4.11.18

TIME: 8:45

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: At the weir overflow

ENVIRONMENTAL OBSERVATIONS

WEATHER: Light rain

VEGETATION: Riparian, overstorey trees (Eucalyptus)

SLOPE: very gentle

EROSION: none - weir concrete

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (°C)	14.	14	~~14~~ PROBE MALFUNCTION
CONDUCTIVITY (uS/cm)	~~133~~	120	127
pH	5.1	5.2	5.1
DO (ppm)	~~12.95~~	too high not recorded.	
REDOX (mV)	337	335	333
Turb	~~4.3~~	4.5	5.0

FLOW OBSERVATIONS

FLOW: Elevated

COLOUR: Tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW2		Eskylite	Y	
1	1			
2	1			
3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

8.4/8.3

112 us

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB

CLIENT:

SITE: SW3

DATE: 4.11.15

TIME: 9:45

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: grab

DETAILED SAMPLE LOCATION DESCRIPTION: slight bend w/ gentle rapids

ENVIRONMENTAL OBSERVATIONS

WEATHER: light rain

VEGETATION: riparian

SLOPE: slight/none

EROSION: none

OTHER

FIELD MEASUREMENTS

	#1	#2	#3
TEMPERATURE (°C)	14.9	14.8	14.7 PROBE
CONDUCTIVITY (uS/cm)	149	148	148 MALFUNCTION
pH	5.17	5.1	5.2
DO (ppm)	—	—	—
REDOX (mV)	345	342	341
NTU		3.5	3.5

FLOW OBSERVATIONS

FLOW: elevated

COLOUR: tannins

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW3	6	Esky/ice	Y	
1	2	↓	↓	
2	2			
3	2			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 4.11.15

PROJECT NAME: EBB

TIME: 10:20

CLIENT:

SAMPLING OFFICERS: JC SL

SITE: SW4

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)* grab

DETAILED SAMPLE LOCATION DESCRIPTION deep channel + constricted

ENVIRONMENTAL OBSERVATIONS

WEATHER light/mod rain

VEGETATION riparian

SLOPE gentle

EROSION none

OTHER

FIELD MEASUREMENTS

	#1	#2	#3	
TEMPERATURE (°C)	14	13.6	13.3	PROBE
CONDUCTIVITY (uS/cm)	93	88	88	MALFUNCTION
pH	5.1	5.3	5.2	
DO (ppm)	—	—	—	
REDOX (mV)	346	333	329	
	13.0	10.0	9.5	

FLOW OBSERVATIONS

FLOW elevated

COLOUR tannin

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW4	3	esky/ice	N	
1	1	↓	↓	
2	1			
3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. _____ DATE: 4.11.15

PROJECT NAME: FBB TIME: 10:00

CLIENT: _____ SAMPLING OFFICERS: JC, SL

SITE: SW5

COORDINATES/GPS *(If Applicable)* _____

SAMPLING METHOD *(ie grab, bucket)* grab

DETAILED SAMPLE LOCATION DESCRIPTION _____

ENVIRONMENTAL OBSERVATIONS

WEATHER Sprinkle

VEGETATION Riparian

SLOPE Steep bank

EROSION None

OTHER _____

FIELD MEASUREMENTS

	#1	#2	#3
TEMPERATURE (°C)	15.14	15.1	15 PROBE
CONDUCTIVITY (uS/cm)	153	155	155 MALFUNCTION
pH	5.3	5.2	5.2
DO (ppm)	—	—	—
REDOX (mV)	335	340	338
	4.0	4.0	3.4

FLOW OBSERVATIONS

FLOW Slow

COLOUR tannins

OTHER _____

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW5	3	esky/ice	N	
1	1	↓	↓	
2	1			
3	1			

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: SBB

CLIENT:

SITE: SW6

DATE: 4.11

TIME: 10:55

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)* grab

DETAILED SAMPLE LOCATION DESCRIPTION

ENVIRONMENTAL OBSERVATIONS

WEATHER Mod warm

VEGETATION riparian

SLOPE gentle

EROSION none

OTHER

FIELD MEASUREMENTS

	#1	#2	#3
TEMPERATURE (°C)	13.99	13.7	15.9 PROBE
CONDUCTIVITY (uS/cm)	154	153	135 MALFUNCTION
pH	5.05	5.1	5.2
DO (ppm)	—		—
REDOX (mV)	325	322	321
	3.3	3.9	4.3

FLOW OBSERVATIONS

FLOW elevated

COLOUR tannin

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW6	3	esky/ice	N	
1	1	↓	↓	
2	1			
3	1			

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB

CLIENT:

SITE: SW7

DATE: 4.11.15

TIME: 11:10

SAMPLING OFFICERS: SL JC

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: Grab

DETAILED SAMPLE LOCATION DESCRIPTION: wide deep channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: light rain

VEGETATION: riparian

SLOPE: gentle

EROSION: none

OTHER

FIELD MEASUREMENTS

	#1	#2	#3	
TEMPERATURE (°C)	13.5	13.4	13.5	PROBE MALFUNCTION
CONDUCTIVITY (uS/cm)	102	100	100	
pH	~~4.8~~ 4.8	~~4.8~~	5.1	
DO (ppm)	—	—	—	
REDOX (mV)	337	348	349	
	~~17.0~~	10.5	10.5	

FLOW OBSERVATIONS

FLOW: elevated

COLOUR: tannin

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
		esky/ice	N	pH probe measurement
SW7-1	1	"	"	@ 5.4 pH
SW7-2	1	"	"	
SW7-3	1	"	"	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME:

CLIENT:

SITE: SW08

DATE: 4.11.15

TIME: 11:30

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: grab

DETAILED SAMPLE LOCATION DESCRIPTION: tc + bundanwallah confluence pt.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Light rain

VEGETATION: riparian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

	~~#1~~	~~#2~~	~~#3~~	
TEMPERATURE (°C)	14.29	14.25	14.33	PROBE
CONDUCTIVITY (uS/cm)	157	125	123	MALFUNCTION
pH	5.1	4.9	5.2	
DO (ppm)	—	—	—	
REDOX (mV)	271	264	263	
	~~84~~	9.1	9.0	

FLOW OBSERVATIONS

FLOW: elevated

COLOUR: tannins

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW8	3	esky/ice	N	
1	1	↓	↓	
2	1	↓	↓	
3	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	4.11.15
PROJECT NAME:	CBB	TIME:	10:40
CLIENT:		SAMPLING OFFICERS:	JC SL
SITE:	SW9		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	grab		
DETAILED SAMPLE LOCATION DESCRIPTION	constructed channel		

ENVIRONMENTAL OBSERVATIONS

WEATHER	Rain light/mod
VEGETATION	riparian
SLOPE	steep
EROSION	none
OTHER	

FIELD MEASUREMENTS

	#1	#2	~~#3~~ PROBE
TEMPERATURE (°C)	14	14.0	13.8
CONDUCTIVITY (uS/cm)	157	159	~~23~~ 161 MALFUNCTION
pH	5	5.1	5.2
DO (ppm)	—	—	—
REDOX (mV)	294	278	286
	5	5	4.3

FLOW OBSERVATIONS

FLOW	elevated
COLOUR	tannin
OTHER	

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW9	3	esky/ice	N	pH checked with separate probe.
1	1	↓	↓	
2	1			
3	1			

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.		DATE:	4.11.15
PROJECT NAME:	FBB	TIME:	12:00
CLIENT:		SAMPLING OFFICERS:	JC & SL
SITE:	SW100		
COORDINATES/GPS *(If Applicable)*			
SAMPLING METHOD *(ie grab, bucket)*	grab		
DETAILED SAMPLE LOCATION DESCRIPTION	low flow channel into pool		

ENVIRONMENTAL OBSERVATIONS

WEATHER	light rain
VEGETATION	riparian / agricultural
SLOPE	gentle
EROSION	none
OTHER	

FIELD MEASUREMENTS	#1	#2	#3 PROBE MALFUNCTION
TEMPERATURE (°C)	14.3	14.38	14.39
CONDUCTIVITY (uS/cm)	~~307~~ 159	159	159
pH	5.2	5.2	5.1
DO (ppm)	–	–	–
REDOX (mV)	307	316	320
	13.4	12.9	12.9

FLOW OBSERVATIONS

FLOW	
COLOUR	
OTHER	

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW100	3	esky/ice	N	
1	1	↓	↓	
2	1	↓	↓	
3	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME: FBB - SWMP

CLIENT:

SITE: SW-12

DATE: 4-Nov-15

TIME: 1740

SAMPLING OFFICERS: JL - JC

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*

DETAILED SAMPLE LOCATION DESCRIPTION

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast clearing showers.

VEGETATION: Pasture grasses, no overstory, Macrophytes

SLOPE: Flat, dam upstream.

EROSION: —

OTHER: —

FIELD MEASUREMENTS

	(1)	(2)	(3)
TEMPERATURE (°C)	15.	15	15
CONDUCTIVITY (uS/cm)	391	380	3
pH	5.1	5.2	5.3
DO (ppm)	NIL	PROBE FAIL.	
REDOX (mV)	218	230	225
TURB	23	24	25.

PROBE MALFUNCTION

FLOW OBSERVATIONS

FLOW: Low flow elevated from dry conditions.

COLOUR: Clear w/ v. slight hue.

OTHER: Frogs calling

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW12	3	esky/ice	N	
1	1	↓	↓	
2	1	↓	↓	
3	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. FBB SWMP

PROJECT NAME:

CLIENT: SW-13

SITE:

DATE: 4.11.15

TIME: 12:30

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Culvert / foot bridge inside gate @ Arbour complex

ENVIRONMENTAL OBSERVATIONS

WEATHER Light rain continuing

VEGETATION Riparian & emergent overhang macrophytes

SLOPE gentle grade

EROSION some exposed banks.

OTHER

FIELD MEASUREMENTS

	①	②	③
TEMPERATURE (°C)	15	15	15
CONDUCTIVITY (uS/cm)	485	462	480
pH	5.1	5.2	5.3
DO (ppm)	NO READING	PROBE FAIL.	
REDOX (mV)	267	266	267
NTU	30.	31.	30.

PROBE MALFUNCTION

FLOW OBSERVATIONS

FLOW Moderate low flow

COLOUR clear.

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW13	3	esky/ice	N	
1	1	↓	↓	
2	1	↓	↓	
3	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

DATE: 4.11.15

PROJECT NAME: FBB

TIME: 12:50

CLIENT:

SAMPLING OFFICERS: JC SL

SITE: SW15

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: grab

DETAILED SAMPLE LOCATION DESCRIPTION: low flow channel. Ephemeral drainage line. (Modified Straight no ~~mature~~ tussey vegetation)

ENVIRONMENTAL OBSERVATIONS

WEATHER: Light rain

VEGETATION: grassland, blackberry, reeds. Open with no overstorey

SLOPE: gentle / low

EROSION: none

OTHER: —

FIELD MEASUREMENTS

	#1	#2	#3
TEMPERATURE (°C)	14.5	14.57	14.5 PROBE
CONDUCTIVITY (uS/cm)	944	~~944~~ 954	~~944~~ 950 MALFUNCTION
pH	5.3	5.1	5.2
DO (ppm)	NO READING	—PROBE FAIL	
REDOX (mV)	211	~~211~~ 183	215
Turb	37.	~~37.~~ 16.3	~~37.~~ 17.

FLOW OBSERVATIONS

FLOW: low to no flow

COLOUR: ~~brown~~ clear

OTHER: Algae

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW 15. 1	1	Esky / Ice	N.1	
2	1	↓	↓	
3	1	↓	↓	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

- Possible substrate material in sample. Very low flow.
Difficult sampling conditions

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. 1

PROJECT NAME: FBB - SWMP

CLIENT: SW-16

SITE:

DATE: 4-11-2015

TIME: 1400

SAMPLING OFFICERS: J. Leigh / J. Cooper

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Upstream of construction, meandering channel.

ENVIRONMENTAL OBSERVATIONS

WEATHER Overcast, rain

VEGETATION Some scattered small trees, tussocks/reeds, macrophytes.

SLOPE Moderate

EROSION Local erosion in the stream channel.

OTHER

FIELD MEASUREMENTS

	①	②	③
TEMPERATURE (°C)	14.48	14.4	14.5
CONDUCTIVITY (uS/cm)	170	170	171
pH	5.0	5.3	5.
DO (ppm)	—	—	
REDOX (mV)	289	223	236
NTU	17.3	12.	9.3

PROBE MALFUNCTION

FLOW OBSERVATIONS

FLOW Low to moderate - elevated from dry flow conditions

COLOUR Clear.

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW16	(3)	Esky/ice	N	
1	1		"	
2	1		"	
3	1		"	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

* 2nd TURB reading @ EUTECH = 8 NTU, 11 NTU 9
* 2nd pH reading = 5.70, — , 5.75

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO.

PROJECT NAME:

CLIENT:

SITE: SW17

DATE: 4.11.15

TIME: 1:30

SAMPLING OFFICERS: JC SL

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)*: grab

DETAILED SAMPLE LOCATION DESCRIPTION: deep constricted channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: riparian / grassland

SLOPE: v. steep at the side, have moderate slope

EROSION: none

OTHER

FIELD MEASUREMENTS

	#1	#2	#3
TEMPERATURE (°C)	14.5	14.6	
CONDUCTIVITY (uS/cm)	193	186	PROBE
pH	5.8	5.3	MALFUNCTION
DO (ppm)	-		
REDOX (mV)	296	5.5 ↑	* pH probe 2nd = 5.8
	7.0	298 ↓	

FLOW OBSERVATIONS

FLOW: mod / low flow

COLOUR: earl grey hue

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW7	3	Esky/Ice	N	2nd pH prior 5.8
1	1	"	"	
2	1	"	"	
3	1	"	"	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1512474**	Page	: 1 of 13
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: JACOB COOPER	Contact	: Glenn Davies
Address	: Level 3 - 61 Dunning Ave ROSEBERRY NSW, AUSTRALIA 2018	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
E-mail	: jacob.cooper@fultonhogan.com.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 8346 9400	Telephone	: 02 42253125
Facsimile	: +61 02 8346 9444	Facsimile	: W 02 42253128 N 02 44232083
Project	: Foxground and Berry Bypass	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 06-Nov-2015 16:00
C-O-C number	: ----	Date Analysis Commenced	: 09-Nov-2015
Sampler	: JACOB COOPER	Issue Date	: 13-Nov-2015 14:55
Site	: ----		
		No. of samples received	: 51
Quote number	: ----	No. of samples analysed	: 51

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics

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.

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW1_1	SW1_2	SW1_3	SW2_1	SW2_2
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-001	EW1512474-002	EW1512474-003	EW1512474-004	EW1512474-005
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**8**	<5	**6**	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW2_3	SW3_1	SW3_2	SW3_3	SW4_1
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512474-006**	**EW1512474-007**	**EW1512474-008**	**EW1512474-009**	**EW1512474-010**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW4_2	SW4_3	SW5_1	SW5_2	SW5_3
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512474-011**	**EW1512474-012**	**EW1512474-013**	**EW1512474-014**	**EW1512474-015**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	**5**	**6**	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW6_1	SW6_2	SW6_3	SW7_1	SW7_2
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-016	EW1512474-017	EW1512474-018	EW1512474-019	EW1512474-020
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW7_3	SW8_1	SW8_2	SW8_3	SW9_1
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-021	EW1512474-022	EW1512474-023	EW1512474-024	EW1512474-025
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**11**	<5	**6**	**5**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW9_2	SW9_3	SW10_1	SW10_2	SW10_3
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-026	EW1512474-027	EW1512474-028	EW1512474-029	EW1512474-030
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW12_1	SW12_2	SW12_3	SW13_1	SW13_2
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-031	EW1512474-032	EW1512474-033	EW1512474-034	EW1512474-035
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**8**	**9**	<5	**6**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW13_3	SW15_1	SW15_2	SW15_3	SW16_1
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1512474-036**	**EW1512474-037**	**EW1512474-038**	**EW1512474-039**	**EW1512474-040**
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**6**	**11**	**14**	**8**	**7**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW16_2	SW16_3	SW17_1	SW17_2	SW17_3
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-041	EW1512474-042	EW1512474-043	EW1512474-044	EW1512474-045
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	**10**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW2_3_1	SW2_1_1	SW2_2_1	SW3_1_1	SW3_3_1
			Client sampling date / time	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]	[04-Nov-2015]
Compound	CAS Number	LOR	Unit	EW1512474-046	EW1512474-047	EW1512474-048	EW1512474-049	EW1512474-050
				Result	Result	Result	Result	Result
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**SW3_2_1**	**----**	**----**	**----**	**----**
				Client sampling date / time	[04-Nov-2015]	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EW1512474-051**	**--------**	**--------**	**--------**	**--------**
					Result	Result	Result	Result	Result
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		<5	**----**	**----**	**----**	**----**

Attachment D: Field Photos

Attachment D: Field Photos

SW01 – Broughton Creek U/S of works

SW02 – Broughton Creek, first site downstream of works

SW03 – Broughton Creek, second site downstream of works

SW05 – Broughton Creek, third and final site downstream of works

SW04 – Broughton Mill Creek, Upstream of works

SW07 – Broughton Mill Creek, downstream of works

SW08 – Bundewallah Creek, Upstream of works

SW06 – Bundewallah Creek, Downstream of works

SW10 – Town Creek, upstream of works

SW12 – Hitchcocks lane creek tributary, upstream of works

SW13 – Hitchcocks lane creek tributary, downstream of works

SW14 – Hitchcocks lane creek, upstream of works

SW16 – Unnamed tributary, upstream of works

SW17 – Unnamed tributary, downstream of works

Surface Water Monitoring

Construction Event 12

Monitoring event after more than 15mm of rain in twenty four hours

Date of Monitoring: 17 December 2015

Rainfall received: 29.8mm

Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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 are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for the schedule of minor suite analysis of:

- Turbidity.

- Total suspended solids.

Weather Monitoring

The project has three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa,

During the construction phase, minor events are classified as at least 15 mm of rainfall in the past 24 hours and major events are classified as at least 50 mm of rainfall in the past 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,
- Attachment D, Laboratory results,
- Attachment E, Field photographs.

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

Surface water	**Upstream of Alignment**	**Downstream of Alignment (test**
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

Results summary

This rainfall event was triggered after 25mm of rain was recorded at the Woodhill Mountain road weather station. The general weather conditions for the month and the month preceding were lower than average rainfall volumes. The total amount of rainfall recorded for the event was 29.8mm.

The project sediment basins did not overtop as a result of the event. The results did not indicate impacts from construction but one site did have a higher reading downstream compared to upstream.

The results from each waterway are shown below:

Broughton Creek Showed no impacts from construction

Connelly's Creek and Broughton Mill Creek and Bundewallah Creek Showed no impacts from construction

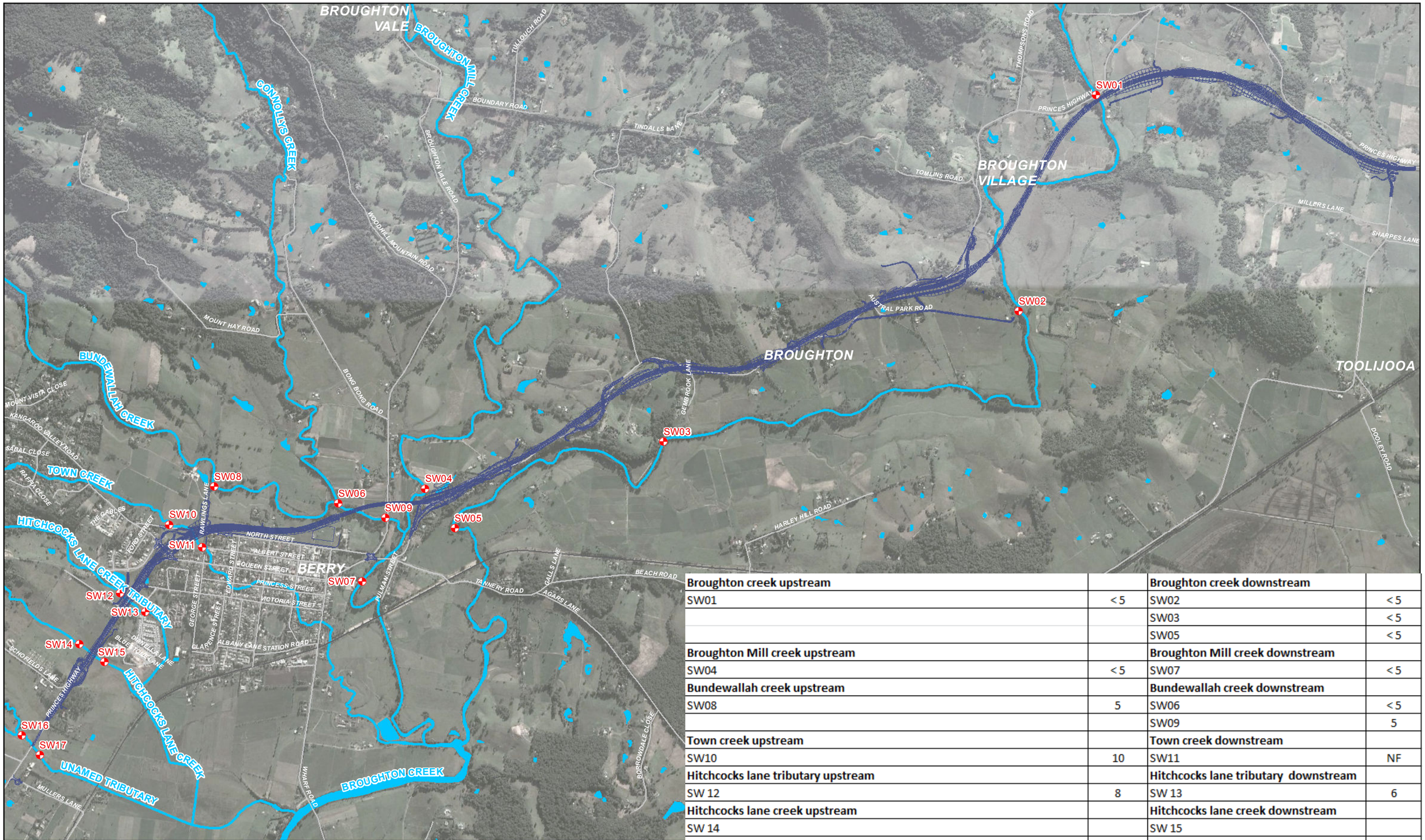
Town Creek Showed no impacts from construction

Hitchcocks Lane Creek Tributary Showed no impacts from construction

Hitchcocks Lane Creek Showed no impacts from construction

Unnamed Tributary this creek recorded an elevated reading of approximately 10mg/L from upstream to downstream. Site photos show the water to be the same colour and appearance. Turbidity readings were 5.9 NTU upstream and 6.1 NTU downstream. The elevated results are considered inconclusive.

Attachment A: Location Map



Broughton creek upstream		**Broughton creek downstream**	
SW01	< 5	SW02	< 5
		SW03	< 5
		SW05	< 5
Broughton Mill creek upstream		**Broughton Mill creek downstream**	
SW04	< 5	SW07	< 5
Bundewallah creek upstream		**Bundewallah creek downstream**	
SW08	5	SW06	< 5
		SW09	5
Town creek upstream		**Town creek downstream**	
SW10	10	SW11	NF
Hitchcocks lane tributary upstream		**Hitchcocks lane tributary downstream**	
SW 12	8	SW 13	6
Hitchcocks lane creek upstream		**Hitchcocks lane creek downstream**	
SW 14		SW 15	
Unnamed creek		**Unnamed creek**	
SW16	< 5	SW17	14
SW 16 - NTU	5.9	SW17 - NTU	6.1

The second sample taken at each site is represented in the above table

* NF indicates no flow

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

\\ghdnet\ghd\AU\Sydney\Projects\21\24306\GIS\Maps\MXD\21_24306_Z001_SurfaceWatersamplingLocations.mxd

Data Source: NSW Department of Lands: DTDB and DCDB - 2012. Created by: mweber

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results

U-50PC DataFile	Version	1	16						
No.	SITE	Date	Time	Temperature (°C)	pH	ORP (mV)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
SW1	WQ-17122015	17/12/2015	8:45	15.59	6.62	214	0.131	0	7.25
SW2	WQ-17122015	17/12/2015	9:05	15.89	6.4	259	0.135	0	7.06
SW3	WQ-17122015	17/12/2015	9:20	14:09	6.43	217	0.146	0	6.05
SW4	WQ-17122015	17/12/2015	10:15	16.79	6.35	243	0.129	12.7	5.82
SW5	WQ-17122015	17/12/2015	9:40	16.37	6.7	174	0.187	0	4.2
SW6	WQ-17122015	17/12/2015	10:45	16.6	6.43	189	0.163	0	6.55
SW7	WQ-17122015	17/12/2015	10:55	15.82	6.4	230	0.148	7.9	2.1
SW8	WQ-17122015	17/12/2015	11:25	17.54	6.64	124	0.147	3.2	5.6
SW9	WQ-17122015	17/12/2015	10:30	15.67	6.18	168	0.164	0	6.65
SW10	WQ-17122015	17/12/2015	11:45	21.7	7.12	166	0.306	16	6.83
SW11	WQ-17122015	17/12/2015	Water level to low to test						
SW12	WQ-17122015	17/12/2015	12:55	17.31	6.7	149	0.273	25.1	4.53
SW13	WQ-17122015	17/12/2015	11:55	18.49	7.68	127	0.433	43.5	7.14
SW14	WQ-17122015	17/12/2015	Water level to low to test						
SW15	WQ-17122015	17/12/2015	Water level to low to test						
SW16	WQ-17122015	17/12/2015	12:25	21.02	6.86	134	0.182	3.5	5.03
SW17	WQ-17122015	17/12/2015	12:15	16.5	7.05	178	0.365	28	2.76

Attachment C: Field Sheets

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW1

DATE: 17 December 2015 TIME: 8:45

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Shallow wide section of creek, rock bottom

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light w winds

VEGETATION: ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.59 NTU: 0.0

CONDUCTIVITY (uS/cm): 131

pH: 6.62

DO (mg/L & %): 7.25 mg/L

REDOX (mV): 214

FLOW OBSERVATIONS

FLOW: low/medium

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW1	1	Esky. ~~Ice~~ Ice	N/A	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW2

DATE: 17 December 2015 TIME: 9:05

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Medium size pool after weir

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: Ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.89 NTU: 0.0

CONDUCTIVITY (uS/cm): 135

pH: 6.4

DO (mg/L & %): 7.06 mg/L

REDOX (mV): 259

FLOW OBSERVATIONS

FLOW: low/med

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW2	1	Sky+Ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW3

DATE: 17 December 2015 TIME: 9:20

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Small rapid on elbow of creek

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 16.59 NTU: 0.0

CONDUCTIVITY (uS/cm): 146

pH: 6.43

DO (mg/L & %): 6.05

REDOX (mV): 217

FLOW OBSERVATIONS

FLOW: medium

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW3	1	Esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW4

DATE: 17 December 2015 TIME: 10:15

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: ETboW bk small constriction

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: Ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 16.79 NTU: 12.7

CONDUCTIVITY (uS/cm): 129

pH: 6.55

DO (mg/L & %): 5.82

REDOX (mV): 243

FLOW OBSERVATIONS

FLOW: slow/med

COLOUR: very slight tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW4	2	esky+ice	Y	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 5

DATE: 17 December 2015 TIME: 9:40

SAMPLING OFFICERS: JC JO

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Wide deep channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny

VEGETATION: ripirian

SLOPE: gentle

EROSION: Minor bank erosion

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 16.37 NTU: 0.0

CONDUCTIVITY (uS/cm): ~~1~~ 1870

pH: 6.7

DO (mg/L & %): 4.2

REDOX (mV): 174

FLOW OBSERVATIONS

FLOW: low

COLOUR: tannin very slight

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW5	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW9

DATE: 17 December 2015 TIME: 10:30

SAMPLING OFFICERS: JK JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: 5th of WHMR bridge constricted channe

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light NE winds

VEGETATION: ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.67 NTU: 0.0

CONDUCTIVITY (uS/cm): 164

pH: 6.18

DO (mg/L & %): 6.65

REDOX (mV): 168

FLOW OBSERVATIONS

FLOW: low/med

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW9	1	esky+ice	N	

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW7

DATE: 17 December 2015 TIME: 10:55

SAMPLING OFFICERS:

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION:

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light NE wind

VEGETATION: Ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.82 NTU: 7.9

CONDUCTIVITY (uS/cm): 148

pH: 6.4

DO (mg/L & %): 2.10

REDOX (mV): 230

FLOW OBSERVATIONS

FLOW: low

COLOUR: ~~tannin~~ turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW7	1	eskeyrice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW6

DATE: 17 December 2015 TIME: 10:45

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: wide shallow channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light NE winds

VEGETATION: ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 16.6 NTU: 0.0

CONDUCTIVITY (uS/cm): 163

pH: 6.43

DO (mg/L & %): 6.55

REDOX (mV): 189

FLOW OBSERVATIONS

FLOW: low

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW6	1	esky ice	N	bugs observed in sample

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW10

DATE: 17 December 2015 TIME: 11:45

SAMPLING OFFICERS: JC JO

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: TC Retention pond

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light NE winds

VEGETATION: agricultural

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 21.7 NTU: 16.0

CONDUCTIVITY (uS/cm): 306

pH: 7.12

DO (mg/L & %): 6.83

REDOX (mV): 166

FLOW OBSERVATIONS

FLOW: very low

COLOUR: tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW10	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW8

DATE: 17 December 2015 TIME: 11:25

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: confluence point bundewallah, TC

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny light NE wind

VEGETATION: Ripirian

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 17.54 NTU: 3.2

CONDUCTIVITY (uS/cm): 147

pH: 6.64

DO (mg/L & %): 5.60

REDOX (mV): 124

FLOW OBSERVATIONS

FLOW: low

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW8	1	esky + ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 12

DATE: 17 December 2015 TIME: 12:55

SAMPLING OFFICERS: JC JO

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: drain from agricultural land

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny NE wind

VEGETATION: agricultural

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 17.31 Nth: 25.1

CONDUCTIVITY (uS/cm): 273

pH: 6.7

DO (mg/L & %): 4.53

REDOX (mV): 149

FLOW OBSERVATIONS

FLOW: very low

COLOUR: clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW13

DATE: 17 December 2015 TIME: 11:55

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Small drainage channel near arbor bridge

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny NE wind

VEGETATION: Parkland

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 18.49 NTU: 43.5

CONDUCTIVITY (uS/cm): 433

pH: 7.68

DO (mg/L & %): 7.14 mg/L

REDOX (mV): 127

FLOW OBSERVATIONS

FLOW: med

COLOUR: turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW13	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW16

DATE: 17 December 2015 TIME: 12:25

SAMPLING OFFICERS: JC JD

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: small drainage channel through farmers paddock

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny NE wind

VEGETATION: farmers paddock agricultural

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 21.02 NTU: 3.5

CONDUCTIVITY (uS/cm): 182

pH: 8.86

DO (mg/L & %): ~~8.3~~ 5.03

REDOX (mV): 134

FLOW OBSERVATIONS

FLOW: Low

COLOUR: dark/heavy tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW16	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW17

DATE: 17 December 2015 TIME: 12:15

SAMPLING OFFICERS: JC JO

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Deep drainage channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny NE5 wind

VEGETATION: Agricultural

SLOPE: gentle

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 16.5 NTU: 28

CONDUCTIVITY (uS/cm): 365

pH: 7.05

DO (mg/L & %): 2.76

REDOX (mV): 178

FLOW OBSERVATIONS

FLOW: low/med

COLOUR: dark tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW17	1	esky ice	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1513060**	Page	: 1 of 5
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR JAMES DIAMOND	Contact	: Aneta Prosaroski
Address	: LEVELI 3 - 90 BOURKE ROAD ALEXANDRIA NSW, AUSTRALIA 2015	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
E-mail	: james.diamond@fultonhogan.com.au	E-mail	: aneta.prosaroski@alsglobal.com
Telephone	: +61 02 8346 9400	Telephone	: 02 4225 3125
Facsimile	: +61 02 8346 9444	Facsimile	: W 02 42253128 N 02 44232083
Project	: Foxground and Berry Bypass	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: ----	Date Samples Received	: 17-Dec-2015 16:35
C-O-C number	: ----	Date Analysis Commenced	: 18-Dec-2015
Sampler	: JAMES DIAMOND	Issue Date	: 25-Dec-2015 11:04
Site	: ----		
		No. of samples received	: 15
Quote number	: ----	No. of samples analysed	: 15

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
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.

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW1**	**SW2**	**SW3**	**SW4_A**	**SW4_B**
			Client sampling date / time	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1513060-001**	**EW1513060-002**	**EW1513060-003**	**EW1513060-004**	**EW1513060-005**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	**0.8**	**2.0**	**1.0**	**3.4**	**3.3**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW5	SW6	SW7	SW8	SW9
			Client sampling date / time	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]
Compound	CAS Number	LOR	Unit	EW1513060-006	EW1513060-007	EW1513060-008	EW1513060-009	EW1513060-010
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**5**	**5**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**2.0**	**2.1**	**8.2**	**3.9**	**3.8**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**W10**	**SW12**	**SW13**	**SW16**	**SW17**
			Client sampling date / time	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]	[17-Dec-2015]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1513060-011**	**EW1513060-012**	**EW1513060-013**	**EW1513060-014**	**EW1513060-015**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**10**	**8**	**6**	<5	**14**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**13.9**	**22.2**	**28.5**	**5.9**	**6.1**

Attachment D: Field Photos

Attachment D: Field Photos

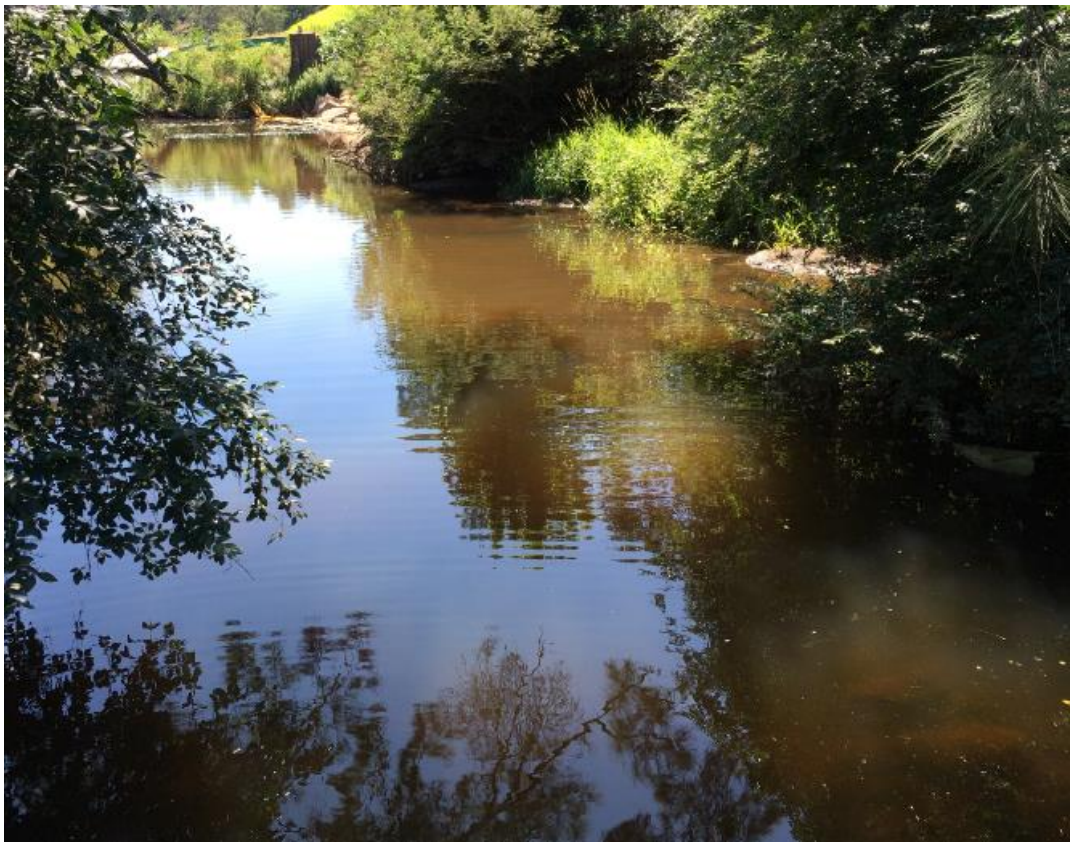
SW01 – Broughton Creek U/S of works

SW02 – Broughton Creek, first site downstream of works

SW03 – Broughton Creek, second site downstream of works

SW05 – Broughton Creek, third and final site downstream of works

SW04 – Broughton Mill Creek, Upstream of works



SW07 – Broughton Mill Creek, downstream of works

SW08 – Bundewallah Creek, Upstream of works

SW06 – Bundewallah Creek, Downstream of works

SW09 – Bundewallah Creek, Downstream of works

SW10 – Town Creek, upstream of works

SW12 – Hitchcocks lane creek tributary, upstream of works

SW13 – Hitchcocks lane creek tributary, downstream of works

SW14 – Hitchcocks lane creek, upstream of works

SW15 – Unnamed tributary, downstream of works

SW16 – Unnamed tributary, upstream of works

SW17 – Unnamed tributary, downstream of works

Surface Water Monitoring

Construction Event 13

Monitoring event after more than 15mm of rain in twenty four hours, the rainfall event whilst significant did not trigger the full suite of monitoring analytes that would be required if 50mm within 24hours had of been received.

Date:	Rainfall Received:
4 Jan 2016	15.2mm
5 Jan 2016	37.8mm
6 Jan 2016	24.2mm
7 Jan 2016	28mm

Date of Monitoring: 7 Jan 2016

Rainfall received: 105.2mm

Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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 are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for the schedule of minor suite analysis of:

- Total suspended solids.

Weather Monitoring

The project has three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa,

During the construction phase, minor events are classified as at least 15 mm of rainfall in the past 24 hours and major events are classified as at least 50 mm of rainfall in the past 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,
- Attachment D, Laboratory results,
- Attachment E, Field photographs.

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

Surface water	Upstream of Alignment	Downstream of Alignment (test
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

Results summary

This was the most significant rainfall event for the local environment in recent months. Rainfall was still occurring during sampling and a total of more than 100mm was received. The project self-reported to the EPA for a rainfall event exceeding the sediment basin design criteria of 48.2mm. Sediment basins were observed to be overtopping at the spillway into the receiving environment.

Water quality monitoring was completed at all locations and generally didn't show impacts from construction.

Broughton Creek – SW05 was elevated compared to the upstream site. This site sits at the bottom of the catchment 8km from the upstream sampling point. There are several creeks that flow into the Broughton creek throughout this 8km. The elevation when considering the wider environment and inflows was minor, the colour of the water was not indicative of construction runoff. The elevated TSS result is not considered conclusive - it could be from elevated stream flow and turbulence in the water column, construction runoff or construction from the wider environment.

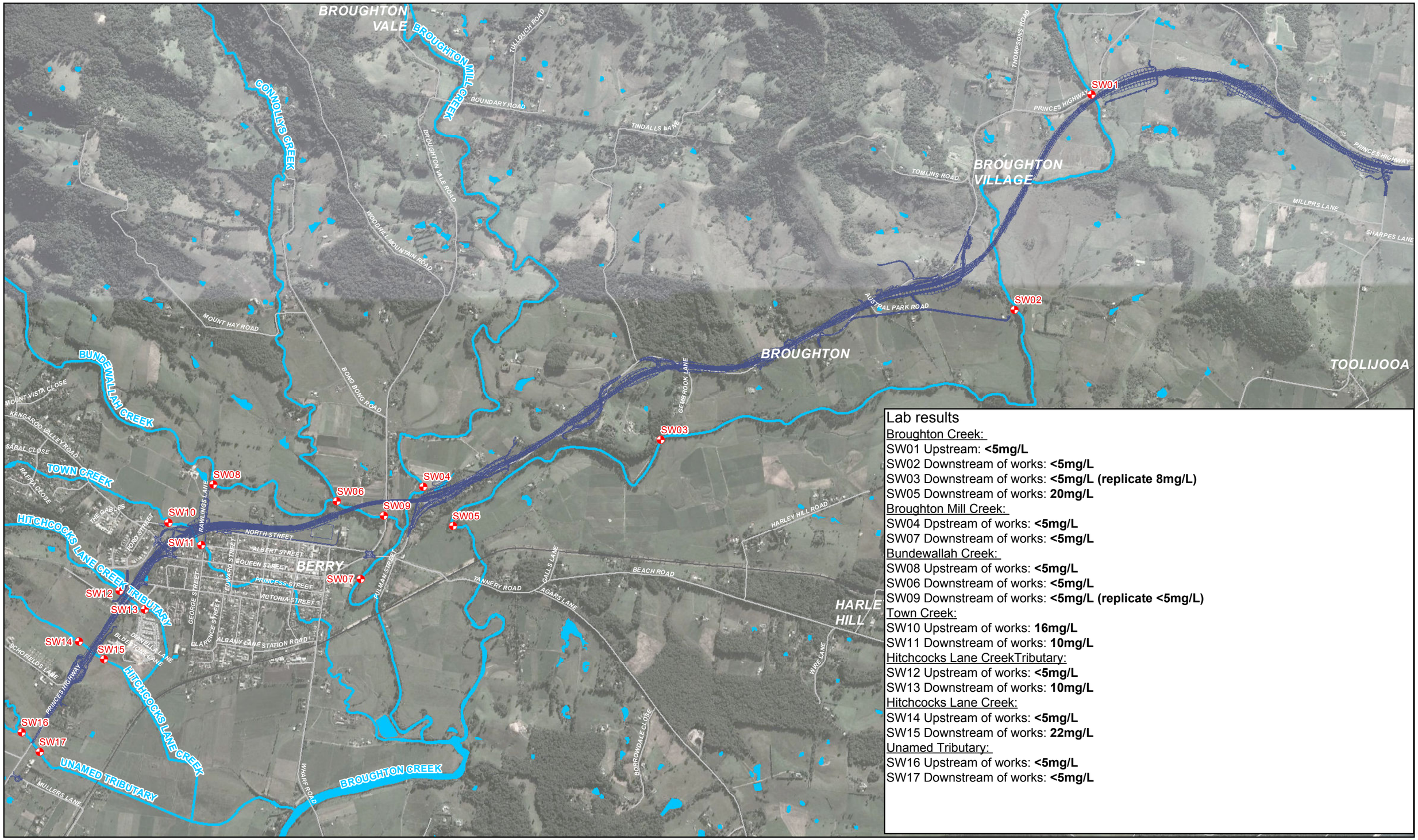
Connelly's Creek, Broughton Creek and Bundewallah Creek – Showed no impacts from construction.

Town creek – Showed no impacts from construction

Hitchcocks Lane Creek – Showed an elevated sample downstream which may be a result of construction water overtopping a site sediment basin after 48.2mm of rainfall.

Unnamed creek – Showed no impacts from construction

Attachment A: Location Map



Lab results

Broughton Creek:

SW01 Upstream: **<5mg/L**

SW02 Downstream of works: **<5mg/L**

SW03 Downstream of works: **<5mg/L (replicate 8mg/L)**

SW05 Downstream of works: **20mg/L**

Broughton Mill Creek:

SW04 Dpstream of works: **<5mg/L**

SW07 Downstream of works: **<5mg/L**

Bundewallah Creek:

SW08 Upstream of works: **<5mg/L**

SW06 Downstream of works: **<5mg/L**

SW09 Downstream of works: **<5mg/L (replicate <5mg/L)**

Town Creek:

SW10 Upstream of works: **16mg/L**

SW11 Downstream of works: **10mg/L**

Hitchcocks Lane CreekTributary:

SW12 Upstream of works: **<5mg/L**

SW13 Downstream of works: **10mg/L**

Hitchcocks Lane Creek:

SW14 Upstream of works: **<5mg/L**

SW15 Downstream of works: **22mg/L**

Unamed Tributary:

SW16 Upstream of works: **<5mg/L**

SW17 Downstream of works: **<5mg/L**

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Surface water monitoring Event: 12

Date: 7 January 2016

Fulton Hogan Pty Ltd
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results

U-50PC DataFile	Version	1	16						
No.	SITE	Date	Time	Temperature (°C)	pH	ORP (mV)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
SW1	WQ-07012016	7/01/2016	10:40	13.03	6.6	303	0.109	8.4	10
SW2	WQ-07012017	7/01/2016	11:00	13.41	6.55	339	0.119	10.8	7.54
SW3	WQ-07012018	7/01/2016	11:30	12:28	6.53	329	0.13	9.7	7.6
SW4	WQ-07012019	7/01/2016	12:10	13.45	6.38	331	0.109	11.3	8.56
SW5	WQ-07012020	7/01/2016	11:50	13.32	6	368	0.139	15.4	7
SW6	WQ-07012021	7/01/2016	12:30	13.15	6.37	328	0.152	15	7.7
SW7	WQ-07012022	7/01/2016	12:50	13.46	6.13	342	0.13	14.8	5.26
SW8	WQ-07012023	7/01/2016	14:45	14.2	6.88	277	0.138	12.3	8.8
SW9	WQ-07012024	7/01/2016	12:20	13.85	6.22	321	0.152	17.4	8.2
SW10	WQ-07012025	7/01/2016	14:30	15.73	6.68	300	0.186	9.6	4.66
SW11	WQ-07012026	7/01/2016	14:20	15.75	6.84	179	0.274	70.4	2.3
SW12	WQ-07012027	7/01/2016	15:30	15.44	6.92	279	0.317	47.1	8.4
SW13	WQ-07012028	7/01/2016	13:30	15.5	7.27	260	0.355	64	6.37
SW14	WQ-07012029	7/01/2016	15:10	15.64	6.06	342	0.235	26.2	4.01
SW15	WQ-07012030	7/01/2016	13:15	15.92	6.81	271	0.293	70	4.5
SW16	WQ-07012031	7/01/2016	14:55	15.14	6.72	237	0.19	21.3	7.8
SW17	WQ-07012032	7/01/2016	16:30	4:48	6.68	271	0.214	13.7	8.6

Attachment C: Field Sheets

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 1

DATE: 7/1/16 TIME: 10.40

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Constructed flow after widening from current Hwy alignment

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds Showers

VEGETATION: Riparian

SLOPE: Gentle

EROSION: Minimal

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.03

CONDUCTIVITY (uS/cm): 109

pH: 6.6

DO (mg/L & %): 10

REDOX (mV): 303

TURBIDITY (NTU): ~~0~~ 8.4

FLOW OBSERVATIONS

FLOW: Moderate/High

COLOUR: Mild Tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW1	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 2

DATE: 7/1/16 TIME: 11am

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Eastern side at weir / Northrapid

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Ripinian

SLOPE: Central

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.41

CONDUCTIVITY (uS/cm): 119

pH: 6.55

DO (mg/L & %): 7.54

REDOX (mV): ~~239~~ 339

TURBIDITY (NTU): 10.8

FLOW OBSERVATIONS

FLOW: moderate / High

COLOUR: mild tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW2	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 3

DATE: 7/1/16 TIME: 11 30am

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Elbow at creek / Rapid

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Pipinian

SLOPE: Gental

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.52

CONDUCTIVITY (uS/cm): 130

pH: 6.53

DO (mg/L & %): 7.60

REDOX (mV): 329

TURBIDITY (NTU): 9.7

FLOW OBSERVATIONS

FLOW: moderate to high

COLOUR: mild tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW3	2	ESKY & ICE	Yes	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 4

DATE: 7/1/16 TIME: 12.10pm

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Narrowed elbow

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds shower?

VEGETATION: Pipicium

SLOPE: ~~moderate~~ Central

EROSION: Low/moderate

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.45

CONDUCTIVITY (uS/cm): 106

pH: 6.38

DO (mg/L & %): 8.56

REDOX (mV): 331

TURBIDITY (NTU): 11.3

FLOW OBSERVATIONS

FLOW: moderate

COLOUR: Tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW 4	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 5

DATE: 7/1/16 TIME: 1150

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Open wide deep channel

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Riparian

SLOPE: ~~Steep~~ Central

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.32

CONDUCTIVITY (uS/cm): 134

pH: 6.0

DO (mg/L & %): 7

REDOX (mV): 368

TURBIDITY (NTU): 15.4

FLOW OBSERVATIONS

FLOW: Slow

COLOUR: Turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW5	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 6

DATE: 7/1/16 TIME: 1230

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Widened creek before neck

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Riparian

SLOPE: Central

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.15

CONDUCTIVITY (uS/cm): 152

pH: 6.37

DO (mg/L & %): ~~328~~ 7.7

REDOX (mV): 328

TURBIDITY (NTU): 15

FLOW OBSERVATIONS

FLOW: Moderate

COLOUR: Turbid Slightly

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW6	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 7

DATE: 7/1/16 TIME: 1250

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Wide loop section

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: riparian

SLOPE: Central

EROSION: ~~Nil~~ Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.46

CONDUCTIVITY (uS/cm): 130

pH: 6.13

DO (mg/L & %): 5.26

REDOX (mV): 342

TURBIDITY (NTU): 14.8

FLOW OBSERVATIONS

FLOW:

COLOUR:

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW7	2	ESKY & ICE	Yes	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 8

DATE: 7/1/16 TIME: 245

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Creek elbow / Confluence point TC's & B/walls

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Riparian

SLOPE: Central

EROSION: nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 14.2

CONDUCTIVITY (uS/cm): 138

pH: 6.88

DO (mg/L & %): 9.8

REDOX (mV): 277

TURBIDITY (NTU): 12.3

FLOW OBSERVATIONS

FLOW: Moderate / low

COLOUR: Mildly turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW8	1	ESKY & ICE		

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 9

DATE: 7/1/16 TIME: 1220

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Restricted waterway / Bottle neck

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds

VEGETATION: Ripirian

SLOPE: ~~Steep~~ moderate

EROSION: none

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 13.85

CONDUCTIVITY (uS/cm): 152

pH: 6.22

DO (mg/L & %): 8.82

REDOX (mV): 321

TURBIDITY (NTU): 17.4

FLOW OBSERVATIONS

FLOW: Moderate

COLOUR: Turbid Slightly

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW 9	1	ESKY & ICE		

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 10

DATE: 7/1/16 TIME: 230

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Narrow Drain

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Agricultural grassland

SLOPE: Gentle / Moderate

EROSION: Minimal

OTHER: Kid playing in creek water upstream at sample area

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.73

CONDUCTIVITY (uS/cm): 186

pH: 6.68

DO (mg/L & %): 4.66

REDOX (mV): 300

TURBIDITY (NTU): 9.6

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear / Slight Turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW10	1	ESKY & ICE		

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 11

DATE: 7/1/16 TIME: 2.20

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Narrow Drain Line

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Riparian / Maintained Grass

SLOPE: Gentle Slope

EROSION: Minor

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.75

CONDUCTIVITY (uS/cm): 274

pH: 6.84

DO (mg/L & %): 2.3

REDOX (mV): 179

TURBIDITY (NTU): 70.4

FLOW OBSERVATIONS

FLOW: Low

COLOUR: turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW11	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 12

DATE: 7/1/16 TIME: 3.30

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Concentrated Neck

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Grassland

SLOPE: Gentle

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.44

CONDUCTIVITY (uS/cm): 317

pH: 6.92

DO (mg/L & %): 8.4

REDOX (mV): 279

TURBIDITY (NTU): 47.1

FLOW OBSERVATIONS

FLOW: Slow / Moderate

COLOUR: lightly turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW12	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 13

DATE: 7/1/16 TIME: 130

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Narrow concentrated flow

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Maintained Grass

SLOPE: Moderate

EROSION: Nil / Slight

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.5

CONDUCTIVITY (uS/cm): 355

pH: 7.27

DO (mg/L & %): 6.37

REDOX (mV): 260

TURBIDITY (NTU): 64

FLOW OBSERVATIONS

FLOW: Moderate

COLOUR: slightly turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW13	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 14

DATE: 7/1/16 TIME: 310

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: slow Grassed drain

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION: Agricultural Grassland

SLOPE: Central

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.64

CONDUCTIVITY (uS/cm): 235

pH: 6.06

DO (mg/L & %): 4.01

REDOX (mV): 342

TURBIDITY (NTU): 26.2

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Slight turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW14	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 15

DATE: 7/1/16 TIME: 115

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Vegetated agricultural land

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds showers

VEGETATION:

SLOPE: Gentle

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.92

CONDUCTIVITY (uS/cm): 293

pH: 6.87

DO (mg/L & %): 4.3

REDOX (mV): 271

TURBIDITY (NTU): 70

FLOW OBSERVATIONS

FLOW: Minimal

COLOUR: Turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW15		ESKY & ICE		

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 16

DATE: 7/1/16 TIME: 2.55

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Drain/creek 100 after rapid

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds Showers

VEGETATION: Agricultural Grassland

SLOPE: Moderate

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15.14

CONDUCTIVITY (uS/cm): 190

pH: 6.72

DO (mg/L & %): 7.8

REDOX (mV): 237

TURBIDITY (NTU): 21.3

FLOW OBSERVATIONS

FLOW: Moderate

COLOUR: Lightly turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW16	1	ESKY & ICE		

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 17

DATE: 7/1/16 TIME: ~~2:55~~ 4:30

SAMPLING OFFICERS: JC

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Narrow creek very deep channel sample after rapid

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast, cloud breaking up with mod SSW winds

VEGETATION: Agricultural grassland

SLOPE: Mod

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): 15·20

CONDUCTIVITY (uS/cm): 214

pH: 6·68

DO (mg/L & %): 8·6

REDOX (mV): 271

TURBIDITY (NTU): 13·7

FLOW OBSERVATIONS

FLOW: Mod

COLOUR: slightly turbid

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW17	1	ESKY & ICE	N	

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1600119**	Page	: 1 of 6
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR JAMES DIAMOND	Contact	: Aneta Prosaroski
Address	: LEVELI 3 - 90 BOURKE ROAD ALEXANDRIA NSW, AUSTRALIA 2015	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
E-mail	: james.diamond@fultonhogan.com.au	E-mail	: aneta.prosaroski@alsglobal.com
Telephone	: +61 02 8346 9400	Telephone	: 02 4225 3125
Facsimile	: +61 02 8346 9444	Facsimile	: W 02 42253128 N 02 44232083
Project	: Foxground and Berry Bypass	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: ----	Date Samples Received	: 08-Jan-2016 16:15
C-O-C number	: ----	Date Analysis Commenced	: 12-Jan-2016
Sampler	: ----	Issue Date	: 15-Jan-2016 14:35
Site	: ----		
		No. of samples received	: 19
Quote number	: ----	No. of samples analysed	: 19

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Senior 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.

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.

- NATA accreditation is not held for results reported in µg/m³.
- This report has been amended as a result of a request to change sample identification numbers (IDs) received by ALS from Fiona Robinson on 09/07/2015. All analysis results are as per the previous report.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW1**	**SW2**	**SW3_A**	**SW3_B**	**SW4**
			Client sampling date / time	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1600119-001**	**EW1600119-002**	**EW1600119-003**	**EW1600119-004**	**EW1600119-005**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**8**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW5**	**SW6**	**SW7_A**	**SW7_B**	**SW8**
			Client sampling date / time	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1600119-006**	**EW1600119-007**	**EW1600119-008**	**EW1600119-009**	**EW1600119-010**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**20**	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW9**	**SW10**	**SW11**	**SW12**	**SW13**
			Client sampling date / time	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1600119-011**	**EW1600119-012**	**EW1600119-013**	**EW1600119-014**	**EW1600119-015**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**16**	**10**	<5	**10**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW14**	**SW15**	**SW16**	**SW17**	**----**
			Client sampling date / time	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	[07-Jan-2016]	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW1600119-016**	**EW1600119-017**	**EW1600119-018**	**EW1600119-019**	**--------**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**22**	<5	<5	**----**

Attachment D: Field Photos

Attachment D: Field Photos

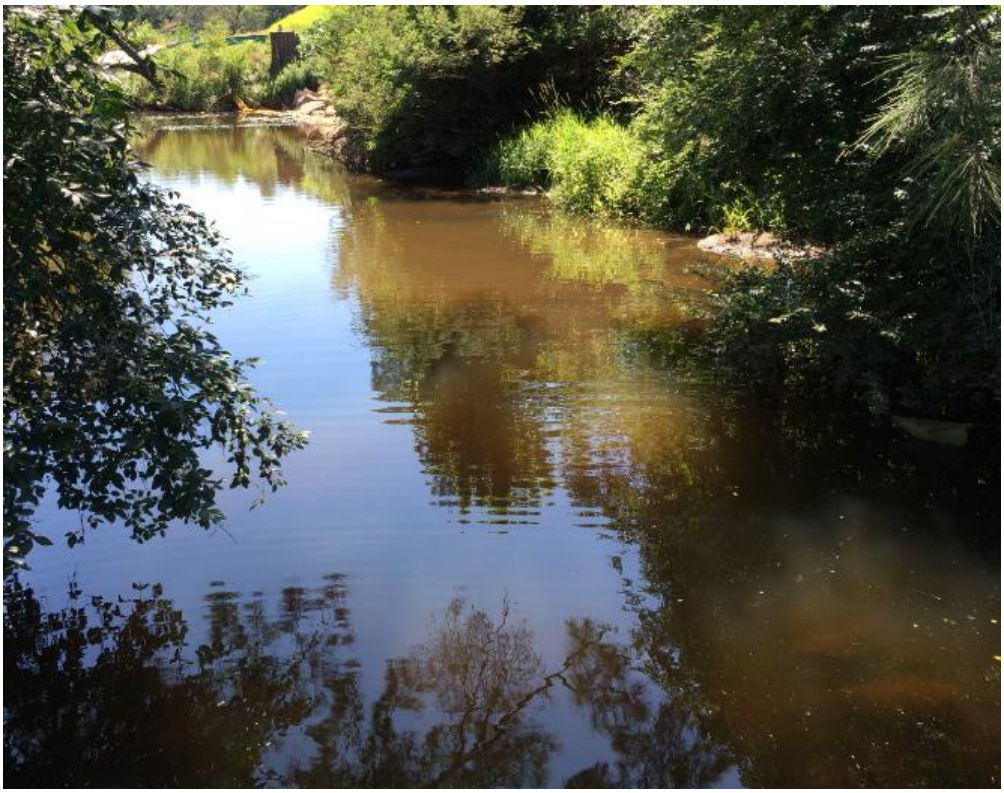
SW01 – Broughton Creek U/S of works

SW02 – Broughton Creek, first site downstream of works

SW03 – Broughton Creek, second site downstream of works

SW05 – Broughton Creek, third and final site downstream of works

SW04 – Broughton Mill Creek, Upstream of works



SW07 – Broughton Mill Creek, downstream of works

SW08 – Bundewallah Creek, Upstream of works – No Photo

SW06 – Bundewallah Creek, Downstream of works

SW09 – Bundewallah Creek, Downstream of works

SW10 – Town Creek, upstream of works

SW11 – Town Creek, downstream of works

SW12 – Hitchcocks lane creek tributary, upstream of works – No Photo

SW13 – Hitchcocks lane creek tributary, downstream of works

SW14 – Hitchcocks lane creek, upstream of works

SW15 – Unnamed tributary, downstream of works

SW16 – Unnamed tributary, upstream of works

SW17 – Unnamed tributary, downstream of works – No Photo

Surface Water Monitoring

Construction Event 14

Monitoring event after triggered after more than 15mm of rain was recorded in twenty four hours.

Date:	Rainfall Received:
30 Jan 2016	13.8mm
31 Jan 2016	1.6mm
1 Feb 2016	0mm
2 Feb 2016	16mm

Date of Monitoring: 3 Feb 2016

Rainfall received: 16mm (continuing rainfall total of 31.4mm between 30/01 – 2/02)

Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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 are provided in Attachment C.

Water samples were submitted to a NATA certified testing laboratory (Australian Laboratory services (ALS)) to be analysed for the schedule of minor suite analysis of:

- Turbidity.
- Total suspended solids.

Weather Monitoring

The project has three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa,

During the construction phase, minor events are classified as at least 15 mm of rainfall in the past 24 hours and major events are classified as at least 50 mm of rainfall in the past 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,
- Attachment D, Laboratory results,
- Attachment E, Field photographs.

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

Surface water	Upstream of Alignment	Downstream of Alignment (test
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

Results summary

Monitoring was completed after 16mm of rainfall was recorded in less than 24 hours. Water quality monitoring was completed at all locations and didn't show impacts from construction.

Broughton Creek: Showed no impacts from construction

Connelly's Creek and Broughton Mill Creek and Bundewallah Creek: Showed no impacts from construction

Bundewallah Creek and Connelly's Creek: Showed no impacts from construction

Town Creek: Showed no impacts from construction, creek has been diverted and downstream site was not flowing.

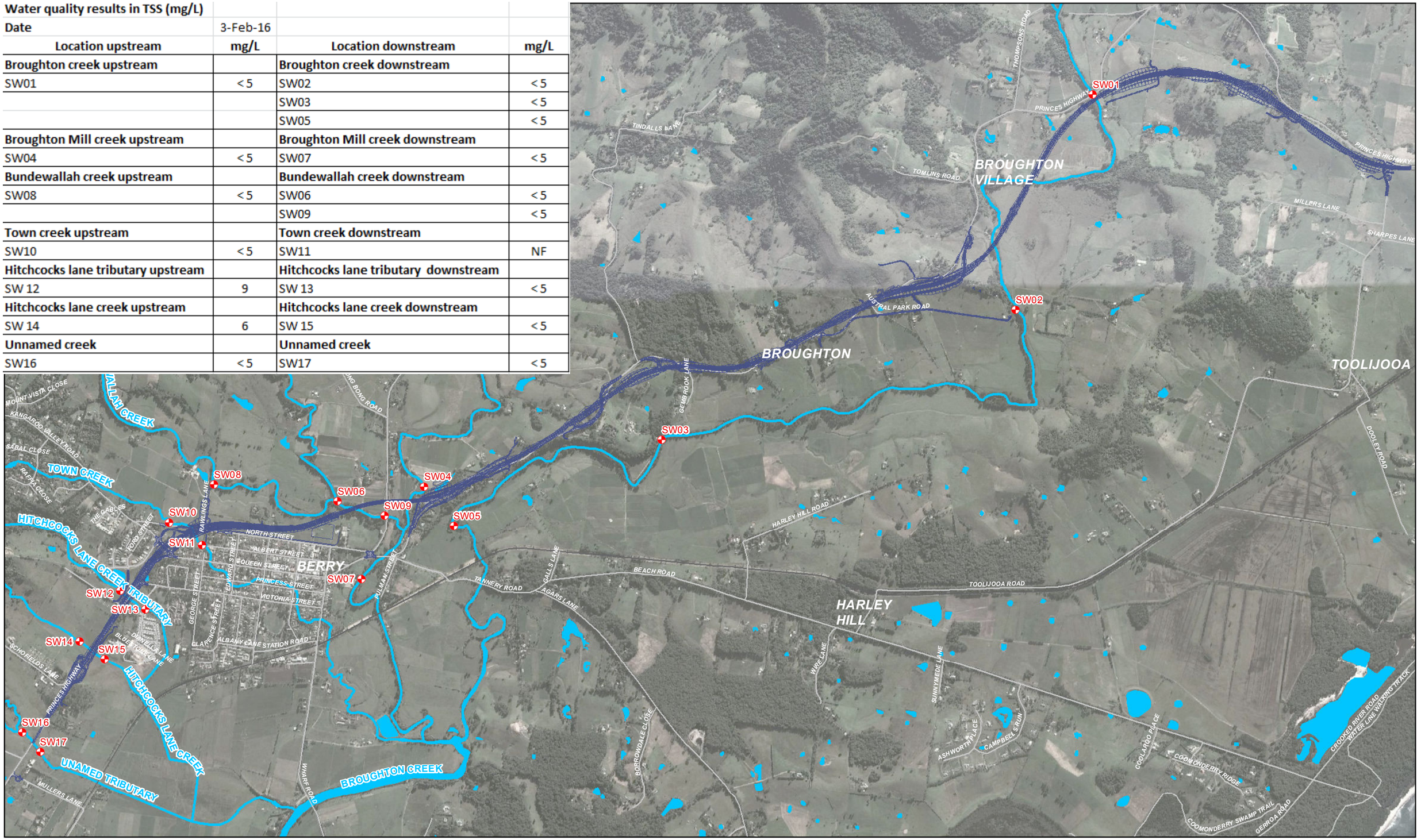
Hitchcocks Lane Creek Tributary: Showed no impacts from construction, the upstream site was observed to have a higher mg/L reading than the downstream site.

Hitchcocks Lane Creek: Showed no impacts from construction, the upstream site was observed to have a higher mg/L reading than the downstream site.

Unnamed Tributary: Showed no impacts from construction

Attachment A: Results Map

Water quality results in TSS (mg/L)			
Date	3-Feb-16		
Location upstream	mg/L	Location downstream	mg/L
Broughton creek upstream		Broughton creek downstream	
SW01	< 5	SW02	< 5
		SW03	< 5
		SW05	< 5
Broughton Mill creek upstream		Broughton Mill creek downstream	
SW04	< 5	SW07	< 5
Bundewallah creek upstream		Bundewallah creek downstream	
SW08	< 5	SW06	< 5
		SW09	< 5
Town creek upstream		Town creek downstream	
SW10	< 5	SW11	NF
Hitchcocks lane tributary upstream		Hitchcocks lane tributary downstream	
SW 12	9	SW 13	< 5
Hitchcocks lane creek upstream		Hitchcocks lane creek downstream	
SW 14	6	SW 15	< 5
Unnamed creek		Unnamed creek	
SW16	< 5	SW17	< 5



1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Surface water monitoring Event: 16

Date: 3 Feb 2016

Fulton Hogan Pty Ltd
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results

No.	Date	Temperature (°C)	pH	ORP (mV)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	DO%	TDS (g/L)	Salinity (ppt)
SW1	3/02/2016	18.59	7.46	283	0.109	1	12.58	138.6	0.071	0.1
SW2	3/02/2016	18.67	7.07	343	0.122	0.7	11.3	124.6	0.079	0.1
SW3	3/02/2016	18.73	7.23	350	0.133	0.3	10.8	119.2	0.087	0.1
SW4	3/02/2016	15.51	6.52	382	0.105	5.1	7.56	78.3	0.068	0
SW5	3/02/2016	18.62	7.17	341	0.14	38.1	5.51	60.8	0.091	0.1
SW6	3/02/2016	15.48	6.57	386	0.139	0.2	6.95	71.9	0.09	0.1
SW7	3/02/2016	17.83	7.09	366	0.132	2.2	8.92	96.7	0.086	0.1
SW8	3/02/2016	16.49	7.41	302	0.132	1.9	10.71	113.1	0.086	0.1
SW9	3/02/2016	15.55	6.03	374	0.144	0.9	9.5	98.5	0.093	0.1
SW10	3/02/2016	19.9	7.25	329	0.19	0.3	1.05	11.8	0.124	0.1
SW11	3/02/2016	**No Flow**								
SW12	3/02/2016	18.03	6.84	293	0.329	53.7	7.95	86.7	0.214	0.2
SW13	3/02/2016	16.78	7.12	317	0.36	13.9	7.81	83.1	0.234	0.2
SW14	3/02/2016	18.52	7	339	0.223	143	4.64	51.1	0.145	0.1
SW15	3/02/2016	19.9	7.21	308	0.378	28.2	8.43	95.2	0.246	0.2
SW16	3/02/2016	16.62	7.11	319	0.168	4.3	10.18	107.8	0.109	0.1
SW17	3/02/2016	16.53	7.4	340	0.172	7.5	10.45	110.5	0.112	0.1

Attachment C: Field Sheets

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW01

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1300

SAMPLING OFFICERS: J. Leigh

SAMPLING METHOD (ie grab, bucket): GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Broughton Creek upstream of works.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear

VEGETATION: Casuarina overstorey

SLOPE: Pools & riffles.

EROSION: Nil

OTHER: —

FIELD MEASUREMENTS Electronically stored.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Slightly elevated from recent rainfall

COLOUR: Clear but with tannin colour

OTHER: —

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW02

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1315

SAMPLING OFFICERS: S. Keogh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: DC downstream of work at wier crossing

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - Hot

VEGETATION: Canopy overstory

SLOPE: Flat pooled section

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

Electronically stored.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderately elevated from recent rainfall.

COLOUR: Clear, but with tannins.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW04

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 0925

SAMPLING OFFICERS: J. Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: u/s weir Broughton Mill Creek

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear hot

VEGETATION: Lagunaria overhang, weeds on banks.

SLOPE: Slight pool & riffles.

EROSION: Various on stream banks.

OTHER:

FIELD MEASUREMENTS Electronically stored.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderate.

COLOUR: Clear

OTHER: -

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: JW05

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1330

SAMPLING OFFICERS: J Keogh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of Works Boughton Creek

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear hot

VEGETATION: Grassing overstorey

SLOPE: Pooled Reflow

EROSION: N.L

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderately elevated from recent rainfall

COLOUR: Clear w Tannins

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW06

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 0935

SAMPLING OFFICERS:

SAMPLING METHOD (ie grab, bucket): GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Confluence Connollys / Broughton Mill u/s creek

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear

VEGETATION: Aquatic weeds - Casuarina Overstorey

SLOPE: Riffles to pool

EROSION: minimal observed.

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderate - Slightly elevated

COLOUR: Opaque → Clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

SURFACE WATER SAMPLING RECORD

PROJECT NO. FBB

PROJECT NAME:

CLIENT: JWO

SITE: JW3

DATE:

TIME: 1400

SAMPLING OFFICERS: S. Keogh

COORDINATES/GPS *(If Applicable)*

SAMPLING METHOD *(ie grab, bucket)* Grab

DETAILED SAMPLE LOCATION DESCRIPTION Downstream of main Brighton Creek Downer property

ENVIRONMENTAL OBSERVATIONS

WEATHER Hot

VEGETATION Sparse Coprosma overstory

SLOPE Pool & riffle

EROSION –

OTHER

FIELD MEASUREMENTS

TEMPERATURE (°C) Electronically logged.

CONDUCTIVITY (uS/cm)

pH

DO (ppm)

REDOX (mV)

FLOW OBSERVATIONS

FLOW Slightly elevated

COLOUR Some tannins → Clear

OTHER

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW01

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1345

SAMPLING OFFICERS: S.Keogh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream work behind bowling club

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear hot

VEGETATION: Semi open canopy

SLOPE: Flat - Ponded section

EROSION: Nil

OTHER:

FIELD MEASUREMENTS Electronically recorded.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Flowing through ponded section.

COLOUR: Tanning

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW08

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1120

SAMPLING OFFICERS: J Leigh

SAMPLING METHOD (*ie grab, bucket*): GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Confluence near Town Creek @ Broughton ... U/S of works

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - warm

VEGETATION: Canopy overstorey

SLOPE: Pools and Riffles

EROSION: Bank erosion

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): Electronically faulted.

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderate flow

COLOUR: Clear.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW09

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 0900

SAMPLING OFFICERS: S Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Bundwallah Ck - D/S of works

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - Warm

VEGETATION: Aquatic weeds on bank, scattered eucalyptus overhang

SLOPE:

EROSION: On bank and where trees have fallen over.

OTHER:

FIELD MEASUREMENTS Electronically Saved.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Moderate Slightly elevated flow

COLOUR: Opaque - clear

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW10

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1105

SAMPLING OFFICERS: J Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: U/S Work Town Creek.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear -

VEGETATION: Agricultural land

SLOPE: Moderate Rolle

EROSION: -

OTHER: -

FIELD MEASUREMENTS Electronically Recd.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low flow

COLOUR: Clear - Minor tannin hue.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW12

DATE: ~~17 December 2015~~ 3 Feb 2015 TIME: 1050

SAMPLING OFFICERS: S Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: @ U/S works Hitchcocks lane tributary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear

VEGETATION: Reeds aquatic vegetation

SLOPE: Flowing out of a large dam.

EROSION: Nil observed.

OTHER:

FIELD MEASUREMENTS Electronically stored

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear. - V. Slightly turbid.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR **CHECKED** (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW13

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1000

SAMPLING OFFICERS: S Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: D/S Work Hitchcocks lane tributary.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - Warm

VEGETATION: Emerging landscaped plants

SLOPE: Moderate.

EROSION: Bank erosion.

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: ~~3 Feb 2016~~ SW14

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1030

SAMPLING OFFICERS: S. Leigh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: U/S Works, Hitchcocks Lane tributary – Disturbed upstream [illegible] channel.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear

VEGETATION: Agriculture pasture and aquatic plants.

SLOPE: Flat

EROSION: Changes to upstream flow path, cut bare earth drain

OTHER: Channel modified.

FIELD MEASUREMENTS Electronically stored.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low → Very low

COLOUR: Tannins

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW15

DATE: ~~17 December 2015~~ 3 Feb 2015 TIME: 1200

SAMPLING OFFICERS: S. Keogh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: O/S Works Hitchcocks lane Libridge.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - Hot

VEGETATION: Agricultural grasses.

SLOPE: Flat.

EROSION: N.I

OTHER: — Site sediment basin being discharged upstream of sampling point.

FIELD MEASUREMENTS

TEMPERATURE (OC): Electronically Stored.

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 16

DATE: ~~17 December 2015~~ 3 Feb 2016 TIME: 1025

SAMPLING OFFICERS: J Hegh

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: U/S wash Unnamed tributary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - warm

VEGETATION: Agricultural pasture scattered trees on bank.

SLOPE: Pools - riffles

EROSION:

OTHER:

FIELD MEASUREMENTS Recorded electronically.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear → Slightly coloured.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW17

DATE: ~~17 December 2015~~ 3 Feb 2016. TIME: 1015

SAMPLING OFFICERS: J. Leng

SAMPLING METHOD (ie grab, bucket): GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: D/S Work, Unnamed Tributary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Clear - Warm

VEGETATION: 5-10m overstorey

SLOPE: Flat

EROSION: Nil observed.

OTHER:

FIELD MEASUREMENTS Recorded Electronically.

TEMPERATURE (OC):

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

FLOW OBSERVATIONS

FLOW: Low

COLOUR: Clear → Slightly coloured

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS

FIELD SUPERVISOR

CHECKED (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1600495**	Page	: 1 of 6
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR JAMES DIAMOND	Contact	: Aneta Prosaroski
Address	: LEVELI 3 - 90 BOURKE ROAD ALEXANDRIA NSW, AUSTRALIA 2015	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
E-mail	: james.diamond@fultonhogan.com.au	E-mail	: aneta.prosaroski@alsglobal.com
Telephone	: +61 02 8346 9400	Telephone	: 02 4225 3125
Facsimile	: +61 02 8346 9444	Facsimile	: W 02 42253128 N 02 44232083
Project	: Foxground and Berry Bypass	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: ----	Date Samples Received	: 04-Feb-2016 16:30
C-O-C number	: ----	Date Analysis Commenced	: 05-Feb-2016
Sampler	: JAMES DIAMOND	Issue Date	: 11-Feb-2016 12:56
Site	: ----		
		No. of samples received	: 17
Quote number	: ----	No. of samples analysed	: 17

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dian Dao		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.

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW1	SW2	SW3	SW4	SW5_1
			Client sampling date / time	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]
Compound	CAS Number	LOR	Unit	EW1600495-001	EW1600495-002	EW1600495-003	EW1600495-004	EW1600495-005
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	**3.0**	**3.1**	**3.4**	**3.7**	**4.2**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW5_2	SW6	SW7	SW8	SW9
			Client sampling date / time	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]
Compound	CAS Number	LOR	Unit	EW1600495-006	EW1600495-007	EW1600495-008	EW1600495-009	EW1600495-010
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	**4.2**	**5.0**	**4.9**	**5.5**	**5.1**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW10	SW12	SW13	SW14	SW15
			Client sampling date / time	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]	[04-Feb-2016]
Compound	CAS Number	LOR	Unit	EW1600495-011	EW1600495-012	EW1600495-013	EW1600495-014	EW1600495-015
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**9**	<5	**6**	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	**4.7**	**36.5**	**15.5**	**20.3**	**21.0**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**SW16**	**SW17**	**----**	**----**	**----**
			Client sampling date / time	[04-Feb-2016]	[04-Feb-2016]	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW1600495-016**	**EW1600495-017**	**--------**	**--------**	**--------**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**12.9**	**13.5**	**----**	**----**	**----**

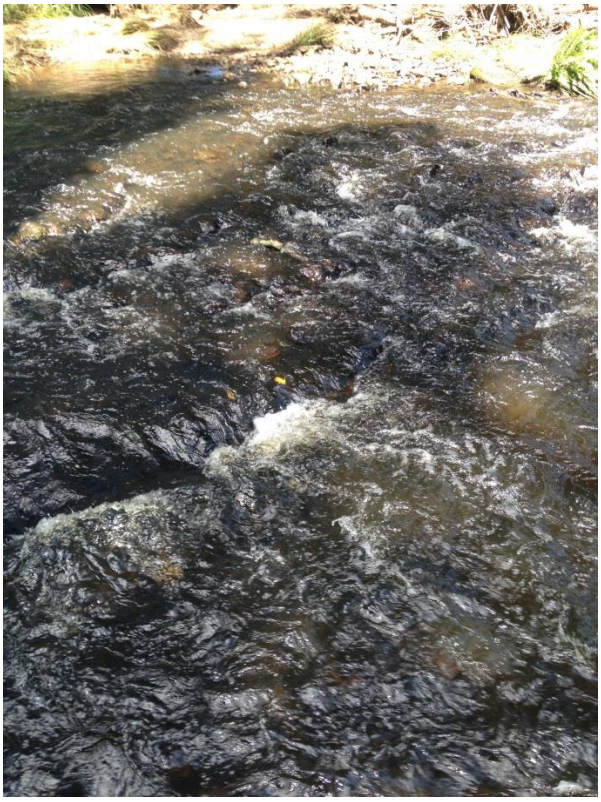
Attachment E: Field Photos

Attachment D: Field Photos

SW01 – Broughton Creek U/S of works

SW02 – Broughton Creek, first site downstream of works

SW03 – Broughton Creek, second site downstream of works



SW05 – Broughton Creek, third and final site downstream of works

SW04 – Broughton Mill Creek, Upstream of works

No Photo taken

SW07 – Broughton Mill Creek, downstream of works

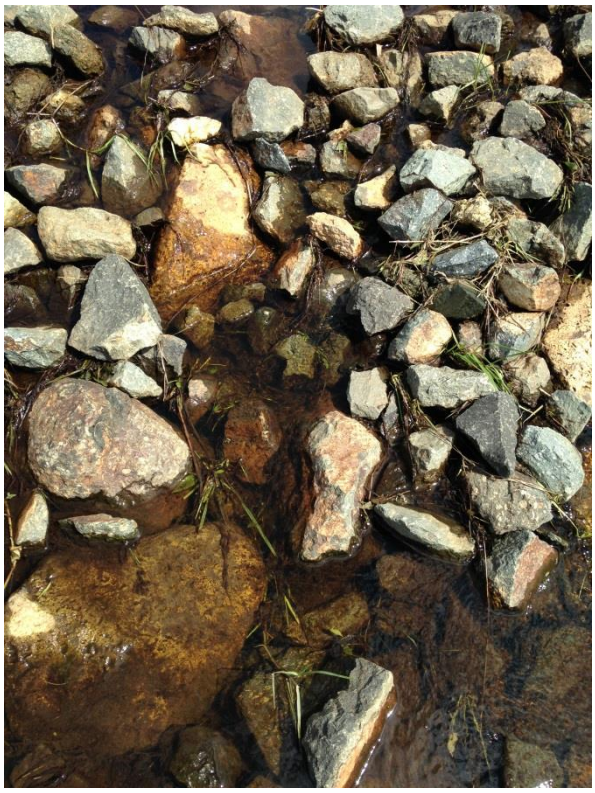
SW08 – Bundewallah Creek, Upstream of works

SW06 – Bundewallah Creek, Downstream of works

SW09 – Bundewallah Creek, Downstream of works

No photo taken

SW10 – Town Creek, upstream of works



SW11 – Town Creek, downstream of works

No Flow - no photo taken

SW12 – Hitchcocks lane creek tributary, upstream of works

SW13 – Hitchcocks lane creek tributary, downstream of works

SW14 – Hitchcocks lane creek, upstream of works

SW15 – Unnamed tributary, downstream of works

Heavily vegetated channel no photo taken

SW16 – Unnamed tributary, upstream of works

SW17 – Unnamed tributary, downstream of works

No photo taken

Surface Water Monitoring

Construction Event 15

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

Date of Monitoring: 15 March 2016

Rainfall Monitoring is shown below.

Woodhill Mountain Road	
Date:	Rainfall Received:
15 Mar 2016	9.6mm
16 Mar 2016	44.8mm
17 Mar 2016	34.8mm

Toolijooa Road	
Date:	Rainfall Received:
15 Mar 2016	25.2mm
16 Mar 2016	18.6mm
17 Mar 2016	37.4mm

Austral Park	
Date:	Rainfall Received:
15 Mar 2016	26mm
16 Mar 2016	32.8mm
17 Mar 2016	40.6mm

Scope and Limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) – Water Monitoring Project Brief, surface water monitoring at seventeen locations (SW01 to SW017) was undertaken. 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 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 three weather stations used to monitor weather and rainfall. For the purpose of triggering water quality monitoring events the project uses these weather stations. The locations of the weather stations are:

- The project office on Woodhill Mountain Road, Berry
- Austral Park Road, ancillary facility, Broughton
- Toolijooa Road, Toolijooa,

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
- Attachment D, Laboratory results
- Attachment E, Field photographs.

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

Surface water	Upstream of Alignment	Downstream of Alignment (test
Broughton Creek	SW01	SW02, SW03, SW05
Connelly's Creek and Broughton Mill Creek and Bundewallah Creek	SW04, SW06	SW07, SW09
Bundewallah Creek and Connelly's Creek	SW08	SW06
Town Creek	SW10	SW11
Hitchcocks Lane Creek Tributary	SW12	SW13
Hitchcocks Lane Creek	SW14	SW15
Unnamed Tributary	SW16	SW17

Results summary

The monitoring for this rainfall event was triggered by 15mm of rainfall received in 24 hours. Rainfall continued to fall during and after the monitoring event. The total event volume was high and between 80-100mm across the project. Despite the high level of total rainfall many of the waterways in the southern section of the project were observed to have no flow. This was because the two months before this event no rainfall had been received.

No construction impacts were observed during this monitoring event.

Broughton Creek: Showed no impacts from construction

Connelly's Creek and Broughton Mill Creek and Bundewallah Creek: Showed no impacts from construction

Bundewallah Creek and Connelly's Creek: Showed no impacts from construction

Town Creek: Showed no impacts from construction

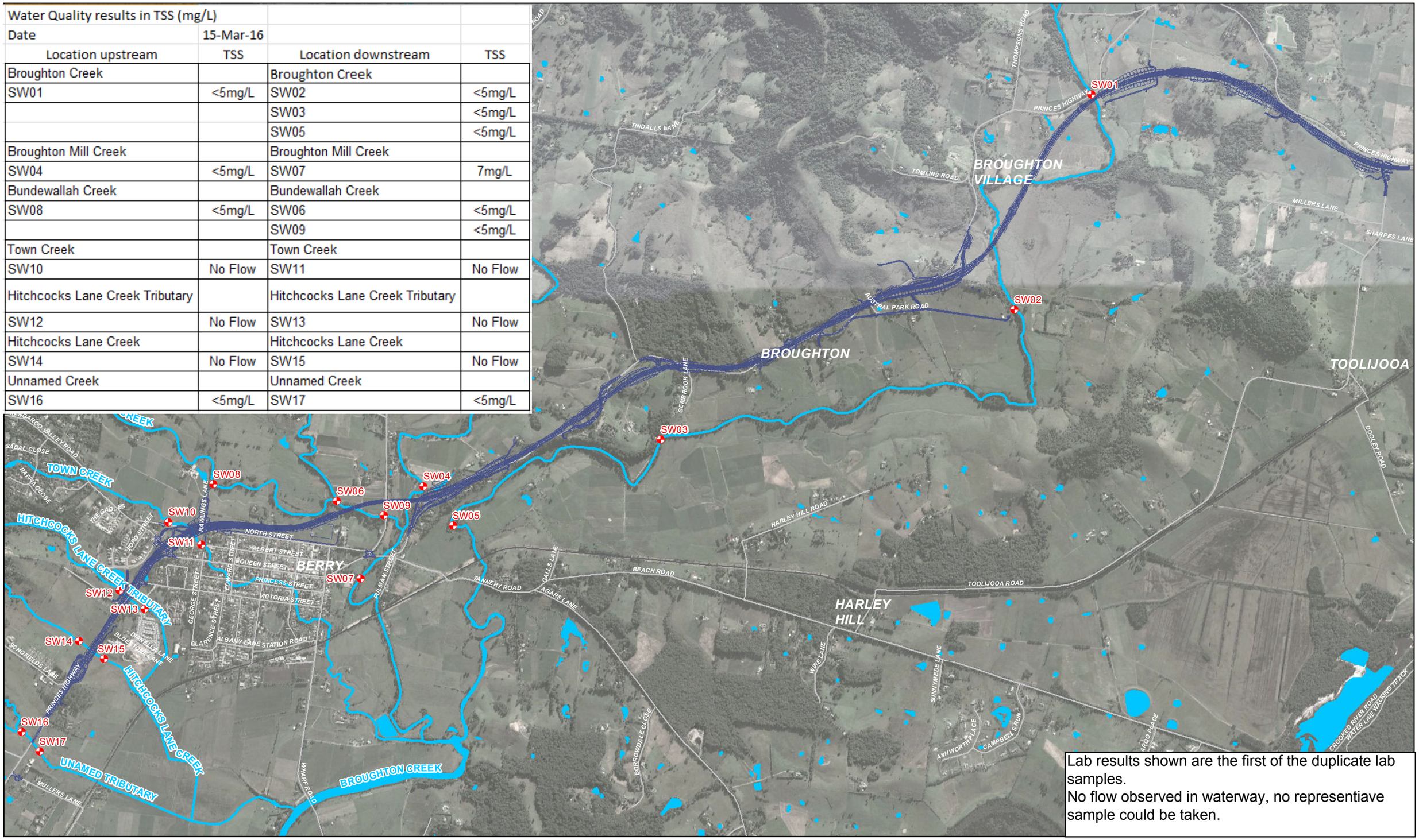
Hitchcocks Lane Creek Tributary: Showed no impacts from construction.

Hitchcocks Lane Creek: Showed no impacts from construction

Unnamed Tributary: Showed no impacts from construction

Attachment A: Location Map

Water Quality results in TSS (mg/L)			
Date	15-Mar-16		
Location upstream	TSS	Location downstream	TSS
Broughton Creek		Broughton Creek	
SW01	<5mg/L	SW02	<5mg/L
		SW03	<5mg/L
		SW05	<5mg/L
Broughton Mill Creek		Broughton Mill Creek	
SW04	<5mg/L	SW07	7mg/L
Bundewallah Creek		Bundewallah Creek	
SW08	<5mg/L	SW06	<5mg/L
		SW09	<5mg/L
Town Creek		Town Creek	
SW10	No Flow	SW11	No Flow
Hitchcocks Lane Creek Tributary		Hitchcocks Lane Creek Tributary	
SW12	No Flow	SW13	No Flow
Hitchcocks Lane Creek		Hitchcocks Lane Creek	
SW14	No Flow	SW15	No Flow
Unnamed Creek		Unnamed Creek	
SW16	<5mg/L	SW17	<5mg/L



Lab results shown are the first of the duplicate lab samples.
No flow observed in waterway, no representiave sample could be taken.

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Surface Water Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Surface water monitoring Event: 15

Date: 15 March 2016

Fulton Hogan Pty Ltd
Water Quality Monitoring

Job Number	21-24306
Revision	A
Date	03 Mar 2015

Surface water sampling locations

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Attachment B: Tabulated Results

No.	Date	Temperature (°C)	pH	ORP (mV)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	
SW1	15/03/2016	18.02	6.57	166	0.154	4	8.51	Issue with DO probe
		18.02	6.69	150	0.15	3.5	8.12	Issue with DO probe
		18.03	6.69	139	0.149	3.8	7.45	Issue with DO probe
SW2	15/03/2016	18.33	6.76	176	0.159	3.5	6.08	Issue with DO probe
		18.34	6.81	168	0.158	3.5	4.88	Issue with DO probe
		18.33	6.81	165	0.16	4.7	4.79	Issue with DO probe
SW3	15/03/2016	18.63	6.87	106	0.18	3.8	4.36	Issue with DO probe
		18.64	6.92	93	0.18	3.7	3.7	Issue with DO probe
		18.63	6.9	91	0.18	3.6	3.22	Issue with DO probe
SW4	15/03/2016	18.81	7.13	158	0.15	12.3	6.46	
		18.85	7.07	165	0.146	4.4	6.49	
		18.86	7.06	167	0.145	3.9	6.43	
SW5	15/03/2016	20.45	6.69	40	10.2	30.3	-	Issue with DO probe
		20.84	6.63	48	12	20.8	-	Issue with DO probe
		20.77	6.65	48	12.2	21	-	Issue with DO probe
SW6	15/03/2016	17.18	6.6	156	0.213	3.2	5.87	
		17.19	6.55	153	0.196	3.1	5.78	
		17.31	6.52	146	0.189	3	5.78	
SW7	15/03/2016	18.91	6.87	170	0.164	7.8	3.61	
		18.89	6.82	158	0.164	4.3	3.95	
		18.87	6.81	149	0.164	4.9	3.82	
SW8	15/03/2016	18.77	7.04	82	0.215	3.5	4.3	
		18.72	6.95	82	0.21	3.4	4.03	
		18.59	6.93	79	0.21	2.4	4.21	
SW9	15/03/2016	17.4	6.74	88	0.191	2.4	6.42	
		17.39	6.73	83	0.191	2.4	6.47	
		17.41	6.73	82	0.191	2.3	6.53	
SW10	15/03/2016	Water level stagnate/no flow to test						
SW11	15/03/2016	Water level stagnate/no flow to test						
SW12	15/03/2016	Water level stagnate/no flow to test						
SW13	15/03/2016	Water level stagnate/no flow to test						
SW14	15/03/2016	Water level stagnate/no flow to test						
SW15	15/03/2016	Water level stagnate/no flow to test						
SW16	15/03/2016	19.65	7.33	50	0.214	6.6	4.65	
		19.39	7.16	49	0.212	3.9	4.6	
		19.27	7.07	55	0.212	3.9	4.75	
SW17	15/03/2016	18.38	6.76	41	0.253	14.7	5.85	
		18.35	6.7	39	0.248	11.4	5.77	
		18.25	6.65	61	0.245	10.7	5.77	

Attachment C: Field Sheets

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 1

DATE: 15.03.2016 TIME: 9am

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: West of alignment @ Broughton Ck crossing #1

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Creek bank dominated by weeds & grass

SLOPE: Central Stke Oak canopy

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	9am	9:07	9:14
TEMPERATURE (OC):	18.02°C	18.02	18.03
CONDUCTIVITY (uS/cm):	0.154 mS/cm	0.150	0.149
pH:	6.57	6.69	6.69
DO (mg/L & %):	8.51	8.12	7.45 80.5%
REDOX (mV):	166	150	139
TURBIDITY (NTU):	4.0	3.5	3.8

FLOW OBSERVATIONS

FLOW: low to Medium

COLOUR: Clear

OTHER: Photos x 1

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW1_1	1	ESKY & ICE	1	
SW1_2	1	"	1	
SW1_3	1	"	1	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Issue with DO Probe

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 2

DATE: 15.3.2016 TIME: 9:30am

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of concrete causeway /culvert crossing

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak Canopy with weed understorey

SLOPE: Gentel

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	#1 9:30am	9:37	9:42
TEMPERATURE (OC):	18.33	18.34	18.33
CONDUCTIVITY (uS/cm):	0.159	0.158	0.16
pH:	6.76	6.81	6.81
DO (mg/L & %):	6.09 66.6%	4.88 / 53.5%	4.79 / 52.5%
REDOX (mV):	176	168	165
TURBIDITY (NTU):	3.5	3.5	4.7

FLOW OBSERVATIONS

FLOW: Low flow in creek → fast through culvert/causeway

COLOUR: Clear → tannin colour (slight) (concentrated)

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
~~SW21~~ SW2-1	1	ESKY & ICE	–	
SW2-2	1	"	–	
SW2-3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Issue with DO Probe.

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 3

DATE: 15-03-2016 TIME: 9:55am

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION:

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak ~~Eucs~~ Canopy with grass & weedy understory

SLOPE: Gentle

EROSION: Nil

OTHER: East of alignment. Downes property @ rock ripples off flat paddock

FIELD MEASUREMENTS	#4 9:55	10:05	10:10
TEMPERATURE (OC):	18.63	18.64	18.63
CONDUCTIVITY (uS/cm):	0.180	0.180	0.180
pH:	6.87	6.92	6.90
DO (mg/L & %):	4.36/48.0%	3.70/40.8%	3.22/35.5%
REDOX (mV):	106	93	91
TURBIDITY (NTU):	3.8	3.7	3.6

FLOW OBSERVATIONS

FLOW: Low to medium

COLOUR: Clear - slight tannin colour

OTHER: Photos x 3

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW3_1	1	ESKY & ICE	–	
SW3_2	1	"	–	
SW3_3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Issue with DO Probe

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 4

DATE: 15 03 2016 TIME: 12.05

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of Broughton Mill Cl @ boundary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak Canopy with weedy understorey

SLOPE: Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS (#17)	12:10	12:15	12:20
TEMPERATURE (OC):	18.81	18.85	18.86
CONDUCTIVITY (uS/cm):	0.150	0.146	0.145
pH:	7.13	7.07	7.06
DO (mg/L & %) (Aquaread):	6.46	6.49	6.43
REDOX (mV):	158	165	167
TURBIDITY (NTU):	12.35	4.4	3.9

↳ Increase due to probe movement

FLOW OBSERVATIONS

FLOW: Very low

COLOUR: Clear with tannin colour

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW4_1	1	ESKY & ICE	–	
SW4_2	1	"	–	
SW4_3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 5

DATE: 15.3.16 TIME: 10.25

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of Bridge at Tonneagh Rd

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Creek bank dominate - weeds Eucalypt

SLOPE: Very Gentle Canopy (scattered)

EROSION: Minor under bridge

OTHER: Photos x 3

FIELD MEASUREMENTS (#8)	10:25	10:35	10:40
TEMPERATURE (OC):	~~19.80~~ 20.45	20.84	20.77
CONDUCTIVITY (uS/cm):	10.2 mS/cm	12	12.2
pH:	~~7.04~~ 6.69	6.63	6.65
DO (mg/L & %):	~~0.24 / 87.8~~	0	0 → Probe issue
REDOX (mV):	40	48	48 failure
TURBIDITY (NTU):	30.3	20.8	21.0

FLOW OBSERVATIONS

FLOW: No to very low flow → wide channel

COLOUR: Turbid & tannin colour

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW5_1	1	ESKY & ICE	–	
SW5_2	1	"	–	
SW5_3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 6

DATE: 15.03.2016 TIME: 11 05

SAMPLING OFFICERS: James

SAMPLING METHOD (ie grab, bucket): GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of Berry Bridge works in Broughton Creek

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak Canopy with weed & grass understorey

SLOPE: very Gentle -> flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS (#11)	10:05	10:13	10:20
TEMPERATURE (OC):	17.18	17.19	17.31
CONDUCTIVITY (uS/cm):	0.213	0.196	0.189
pH:	6.60	6.55	6.52
DO (mg/L & %):	5.87	5.78	5.78 -> AquaRead probe
REDOX (mV):	156	153	146
TURBIDITY (NTU):	3.2	3.1	3

FLOW OBSERVATIONS

FLOW: Very low to low flow level low

COLOUR: Clear

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW6_1	1	ESKY & ICE	–	
SW6_2	1	"	–	
SW6_3	1	"	–	

FIELD SUPERVISOR James

CHECKED (SIGN & DATE) [signature]

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 7

DATE: 15.03.2016 TIME: 12:35

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of works below the Berry Bowling Club.

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak & Eucalypts canopy & weed understory

SLOPE: Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	12:35 #10	12:40	12:45
TEMPERATURE (OC):	18.91	18.89	18.87
CONDUCTIVITY (uS/cm):	0.164	0.164	0.164
pH:	6.87	6.82	6.81
DO (mg/L & %):	3.61	3.95	3.82
REDOX (mV):	170	158	149
TURBIDITY (NTU):	7.8	4.3	4.9

FLOW OBSERVATIONS

FLOW: Very low

COLOUR: Clear & tannin colour

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW7_1	1	ESKY & ICE	—	
SW7_2	1	"	—	
SW7_3	1	"	—	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 8

DATE: 15.03.2016 TIME: 13:20

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Intersection point of Town Ck and Brodewallah Ck

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak Canopy weed & pasture below

SLOPE: 5 ; Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	13:20	13:30	13:35
TEMPERATURE (OC):	18.77	18.72	18.59
CONDUCTIVITY (uS/cm):	0.215	0.210	0.210
pH:	7.04	6.95	6.93
DO (mg/L & %):	4.30	4.03	4.21
REDOX (mV):	82	82	79
TURBIDITY (NTU):	3.5	3.4	2.4

FLOW OBSERVATIONS

FLOW: Very low

COLOUR: Clear & tannin colour

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW8_1	1	ESKY & ICE	—	
SW8_2	1	"	—	
SW8_3	1	"	—	

FIELD SUPERVISOR James

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 9

DATE: 15-03-2016 TIME: 1130 am

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: 5m Downstream of Woodhill Mountain Rd Bridge

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: She Oak Canopy with Weed understorey

SLOPE: Gentle

EROSION: Nil

OTHER:

FIELD MEASUREMENTS (#14)	11:35	11:40	11:45
TEMPERATURE (OC):	17.40	17.39	17.41
CONDUCTIVITY (uS/cm):	0.191	0.191	0.191
pH:	6.74	6.73	6.73
DO (mg/L ~~&%~~): AquaRead	6.42	6.47	6.53
REDOX (mV):	88	83	82
TURBIDITY (NTU):	2.4	2.4	2.3

FLOW OBSERVATIONS

FLOW: Low flows - narrow creek

COLOUR: Clear

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW9-1	1	ESKY & ICE	DUPL2_1	
SW9-2	1	"	DUPL2_2	
SW9_3	1	"	DUPL2_3	

FIELD SUPERVISOR James S

CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 10

DATE: 15 03 2016 TIME: 13 00

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Town Ck detention pond

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture

SLOPE: Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	13:00	13:05	13 10
TEMPERATURE (OC): (#23)	20.58	20.63	20.71
CONDUCTIVITY (uS/cm):	0.385	0.385	0.384
pH:	7.21	7.22	7.23
DO (mg/L & %):	3.80	3.33	3.13
REDOX (mV):	77	70	78
TURBIDITY (NTU):	16.9	13.0	10.6

FLOW OBSERVATIONS

FLOW: No flow

COLOUR: Tannin brown → Ducks stirred up to bottom

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW10-1	1	ESKY & ICE	–	
SW10-2	1	"	–	
SW10-3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 11

DATE: 15.03.2016 TIME: 12.50

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Old Town Ck off George St

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: White Cedar & young She Oak canopy & weed/grass understorey

SLOPE: Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): Water level to low to sample

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

TURBIDITY (NTU):

FLOW OBSERVATIONS

FLOW: No flow. Stagnate water

COLOUR: clear and tannin

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
N/A		ESKY & ICE		
N/A				
N/A				

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 12

DATE: 15.03.2016 TIME: 14:15

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: West of Alignment @ boundary off Hitchcocks Rd

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture & weeds

SLOPE: Level

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): No water to test

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

TURBIDITY (NTU):

FLOW OBSERVATIONS

FLOW: No flow - No water

COLOUR: -

OTHER: Photos x 3

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
		ESKY & ICE		

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 13

DATE: 15-03-2015 TIME: 14:35

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of Cul 18.10
At Arbor retirement village

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Grassland with Mature Eucalypts

SLOPE: Gentle

EROSION: Nil/Minor not progressing

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): No water level to low to monitor

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

TURBIDITY (NTU):

FLOW OBSERVATIONS

FLOW: No flow

COLOUR: Clear.

OTHER:

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
		ESKY & ICE		

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 14

DATE: 15-03-2016 TIME: 15:30

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of CW 18.51 to the west of project boundary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture

SLOPE: Gentel to flat in drainage line

EROSION: N.I

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): No water to sample

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

TURBIDITY (NTU):

FLOW OBSERVATIONS

FLOW: No flow / No water

COLOUR: -

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
		ESKY & ICE		

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 15

DATE: 15 03 2016 TIME: 14:30

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream of Culvert 18500 From Bypass

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture

SLOPE: Flat

EROSION: Nil

OTHER:

FIELD MEASUREMENTS

TEMPERATURE (OC): No water to monitor

CONDUCTIVITY (uS/cm):

pH:

DO (mg/L & %):

REDOX (mV):

TURBIDITY (NTU):

FLOW OBSERVATIONS

FLOW: No flow - No water

COLOUR:

OTHER: Photos x 1

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
		ESKY & ICE		

FIELD SUPERVISOR JamOS CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 16

DATE: 15-03-2016 TIME: 15.15

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Upstream of SB11 @ boundary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Sunny/Overcast

VEGETATION: Pasture

SLOPE: Gentle

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	15:15	15:20	15:25
TEMPERATURE (OC):	19.65	19.39	19.27
CONDUCTIVITY (uS/cm):	0.214	0.212	0.212
pH:	7.33	7.16	7.07
DO (mg/L & %):	4.65	4.60	4.75
REDOX (mV):	50	49	55
TURBIDITY (NTU):	6.6	3.9	3.9

FLOW OBSERVATIONS

FLOW: Low flow

COLOUR: Clear

OTHER: Photos x 1

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW16-1	1	ESKY & ICE	—	
SW16-2	1	"	—	
SW16-3	1	"	—	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Fulton Hogan

FOXGROUND AND BERRY BYPASS
SURFACE WATER SAMPLING RECORD

SITE: SW 17

DATE: 15.03.2018 TIME: 14:45

SAMPLING OFFICERS: James

SAMPLING METHOD *(ie grab, bucket)*: GRAB

DETAILED SAMPLE LOCATION DESCRIPTION: Downstream on SB11 @ Boundary

ENVIRONMENTAL OBSERVATIONS

WEATHER: Overcast

VEGETATION: Pasture

SLOPE: Gentle

EROSION: Nil

OTHER:

FIELD MEASUREMENTS	14:45	14:50	14:55
TEMPERATURE (OC):	18.38	18.35	18.25
CONDUCTIVITY (uS/cm):	0.253	0.248	0.245
pH:	6.76	6.70	6.65
DO (mg/L & %):	5.85	5.77	5.74
REDOX (mV):	41	39	61
TURBIDITY (NTU):	14.7	11.4	10.7

FLOW OBSERVATIONS

FLOW: Low flows

COLOUR: Slightly turbid / tannin colour

OTHER: Photos x 2

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SW17_1	1	ESKY & ICE	–	
SW17_2	1	"	–	
SW17_3	1	"	–	

FIELD SUPERVISOR James CHECKED (SIGN & DATE)

Attachment D: Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1601077**	Page	: 1 of 10
Client	: **FULTON HOGAN PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR JAMES DIAMOND	Contact	: Aneta Prosaroski
Address	: LEVELI 3 - 90 BOURKE ROAD ALEXANDRIA NSW, AUSTRALIA 2015	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
Telephone	: +61 02 8346 9400	Telephone	: 02 4225 3125
Project	: Foxground and Berry Bypass	Date Samples Received	: 17-Mar-2016 14:00
Order number	: ----	Date Analysis Commenced	: 18-Mar-2016
C-O-C number	: ----	Issue Date	: 21-Mar-2016 12:53
Sampler	: JAMES DIAMOND		
Site	: ----		
Quote number	: ----		
No. of samples received	: 39		
No. of samples analysed	: 39		

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

NATA
WORLD RECOGNISED
ACCREDITATION

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	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.

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.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW1_1	SW1_2	SW1_3	SW2_1	SW2_2
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-001	EW1601077-002	EW1601077-003	EW1601077-004	EW1601077-005
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW2_3	SW3_1	SW3_2	SW3_3	SW4_1
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	*CAS Number*	*LOR*	*Unit*	**EW1601077-006**	**EW1601077-007**	**EW1601077-008**	**EW1601077-009**	**EW1601077-010**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW4_2	SW4_3	SW5_1	SW5_2	SW5_3
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-011	EW1601077-012	EW1601077-013	EW1601077-014	EW1601077-015
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	**5**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW6_1	SW6_2	SW6_3	SW7_1	SW7_2
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-016	EW1601077-017	EW1601077-018	EW1601077-019	EW1601077-020
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**6**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW7_3	SW8_1	SW8_2	SW8_3	SW9_1
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-021	EW1601077-022	EW1601077-023	EW1601077-024	EW1601077-025
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW9_2	SW9_3	SW16_1	SW16_2	SW16_3
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-026	EW1601077-027	EW1601077-028	EW1601077-029	EW1601077-030
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	SW17_1	SW17_2	SW17_3	DUPL1_1	DUPL1_2
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	EW1601077-031	EW1601077-032	EW1601077-033	EW1601077-034	EW1601077-035
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**DUPL1_3**	**DUPL2_1**	**DUPL2_2**	**DUPL2_3**	**----**
			Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW1601077-036**	**EW1601077-037**	**EW1601077-038**	**EW1601077-039**	**--------**
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	**----**

Attachment E: Field Photos

Attachment E: Field Photos

SW01 – Broughton Creek upstream of works

SW02 – Broughton Creek, first site downstream of works

SW03 – Broughton Creek, second site downstream of works

SW05 – Broughton Creek, third and final site downstream of works

SW04 – Broughton Mill Creek, Upstream of works

SW07 – Broughton Mill Creek, downstream of works

SW08 – Bundewallah Creek, Upstream of works

No photo taken

SW06 – Bundewallah Creek, midstream of works

SW09 – Bundewallah Creek, Downstream of works

SW10 – Town Creek, upstream of works

SW11 – Town Creek, Downstream of works

SW12 – Hitchcocks lane creek tributary, upstream of works

SW13 – Hitchcocks lane creek tributary, downstream of works

SW14 – Hitchcocks lane creek, upstream of works

SW15 - Hitchcocks lane creek, downstream of works

SW16 – Unnamed tributary, upstream of works

SW17 – Unnamed tributary, downstream of works

Appendix C Groundwater quality monitoring results

2 March 2016

James Diamond
Environmental Coordinator
Fulton Hogan Construction Pty Ltd
P.O. Box 353
Berry NSW 2535

Our ref: 21/24306
211867 Rev1
Your ref:

Dear James,

Groundwater Monitoring Event
Construction Event 3

1 Scope and limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) - Water Monitoring Project Brief (*Contract No. 12.2574.3019)*, GHD Pty Ltd (GHD) completed a quarterly round of groundwater monitoring at six locations (namely MW01, MW04, MW09, MW10, MW12 and MW16) which is the third of its nature undertaken (the first and second being completed in March and June 2015).

This letter report documents the findings of third groundwater sampling (Event 3) undertaken since the commencement of construction.

2 Field and Analytical Program

The groundwater sampling was undertaken at the six nominated groundwater monitoring wells on 1 October 2015; refer to Figure 1, Attachment A, depicting the monitoring well locations. This quarterly groundwater sampling event was conducted in accordance with the sampling program and protocols provided in the following documents:

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

Groundwater field parameters were measured during sampling including temperature, pH, electrical conductivity (EC), dissolved oxygen (DO) and reduction-oxidation potential (redox). The readings are summarised in Table B1, Attachment B. GHD's detailed field record sheets and calibration certificates are provided in Attachment C and indicate suitable calibration of the water quality meter prior to use.

Water samples were submitted to a National Association of Testing Authorities (NATA) certified testing laboratory (Eurofins | Mgt) with the following analysis undertaken:

- Total Petroleum Hydrocarbons (TPH).
- Benzene, Toluene, Ethyl-benzene and Xylene (BTEX).

- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) dissolved.

Each sample was field filtered prior to laboratory analysis for heavy metals.

One duplicate sample was collected, namely DUPL, from well MW16.

3 Results and Discussion

This section presents control charts and discusses results (with regard to exceedances of criteria or inconsistencies in the groundwater results for Event 3) in accordance with the following:

- GHD's letter report limitations provided in Section 4.
- GHD 2014, 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.

3.1 Groundwater Elevations

The rainfall within Broughton Creek catchment and the groundwater elevations within monitored wells are presented in Figure 2, Attachment A. The rainfall data was obtained from the NSW Office of Water website (http://realtimedata.water.nsw.gov.au/water.stm).

The recorded groundwater levels indicate the majority of wells are relatively stable with the exception of MW01, which showed an increasing groundwater elevation compared with the previous pre-construction observations (i.e. pre-December 2014). The increase in groundwater elevation at MW01 is interpreted to be a response to rainfall and has stabilised for the last three events. A decrease in groundwater elevation is the expected response associated with construction activities near to MW01 and is not currently evident. A clear longer-term construction response is not evident in MW04, MW10, MW12 and MW16 standing water levels. There is an indication of a slight fall in groundwater elevations at MW09.

3.1.1 Groundwater level data loggers

Four wells along the alignment (MW03, MW08, MW13 and MW16) have groundwater level data loggers installed. The data loggers were installed on 3 July 2015 and this data will be reported in the 4th groundwater monitoring report.

3.2 Groundwater Quality Sampling Results

There were no visual or olfactory signs of contamination observed at any of the sampling points during the groundwater investigation. Groundwater was generally described as clear to cloudy (grey).

In situ water quality parameters measured during sampling are presented in Table B1, Attachment B.

Groundwater laboratory analytical results for the suite listed in Section 2, are tabulated against selected criteria (in accordance with the protocols detailed in Section 2) in Table B2, Attachment B. Laboratory documents are provided in Attachment D.

Groundwater quality parameters and chemical concentrations outside of the ranges present within the screening criteria are summarised in Table 1, Attachment B. The findings suggest groundwater quality is above some screening criteria at a number of locations throughout the catchment. All monitoring locations exceeded the adopted screening criteria for zinc. The naphthalene results are all less than the laboratory limit of reporting, however this limit is above the adopted screening criteria. Electrical conductivity and pH readings were outside of the ADWG (Aesthetic) criteria and lowland rivers (ANZECC

2000) indicating the groundwater is not suitable from an aesthetic drinking water perspective. All results are well below the ANZECC Stock Watering criteria indicating suitability for this purpose.

Table 1 Summary of Water Quality Screening

Analyte	Units	Screening Criteria	No. Locations Exceeding Adopted Criteria	Minimum value	Maximum value
pH (field)	pH units	6.5 - 8.5 (ADWG Aesthetic) and 6.5 – 8.0 (Lowland Rivers ANZECC 2000)	4	5.59 (MW09)	7.27 (MW01)
Electrical Conductivity (field)	us/cm	890 (ADWG Aesthetic) and 300 (Lowland Rivers ANZECC 2000)	3 (ADWG) 5 (Lowland Rivers)	146.2 (MW04)	2,603 (MW01)
Zinc dissolved (laboratory)	mg/L	0.008 (ANZECC 2000 Freshwater 95%)	6	0.012 (MW04)	0.03 (MW01)
Naphthalene (laboratory)	µg/L	16* (ANZECC 2000 Freshwater 95%)	6	<20 (all)	<20 (all)

Note: * EQL is greater than the criteria and not representative of an exceedance of criteria, trace analysis recommended in future.

The majority of these exceedances of criteria were also reported during the pre-construction phase of monitoring. Further discussion of this rounds results with regard to pre-construction data are presented in Sections 3.2.1 and 3.2.2.

The laboratory limit for naphthalene reporting is slightly above the selected criteria for freshwater ecosystems. This is not considered to represent an issue as the concentrations in the well would need to be significantly above the reporting limit to be present at concentrations above criteria at down gradient ecosystems in surface water.

An assessment of the field quality control sampling is provided in Table B3, Attachment B and suggests that there were no unacceptable differences in the primary (MW16) and duplicate sample (DUPL) analysed.

A discussion of the field and laboratory quality assurance and quality control findings is provided in Attachment E.

3.2.1 Control Charts

In accordance with the assessment criteria documented in the monitoring plans and summarised in Section 2, control charts have been developed for specific analytes. These are discussed below.

Electrical Conductivity (field)

The groundwater control charts compare pre-construction (reference) data with construction and operation (test) data. The ‘reference’ data is presented as an 80th percentile of the pre-construction monitoring, while the ‘test’ data represent the median of the sampling. The control charts for Event 3 are presented in Attachment F.

The control chart suggests that the results are generally consistent with previous rounds. There are no exceedances of the 80th percentile reference data, which suggests that these results are not being significantly influenced by construction works.

pH (field)

The pH control charts vary from the method used for electrical conductivity because there is a criteria range for assessing pH water quality as opposed to an upper threshold value. This limits the value of comparing pH changes to an 80th percentile baseline value in the control chart. As such, the actual data has been compared against the Australian Drinking Water Guidelines (ADGW 2011) of 6.5 – 8.5 pH units for drinking water and the lowest pH baseline value for each well recorded before construction (baseline data). This method allows characterisation of the pH relative to the baseline data and the adopted screening criteria.

The control charts show that MW01 is within the screening criteria and is relatively stable. pH levels for MW04 have increased for the last two sampling events and are acceptably above the minimum values recorded during baseline and are slightly below the low range screening criteria value. MW09 pH levels are below the lower range of the adopted screening criteria with the latest sampling event acceptably above the minimum values recorded before construction. MW10 pH levels shows variability with the latest measurement just outside of the low range screening criteria limit and just below the minimum value recorded before construction. There does not appear to be any consistent trend in the results. MW12 and MW16 results are outside of the range of the screening criteria. However, the measurements are both within, or close to, the minimum baseline values reported before construction.

Overall, the pH control chart suggests that the results are generally consistent with previous rounds, which suggests that the wells are not being significantly influenced by construction works.

The remaining analytes with detectable concentrations have been assessed using other methods and are discussed in the following sections.

3.2.2 Results Graphs

The concentrations for dissolved heavy metals (with detectable concentrations) were plotted in time series to assess the changes pre and during construction and the emergence of trends. Control charts were considered unsuitable in this instance as metals data sets generally have a high percentage of values below detection limits. This resulted in identified exceedences in the control charts that were associated with statistical issues rather than trends in the data. Time series results graphs were created for the following metals (which had detectable concentrations):

- Nickel.
- Copper.
- Arsenic.
- Zinc.

The results graphs for Event 3 are presented in Attachment F.

The results graphs for nickel and arsenic are well below the selected human health and ecological criteria. Further to this, with the inclusion of the latest results, there does not appear to be any increasing trends. As such, any changes, whether associated with background variations or associated with construction activities are not representing a significant risk.

The results graphs for copper for wells MW01 and MW04 appeared to have had a significant increase in the first construction monitoring event (March 2015). The concentrations were above the selected ANZECC (2000) freshwater criteria for the protection of aquatic ecosystems but were less than half of the human health drinking water criteria of 2 mg/L. The results from this monitoring event and from the July 2015 monitoring events suggest a decrease in concentrations to within the range of pre-construction conditions (Pre-December 2014) and below the selected ANZECC (2000) aquatic ecosystems criteria. This suggests that there is no increasing trend associated with the emergence of impacts from

construction and that the previously elevated concentrations were more likely to be associated with natural background variations.

The results graphs for zinc for wells MW01, MW04, MW09, MW10, MW12 and MW16 have elevated concentrations relative to pre-construction conditions (Pre-December 2014) and the selected ANZECC (2000) freshwater criteria for the protections of aquatic ecosystems. There is no human health value for zinc. Concentrations were reported above the freshwater aquatic ecosystems criteria during baseline monitoring, however, these were lower than those reported after commencement of construction. Concentrations in MW01, MW09 and MW10 have fallen in the latest monitoring event; however, they are above screening criteria.

Concentrations in MW01, MW04, MW09 and MW10, however, appear to have an ongoing statistically upward trend since commencement of construction.

The data shows that zinc concentrations in all monitoring wells sampled have increased since construction. The source of this is currently uncharacterised and due to the slow groundwater flow velocities in the area it is unlikely that construction impacted' groundwater would not have migrated to the wells at this stage. Disturbance of soil has the potential to be releasing zinc to groundwater however, an increase in zinc in surface water would also be expected to occur and the results for zinc in surface water do not show this.

Exposure of bedrock, specifically those high in sulphides, to air has the potential to produce acid and metalliferous drainage. This process may be occurring at the site and be responsible for the increases in zinc.

It is plausible that the elevated concentrations could be associated with construction activities. As such, a more detailed assessment of the possible source and trends should be considered. Concentrations of TPH and BTEX (including naphthalene) were below detection and as such, the results were not graphed.

The results of this event (3) suggest that construction works are currently having limited impact on groundwater quality at the site, although further assessment of localised trends in zinc concentrations is required.

3.3 Recommendations

It is recommended that a strategy is developed to assess potential localised changes in groundwater quality, relative to baseline conditions, since the start of construction.

The next quarterly groundwater sampling event (Event 4) will be completed by GHD in December 2015.

4 Limitations

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

GHD otherwise disclaims responsibility to any person other than Fulton Hogan 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 Fulton Hogan 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.

Please contact the undersigned if you have any questions or require further information.

Kind Regards,

Stefan Charteris
Principal Hydrogeologist
02 9239 7472

Nicole Rosen
Senior Environmental Consultant
02 9239 7683

Attachment A - Figures

Figure 1: Groundwater Sampling Locations

Figure 2: Rainfall vs Groundwater Elevations in Monitoring Wells

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Groundwater Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Roads and Maritime Services
Water Quality Monitoring

Job Number	61-24306
Revision	A
Date	28 Apr 2015

Groundwater Sampling Locations

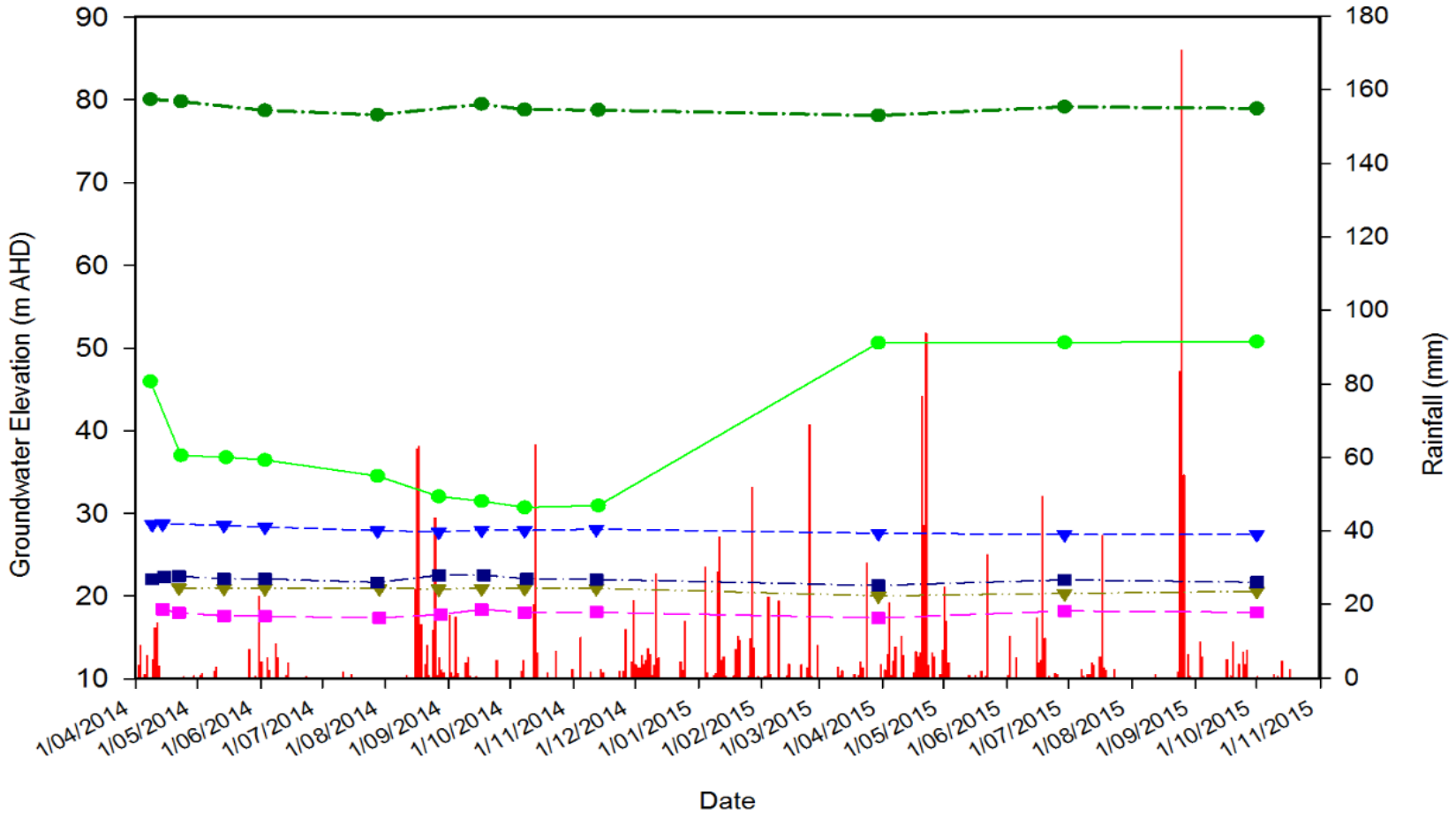
Figure 1

\\ghdnet\ghd\AU\Sydney\Projects\21\24306\GIS\Maps\MXD\21_24306_Z002_GroundWatersamplingLocations.mxd

Data Source: NSW Department of Lands: DTDB and DCDB - 2012. Created by: mweber

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Figure 2: Foxground to Berry Bypass Groundwater and Rainfall Observations



Attachment B - Tabulated Results

Table B1: Event 2 – Field Parameters

Table B2: Event 2 – Analytical Results

Table B3: Event 2 – RPD Results

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Appendix B
Table B1
Event 3 - Field Parameters

	Field				
	Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Redox (Field)	Temp (Field)
	mg/L	µS/cm	pH Units	mV	oC
ADWG 2011 Aesthetic		*890 #2*	*6.5-8.5 #1*		
ADWG 2011 Health					
ANZECC 2000 - Stock Watering					
ANZECC 2000 FW 95%					
Lowland rivers (ANZECC 2000)		300	6.5-8		

Field_ID	Sampled_Date	SampleCode					
MW01	01-Oct-15	MW01_01 Oct 15_ -	5.81	*2603*	7.27	150.3	18.3
MW04	01-Oct-15	MW04_01 Oct 15_ -	0.51	146.2	*6.07*	187.1	17.4
MW09	01-Oct-15	MW09_01 Oct 15_ -	1.05	*1627*	6.51	82.6	17.5
MW10	01-Oct-15	MW10_01 Oct 15_ -	0.63	*2215*	*6.42*	127.2	17.7
MW12	01-Oct-15	MW12_01 Oct 15_ -	3.11	350.5	*5.59*	149.2	18
MW16	01-Oct-15	MW16_01 Oct 15_ -	0.47	539	*6.03*	145.8	17.1

Statistical Summary

Number of Results	6	6	6	6	6
Number of Detects	6	6	6	6	6
Minimum Concentration	0.47	146.2	5.59	82.6	17.1
Minimum Detect	0.47	146.2	5.59	82.6	17.1
Maximum Concentration	5.81	2603	7.27	187.1	18.3
Maximum Detect	5.81	2603	7.27	187.1	18.3
Average Concentration	1.9	1247	6.3	140	18
Median Concentration	0.84	1083	6.245	147.5	17.6
Standard Deviation	2.1	1043	0.57	34	0.43
Number of Guideline Exceedances	0	5	4	0	0
Number of Guideline Exceedances(Detects Only)	0	5	4	0	0

Env Stds Comments
#1:While extreme ph values (<4 and >11) may adversely affect health.
#2 TDS value divided by 0.67

Appendix B
Table B2
Event 3 Analytical Results

				Metals							BTEX & MAH						TRH - NEPM 2013						TPH - NEPM 1999					PAH
				Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	C6 - C10 less BTEX (F1)	C6 - C10 Fraction	>C10 - C16 less Naphthalene (F2)	>C10 - C16 Fraction	>C16 - C34 Fraction (F3)	>C34 - C40 Fraction (F4)	C6 - C 9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 (Sum of Total) - Lab calc	Naphthalene
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/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	mg/L	mg/L	mg/L	µg/L
EQL				0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	1	1	1	1	2	3	0.02	0.02	0.05	0.05	0.1	0.1	0.02	0.05	0.1	0.1	0.1	20
ADWG 2011 Aesthetic							1[#1]				3[#2]		25[#3]	3[#4]			20[#5]												
ADWG 2011 Health				0.01	0.002		2	0.01	0.001	0.02		1	800	300			600												
ANZECC 2000 - Stock Watering				0.5	0.01	1	0.5[#6]	0.1	0.002	1	20																		
ANZECC 2000 FW 95%					0.0002	0.001[#7]	0.0014	0.0034	0.0006	0.011	0.008	950			350														16
Lowland rivers (ANZECC 2000)																													
SampleCode	**Field_ID**	**LocCode**	**Sampled_Date**																										
S15-Oc02842	MW01	MW01	01-Oct-15	0.002	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.03	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02843	MW04	MW04	01-Oct-15	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.012	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02844	MW09	MW09	01-Oct-15	0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.001	0.022	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02845	MW10	MW10	01-Oct-15	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.029	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02846	MW12	MW12	01-Oct-15	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.006	0.019	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02847	MW16	MW16	01-Oct-15	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.012	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
S15-Oc02848	DUPL1	MW16	01-Oct-15	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.014	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
Statistical Summary																													
Number of Results				7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Number of Detects				2	0	0	0	0	0	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.012	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
Minimum Detect				0.001	ND	ND	ND	ND	ND	0.001	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				0.002	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.006	0.03	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<20
Maximum Detect				0.002	ND	ND	ND	ND	ND	0.006	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.00079	0.00005	0.0005	0.0005	0.0005	0.00005	0.002	0.02	0.5	0.5	0.5	0.5	1	1.5	0.01	0.01	0.025	0.025	0.05	0.05	0.01	0.025	0.05	0.05	0.05	10
Median Concentration				0.0005	0.00005	0.0005	0.0005	0.0005	0.00005	0.002	0.019	0.5	0.5	0.5	0.5	1	1.5	0.01	0.01	0.025	0.025	0.05	0.05	0.01	0.025	0.05	0.05	0.05	10
Standard Deviation				0.00057	0	0	0	0	0	0.0019	0.0076	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:from corrosion of pipes/fittings by salt, low ph water. taste threshold 3 mg/l. high concentrations colour water blue/green. >1 mg/l may stain fitings. >2 mg/l can cause ill effects in some people.
#2:usually from corrosion of galvanised pipes/fittings and brasses. natural concentrations generally <0.01 mg/l. taste problems >3 mg/l.
#3:occurs naturally in petrol and natural gas, forest-fire emissions.
#4:natural component of petrol and petroleum products.
#5:Could occur in drinking water as a pollutant, or from solvent used for bonding plastic fittings.
#6:Guideline value for sheep
#7:In absence of Total Cr guideline Cr(VI) guideline has been adopted

Appendix B
Table B3
Event 3 RPD Results

Field Duplicates (WATER)
Filter: SDG in('06 Oct 2015')

SDG	6-Oct-15	6-Oct-15	
Field ID	MW16	DUPL1	RPD
Sampled Date/Time	1/10/2015	1/10/2015	

Chem_Group	ChemName	Units	EQL			
Metals	Arsenic (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Cadmium (Filtered)	mg/l	0.0001	<0.0001	<0.0001	0
	Chromium (III+VI) (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Copper (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Lead (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Mercury (Filtered)	mg/l	0.0001	<0.0001	<0.0001	0
	Nickel (Filtered)	mg/l	0.001	0.002	0.002	0
	Zinc (Filtered)	mg/l	0.005	0.012	0.014	15
BTEX & MAH	Benzene	µg/l	1	<1.0	<1.0	0
	Toluene	µg/l	1	<1.0	<1.0	0
	Ethylbenzene	µg/l	1	<1.0	<1.0	0
	Xylene (o)	µg/l	1	<1.0	<1.0	0
	Xylene (m & p)	µg/l	2	<2.0	<2.0	0
	Xylene Total	µg/l	3	<3.0	<3.0	0
TRH - NEPM 2013	C6 - C10 less BTEX (F1)	mg/l	0.02	<0.02	<0.02	0
	C6 - C10 Fraction	mg/l	0.02	<0.02	<0.02	0
	>C10 - C16 less Naphthalene (F2)	mg/l	0.05	<0.05	<0.05	0
	>C10 - C16 Fraction	mg/l	0.05	<0.05	<0.05	0
	>C16 - C34 Fraction (F3)	mg/l	0.1	<0.1	<0.1	0
	>C34 - C40 Fraction (F4)	mg/l	0.1	<0.1	<0.1	0
TPH - NEPM 1999	C6 - C 9 Fraction	mg/l	0.02	<0.02	<0.02	0
	C10 - C14 Fraction	mg/l	0.05	<0.05	<0.05	0
	C15 - C28 Fraction	mg/l	0.1	<0.1	<0.1	0
	C29 - C36 Fraction	mg/l	0.1	<0.1	<0.1	0
	C10 - C36 (Sum of Total) - Lab calc	mg/l	0.1	<0.1	<0.1	0
PAH	Naphthalene	µg/l	20	<20.0	<20.0	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: 50 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL))

Attachment C - Field Sheets and Calibration Certificates

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW01
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW01
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc): Was Good.	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.202m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 9.545m	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
9.21	1	2.740	6.14	2621	6.41	163.3	18.6	clear
9.24	3	3.340	5.69	2525	6.65	160.6	16.9	clear
9.26	5	3.923	5.76	2537	6.83	157.6	17.1	clear
9.29	7	4.383	5.65	2576	6.96	154.5	17.9	clear
9.32	9	5.152	5.61	2565	7.04	153.2	17.7	clear
9.34	11	5.958	5.63	2574	7.10	153.6	17.7	clear
9.37	13	6.712	5.76	2570	7.14	153.8	17.6	"
9.40	14	7.175	5.62	2574	7.16	152.8	17.8	"
9.42	15	7.470	5.47	2589	7.21	151.9	18.3	"
9.44	16	7.797	5.64	2611	7.25	150.3	16.6	"
9.46	17	8.160	5.61	2603	7.27	150.3	16.3	"
Post Sample Parameters								

Number of Bottles: 4

Comments: Drilling is occuring to North. (vibrations felt around well).

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW04
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW04
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.052m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 2.210m	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
10.24	1	1.472	1.34	160.2	8.05	160.7	17.6	slightly cloudy
10.25	3	1.770	0.61	146.0	7.56	172.0	16.9	clear
10.28	6	1.983	0.56	144.6	7.07	176.9	17.0	clear
10.29	7	1.957	0.51	145.0	6.94	176.3	17.1	clear
10.31	9	1.966	0.40	145.9	6.70	182.2	17.3	"
10.33	10	1.972	0.40	146.1	6.57	183.6	17.3	slightly cloudy.
10.35	12	1.996	0.43	145.9	6.41	184.4	17.3	"
10.36	13	2.005	0.45	145.6	6.35	185.0	17.3	"
10.38	15	2.041	0.45	146.4	6.21	185.6	17.4	"
10.40	17	2.050	0.50	146.2	6.09	187.6	17.4	"
	18	2.044	0.51	146.2	6.07	187.1	17.4	"
Post Sample Parameters								

Number of Bottles: 4

Comments:

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW09
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW09
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 4.886m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 6.610	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
1.50	1	5.276	0.36	1694	6.70	41.1	16.6	Cloudy - dark grey.
1.54	3	5.665	0.53	1647	6.61	61.4	17.8	" "
1.55	5	5.963	0.75	1632	6.55	72.9	17.6	" "
1.57	7	6.166	0.96	1629	6.52	79.2	17.5	" "
1.58	8	6.260	1.05	1627	6.51	82.6	17.5	" "
Post Sample Parameters								

Number of Bottles: 4

Comments: Mulch located immediately adjacent.

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW10
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW10
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 11.712m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 11.775m	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
2.34	1	11.767	0.95	2367	6.63	139.8	16.8	cloudy grey
2.36	2	11.767	0.52	2377	6.57	136.7	18.3	" "
2.38	3	11.762	0.52	2349	6.51	133.1	18.0	" "
2.40	4	11.770	0.45	2327	6.48	130.6	17.9	" "
2.42	6	11.793	0.51	2229	6.45	126.1	17.6	" "
2.44	7	11.762	0.58	2212	6.44	127.4	17.7	" "
2.45	8	11.795	0.63	2215	6.42	127.2	17.7	" "
Post Sample Parameters								

Number of Bottles:

Comments:

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW12
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW12
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 6.360m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 7.452m	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
3.15	1	6.690	2.18	360.2	6.48	161.9	19.1	grey - turbid
3.17	2	6.975	2.77	351.2	6.13	154.2	18.4	" "
3.19	3	7.036	2.98	349.8	6.01	152.6	18.2	" "
3.20	4	7.108	3.17	349.4	5.86	151.0	18.1	" "
3.22	5	7.166	3.18	349.7	5.78	149.9	18.1	" "
3.24	6	7.246	3.22	350.0	5.72	148.8	18.1	" "
3.25	7	7.302	3.24	350.4	5.65	149.8	18.0	" "
3.26	8	7.355	3.02	350.3	5.62	149.6	18.0	" "
3.27	9	7.418	3.11	350.5	5.59	149.2	18.0	" "
Post Sample Parameters								

Number of Bottles: 4

Comments:

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW16
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW16
Client: Fulton Hogan	Date: 1/10/15
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc): Good	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.144m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 1.910m	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
11.45	1	1.599	0.57	516	6.27	164.0	17.7	cloudy-grey.
11.47	3	1.658	0.31	510	6.18	163.6	17.3	"
11.49	5	1.662	0.30	539	6.11	159.4	17.2	"
11.51	7	1.709	0.31	539	6.07	156.3	17.1	a little clearer.
11.54	9	1.740	0.45	539	6.04	149.7	17.2	"
11.57	11	1.762	0.47	539	6.03	145.6	17.1	"
Post Sample Parameters								

Number of Bottles: 6. Comments: DUPL1

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

Attachment D - Laboratory Certificates

eurofins | mgt

☑ **Sydney**
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Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD Pty Ltd	**Contact Name :** Stefan Charteris 02 9239 7472	**Purchase Order :**	**COC Number :**
Office Address :	**Project Manager :** Stefan Charteris	**PROJECT Number :** 21/2430601	**Eurofins | mgt quote ID :** 150501
Level 15, 133 Castlereagh Street, Sydney NSW 2000	**Email for results :** stefan.charteris@ghd.com, jane.curran@ghd.com, amy.dobson@ghd.com	**PROJECT Name :** Foxground to Berry	**Data output format:**

Special Directions & Comments :

Eurofins | mgt DI water batch number:

Analytes

	Sample ID	Date	Matrix	TPH	BTEX	Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
1	MW01	01/10/15	w	x	x	x
2	MW04	01/10/15	w	x	x	x
3	MW09	01/10/15	w	x	x	x
4	MW10	01/10/15	w	x	x	x
5	MW12	01/10/15	w	x	x	x
6	MW16	01/10/15	w	x	x	x
7	DUPL1	01/10/15	w	x	x	x
8						
9						
10						
11						
12						
13						
14						
15						
16						

Some common holding times (with correct preservation)
For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

Containers:

	1LP	200ml	125P	1LA	40mL vial	125mL A	Jar	
1		1		1	2			
2		1		1	2			
3		1		1	2			
4		1		1	2			
5		1		1	2			
6		1		1	2			
7		1		1	2			
8								
9								
10								
11								
12								
13								
14								
15								
16								

Sample comments:

Metals have been field filtered.

Laboratory Staff

Relinquished By: Jane Curran
Date & Time : 02/10/2015 11 am
Signature:

Received By: Sean
Date & Time : 6/10 8:44
Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment

☐ Courier
☐ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival:

Report number: 474744

06 OCT 2015 08:44

eurofins | mgt

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com.au web : www.eurofins.com.au

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Sample Receipt Advice

Company name:	**GHD Pty Ltd NSW**
Contact name:	Stefan Charteris
Project name:	FOXGROUND TO BERRY
Project ID:	21/2430601
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Oct 6, 2015 8:44 AM
Eurofins | mgt reference:	**474744**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 24 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Charl Du Preez on Phone : +61 (2) 9900 8400 or by e.mail: charldupreez@eurofins.com.au

Results will be delivered electronically via e.mail to Stefan Charteris - stefan.charteris@ghd.com.

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Stefan Charteris**

Report **474744-W**
Project name FOXGROUND TO BERRY
Project ID 21/2430601
Received Date Oct 06, 2015

Client Sample ID			**MW01**	**MW04**	**MW09**	**MW10**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**S15-Oc02842**	**S15-Oc02843**	**S15-Oc02844**	**S15-Oc02845**
Date Sampled			**Oct 01, 2015**	**Oct 01, 2015**	**Oct 01, 2015**	**Oct 01, 2015**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	96	96	95	96
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.002	< 0.001	0.001	< 0.001
Cadmium (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	0.001	0.002
Zinc (filtered)	0.005	mg/L	0.030	0.012	0.022	0.029

Client Sample ID			MW12	MW16	DUPL1
Sample Matrix			Water	Water	Water
Eurofins | mgt Sample No.			S15-Oc02846	S15-Oc02847	S15-Oc02848
Date Sampled			Oct 01, 2015	Oct 01, 2015	Oct 01, 2015
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1
BTEX					
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	95	94	96
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	< 0.05
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1
Heavy Metals					
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.006	0.002	0.002
Zinc (filtered)	0.005	mg/L	0.019	0.012	0.014

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Oct 08, 2015	7 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Oct 06, 2015	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Oct 08, 2015	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
BTEX	Sydney	Oct 06, 2015	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8 filtered	Sydney	Oct 06, 2015	28 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: FOXGROUND TO BERRY
Project ID: 21/2430601

Order No.:
Report #: 474744
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Oct 6, 2015 8:44 AM
Due: Oct 13, 2015
Priority: 5 Day
Contact Name: Stefan Charteris

Eurofins | mgt Client Manager: Charl Du Preez

Sample Detail					Metals M8 filtered	BTEX	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted							
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217					X	X	X
Brisbane Laboratory - NATA Site # 20794							
External Laboratory							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
MW01	Oct 01, 2015		Water	S15-Oc02842	X	X	X
MW04	Oct 01, 2015		Water	S15-Oc02843	X	X	X
MW09	Oct 01, 2015		Water	S15-Oc02844	X	X	X
MW10	Oct 01, 2015		Water	S15-Oc02845	X	X	X
MW12	Oct 01, 2015		Water	S15-Oc02846	X	X	X
MW16	Oct 01, 2015		Water	S15-Oc02847	X	X	X
DUPL1	Oct 01, 2015		Water	S15-Oc02848	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.02			0.02	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0001			0.0001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	108			70-130	Pass	
TRH C10-C14	%	121			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	101			70-130	Pass	
Toluene	%	101			70-130	Pass	
Ethylbenzene	%	89			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
o-Xylene	%	89			70-130	Pass	
Xylenes - Total	%	104			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	96			70-130	Pass	
TRH C6-C10	%	102			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	116			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	99			70-130	Pass	
Cadmium (filtered)	%	99			70-130	Pass	
Chromium (filtered)	%	95			70-130	Pass	
Copper (filtered)	%	94			70-130	Pass	
Lead (filtered)	%	97			70-130	Pass	
Mercury (filtered)	%	92			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Nickel (filtered)			%	99			70-130	Pass	
Zinc (filtered)			%	93			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S15-Oc02843	CP	%	110			70-130	Pass	
TRH C10-C14	S15-Oc02843	CP	%	114			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S15-Oc02843	CP	%	109			70-130	Pass	
Toluene	S15-Oc02843	CP	%	106			70-130	Pass	
Ethylbenzene	S15-Oc02843	CP	%	107			70-130	Pass	
m&p-Xylenes	S15-Oc02843	CP	%	106			70-130	Pass	
o-Xylene	S15-Oc02843	CP	%	109			70-130	Pass	
Xylenes - Total	S15-Oc02843	CP	%	107			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S15-Oc02843	CP	%	101			70-130	Pass	
TRH C6-C10	S15-Oc02843	CP	%	103			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S15-Oc02843	CP	%	110			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S15-Oc02845	CP	%	102			70-130	Pass	
Cadmium (filtered)	S15-Oc02845	CP	%	102			70-130	Pass	
Chromium (filtered)	S15-Oc02845	CP	%	95			70-130	Pass	
Copper (filtered)	S15-Oc02845	CP	%	86			70-130	Pass	
Lead (filtered)	S15-Oc02845	CP	%	85			70-130	Pass	
Mercury (filtered)	S15-Oc02845	CP	%	84			70-130	Pass	
Nickel (filtered)	S15-Oc02845	CP	%	92			70-130	Pass	
Zinc (filtered)	S15-Oc02845	CP	%	91			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S15-Oc02842	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S15-Oc02842	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S15-Oc02842	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S15-Oc02842	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S15-Oc02842	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S15-Oc02842	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S15-Oc02842	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S15-Oc02842	CP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S15-Oc02842	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S15-Oc02842	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S15-Oc02842	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C6-C10	S15-Oc02842	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S15-Oc02842	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S15-Oc02842	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S15-Oc02842	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S15-Oc02844	CP	mg/L	0.001	0.001	<1	30%	Pass	
Cadmium (filtered)	S15-Oc02844	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Chromium (filtered)	S15-Oc02844	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S15-Oc02844	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	S15-Oc02844	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S15-Oc02844	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S15-Oc02844	CP	mg/L	0.001	0.001	2.0	30%	Pass	
Zinc (filtered)	S15-Oc02844	CP	mg/L	0.022	0.022	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Charl Du Preez	Analytical Services Manager
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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 Co = Analyte concentration of the original sample
Cd = 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, or at low analyte concentrations. Groundwater QA/QC results are presented in Table B3, Attachment B.

There were no discrepancies in GHD's adopted criterion for RPDs calculated for the intra laboratory duplicate pairs for the analytes tested.

Laboratory Program

The NATA certified laboratory utilised for this assessment (i.e. Eurofins | Mgt) 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 provided as Attachment D. In summary:

- All samples were noted to be correctly preserved.
- Samples were extracted within allocated holding times.

Method blank results were less than the PQL, and surrogate spike and laboratory control sample recoveries were within laboratory acceptance criteria for majority of the samples collected over the event.

Summary of Quality Assurance / Quality Control Results

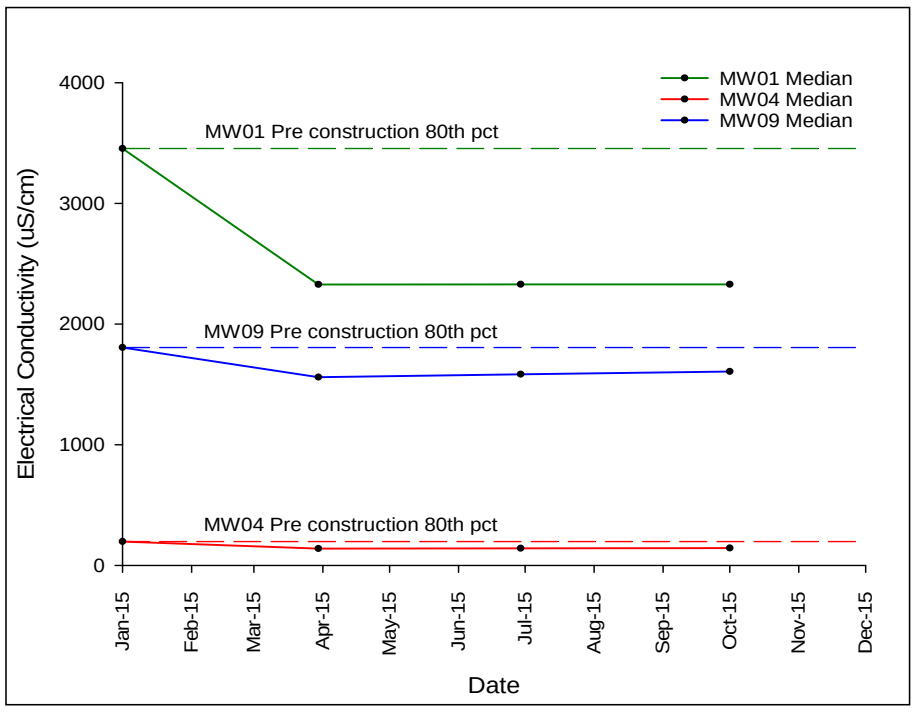
The QA/QC results show that the samples collected have met the appropriate standards and therefore, the data was considered to be valid and of sufficient quality to meet the data quality objectives for the assessment.

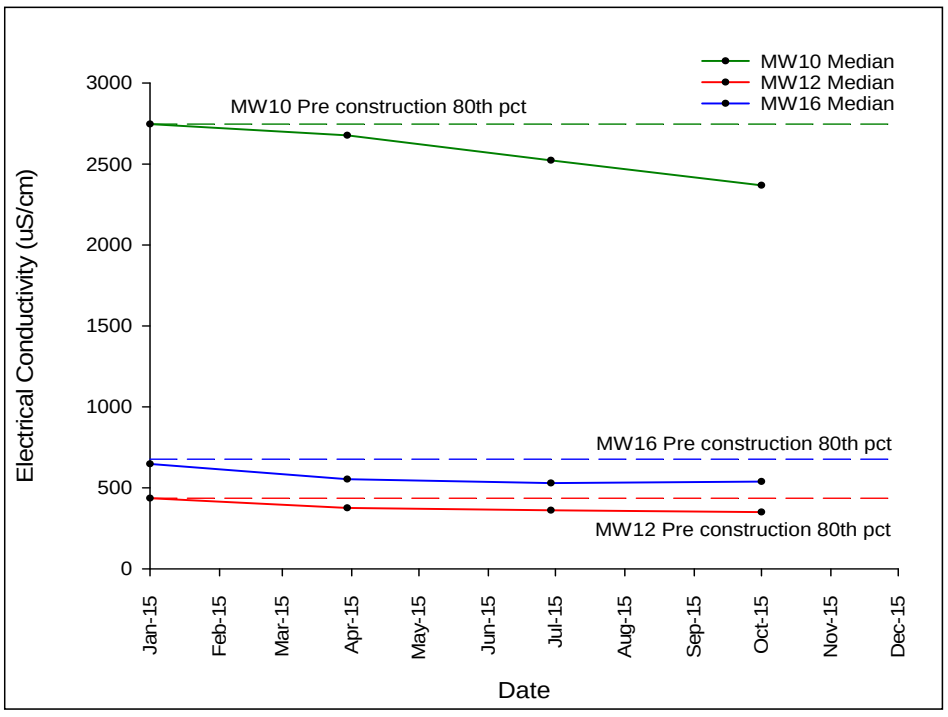
Attachment F - Control Charts and Result Graphs

Control Charts: Electrical Conductivity, pH

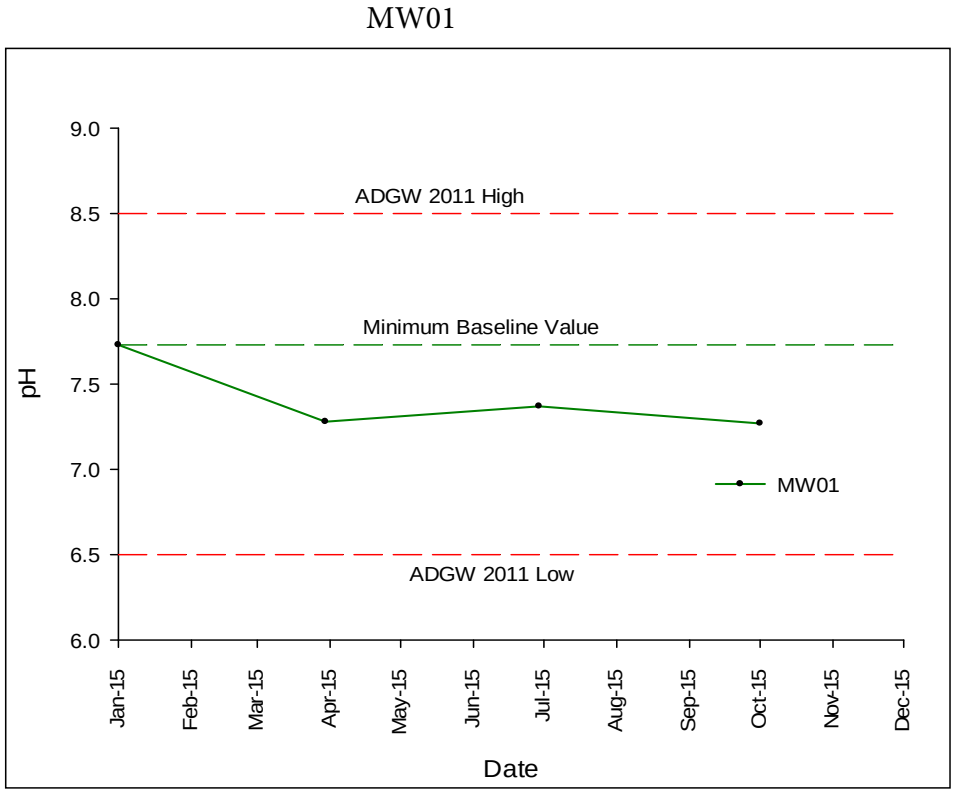
Result Graphs: Nickel, Copper, Arsenic, Zinc

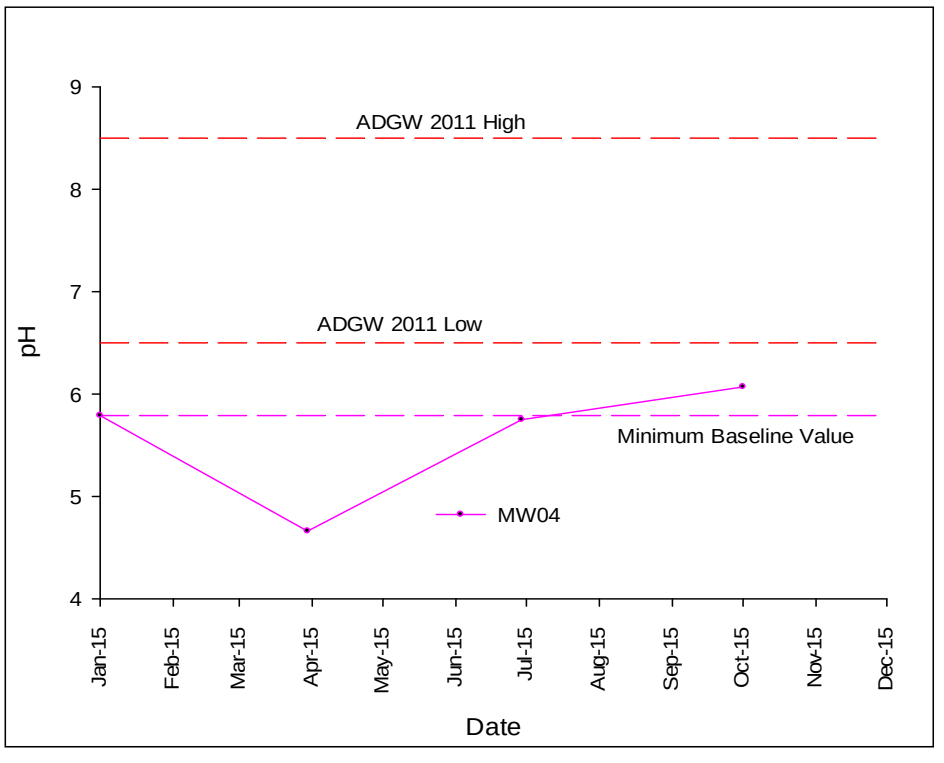
Electrical Conductivity



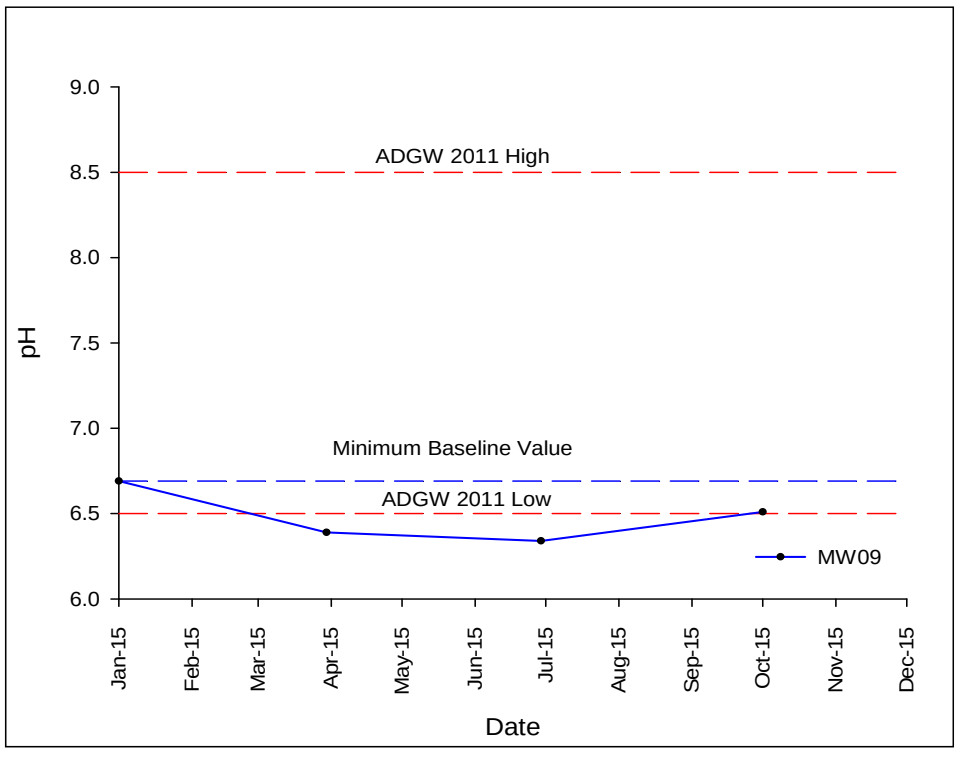


pH

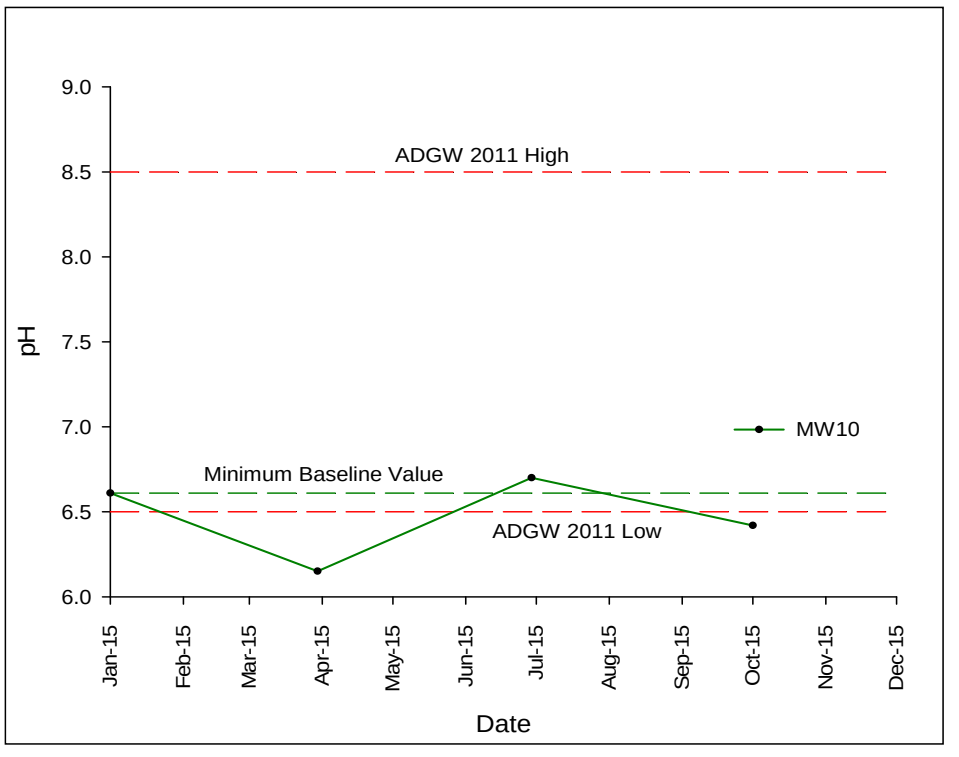




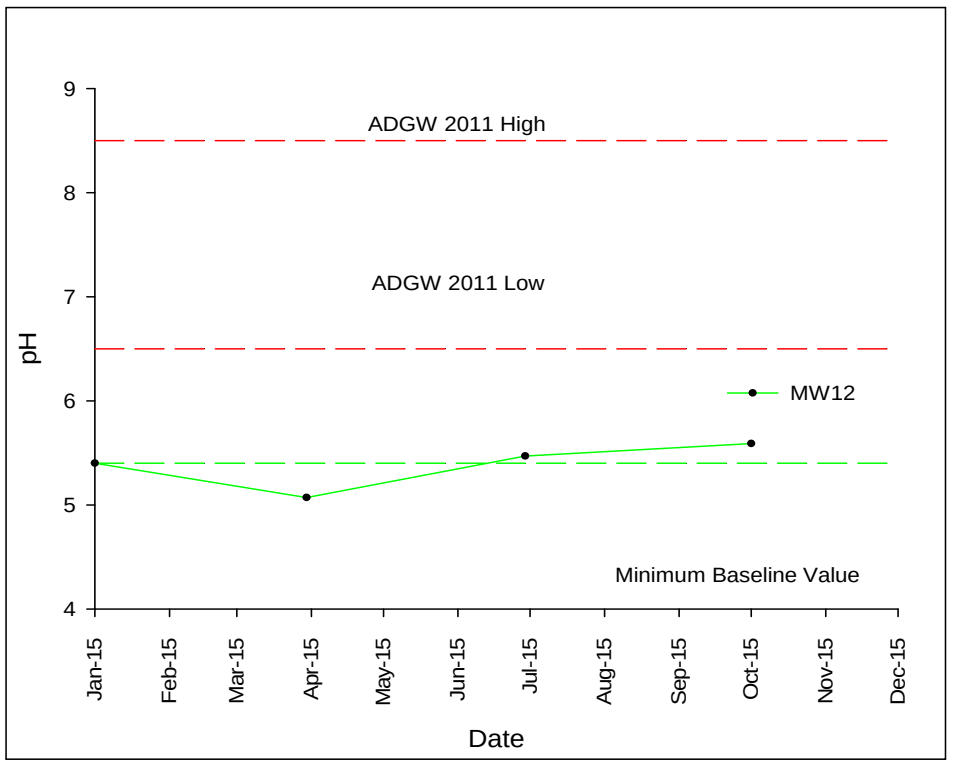
MW09



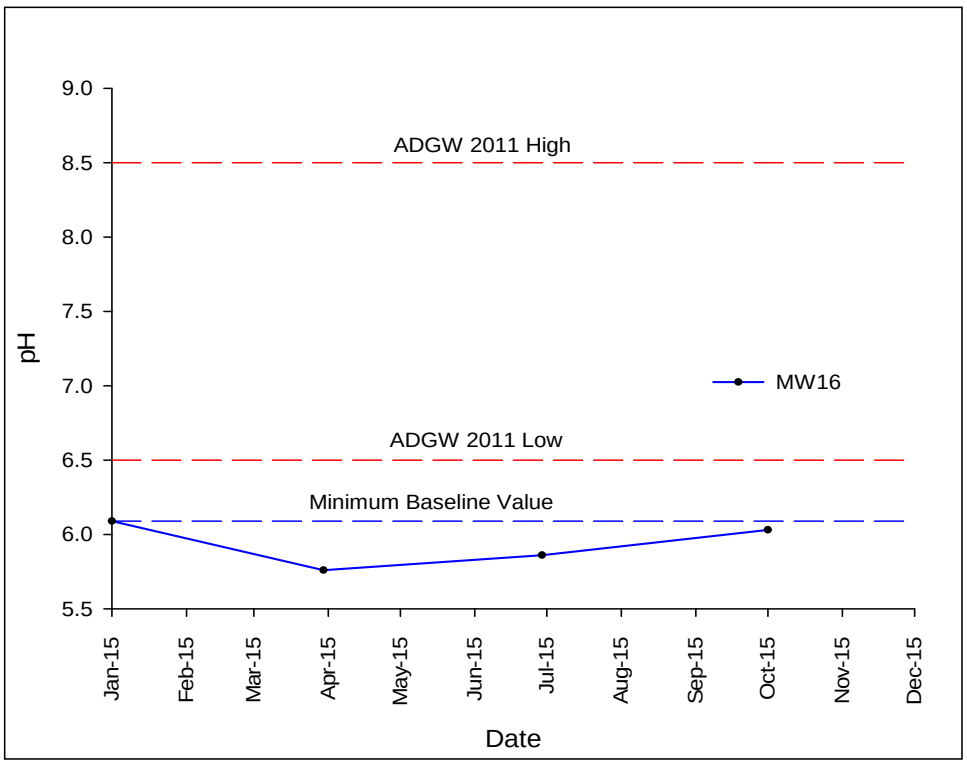
MW10



MW12

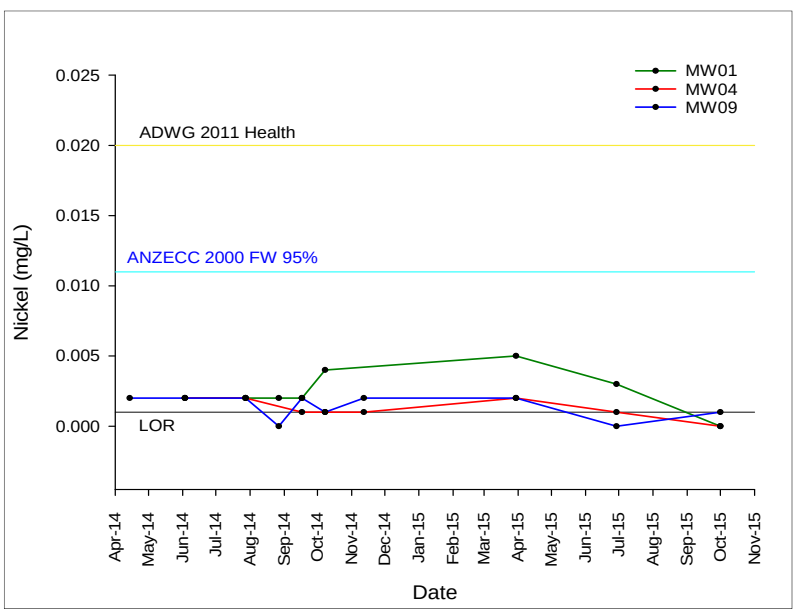


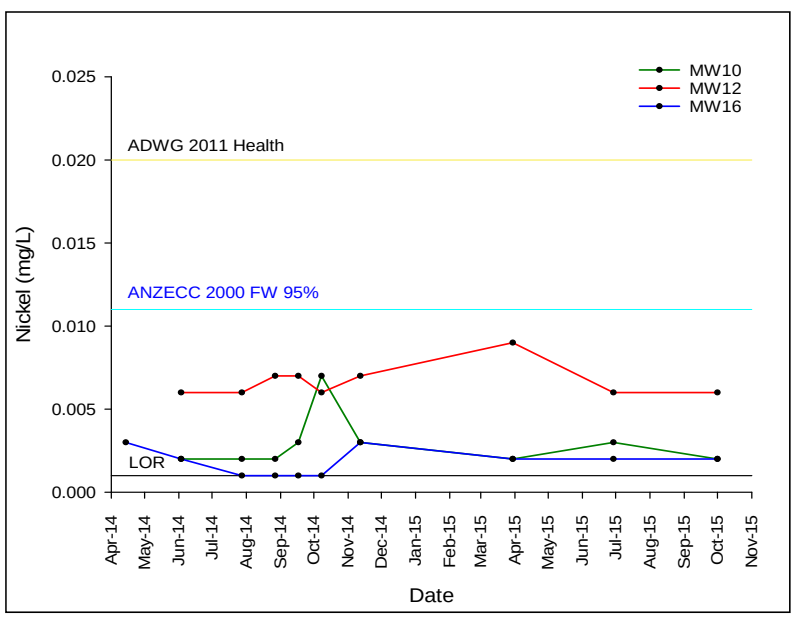
MW16



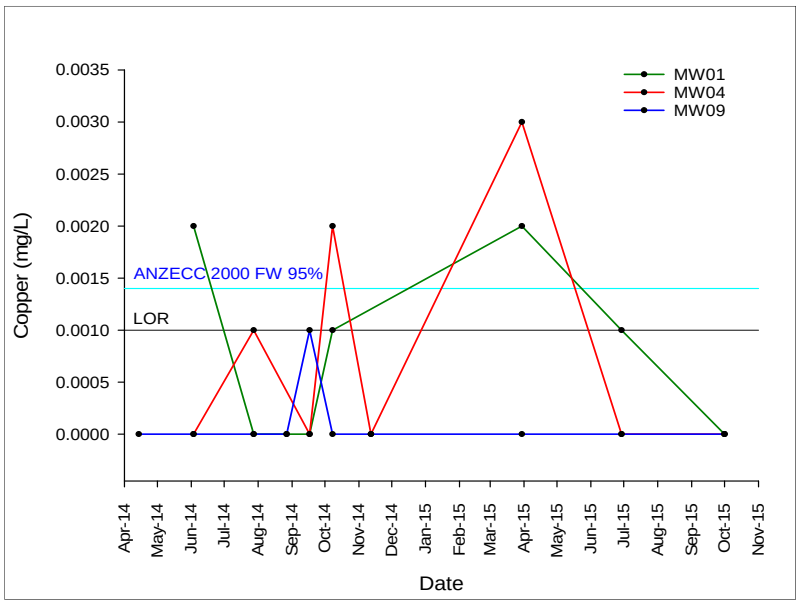
Attachment F
Control Charts

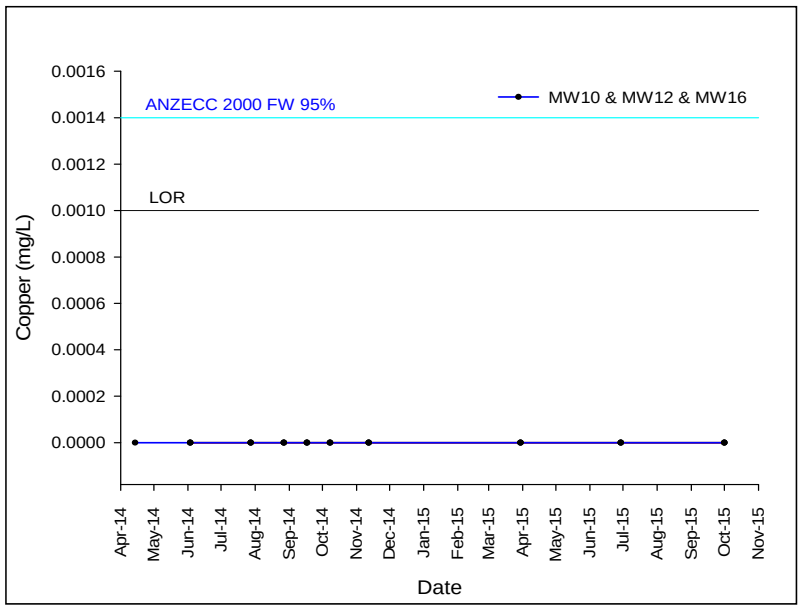
Nickel



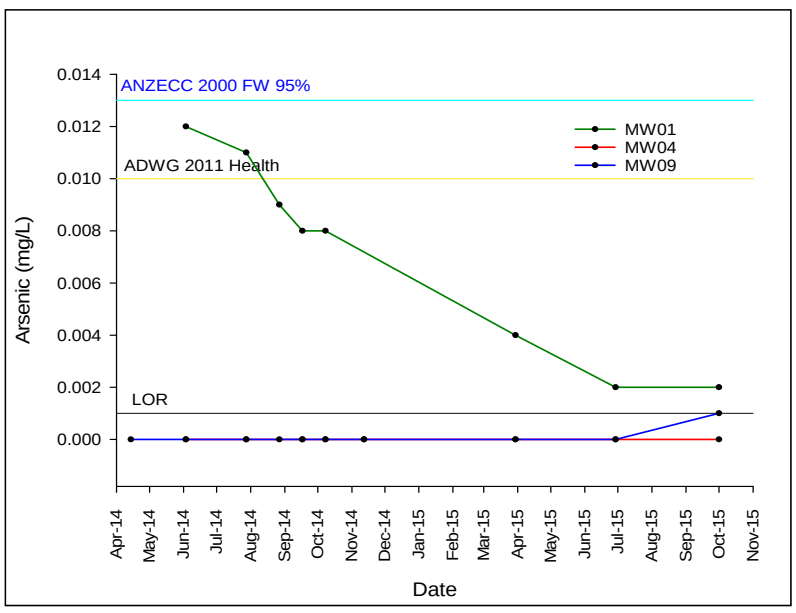


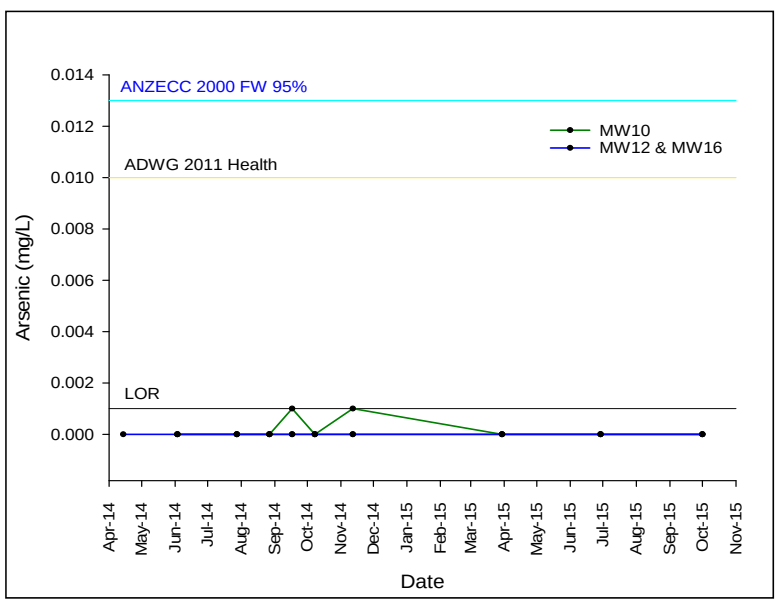
Copper



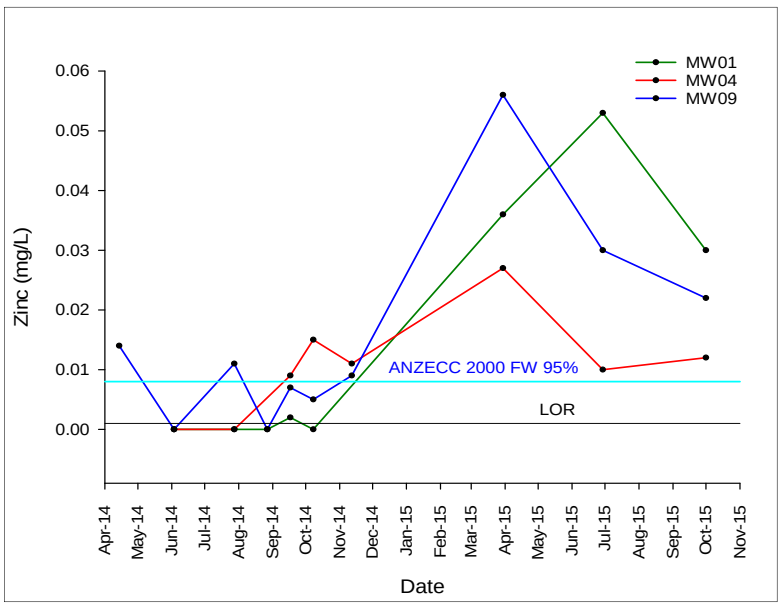


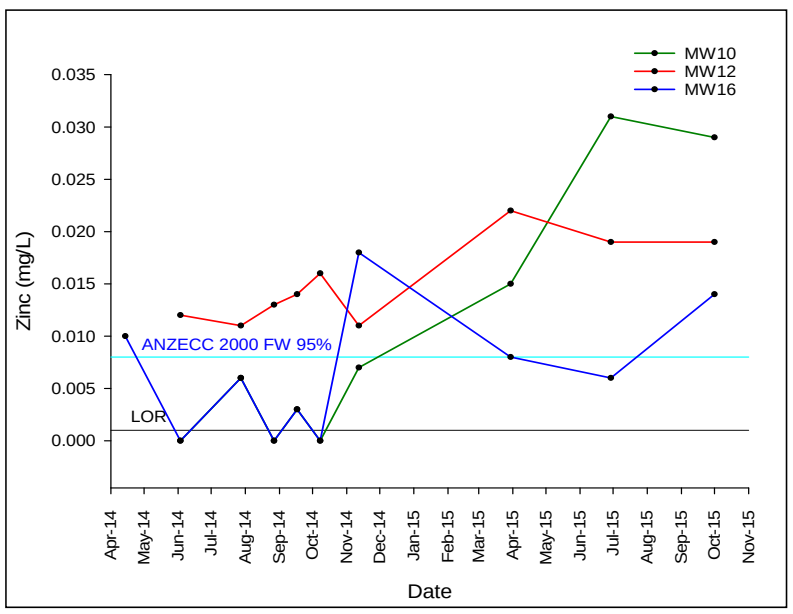
Arsenic





Zinc





2 March 2016

James Diamond
Environmental Coordinator
Fulton Hogan Construction Pty Ltd
P.O. Box 353
Berry NSW 2535

Our ref: 21/24306
213736 Rev1

Your ref:

Dear James,

Groundwater Monitoring Event
Construction Event 4

1 Scope and limitations

In accordance with the Princes Highway upgrade for Foxground and Berry Bypass (FBB) - Water Monitoring Project Brief (*Contract No. 12.2574.3019)*, GHD Pty Ltd (GHD) completed a quarterly round of groundwater quality monitoring at six locations (namely MW01, MW04, MW09, MW10, MW12 and MW16) which is the fourth of its nature undertaken. Groundwater elevations have also been monitored using data loggers at MW03, MW08, MW13 and MW16.

This letter report documents the findings of the fourth groundwater monitoring event (Event 4) undertaken since the commencement of construction.

2 Field and Analytical Program

The groundwater sampling was undertaken at the six nominated groundwater monitoring wells on 13 January 2016; refer to Figure 1, Attachment A, depicting the monitoring well locations. This quarterly groundwater sampling event was conducted in accordance with the sampling program and protocols provided in the following documents:

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

Groundwater field parameters were measured during sampling including temperature, pH, electrical conductivity (EC), dissolved oxygen (DO) and reduction-oxidation potential (redox). The readings are summarised in Table B1, Attachment B. GHD's detailed field record sheets and calibration certificates are provided in Attachment C and indicate suitable calibration of the water quality meter prior to use.

Water samples were submitted to a National Association of Testing Authorities (NATA) certified testing laboratory (Eurofins | Mgt) with the following analysis undertaken:

- Total Petroleum Hydrocarbons (TPH).
- Benzene, Toluene, Ethyl-benzene and Xylene (BTEX).

- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) dissolved.

Each sample was field filtered prior to laboratory analysis for heavy metals.

One duplicate sample was collected (labelled DUPL), from well MW16.

3 Results and Discussion

This section presents control charts and discusses results (with regard to exceedances of criteria or inconsistencies in the groundwater results for Event 4) in accordance with the following:

- GHD's letter report limitations provided in Section 4.
- GHD 2014, 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.

3.1 Groundwater Elevations

The rainfall within Broughton Creek catchment and the groundwater elevations within monitored wells are presented in Figure 2, Attachment A. The rainfall data was obtained from the NSW Office of Water website (http://realtimedata.water.nsw.gov.au/water.stm).

The recorded groundwater levels indicate the majority of wells are relatively stable with the exception of MW01, which showed an increased groundwater elevation between pre-construction observations (i.e. pre-December 2014) and construction observations. Groundwater elevations have stabilised since construction began at relatively higher elevation. A decrease in groundwater elevation is the expected response associated with construction activities near to MW01, which is not currently evident. A clear longer-term construction response is not evident in MW04, MW10, MW12 and MW16 standing water levels. There is an indication of a slight fall in groundwater elevations at MW04.

The manually recorded groundwater elevations for all wells monitored, including those with data loggers installed are presented in Table 1 below.

Table 1 Manual groundwater observations for monitoring event 4

Well ID	Well Depth (m)	Well Elevation (m AHD)	Groundwater Elevation (m btoc)	Groundwater Elevation (m AHD)
MW01	22.88	52.71	1.31	51.40
MW03	21.79	102.93	13.01	89.92
MW04	7.59	80.77	2.15	78.62
MW08	9.87	28.59	2.60	25.99
MW09	10.26	33.06	4.94	28.12
MW10	14.85	33.13	11.73	21.40
MW12	10.56	25.15	6.84	18.31
MW13	14.76	49.94	10.47	39.47
MW16	10.75	22.82	1.16	21.67

Notes:
m btoc = metres below top of casing
m AHD = metres above Australian height datum

3.2 Groundwater Quality Sampling Results

There were no visual or olfactory signs of contamination observed at any of the sampling points during the groundwater investigation. Groundwater was generally observed to be clear to cloudy (grey).

In situ water quality parameters measured during sampling are presented in Table B1, Attachment B.

Groundwater laboratory analytical results for the suite listed in Section 2 are tabulated against selected criteria (in accordance with the protocols detailed in Section 2) in Table B2, Attachment B. Laboratory documents are provided in Attachment D.

Groundwater quality parameters and chemical concentrations outside of the ranges present within the screening criteria are summarised in Table 2. The findings suggest groundwater quality is above some screening criteria at a number of locations throughout the catchment. All monitoring locations, apart from sampling location MW04, exceeded the adopted ecological freshwater screening criteria for zinc, but were below selected drinking water criteria. Electrical conductivity and pH readings were outside of the ADWG (Aesthetic) criteria and lowland rivers (ANZECC 2000) indicating the groundwater is not suitable from an aesthetic drinking water perspective. All results are below the ANZECC Stock Watering criteria indicating suitability for this purpose.

Table 2 Summary of Water Quality Screening

Analyte	Units	Screening Criteria	No. Locations Exceeding Adopted Criteria	Minimum value	Maximum value
pH (field)	pH units	6.5 - 8.5 (ADWG Aesthetic) and 6.5 – 8.0 (Lowland Rivers ANZECC 2000)	3	5.7 (MW12)	7.7 (MW01)
Electrical Conductivity (field)	us/cm	890 (ADWG Aesthetic) and 300 (Lowland Rivers ANZECC 2000)	3 (ADWG) 5 (Lowland Rivers)	483 (MW12)	3,294 (MW01)
Zinc dissolved (laboratory)	mg/L	0.008 (ANZECC 2000 Freshwater 95%)	6	0.012 (MW04)	0.03 (MW01)

Note: * EQL is greater than the criteria and not representative of an exceedance of criteria, trace analysis recommended in future.

The majority of these exceedances of criteria were also reported during the pre-construction phase of monitoring. Additional discussion of the results with regard to pre-construction data is provided in Sections 3.2.1 and 3.2.2.

An assessment of the field quality control sampling is provided in Table B3, Attachment B and suggests there was only one unacceptable difference in the primary (MW16) and duplicate sample (DUPL1) analysed (RPD 98%).

A discussion of the field and laboratory quality assurance and quality control findings is provided in Attachment E.

3.2.1 Control Charts

In accordance with the assessment criteria documented in the monitoring plans and summarised in Section 2, control charts have been developed for specific analytes. These are discussed below.

Electrical Conductivity (field)

The groundwater control charts compare pre-construction (reference) data with construction and operation (test) data. The 'reference' data is presented as an 80th percentile of the pre-construction monitoring, while the 'test' data represent the median of the sampling. The control charts for Event 4 are presented in Attachment F.

The Electrical Conductivity control chart has an upper threshold 80th percentile limit. At all wells there has been a slight upswing in the median levels since the last monitoring event with median values closer to those sampled at the start of the construction works. Well MW16 conductivity levels are at the 80th percentile and well MW12 exceeds the 80th percentile suggesting construction works may be influencing the slight increase in electrical conductivity results at these locations.

pH (field)

The pH control charts vary from the method used for electrical conductivity because there is a criteria range for assessing pH water quality as opposed to an upper threshold value. This limits the value of comparing pH changes to an 80th percentile baseline value in the control chart. As such, the actual data has been compared against the Australian Drinking Water Guidelines (ADWG 2011) of 6.5 – 8.5 pH units for drinking water and the lowest pH baseline value for each well recorded before construction (baseline

data). It is noted that the ecological values for lowland rivers in south east Australia ranges between pH units of 6.5 and 8.0. This method allows characterisation of the pH relative to the baseline (pre-construction) data and the adopted screening criteria.

The control charts show MW01 is within the screening criteria and has recently increased toward the pre-construction minimum value. The pH values at MW04 are similar to the previous monitoring event and are acceptably above the minimum baseline (pre-construction) value. They are slightly below the ADWG 2011 low range screening criteria value. MW09 pH levels have increased to above the minimum baseline (pre-construction) value and are also within the ADWG 2011 screening criteria. MW10 pH values are slightly above the minimum baseline (pre-construction) value and the ADWG 2011 low range screening criteria for Event 4 although the values have a variable pattern. MW12 and MW16 results are outside of ADWG 2011 screening criteria although they are both acceptably above the minimum baseline values reported before construction.

Overall, the pH control charts suggest that the results are generally consistent with previous rounds and pre-construction data, which suggest that the wells have not been significantly influenced by construction works.

The remaining analytes with detectable concentrations have been assessed using other methods and are discussed in the following sections.

3.2.2 Results Graphs

The concentrations for dissolved heavy metals (with detectable concentrations) were plotted in time series to assess the changes pre- and during construction and the emergence of trends. Control charts were considered unsuitable in this instance as the metals data generally has 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. Time series results graphs were created for the following metals (which had detectable concentrations):

- Nickel.
- Copper.
- Arsenic.
- Zinc.

The results graphs for Event 4 are presented in Attachment F.

The results graphs for nickel and arsenic are well below the selected human health and ecological criteria. Further to this, with the inclusion of the latest results, there does not appear to be any increasing trends. As such, any changes, whether associated with background variations or associated with construction activities are not representing a significant risk.

The copper results graphs for wells MW01 and MW04 have continued to have no exceedances above the selected criteria since monitoring Event 3 and have decreased in concentration to pre-construction conditions. MW09 has a slight increase in reported copper concentration although it is still below the ANZECC (2000) freshwater criteria for the protection of aquatic ecosystems. The results from this monitoring event and from the previous two monitoring events suggest a decrease in concentrations to within the range of pre-construction conditions (Pre-December 2014) and below the selected ANZECC (2000) aquatic ecosystems criteria. This suggests that there is no increasing trend associated with the emergence of impacts from construction and that the previously elevated concentrations were more likely to be associated with natural background variations.

Zinc at all wells have elevated concentrations relative to pre-construction conditions (Pre-December 2014). Wells MW01, MW09, MW10, MW12 and MW16 have Zinc concentrations above the selected

ANZECC (2000) freshwater criteria for the protections of aquatic ecosystems (there is no human health value for zinc). An elevated concentration in baseline data (pre-construction) was seen in wells MW09, MW04, MW16 and MW12 with values above the freshwater aquatic ecosystem criteria, however these values were most often at a lower concentrations than those reported during construction. MW16 has continued its upward trend in zinc concentration with the greatest increase since monitoring started. Well MW09 increased in concentration rather than falling as it has done in the last two monitoring events. MW12 also increased in concentration from relatively stable concentrations seen in the last two monitoring events. MW01 and MW10 have continued to decrease in concentration with MW10 values almost below the freshwater aquatic ecosystem criteria.

The data shows that zinc concentrations in most monitoring wells sampled have increased since construction commenced. Disturbance of surface soils has the potential to release background soil constituents such as zinc to groundwater and surface water run-off. An increase in zinc in surface water is not apparent.

Exposure of bedrock, specifically those high in sulphides, to air has the potential to produce acid and metalliferous drainage. This process may be occurring at the site and may be responsible for the increases in zinc although there does not appear to be a corresponding decrease in pH in the results.

It is plausible that the elevated concentrations could be associated with construction activities. As such, a more detailed assessment of the possible source and trends should be considered.

Concentrations of TPH and BTEX (including naphthalene) were below detection and as such, the results were not graphed.

The results of this event (Event 4) suggest that construction works could be influencing groundwater quality at the site, although further assessment of localised trends in zinc concentrations is required.

3.3 Recommendations

It is recommended that a strategy is developed to assess potential localised changes in groundwater quality, relative to baseline conditions, since the start of construction.

The next quarterly groundwater sampling event (Event 5) will be completed by GHD in March 2016.

4 Limitations

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

GHD otherwise disclaims responsibility to any person other than Fulton Hogan 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 Fulton Hogan 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.

Please contact the undersigned if you have any questions or require further information.

Kind Regards,

Jane Curran
Environmental Scientist
02 4424 4960

Stefan Charteris
Senior Hydrogeologist
02 9239 7472

Attachment A - Figures

1:25,000 (at A3)

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Groundwater Sampling Locations
- Berry to Foxground upgrade alignment
- Roads
- Railways
- Waterways
- Lakes and dams

Roads and Maritime Services
Water Quality Monitoring

Job Number	61-24306
Revision	A
Date	28 Apr 2015

Groundwater Sampling Locations

Figure 1

\\ghdnet\ghd\AU\Sydney\Projects\21\24306\GIS\Maps\MXD\21_24306_Z002_GroundWatersamplingLocations.mxd

Data Source: NSW Department of Lands: DTDB and DCDB - 2012. Created by: mweber

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Figure 2: Foxground to Berry Bypass Groundwater and Rainfall Observations

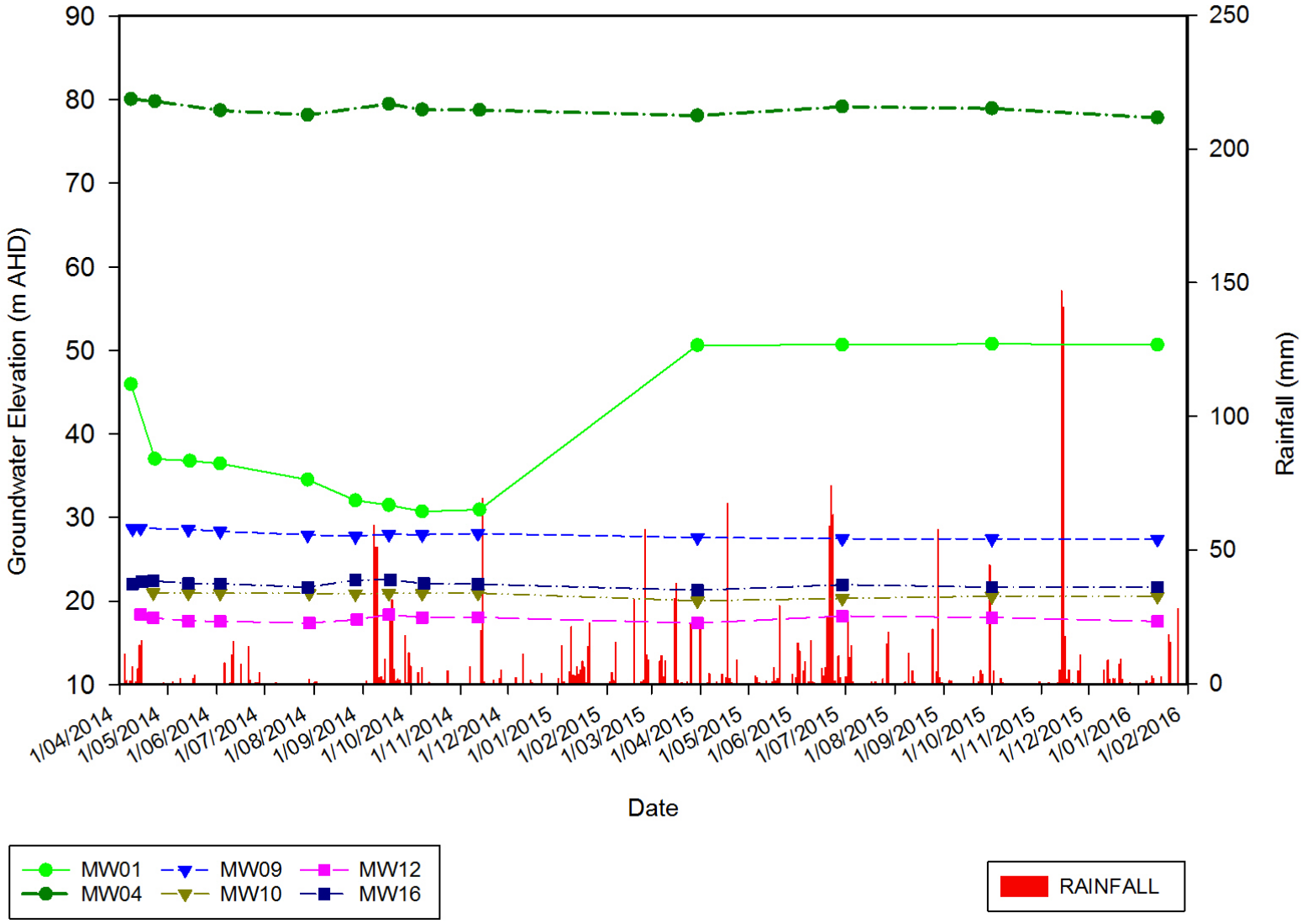
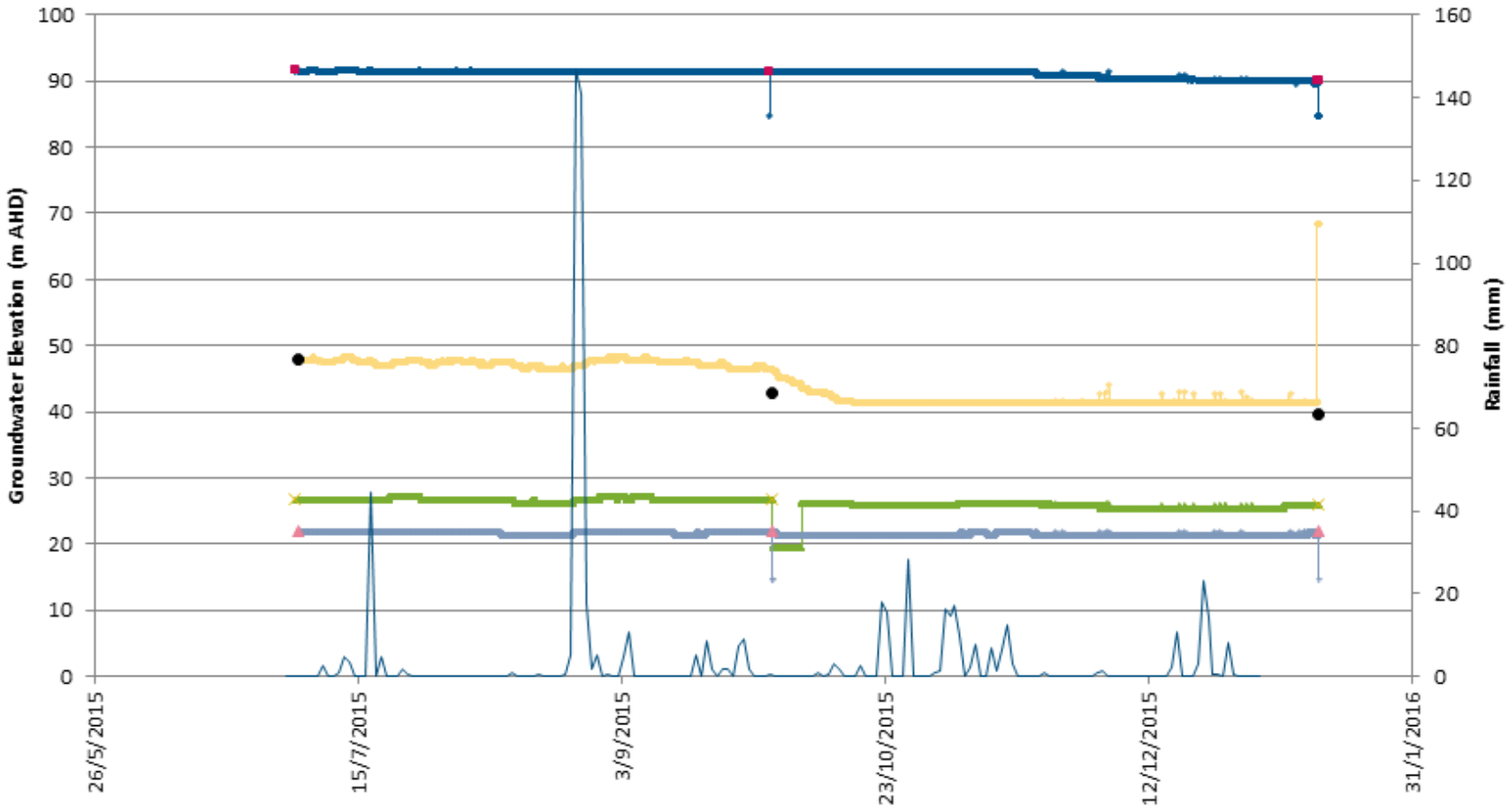


Figure 3: Foxground to Berry Bypass Groundwater Data Logger Elevation Data



Attachment B - Tabulated Results

Attachment B
Table B1
Event 4 - Field Parameters

	Field				
	Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Redox	Temp (Field)
	mg/L	µS/cm	pH_Units	mV	oC
ADWG 2011 Aesthetic		*890* [#2]	*6.5-8.5* [#1]		
ADWG 2011 Health					
ANZECC 2000 - Stock Watering					
ANZECC 2000 FW 95%					
Lowland rivers (ANZECC 2000)		300	6.5-8		

SampleCode	Field_ID	LocCode	Sampled_Date-Time					
MW01_13 Jan 16_-	MW01	MW01	13/01/2016	0.32	*3294*	7.76	17.4	22.8
MW04_13 Jan 16_-	MW04	MW04	13/01/2016	1.05	170.6	*6*	152.6	18.3
MW09_13 Jan 16_-	MW09	MW09	13/01/2016	1.13	*1758*	6.8	90.3	18.5
MW10_13 Jan 16_-	MW10	MW10	13/01/2016	1.9	*2596*	6.7	94	18.5
MW12_13 Jan 16_-	MW12	MW12	13/01/2016	0.8	483.4	*5.68*	152.7	18.3
MW16_13 Jan 16_-	MW16	MW16	13/01/2016	0.3	676	*6.3*	115.6	19.1

Statistical Summary

Number of Results	6	6	6	6	6
Number of Detects	6	6	6	6	6
Minimum Concentration	0.3	170.6	5.68	17.4	18.3
Minimum Detect	0.3	170.6	5.68	17.4	18.3
Maximum Concentration	1.9	3294	7.76	152.7	22.8
Maximum Detect	1.9	3294	7.76	152.7	22.8
Average Concentration	0.92	1496	6.5	104	19
Median Concentration	0.925	1217	6.5	104.8	18.5
Standard Deviation	0.6	1262	0.73	50	1.8
Number of Guideline Exceedances	0	5	3	0	0
Number of Guideline Exceedances(Detects Only)	0	5	3	0	0

Env Stds Comments

#1:While extreme ph values (<4 and >11) may adversely affect health.
#2 TDS value divided by 0.67

Chem_Group = 'Field'
G:\21\24306\Technical\Results\Results Graphs\Groundwater\Contol Charts\Event 4\Table B1. Field Parameters

Attachment B
Table B2
Event 4 Analytical Results

				Metals							BTEX & MAH						TRH - NEPM 2013						TPH - NEPM 1999					PAH
				Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	C6 - C10 less BTEX (F1)	C6 - C10 Fraction	>C10 - C16 less Naphthalene (F2)	>C10 - C16 Fraction	>C16 - C34 Fraction (F3)	>C34 - C40 Fraction (F4)	C6 - C 9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 (Sum of Total) - Lab calc	Naphthalene
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/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	mg/L	mg/L	mg/L	µg/L
EQL				0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	1	1	1	1	2	3	0.02	0.02	0.05	0.05	0.1	0.1	0.02	0.05	0.1	0.1	0.1	10
ADWG 2011 Aesthetic							*1* [#1]				*3* [#2]		*25* [#3]	*3* [#4]			*20* [#5]												
ADWG 2011 Health				0.01	0.002		2	0.01	0.001	0.02		1	800	300			600												
ANZECC 2000 - Stock Watering				0.5	0.01	1	0.5 [#6]	0.1	0.002	1	20																		
ANZECC 2000 FW 95%					0.0002	0.001 [#7]	0.0014	0.0034	0.0006	0.011	0.008	950			350														16
Lowland rivers (ANZECC 2000)																													
SampleCode	**Field_ID**	**LocCode**	**Sampled_Date**																										
S16-Ja06160	MW01	MW01	13-Jan-16	0.007	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.026	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06161	MW04	MW04	13-Jan-16	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.005	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06162	MW09	MW09	13-Jan-16	<0.001	<0.0001	<0.001	0.001	<0.001	<0.0001	0.002	0.039	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06163	MW10	MW10	13-Jan-16	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.009	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06164	MW12	MW12	13-Jan-16	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.007	0.028	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06165	MW16	MW16	13-Jan-16	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.011	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
S16-Ja06166	DUPL1	MW16	13-Jan-16	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.002	0.032	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
Statistical Summary																													
Number of Results				7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Number of Detects				1	0	0	1	0	0	5	7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Minimum Concentration				<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.005	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
Minimum Detect				0.007	ND	ND	0.001	ND	ND	0.002	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				0.007	<0.0001	<0.001	0.001	<0.001	<0.0001	0.007	0.039	<1	<1	<1	<1	<2	<3	<0.02	<0.02	<0.05	<0.05	0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<10
Maximum Detect				0.007	ND	ND	0.001	ND	ND	0.007	0.039	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.0014	0.00005	0.0005	0.00057	0.0005	0.00005	0.0023	0.021	0.5	0.5	0.5	0.5	1	1.5	0.01	0.01	0.025	0.025	0.057	0.05	0.01	0.025	0.05	0.05	0.05	5
Median Concentration				0.0005	0.00005	0.0005	0.0005	0.0005	0.00005	0.002	0.026	0.5	0.5	0.5	0.5	1	1.5	0.01	0.01	0.025	0.025	0.05	0.05	0.01	0.025	0.05	0.05	0.05	5
Standard Deviation				0.0025	0	0	0.00019	0	0	0.0022	0.013	0	0	0	0	0	0	0	0	0	0	0.019	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:from corrosion of pipes/fittings by salt, low ph water. taste threshold 3 mg/l. high concentrations colour water blue/green. >1 mg/l may stain fitings. >2 mg/l can cause ill effects in some people.
#2:usually from corrosion of galvanised pipes/fittings and brasses. natural concentrations generally <0.01 mg/l. taste problems >3 mg/l.
#3:occurs naturally in petrol and natural gas, forest-fire emissions.
#4:natural component of petrol and petroleum products.
#5:Could occur in drinking water as a pollutant, or from solvent used for bonding plastic fittings.
#6:Guideline value for sheep
#7:In absence of Total Cr guideline Cr(VI) guideline has been adopted

Attachment B
Table B3
Event 3 RPD Results

Field Duplicates (WATER)
Filter: SDG in('15 Jan 2016')

SDG	15-Jan-16	15-Jan-16	
Field ID	MW16	DUPL1	RPD
Sampled Date/Time	13/01/2016	13/01/2016	

Chem_Grc	ChemName	Units	EQL			
Metals	Arsenic (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Cadmium (Filtered)	mg/l	0.0001	<0.0001	<0.0001	0
	Chromium (III+VI) (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Copper (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Lead (Filtered)	mg/l	0.001	<0.001	<0.001	0
	Mercury (Filtered)	mg/l	0.0001	<0.0001	<0.0001	0
	Nickel (Filtered)	mg/l	0.001	0.002	0.002	0
	Zinc (Filtered)	mg/l	0.005	**0.011**	**0.032**	**98**
BTEX & M/	Benzene	µg/l	1	<1.0	<1.0	0
	Toluene	µg/l	1	<1.0	<1.0	0
	Ethylbenzene	µg/l	1	<1.0	<1.0	0
	Xylene (o)	µg/l	1	<1.0	<1.0	0
	Xylene (m & p)	µg/l	2	<2.0	<2.0	0
	Xylene Total	µg/l	3	<3.0	<3.0	0
AH						
TRH - NEP	C6 - C10 less BTEX (F1)	mg/l	0.02	<0.02	<0.02	0
	C6 - C10 Fraction	mg/l	0.02	<0.02	<0.02	0
	>C10 - C16 less Naphthalene (F2)	mg/l	0.05	<0.05	<0.05	0
	>C10 - C16 Fraction	mg/l	0.05	<0.05	<0.05	0
	>C16 - C34 Fraction (F3)	mg/l	0.1	<0.1	<0.1	0
	>C34 - C40 Fraction (F4)	mg/l	0.1	<0.1	<0.1	0
M 2013						
TPH - NEP	C6 - C 9 Fraction	mg/l	0.02	<0.02	<0.02	0
	C10 - C14 Fraction	mg/l	0.05	<0.05	<0.05	0
	C15 - C28 Fraction	mg/l	0.1	<0.1	<0.1	0
	C29 - C36 Fraction	mg/l	0.1	<0.1	<0.1	0
	C10 - C36 (Sum of Total) - Lab calc	mg/l	0.1	<0.1	<0.1	0
M 1999						
PAH	Naphthalene	µg/l	10	<10.0	<10.0	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: 50 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL))

Attachment C - Field Sheets and Calibration Certificates

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

GHD

PROJECT DETAILS	Borehole ID
Project Number: 21/24306	MW01
Project Name: Foxground to Berry Bypass	Sample ID: MW01
Client: Fulton Hogan	Date: 13/01/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.310m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 7.865m	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
2.27	1	2.379	4.06	3435	7.27	94.6	26.1	Clear, nil odour, nil sheen
2.28	2.5	2.740	3.96	3341	7.24	93.6	24.5	" "
2.29	3.5	3.090	3.86	3240	7.24	93.0	23.3	" "
2.31	4.5	3.514	3.35	3169	7.26	92.4	23.1	" "
2.32	5.5	3.930	2.99	3149	7.29	91.3	23.4	" "
2.34	6.5	4.270	2.66	3145	7.33	89.5	23.9	" "
2.37	7.5	4.660	2.32	3150	7.37	87.0	24.0	" "
2.42	9.0	4.702	1.91	3168	7.43	81.3	25.6	Slightly turbid grey
2.45	10	5.349	1.62	3245	7.50	67.4	24.0	" "
2.46	11	5.778	0.61	3245	7.67	36.8	23.2	" "
2.50	12	6.155	0.32	3294	7.76	17.4	22.8	" "
Post Sample Parameters								

5m in well

14.62m in well

Number of Bottles:

Comments: Well is not recharging very s/sw recharge. Methanol + Ethanol.

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW04
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW04
Client: Fulton Hogan	Date: 13/1/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 2.146m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 2.846m	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
3.36	1	2.543	3.02	189.6	6.46	132.3	21.0	Grey turbid, no sheen, no odour
3.39	2	2.655	2.63	171.8	6.06	141.9	19.4	" "
3.41	3	2.704	2.39	164.7	5.96	149.9	18.7	" "
3.43	4	2.744	1.80	162.9	5.92	154.3	18.5	" "
3.45	5	2.778	1.56	163.7	5.94	154.5	18.4	" "
3.47	6	2.793	1.33	167.0	5.97	153.5	18.4	" "
3.46	7	2.815	1.05	170.6	6.00	152.6	18.3	
Post Sample Parameters								

Number of Bottles:

Comments: Metals filtered

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	
Project Number: 21/24306	Borehole ID: MW09.
Project Name: Foxground to Berry Bypass	Sample ID: MW09.
Client: Fulton Hogan	Date: 13/1/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 4.937m.	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 6.310 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
9.10	1	5.30	2.55	1950	6.96	96.7	20.4	Grey turbid, no odour, no sheen.
9.12	2	5.546	1.63	1813	6.61	94.4	18.4	" "
9.14	3.5	5.575	1.34	1796	6.60	92.9	18.4	" "
9.15	4.5	5.667	1.17	1788	6.79	92.0	18.5	" "
9.16	5.5	5.774	1.11	1772	6.79	91.1	18.5	" "
9.16	6.5	5.855	1.13	1758	6.80	90.3	18.5	" "
Post Sample Parameters								

Number of Bottles: 4

Comments: Metals filtered.

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID
Project Number: 21/24306	MW10
Project Name: Foxground to Berry Bypass	Sample ID: MW10
Client: Fulton Hogan	Date: 13/1/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 11.730m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 11.788	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
9.52	1	11.710	2.03	2702	6.77	117.2	21.7	Grey turbid, no sheen, no odour
9.54	2	11.746	0.91	2753	6.67	111.5	19.6	" "
9.56	3	11.756	0.96	2705	6.67	104.8	18.9	" "
9.58	4	11.756	1.35	2646	6.68	99.5	18.5	" "
10.00	5	11.743	1.49	2634	6.68	96.5	18.5	" "
10.02	6	11.772	1.64	2621	6.69	95.1	18.5	" "
10.04	7	11.769	1.90	2596	6.70	94.0	18.5	" "
Post Sample Parameters								

Number of Bottles: 4

Comments: Metals filtered.

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID
Project Number: 21/24306	MW12
Project Name: Foxground to Berry Bypass	Sample ID: MW12
Client: Fulton Hogan	Date: 13/1/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 6.837m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC: 10.555m	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 7.760	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
10.33	1	7.125	1.65	496.7	5.76	151.2	19.2	Grey-brown turbid w/ no odour, no sheen
10.35	2	7.270	1.35	486.2	5.73	154.9	18.6	" "
10.37	3	7.330	1.23	482.0	5.70	154.7	18.2	" "
10.39	4	7.418	1.10	481.6	5.69	154.2	18.2	" "
10.41	5	7.490	0.93	482.5	5.68	153.7	18.3	" "
10.43	6	7.542	0.80	483.4	5.68	152.7	18.3	" "
Post Sample Parameters								

Number of Bottles: 4

Comments: Metals filtered

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

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

GHD

PROJECT DETAILS	Borehole ID: MW16
Project Number: 21/24306	
Project Name: Foxground to Berry Bypass	Sample ID: MW16
Client: Fulton Hogan	Date: 13/1/16
Site: Foxground to Berry Bypass	Sampler: JC
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.155m	Sample Method: Low Flow
Depth of PSH (from TOC):	Casing Type: PVC
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50mm
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC): 1.580m	QA Collected: Yes DUPL1

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
11.40	1	1.510	1.20	719	6.41	132.3	21.6	Mostly clear, slightly cloudy, no odour, no sheen.
11.42	2.5	1.634	0.47	678	6.31	122.3	19.3	" "
11.43	3.5	1.590	0.41	677	6.30	119.7	19.2	" "
11.44	4.5	1.588	0.34	676	6.30	118.5	19.1	clear, no odour, no sheen
11.46	5.5	1.565	0.30	676	6.30	115.6	19.1	" "
Post Sample Parameters								

Number of Bottles: 8

Comments: DUPL1

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

13/01/16

WELL	TIME	DEPTH.
MW08	8.44am.	2.600m.
MW13	11.10 am	10.47m
MW16	11.40 am	1.155m
MW03	1.49pm	13.006.m

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: 1 December, 2015
Calibration Date: 30 November, 2015
Next Calibration Due: 30 May, 2016

Call ID: **00184795**

Arrow Job Code: *214090*

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
EC		Electro solution		NA1731	2.76	ms
Redox		Zobell 231		NE1080/NE1079	227.4	mV
Dissolved Oxygen				2810	0.01	%
Ph		Rowe Scientific Ph4		MG1348	4.16	Ph
Ph		Rowe Scientific Ph7		LC1731	7.10	Ph
Ph		Rowe Scientific Ph10		NB1242	9.94	Ph

Completed by: *Bill Van Duin* **Signed:**

Australian Standard Alarm Levels ☐

Attachment D - Laboratory Certificates

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☑ **Sydney**
Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
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☐ **Melbourne**
2 Kingston Town Close, Oakleigh, VIC 3166
Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD Pty Ltd	**Contact Name :** Stefan Charteris 02 9239 7472	**Purchase Order :**	**COC Number :**
Office Address :	**Project Manager :** Stefan Charteris	**PROJECT Number :** 21/24306/01	**Eurofins | mgt quote ID :**
Level 15, 133 Castlereagh Street, Sydney NSW 2000	**Email for results :** stefan.charteris@ghd.com, jane.curran@ghd.com	**PROJECT Name :** Foxground to Berry Bypass	**Data output format:**

Special Directions & Comments :

Eurofins | mgt DI water batch number:

	Sample ID	Date	Matrix	TPH	BTEX	Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
1	MW01	13/01/16	W	x	x	x
2	MW04	13/01/16	W	x	x	x
3	MW09	13/01/16	W	x	x	x
4	MW10	13/01/16	W	x	x	x
5	MW12	13/01/16	W	x	x	x
6	MW16	13/01/16	W	x	x	x
7	DUPL1	13/01/16	W	x	x	x
8						
9						
10						
11						
12						
13						
14						
15						
16						

Some common holding times (with correct preservation). For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

Containers:

1LP	200ml	125P	1LA	40mL vial	125mL A	Jar
	1		1	2		
	1		1	2		
	1		1	2		
	1		1	2		
	1		1	2		
	1		1	2		
	1		1	2		

Sample comments:

Metals have been field filtered.

Laboratory Staff

Relinquished By: Jane Curran

Date & Time : 14/01/2016 11 am

Signature:

Received By: Sean

Date & Time : 15/1 8:53

Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐

5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment

☐ Courier
☐ Hand Delivered
☐ Postal

Courier Consignment # :

Temperature on arrival:

Report number: 485679

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ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com.au web : www.eurofins.com.au

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Oakleigh Vic 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Sample Receipt Advice

Company name:	**GHD Pty Ltd NSW**
Contact name:	Stefan Charteris
Project name:	FOXGROUND TO BERRY BYPASS
Project ID:	21/24306/01
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Jan 15, 2016 8:53 AM
Eurofins | mgt reference:	**485679**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 17.5 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Charl Du Preez on Phone : +61 (2) 9900 8400 or by e.mail: charldupreez@eurofins.com.au

Results will be delivered electronically via e.mail to Stefan Charteris - stefan.charteris@ghd.com.

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Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Stefan Charteris**

Report **485679-W**
Project name FOXGROUND TO BERRY BYPASS
Project ID 21/24306/01
Received Date Jan 15, 2016

Client Sample ID			**MW01**	**MW04**	**MW09**	**MW10**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**S16-Ja06160**	**S16-Ja06161**	**S16-Ja06162**	**S16-Ja06163**
Date Sampled			**Jan 13, 2016**	**Jan 13, 2016**	**Jan 13, 2016**	**Jan 13, 2016**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	86	85	85	84
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.007	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	0.002	0.002
Zinc (filtered)	0.005	mg/L	0.026	0.005	0.039	0.009

Client Sample ID			MW12	MW16	DUPL1
Sample Matrix			Water	Water	Water
Eurofins | mgt Sample No.			S16-Ja06164	S16-Ja06165	S16-Ja06166
Date Sampled			Jan 13, 2016	Jan 13, 2016	Jan 13, 2016
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1
BTEX					
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	85	85	82
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	< 0.05
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1
Heavy Metals					
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.007	0.002	0.002
Zinc (filtered)	0.005	mg/L	0.028	0.011	0.032

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Jan 20, 2016	7 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 15, 2016	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 20, 2016	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
BTEX	Sydney	Jan 15, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8 filtered	Sydney	Jan 15, 2016	28 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			

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ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com.au web : www.eurofins.com.au

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NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Company Name:	GHD Pty Ltd NSW	**Order No.:**		**Received:**	Jan 15, 2016 8:53 AM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	**Report #:**	485679	**Due:**	Jan 22, 2016
		Phone:	02 9239 7100	**Priority:**	5 Day
		Fax:	02 9239 7199	**Contact Name:**	Stefan Charteris
Project Name:	FOXGROUND TO BERRY BYPASS				
Project ID:	21/24306/01				

Eurofins | mgt Client Manager: Charl Du Preez

Sample Detail					Metals M8 filtered	BTEX	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted							
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217					X	X	X
Brisbane Laboratory - NATA Site # 20794							
External Laboratory							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
MW01	Jan 13, 2016		Water	S16-Ja06160	X	X	X
MW04	Jan 13, 2016		Water	S16-Ja06161	X	X	X
MW09	Jan 13, 2016		Water	S16-Ja06162	X	X	X
MW10	Jan 13, 2016		Water	S16-Ja06163	X	X	X
MW12	Jan 13, 2016		Water	S16-Ja06164	X	X	X
MW16	Jan 13, 2016		Water	S16-Ja06165	X	X	X
DUPL1	Jan 13, 2016		Water	S16-Ja06166	X	X	X

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0001			0.0001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	112			70-130	Pass	
TRH C10-C14	%	79			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	103			70-130	Pass	
Toluene	%	99			70-130	Pass	
Ethylbenzene	%	94			70-130	Pass	
m&p-Xylenes	%	96			70-130	Pass	
o-Xylene	%	96			70-130	Pass	
Xylenes - Total	%	96			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	89			70-130	Pass	
TRH C6-C10	%	114			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	80			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Heavy Metals									
Arsenic (filtered)			%	96			70-130	Pass	
Cadmium (filtered)			%	89			70-130	Pass	
Chromium (filtered)			%	96			70-130	Pass	
Copper (filtered)			%	96			70-130	Pass	
Lead (filtered)			%	96			70-130	Pass	
Mercury (filtered)			%	110			70-130	Pass	
Nickel (filtered)			%	96			70-130	Pass	
Zinc (filtered)			%	86			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S16-Ja06161	CP	%	106			70-130	Pass	
TRH C10-C14	S16-Ja06161	CP	%	81			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S16-Ja06161	CP	%	100			70-130	Pass	
Toluene	S16-Ja06161	CP	%	98			70-130	Pass	
Ethylbenzene	S16-Ja06161	CP	%	91			70-130	Pass	
m&p-Xylenes	S16-Ja06161	CP	%	92			70-130	Pass	
o-Xylene	S16-Ja06161	CP	%	93			70-130	Pass	
Xylenes - Total	S16-Ja06161	CP	%	93			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S16-Ja06161	CP	%	79			70-130	Pass	
TRH C6-C10	S16-Ja06161	CP	%	101			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-Ja06161	CP	%	82			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S16-Ja06166	CP	%	105			70-130	Pass	
Cadmium (filtered)	S16-Ja06166	CP	%	94			70-130	Pass	
Chromium (filtered)	S16-Ja06166	CP	%	96			70-130	Pass	
Copper (filtered)	S16-Ja06166	CP	%	87			70-130	Pass	
Lead (filtered)	S16-Ja06166	CP	%	70			70-130	Pass	
Mercury (filtered)	S16-Ja06166	CP	%	95			70-130	Pass	
Nickel (filtered)	S16-Ja06166	CP	%	95			70-130	Pass	
Zinc (filtered)	S16-Ja06166	CP	%	91			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S16-Ja06160	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S16-Ja06160	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S16-Ja06160	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S16-Ja06160	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S16-Ja06160	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S16-Ja06160	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S16-Ja06160	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S16-Ja06160	CP	mg/L	< 0.002	< 0.002	<1	30%	Pass	

Duplicate									
BTEX				Result 1	Result 2	RPD			
o-Xylene	S16-Ja06160	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S16-Ja06160	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S16-Ja06160	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S16-Ja06160	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S16-Ja06160	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S16-Ja06160	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S16-Ja06160	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S16-Ja06165	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	S16-Ja06165	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Chromium (filtered)	S16-Ja06165	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S16-Ja06165	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	S16-Ja06165	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S16-Ja06165	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S16-Ja06165	CP	mg/L	0.002	0.002	4.0	30%	Pass	
Zinc (filtered)	S16-Ja06165	CP	mg/L	0.011	0.010	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Charl Du Preez	Analytical Services Manager
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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 Co = Analyte concentration of the original sample
Cd = 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, or at low analyte concentrations. Groundwater QA/QC results are presented in Table B3, Attachment B.

Discrepancies in GHD's adopted criterion for RPDs calculated for the intra laboratory duplicate pairs for the analytes tested are:

- Duplicate sample MW16, Zinc failed the internal lab duplicate analysis (RPD 98%).

There were no other discrepancies in GHD's adopted criterion for RPDs calculated for the intra laboratory duplicate pairs for the analytes tested.

Laboratory Program

The NATA certified laboratory utilised for this assessment (i.e. Eurofins | Mgt) 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 provided as Attachment D. In summary:

- All samples were noted to be correctly preserved.
- Samples were extracted within allocated holding times.

Method blank results were less than the PQL, and surrogate spike and laboratory control sample recoveries were within laboratory acceptance criteria for majority of the samples collected over the event.

Summary of Quality Assurance / Quality Control Results

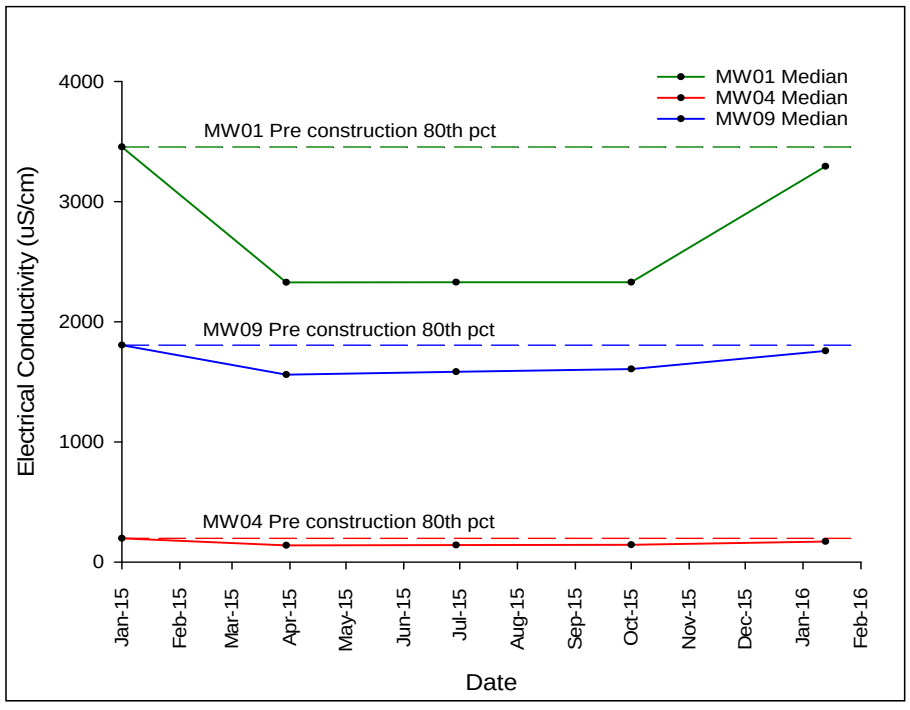
The QA/QC results show that the samples collected have met the appropriate standards and therefore, the data was considered to be valid and of sufficient quality to meet the data quality objectives for the assessment.

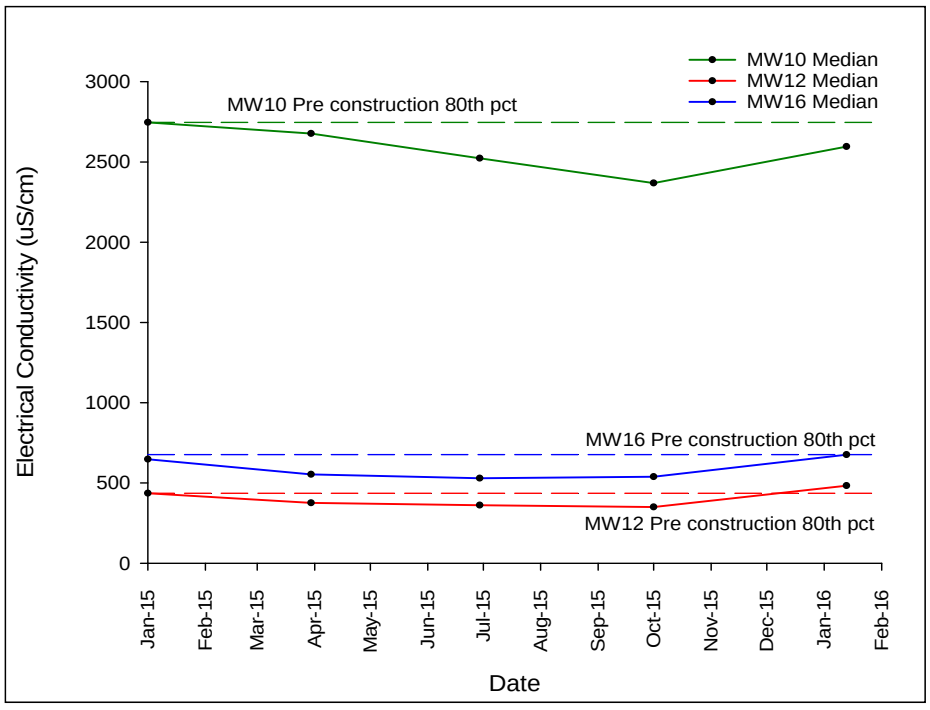
Attachment F - Control Charts and Result Graphs

Control Charts: Electrical Conductivity, pH

Result Graphs: Nickel, Copper, Arsenic, Zinc

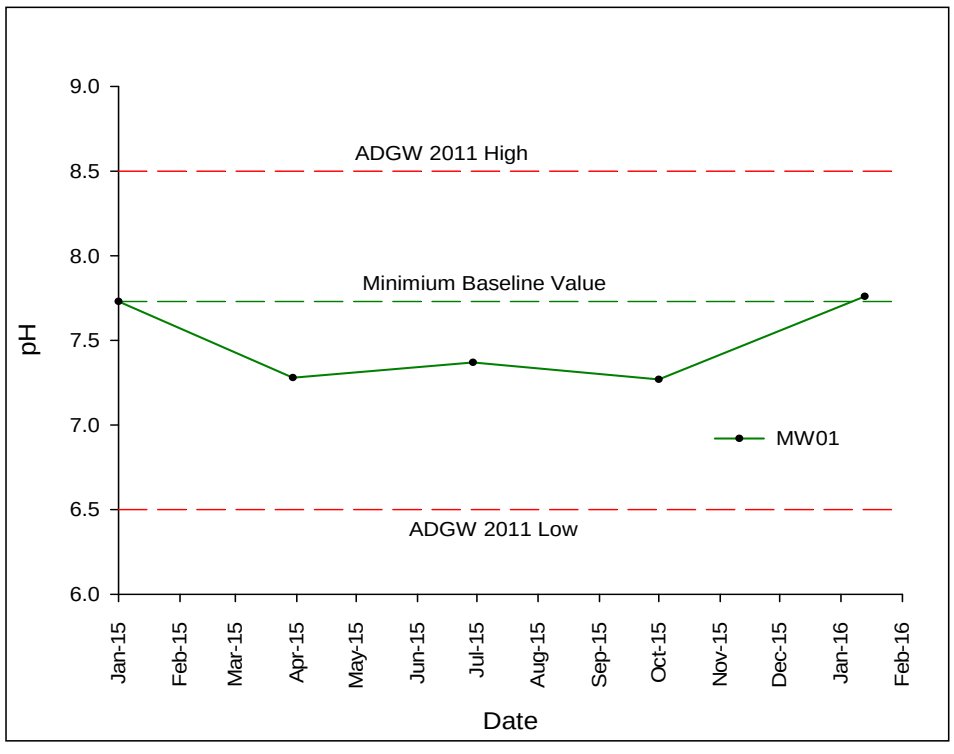
Electrical Conductivity



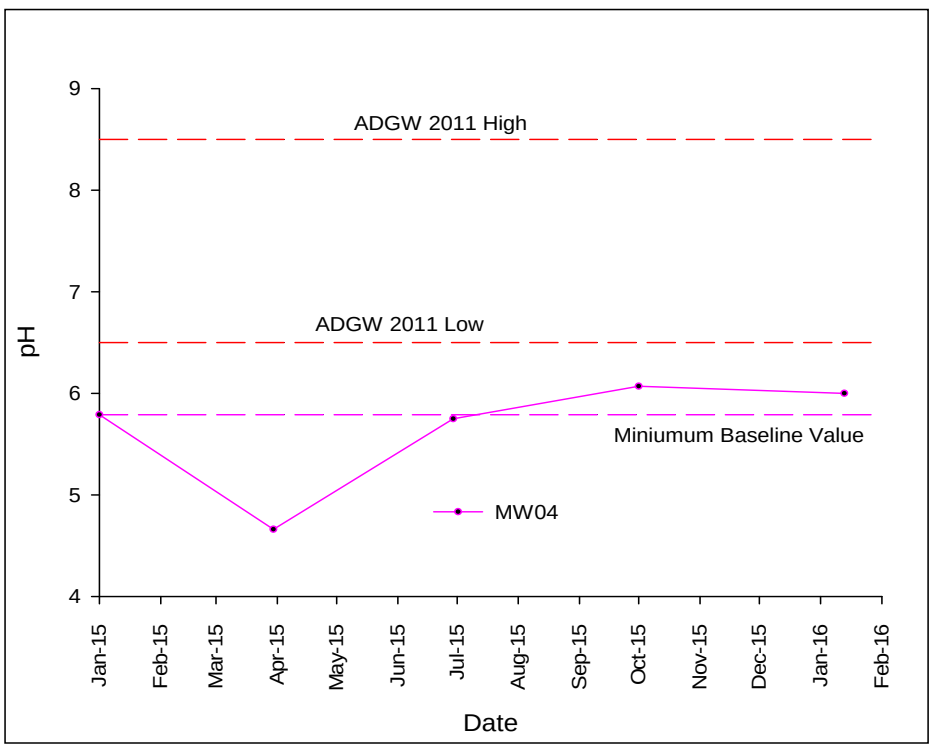


pH

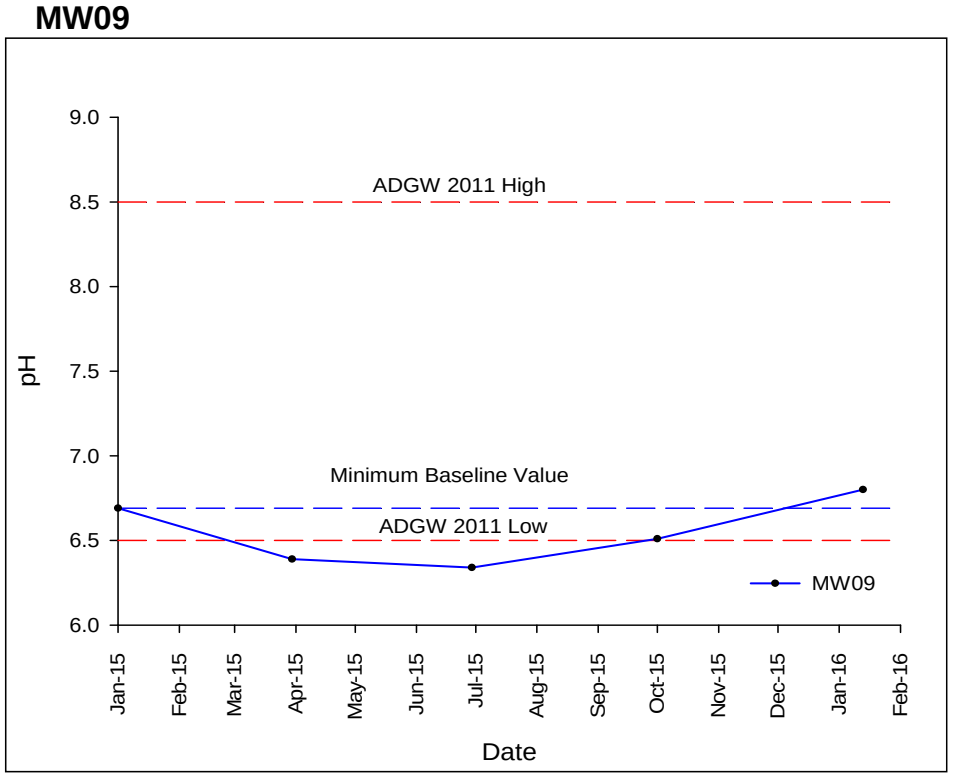
MW01



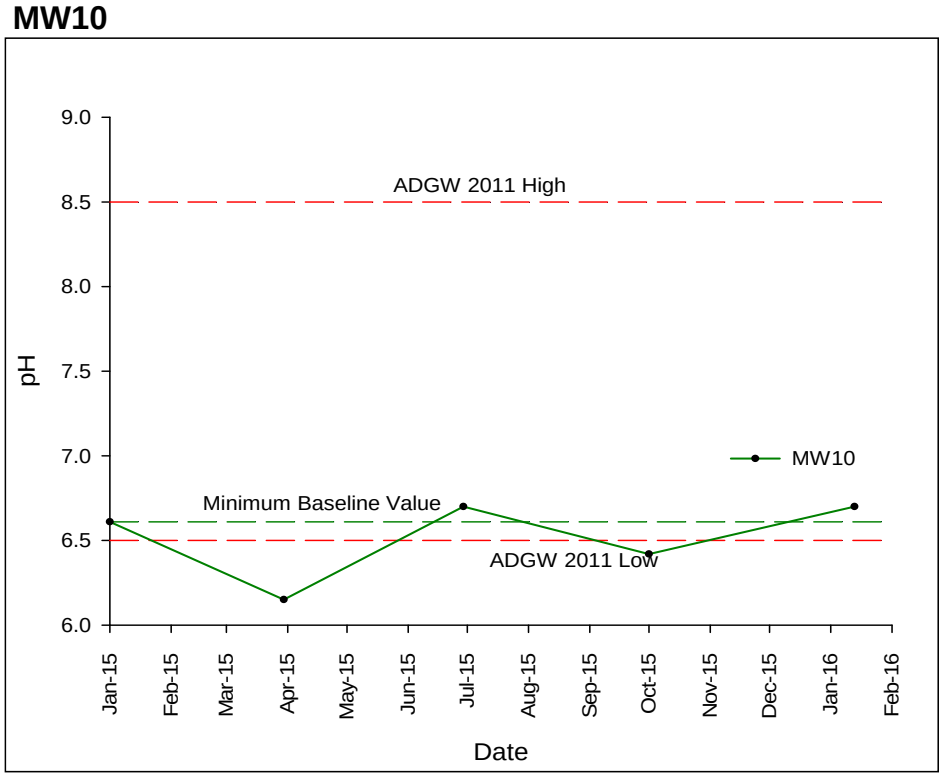
MW04



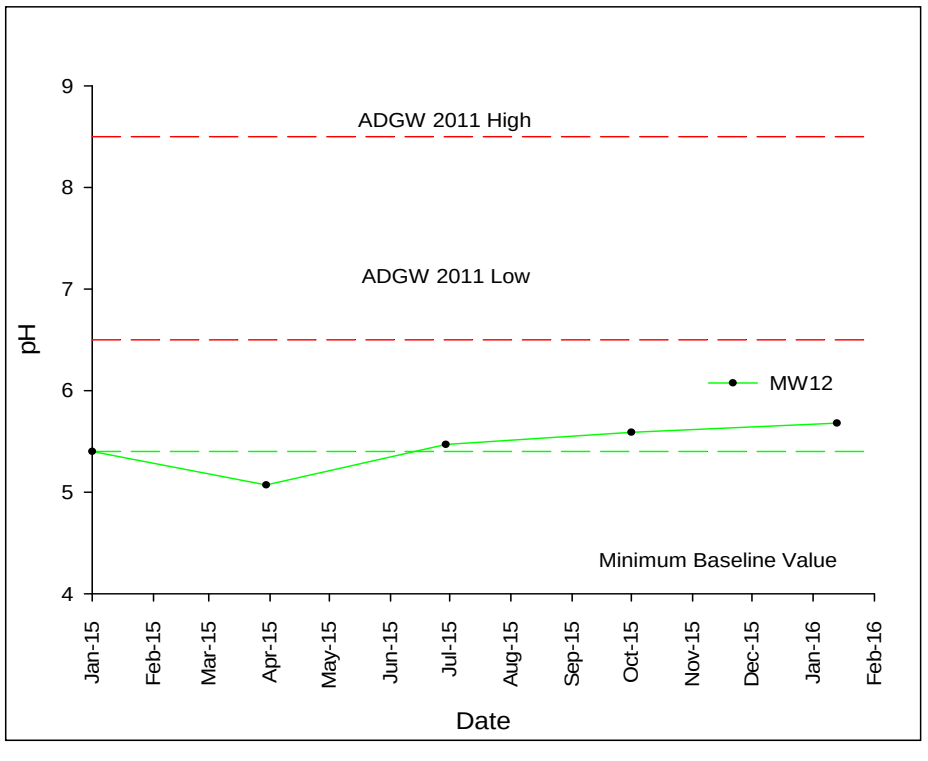
MW09



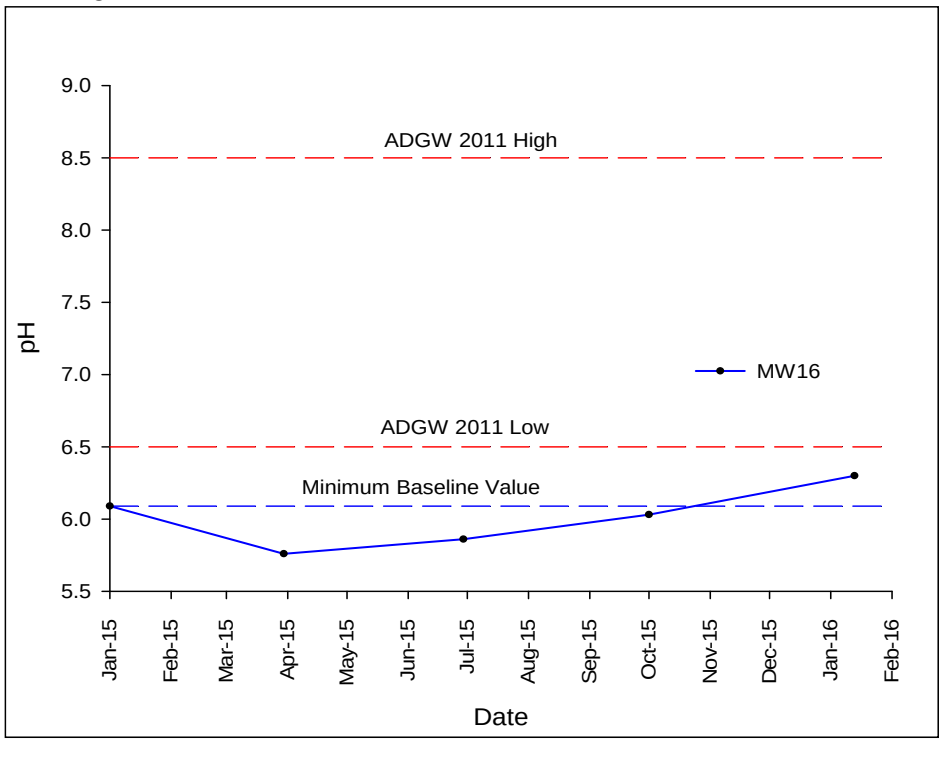
MW10



MW12

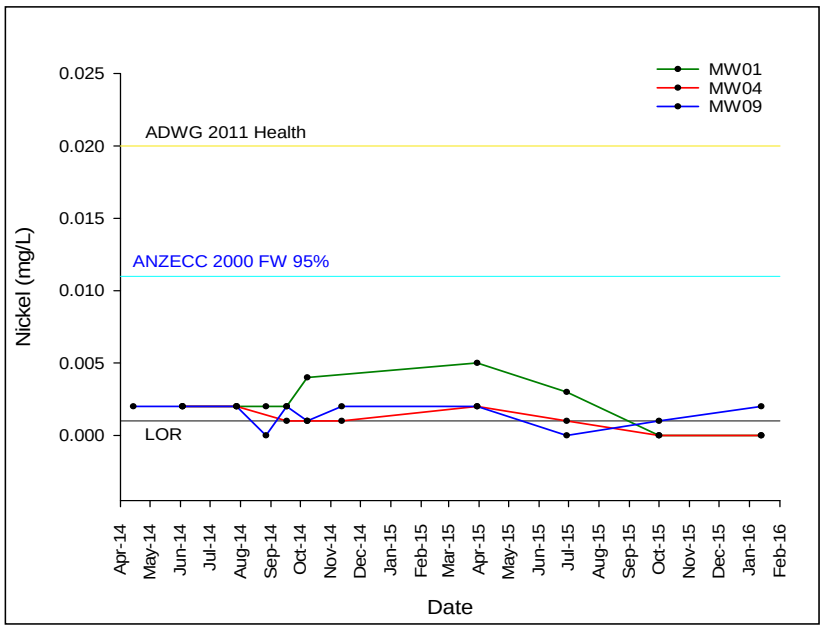


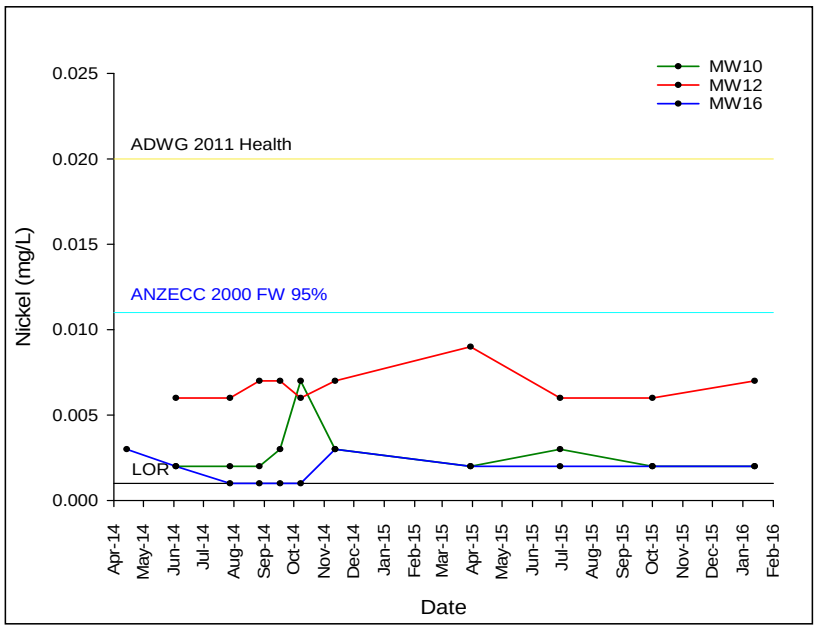
MW16



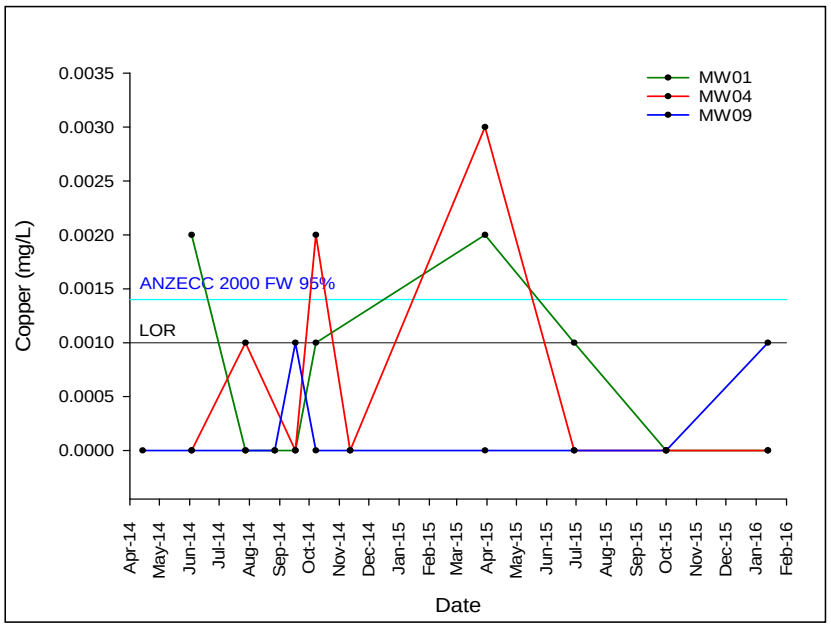
Attachment F
Control Charts

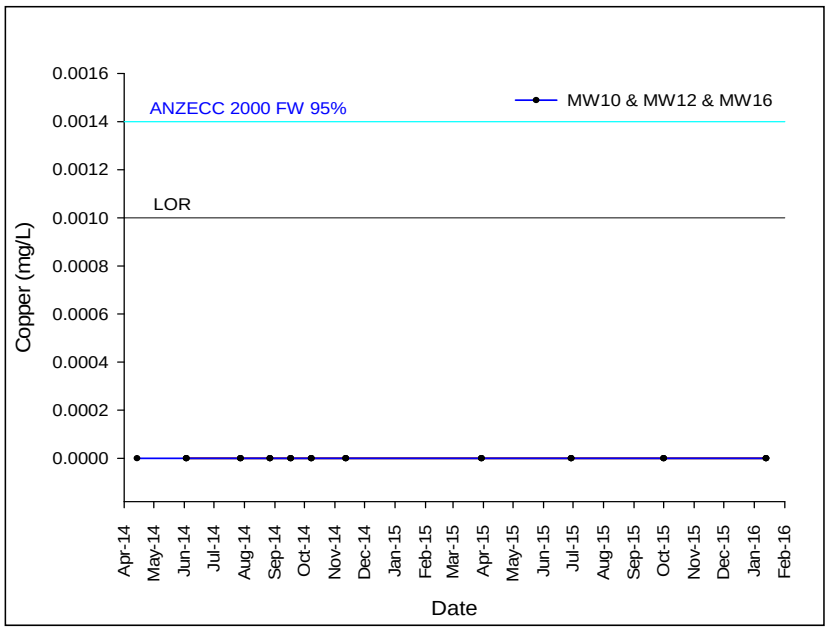
Nickel



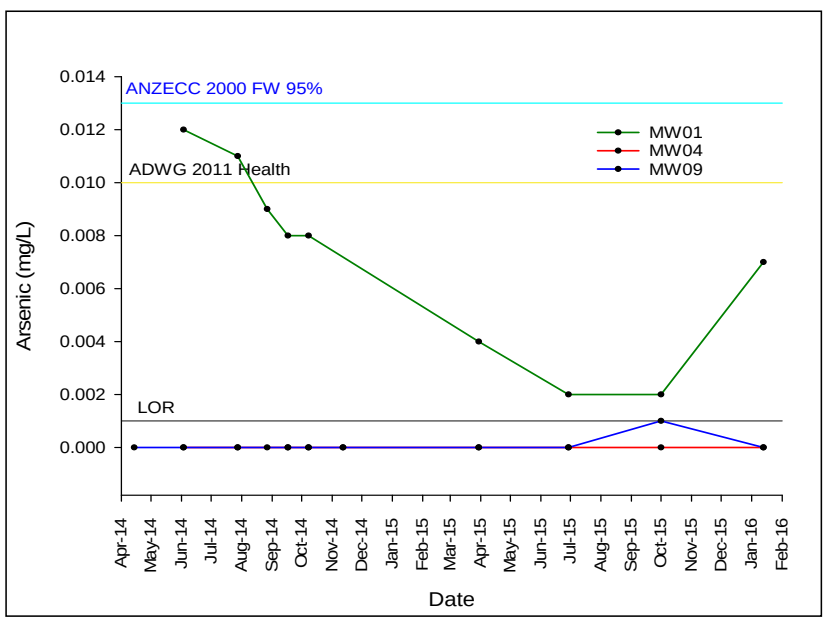


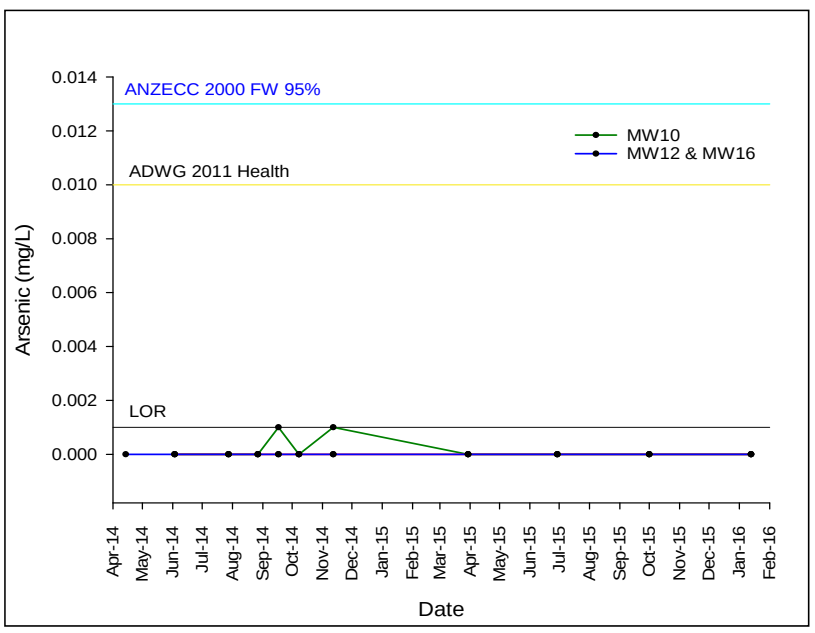
Copper





Arsenic





Zinc