EPBC ACT APPROVAL - COMPLIANCE REPORT

Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)

Prepared for:

Stanmore IP Coal Pty Ltd
GPO Box 2602 BRISBANE QLD 4001

SLR Ref: 626.10582-R01
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PREPARED BY

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Stanmore IP Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
626.10582-R01-v0.1	12 August 2019	Paul Tett	B. Radloff B/ O'Neil	B. Radloff B/ O'Neil

EXECUTIVE SUMMARY

Introduction

Stanmore IP Coal Pty Ltd (Stanmore) engaged SLR Consulting Australia Pty. Ltd. (SLR) to prepare the Annual Compliance Report (the Report) for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Approval for Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*, (the Approval). The Report is required by Condition 17 of the Approval.

Description of Activities and EPBC Act Approval

The Isaac Plains Complex is located in Central Queensland, approximately 145 kilometres (km) southwest of Mackay and 7 km east of the Moranbah township (**Figure 1**).

The Isaac Plains East Project is the subject of the Approval and was referred under the EPBC Act in late 2016.

The Approved Action is:

> *"To undertake the Isaac Plains East Project, developing five open cut coal pits over Lot 4 SP252740, Lot 17 SP261431 and Lot 5 GV132, adjoining the existing Isaac Plains Mine mining lease near Moranbah, Queensland (see EPBC Act referral 2016/7827)."*

The Approved Action was officially commenced on the 9th of June 2018, and this report is the inaugural report covering the period 9th of June 2018 to 8th of June 2019.

The Approval relates to the EPBC Act Controlling Provisions:

1. Listed threatened species and communities (sections 18 & 18A); and
2. Water resources/trigger (sections 24D & 24E).

Specifically, the Approval addresses:

1. Clearing of habitat for Koala (*Phascolarctos cinereus*), Squatter Pigeon (Southern) (*Geophaps scripta scripta*), Greater Glider (*Petauroides volans*) and Ornamental Snake (*Denisonia maculata*); and
2. Monitoring of surface water, groundwater and riparian zone.

Furthermore, the Approval contains requirements for offsets under the *EPBC Act Environmental Offsets Policy*, including development of an Offset Management Plan (OMP). The Approval also requires development of a Species Management Plan (SMP) outlining management and monitoring actions to minimise any impact to Listed threatened species.

Habitat Impacts and Potential Offset area

The required offset areas (of 434 ha) identified in the OMP (Base 2018) include impacted habitat for the Koala (*Phascolarctos cinereus*) (125 ha), Greater Glider (*Petauroides volans*) (125 ha) and Squatter Pigeon (Southern) (*Geophaps scripta scripta*) (74 ha).

EXECUTIVE SUMMARY

The OMP includes a suitable offset area located on Byrne Valley Station near Ayr in North Queensland (**Figure 1**) to compensate for the habitat clearing required for the Isaac Plains East Project. The actual offset area is expected to be delivered within the identified suitable offset area as per the OMP.

Audit Methods

The key site contact was Stanmore's, Senior Advisor – Health, Safety, Environment and Community (HSEC), Melanie Ballantine. The Audit was conducted by SLR Associate Consultant, Paul Tett. Paul has in excess of 28 years' experience as an environmental professional associated with the mining and industrial sectors.

A site visit to the Isaac Palins Complex was undertaken by the auditor on the 16th of July 2019 during which interviews and evidence gathering was undertaken. A site inspection of the Isaac Plains East disturbance footprint was undertaken as part of the site visit.

Compliance status for each Approval Condition was determined in accordance with the rankings C = Complaint, NC = Non-Compliant and NA = Not Applicable.

Key Findings and Recommendations

The audit found Stanmore were compliant with all relevant conditions of the Approval for the duration of the approval on the audit date. Full compliance with Approval Condition 22 was not able to be fully verified. On the date of the audit Stanmore were compliant with Approval Condition 22, however the actual publication date of the SMP and OMP on the Stanmore Website could not be verified.

There were 12 "Not Applicable" findings made during the Audit.

No new environmental risks relative to the Approval were identified during the reporting period.

SLR recommend that Stanmore further investigate the date of SMP and OMP publication to the Stanmore Web Site. This will assist in verification of compliance in future.

Detailed findings are presented (**Table 2**).

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

Stanmore IP Coal Pty Ltd (Stanmore) engaged SLR Consulting Australia Pty. Ltd. (SLR) to prepare the Annual Compliance Report (the Report) for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Approval for Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*, (the Approval). The Report is required by Condition 17 of the Approval, which states:

> *"Within three (3) months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report (the Annual Compliance Report) on its website addressing compliance with each of the conditions of this approval, during the previous 12 months. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the Annual Compliance Report is published. Reports must remain published for the life of the approval. The approval holder must continue to publish the Annual Compliance Report each year until such time as agreed to in writing by the Minister."*

The Report presents the findings of an audit which was undertaken to assess the compliance status of the Isaac Plains Complex against the Approval. The audit focused on each of the conditions contained in the Approval. The audit site visit was undertaken on the 16th of July 2019, with evidence gathering and reporting finalised throughout July 2019.

The report has been prepared in general accordance with the *Annual Compliance Report Guidelines, Commonwealth of Australia 2014*.

1.1 Description of Activities and EPBC Act Approval

The Isaac Plains Complex is located in Central Queensland, approximately 145 kilometres (km) southwest of Mackay and 7 km east of the Moranbah township (**Figure 1**). The Complex includes the original Isaac Plains Open Cut Mine, the adjoining Isaac Plains East Open Cut operations, Isaac Downs (open cut mine project) and the Isaac Plains Underground Mine project. The Isaac Plains East project (formerly Wotonga Project) was acquired by Stanmore in 2015. The project is located adjacent to the east of the Isaac Plains Coal Mine and is currently operational having commenced in June 2018 and in December 2018 the Dragline was transferred from Isaac Plains to Isaac Plains East.

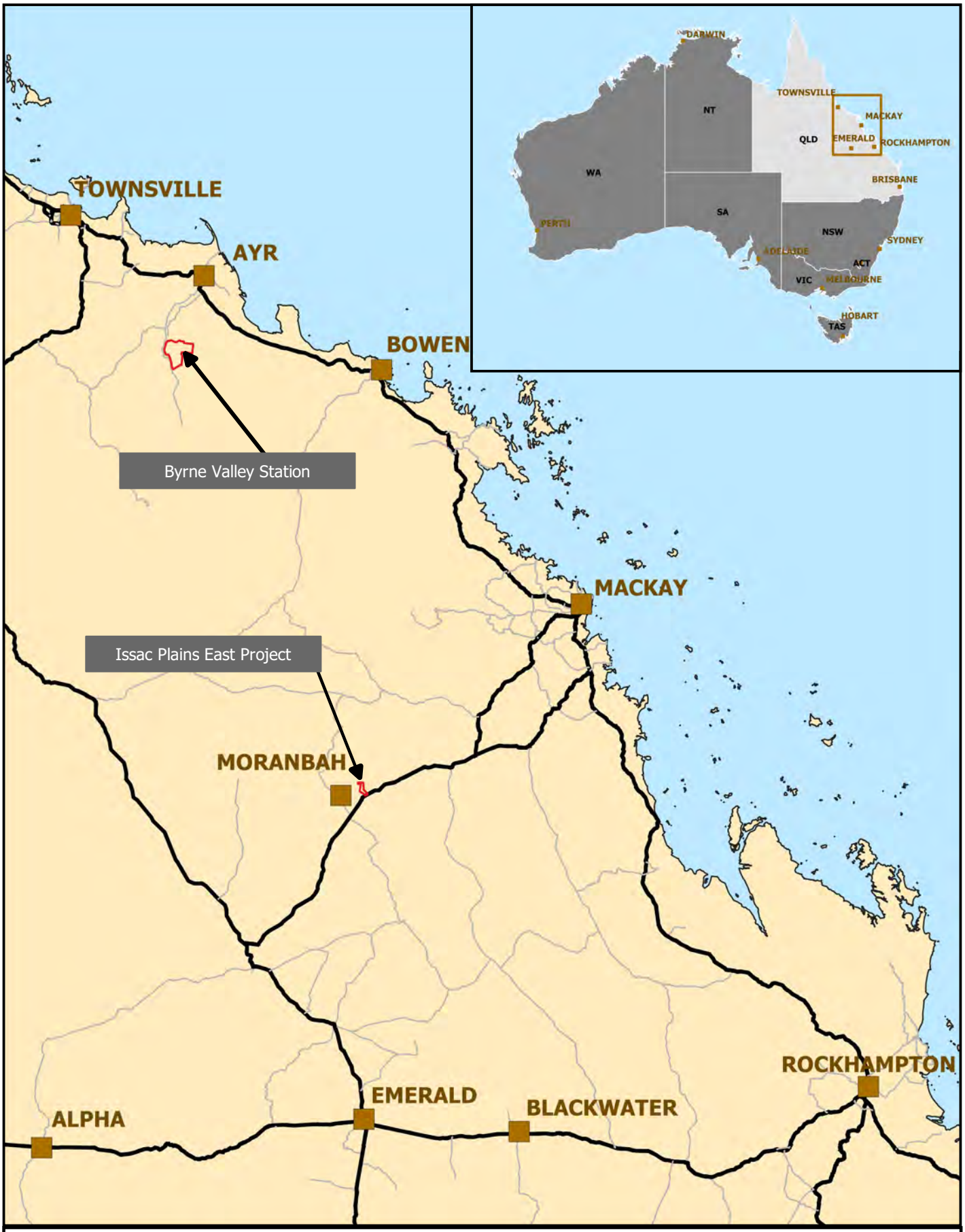
Isaac Plains East Project is the subject of the Approval and was referred under the EPBC Act in late 2016. The Referral Decision was issued on the 4th of January 2017, being Controlled Action Assessment Approach Preliminary Documentation, public notification of the Preliminary Documentation was undertaken on the 19th of July 2017. The initial Approval (EPBC 2016/7827) was issued to Stanmore IP Coal Pty Ltd (ABN: 79 606 244 615) on the 28th of February 2018. The Approved Action is:

> *"To undertake the Isaac Plains East Project, developing five open cut coal pits over Lot 4 SP252740, Lot 17 SP261431 and Lot 5 GV132, adjoining the existing Isaac Plains Mine mining lease near Moranbah, Queensland (see EPBC Act referral 2016/7827)."*

A variation to the Approval took effect on the 6th of August 2018. The subject of the variation was as below:

> *"Delete Attachment A attached to the approval and substitute with Attachment A specified over page."*

The variations to Attachment A included minor adjustments to the planned disturbance boundaries. The Project layout including the approved disturbance area is shown (**Figure 2**).



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Date: 18/7/2018
Drawn: Joshua T

DATA SOURCE
BASE CONSULTING GROUP 2018; QSPATIAL 2018
The State of Queensland (Department of Natural Resource and Mines) 2017

Legend

- Property Boundary
- Highway
- Road
- Town

Figure 1: Project Location

BASE/

Source: Isaac Plains East - Offset Management Plan EPBC 2016/7827

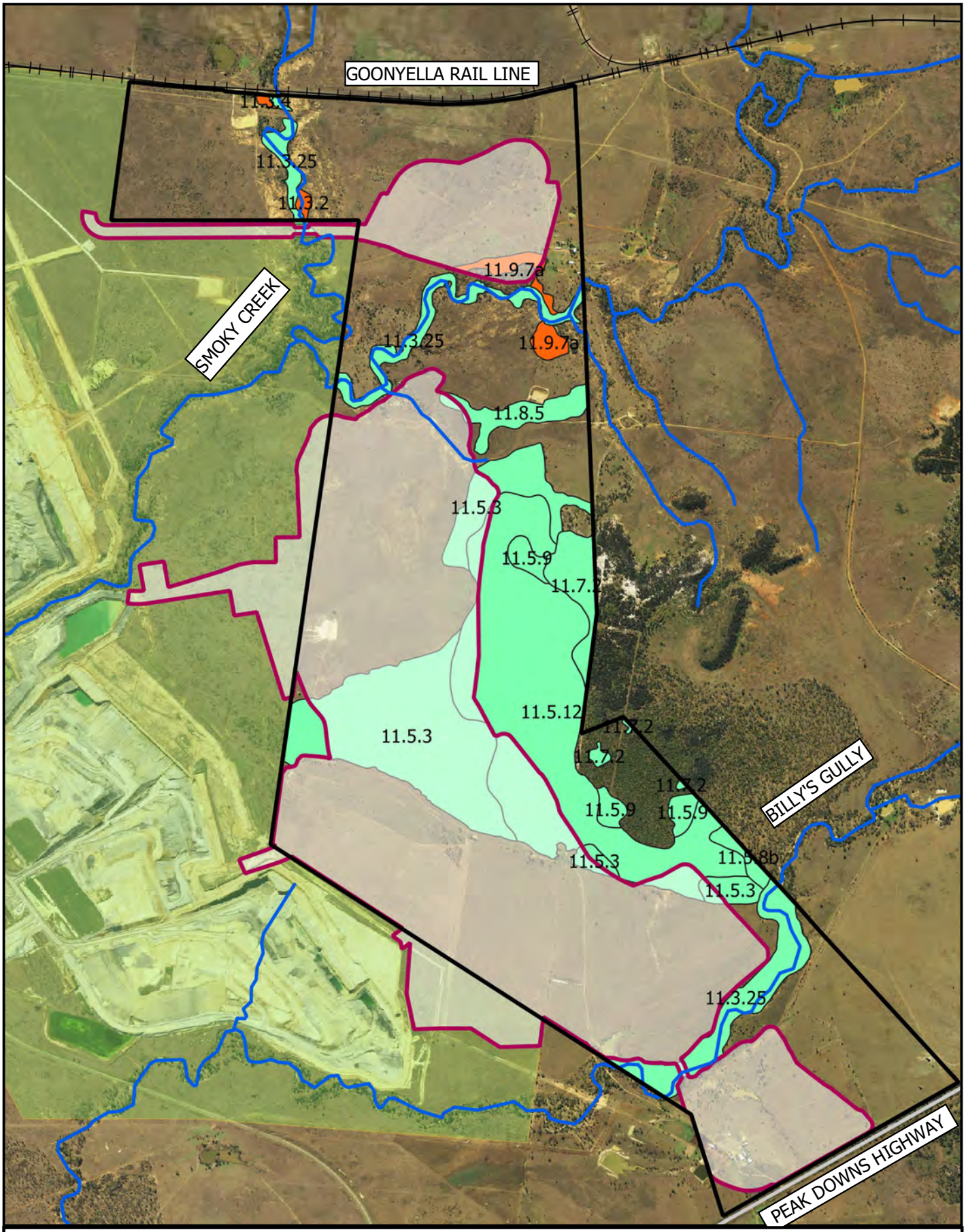


Figure 2: Project Layout and Disturbance Footprint

BASE/

Source: Isaac Plains East - Offset Management Plan EPBC 2016/7827

The action subject to the Approval officially commenced on the 9th of June 2018, subsequently this report is the inaugural report and covers the period of the 9th of June 2018 to the 8th of June 2019.

The Approval relates to the EPBC Act Controlling Provisions:

3. Listed threatened species and communities (sections 18 & 18A); and
4. Water resources/trigger (sections 24D & 24E).

Specifically, the Approval addresses:

5. Clearing of habitat for Koala (*Phascolarctos cinereus*), Squatter Pigeon (Southern) (*Geophaps scripta scripta*), Greater Glider (*Petauroides volans*) and Ornamental Snake (*Denisonia maculata*); and
6. Monitoring of surface water, groundwater and riparian zone.

Furthermore, the Approval contains requirements for offsets under the *EPBC Act Environmental Offsets Policy*, including development of an Offset Management Plan (OMP). The Approval also requires development of a Species Management Plan (SMP) outlining management and monitoring actions to minimise any impact to Listed threatened species under the EPBC Act.

1.2 Habitat Impacts and Potential Offset area

The required offset areas identified in the OMP (Base 2018) include impacted habitat for the Koala (125 ha), Greater Glider (125 ha) and Squatter Pigeon (74 ha).

The OMP includes a suitable offset area to compensate for the habitat clearing required for the Isaac Plains East Project.

A suitable offset area has been identified and is located on Byrne Valley Station near Ayr in North Queensland (**Figure 1**). The suitable offset area addressed all requirements for offsetting relative to habitat clearing authorised by the Approval as well as satisfying Queensland Offset requirements for impacts to Matters of State Environmental Significance (MSES). The actual offset area is expected to be delivered within the identified suitable offset area as per the OMP which states:

> *"It is the intent of Stanmore to where possible collocate all required offsets within an area of 434 ha within Byrne Valley Station. An 810 ha offset area has been identified as suitable for the offset requirements and the final location of the offset area within the interim 810 ha offset area will be determined during landowner negotiations for legally securing the offset.".*

The suitable 810 ha offset area is shown (**Figure 3**).

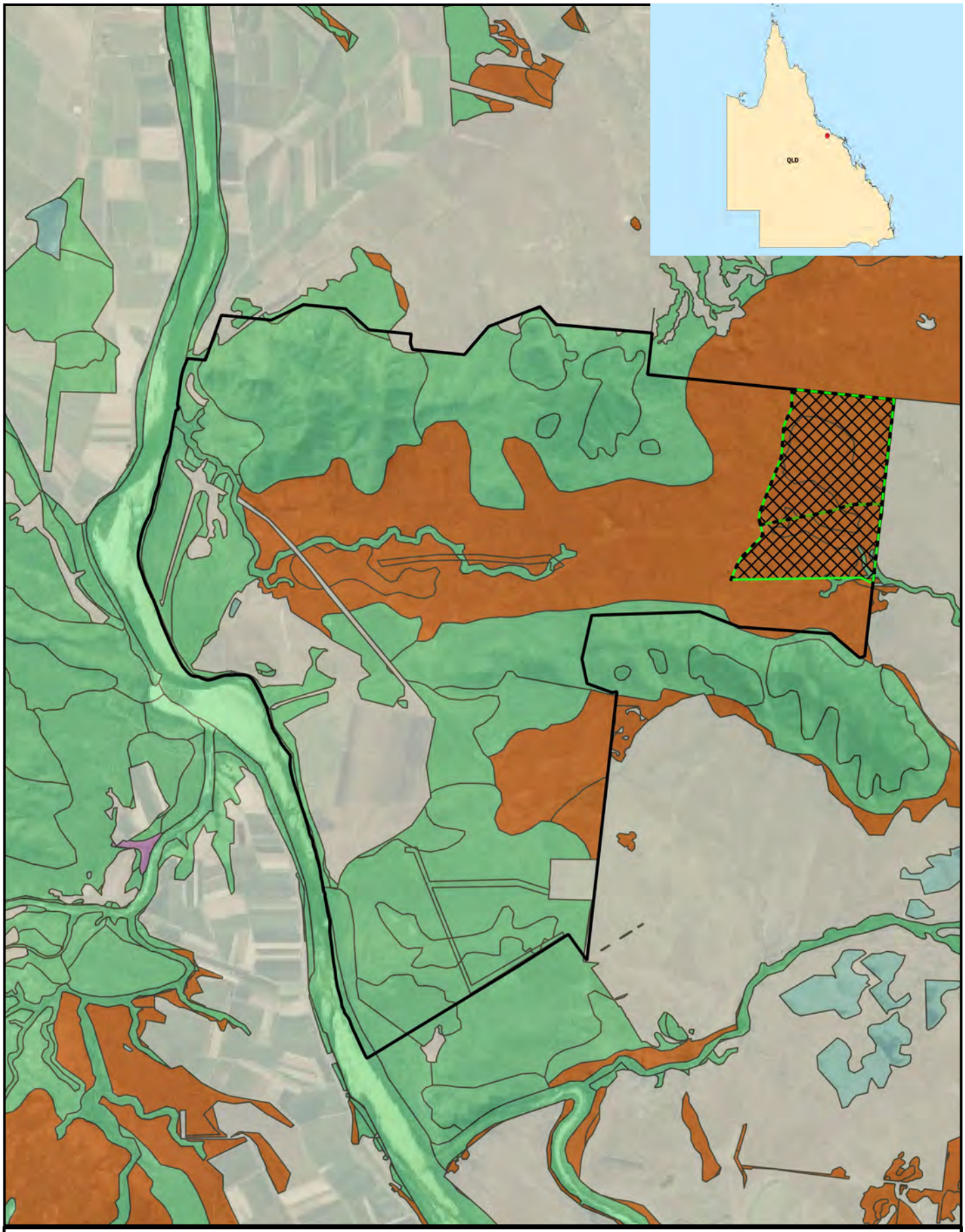


Figure 3: Byrne Valley Station Potential Offset Extent

BASE/

Source: Isaac Plains East - Offset Management Plan EPBC 2016/7827

2 Audit Methods

The key site contact was Stanmore's, Senior Advisor – Health, Safety, Environment and Community (HSEC), Melanie Ballantine.

The Audit was conducted by SLR Associate Consultant, Paul Tett. Paul has in excess of 28 years' experience as an environmental professional associated with the mining and industrial sectors, including more than 11 years as a site based environmental practitioner, with the balance as a consultant focused primarily on mining and industrial projects. Paul is an experienced auditor having undertaken multiple compliance audits of mining and industrial operations. In addition, Paul has completed Environmental Management System (EMS) Auditor (ISO14001:2015) training, is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM) and the Environment Institute of Australia and New Zealand (EIANZ). Paul is a Certified Environmental Practitioner (CEnvP) (Number 0638) and Queensland Commissioner for Declarations.

The audit was conducted through sourcing key site documents from Stanmore staff. The audit protocol was developed based on the conditions of the Approval and used as the primary basis for questioning and evidence gathering.

A site visit to the Isaac Palins Complex was undertaken by the auditor on the 16th of July 2019 during which interviews and evidence gathering was undertaken. A site inspection of the Isaac Plains East disturbance footprint was undertaken as part of the site visit.

The following staff were interviewed throughout the audit process:

- Melanie Ballantine – Senior Advisor – Health, Safety, Environment and Community (HSEC);
- Katelyn Gibson AusEcology (Ecologist and Spotter Catcher);
- Darren Robinson MSS (clearing operators – Leading Hand); and
- Brett Murphy MSS (clearing operators Operator\ Supervisor).

Selected photographs taken during the site visit are included in **Appendix B**.

Compliance status for each Approval Condition was determined in accordance with the rankings in **Table 1**.

Table 1: Audit Rankings

Rankings	Description
C - Compliant	Evidence and or actions completed, signifies compliance with the intent and/or requirement of the condition.
NC – Non-Compliant	Evidence indicates that a specific requirement of the condition has not been met.
NA - Not Applicable	Requirement was not triggered within the period of the audit, or the requirement was met prior to the audit period.

2.1 Limitations

The Report reflects the audit findings based on, preliminary questioning, visual inspections undertaken during the site visit, interview responses received during the site visit, follow up questioning post site visit and information contained in provided documentation only.

2.2 Declaration of Accuracy

In making this declaration, I am aware that sections 490 and 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed 

Full name (please print) Paul Tett (BSc (AES), Member AusIMM, Member EIANZ, CEnvP (0638))

Position (please print) Associate Consultant (Environmental Management Permitting and Compliance)

Organisation (please print including ABN/ACN if applicable) SLR Consulting Australia Pty. Ltd. (ABN: 29 001 584 612)

Date 12 August 2019

3 Key Findings and Recommendations

For the period of the Audit the Stanmore were compliant with all relevant conditions of the Approval. Full compliance with Approval condition 22 was not able to be verified relative to the actual publication date of the SMP and OMP on the Stanmore Website.

There were 12 “Not Applicable” findings made during the audit.

No new environmental risks relative to the Approval have been identified during the reporting period.

It is recommended that Stanmore further investigate the date of SMP and OMP publication to the Stanmore Web Site. This will assist in verification of compliance in future.

4 Detailed Findings

Table 2 details the findings of the audit relative to each EA condition.

Table 2: Detailed Audit Findings

Condition Number	Condition	Findings	Compliance Status
	Conditions specific to the action		
	Clearance limits		
1	The approval holder must undertake the action within the **Isaac Plains East Project Area**.	The action has been undertaken in the Isaac Plains East Project area and within the Project Disturbance Boundary and Additional Disturbance (pipelines and roads) areas shown in Attachment A of the Approval. *Evidence: Clearing records, Disturbance Permits, Disturbance Permit Register, field inspection, copy of letter dated 23 May 2019 from DoEE re Compliance Monitoring Inspection.*	C
2	The approval holder must not clear more than: *a.* 125 hectares (ha) of habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans);* b. 74 ha of Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat; and c. 1.4 ha of Ornamental Snake *(Denisonia maculata)* habitat.	As addressed in Condition 1, Clearing has been undertaken in accordance with the Disturbance Boundary and Additional Disturbance (pipelines and roads) areas shown in Attachment A of the Approval. Therefore, the specific habitat clearing constraints have not been exceeded. *Evidence: Clearing records, Disturbance Permits, Disturbance Permit Register, field inspection, copy of letter dated 23 May 2019 from DoEE re Compliance Monitoring Inspection.*	C
	Species Management Plan		
3	The approval holder must submit a Species Management Plan for the written approval of the **Minister**. The approved Species Management Plan must be implemented. The Species Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and	A Species Management Plan (SMP) has been prepared by BASE Consulting Group (28th of September 2018). The SMP was submitted to the Department of Environment and Energy (DoEE) for written approval. Written approval for the SMP was given by DoEE via letter dated the 2nd of October 2018. A second letter dated the	C

Condition Number	Condition	Findings	Compliance Status
	include: a. measures that will be implemented to avoid, mitigate and manage **impacts** to **EPBC Act listed threatened species** and their habitat during vegetation **clearance**, construction, operation and decommissioning of the action; b. a program of monitoring and periodic evaluation of monitoring data to determine the effectiveness of management measures and inform adaptive implementation of the Species Management Plan for the duration of this approval; and c. details of how proposed management measures take into account relevant **approved conservation advices** and are consistent with the measures contained in relevant **recovery plans** and **threat abatement plans**.	21st of November 2018 from DoEE relating to the SMP approval was issued correcting errors within the initial letter. Implementation of the SMP has been undertaken in accordance with Table 7 of SMP as per **Appendix A**. The SMP was prepared by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). The SMP was prepared in accordance with the Department's Environmental Management Plan Guidelines. Sections 4.0 and 4.7 of the SMP include measures to avoid, mitigate and manage impacts to threatened species and their habitat throughout all stages of the Project - (a). Section 5.0 of the SMP provides a program of monitoring and evaluation to assess effectiveness of the management measures – (b). Section 4.0 and 4.7 of the SMP provide details of how management measures relate to approved conservation advices, recovery plans and treat abatement plans – (c). *Evidence: SMP, copy of letter dated the 21st of November 2018 from DoEE, CV of Dr Craig Streatfeild (suitably qualified person) who prepared the SMP, DoEE Environmental Management Plan Guidelines, copy of the letter dated the 23rd of May 2019 from DoEE re Compliance Monitoring Inspection,* ***Appendix A****.*	
4	The approval holder must not **clear habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** or **Squatter Pigeon**	The commencement date of the action was notified to DoEE as 09 June 2018. Initial written approval of the SMP was received on the 2nd of	C

Condition Number	Condition	Findings	Compliance Status
	(Southern) ***(Geophaps scripta scripta)*** **habitat** or **Ornamental Snake** ***(Denisonia maculata)*** **habitat** until the **Minister** has approved the Species Management Plan.	October 2018. Clearing of areas within the Project Disturbance Boundary and Additional Disturbance (pipelines and roads) areas shown in Attachment A of the Approval, were addressed in the Disturbance Permits evidenced, the first (99) dated 04 October 2019, which pre-dated the commencement of clearing. *Evidence : Action commencement notification Email 27th of May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au, 27th of June 2018 letter from DoEE to Stanmore acknowledging commencement date, copy of letter dated 23rd of May 2019 from DoEE re Compliance Monitoring Inspection, Disturbance Permits 99, 116, 121 and 131.*	
	Offset Management Plan		
5	The approval holder must submit an Offset Management Plan for the written approval of the **Minister**. The approved Offset Management Plan must be implemented. The Offset Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and include: a. details of environmental offset/s to compensate for the habitat suitable for the Koala (Phascolarctos cinereus) (combined populations of Qld, NSW and the ACT) and Greater Glider (Petauroides volans) and Squatter Pigeon (Southern) (Geophaps scripta scripta) habitat to be cleared as identified in condition 2. b. details of how the proposed offset/s and Offset Management Plan meet the requirements of the **EPBC Act Environmental Offsets Policy**; c. a field validation survey and baseline description of the current condition (prior to any management activities) of the offset	The Offset Management Plan (OMP) has been prepared by BASE Consulting Group (27th of September 2018). The OMP was submitted to the Department of Environment and Energy (DoEE) for written approval. Written approval for the OMP was given (intended to be) by DoEE via letter dated the 2nd of October 2018. A second letter dated the 21st of November 2018 from DoEE relating to the OMP approval was issued correcting errors within the initial letter. Implementation of the OMP as per Table 21 of OMP, **Appendix A**. *It is noted that the Offset area was not included in the site visit and documentary evidence is relied upon relative to the implementation activities within this area.* The OMP was prepared by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment,*	C

Condition Number	Condition	Findings	Compliance Status
	area/s, including existing vegetation, for **habitat suitable for the Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) and Greater Glider (*Petauroides volans*)** and **Squatter Pigeon (Southern) (*Geophaps scripta scripta*) habitat**; d. a description and map (including **shapefiles**) to clearly define the location and boundaries of the proposed offset area/s, accompanied by the **offset attributes**; e. information about how the proposed offset area/s provide connectivity with other relevant habitats and biodiversity corridors; f. a description of the management measures (including timing, frequency and duration) that will be implemented in each offset area/s; g. a discussion of how proposed management measures take into account relevant **approved conservation advices** and are consistent with the measures contained in relevant **recovery plans** and **threat abatement plans**; h. completion criteria and performance targets for evaluating the effectiveness of Offset Management Plan implementation, and criteria for triggering corrective actions; i. a program to monitor, report on and review the effectiveness of the Offset Management Plan; j. a description of potential risks to the successful implementation of the offset/s, and contingency measures that would be implemented to mitigate against these risks; and k. details of the mechanism to **legally secure** the environmental offset/s.	*advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). The OMP was prepared in accordance with the Department's Environmental Management Plan Guideline. Section 4.3 of the OMP addresses details of the offsets to compensate for MNES species habitat clearing – (a). Section 4.7 of the OMP addresses the requirements of the EPBC Act Environmental Offsets Policy – (b). Section 4.3 and Appendix A of the OMP details the field validation baseline survey for offset areas – (c). Section 4.3 and Figures 3, 4 & 5 of the OMP describe and map proposed offset areas – (d). Section 4.3 of the OMP provides information on habitat connectivity of the proposed offset areas relative to other habitat and corridors – (e). Sections 6.0 and 7.0 of the OMP describe management measures to be implemented in offset areas – (f). Sections 5.0 and 6.0 of the OMP discuss how management measures account for relevant approved conservation advices and are consistent with recovery plans and treat abatement plans – (g). Section 5.1 of the OMP addresses completion criteria and performance targets for evaluating effectiveness of the OMP implementation or triggering corrective actions – (h). Section 7.0 and 8.0 of the OMP discuss monitoring and reporting to review OMP effectiveness – (i). Section 9 of the OMP describes risks to the OMP implementation and contingency measures to mitigate risks – (j). Section 4.6 of the OMP provides details of mechanisms for legally	

Condition Number	Condition	Findings	Compliance Status
		securing offsets – (k). *Evidence: OMP, copy of letter dated 21st of November 2018 from DoEE, CV of Dr Craig Streatfeild (suitably qualified person) who prepared the OMP, DoEE Environmental Management Plan Guidelines.*	
6	The approval holder must **legally secure** the environmental offset/s within two (2) years from the **commencement** of the **clearance** of **habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** and **Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat.**	Not applicable to the period of this report. Two years from commencement of clearing (the action) will nominally be the 25th of October 2020 (Date of Commencement for Fauna Capture Records - AusEcology).	NA
7	The approval holder must not **clear habit t** *[sic]* **suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** and **Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat** until the **Minister** has approved the Offset Management Plan.	The commencement date of the action was notified to DoEE as the 9th of June 2018. Initial written approval of the OMP was received on the 2nd of October 2018. Clearing of areas within the Project Disturbance Boundary and Additional Disturbance (pipelines and roads) areas shown in Attachment A of the Approval, were addressed in the Disturbance Permits evidenced, the first (99) dated the 4th of October 2019, which pre-dated the commencement of clearing. *Evidence : Action commencement notification Email 27th of May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au, 27th of June 2018 letter from DoEE to Stanmore acknowledging commencement date, copy of letter dated 23rd of May 2019 from DoEE re Compliance Monitoring Inspection, Disturbance Permits 99, 116, 121 and 131.*	C
	Surface water management		

Condition Number	Condition	Findings	Compliance Status
8	In addition to the surface water quality monitoring requirements of the Environmental Authority issued for the action under the *Environmental Protection Act 1994* (Qld) (EP Act), the approval holder must construct, operate and monitor an additional surface water quality monitoring point at the Isaac River above the confluence with Smoky Creek prior to **commencement** of the action.	A water quality monitoring point has been installed at the Isaac River above Smokey Creek. Initial installation and commissioning was completed during April 2018 prior to official commencement of the action (9th of June 2018). *Evidence: Environmental Authority (EA) for the site, Email correspondence 7th of May 2019 from Melanie Ballantine (Stanmore) to Chris Oats (DoEE Compliance Monitoring Team), Confirmation email from Melanie Ballantine to the Auditor 17th of July 2019.*	C
	Groundwater monitoring and management		
9	The approval holder must publish annual groundwater monitoring data, required to be collected by the Environmental Authority for the action under the EP Act, in the Annual Compliance Report required under condition 17.	The current version of the EA took effect on the 6th of June 2019. Condition C43 of the Current EA requires development of a Groundwater Management and Monitoring Program – The current site Plan of Operations states *"A Groundwater Management and Monitoring Program was developed in accordance with C43 and provided to DES on the 29 June 2018."*. Condition C44 of the EA requires collection and annual review of monitoring data (by an appropriately qualified person) in accordance with EA condition C43. The annual review has been conducted by C&R Consulting (Sian Kennare – Suitably Qualified) and is attached (**Appendix C**) of this report to satisfy this condition of the Authority. (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*).	C

Condition Number	Condition	Findings	Compliance Status
		Condition C45 of the EA prescribes the groundwater monitoring locations, frequencies and parameters. The Groundwater Management and Monitoring Program addresses these requirements. *Evidence: Current PoO for the Isaac Plains Complex, 2019 Annual Groundwater review (**Appendix C**).*	
	Riparian zone monitoring		
10	Prior to the **commencement** of **mining activities,** a **suitably qualified person** must undertake ecological surveys in accordance with the **Department's** survey guidelines to determine the extent (in hectares) and **habitat condition** for **EPBC Act listed threatened species** in the **riparian area.** The approval holder must report its findings in the first Annual Compliance Report required under condition 17.	Ecological surveys were undertaken in April (17th to 20th) by Ecological Survey and Management (EcoSM) to determine the extent and habitat condition for EPBC Act Listed threatened species within the riparian area. A specific report was produced, *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**) and addresses the extent and condition of the riparian habitat relative to the EPBC Act listed threatened species. The ecological surveys predate the commencement of action notification date (9th of June 2018). The ecological survey was completed by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). The findings of this assessment are included (**Appendix D**). *Evidence*: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**), Review of EcoSM website (people page) and Linked in profiles (report authors).	C

Condition Number	Condition	Findings	Compliance Status
11	For the duration of this approval, the approval holder must maintain the extent and **habitat condition** for **EPBC Act listed threatened species** in the **riparian area,** as determined by the ecological surveys required under condition 10.	The proposed monitoring regime nominated in the *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**) will be implemented to monitor habitat condition against the baseline established in **Appendix D**. The monitoring frequency proposed in **Appendix D** is every two years, with the next monitoring event to be in 2020. Therefore, compliance with this condition is unable to be determined as part of this Report. Evidence: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**).	NA
12	If it is determined that the **habitat condition** for **EPBC Act listed threatened species** in the **riparian area** has not been maintained, the approval holder must notify the **Department** within one (1) month of determining that the **habitat condition** has not been maintained.	Not Triggered as monitoring of ongoing habitat condition beyond baseline will not commence until 2020, see Condition 11. Evidence: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**).	NA
13	Within 12 months of notification in accordance with condition 12, the approval holder must submit an Offset Management Plan for the written approval of the **Minister.** The approved Offset Management Plan must be implemented. The Offset Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and include: a. details of the environmental offset/s to compensate for the extent and habitat condition for EPBC Act listed threatened species in the riparian area not maintained as required under condition 11; b. details of how the proposed offset/s and Offset Management Plan meet the requirements of the EPBC Act Environmental Offsets Policy; and	Not Triggered as Condition 12 has also not been triggered. Evidence: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**).	NA

Condition Number	Condition	Findings	Compliance Status
	c. details of the mechanism to legally secure the environmental offset/s.		
14	The approval holder must **legally secure** the environmental offset/s within two (2) years from the date that the **Department** was notified in accordance with condition 12.	Not Triggered as Condition 12 has also not been triggered. *Evidence*: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 (**Appendix D**).	NA
	Standard administrative conditions		
	Notification of date of commencement of the action		
15	Within 20 days after the **commencement** of the action, the approval holder must advise the **Department** in writing of the actual date of **commencement.**	The commencement date of the action (9th of June 2018) was notified to DoEE on the 27th of May 2018. *Evidence : Action commencement notification Email 27 May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au. and 27 June 2018, letter from DoEE to Richard Oldham (Stanmore) acknowledging commencement date.*	C
16	The approval holder must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement management plans required by this approval, and make them available upon request to the **Department.** Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act,** or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.	Evidence was sighted of Disturbance Permits, clearing dates, fauna capture records, clearing survey of extents and OMP and SMP actions (**Appendix A**). Records were made available as requested to DoEE officers in attendance at the Compliance Monitoring Inspection on the 23rd of May 2019. *Evidence: Survey records (MapInfo), Offset Management Plan and Species Management Plan implementation records, water monitoring site installation (Isaac River) records*.	C

Condition Number	Condition	Findings	Compliance Status
17	Within three (3) months of every 12 month anniversary of the **commencement** of the action, the approval holder must publish a report (the Annual Compliance Report) on its website addressing compliance with each of the conditions of this approval, during the previous 12 months. Documentary evidence providing proof of the date of publication must be provided to the **Department** at the same time as the Annual Compliance Report is published. Reports must remain published for the life of the approval. The approval holder must continue to publish the Annual Compliance Report each year until such time as agreed to in writing by the **Minister.**	This report. Notification will be provided to DoEE confirming upload of this report to Stanmore Website. *Evidence: This Report, Pending upload to Stanmore Website and notification to DoEE.*	C - Pending
18	The approval holder must report any potential or actual contravention of the conditions of this approval to the **Department** in writing within five (5) business days of the approval holder becoming aware of a contravention.	To date no contravention of conditions has been determined. *Evidence: This Report.*	NA
19	Upon the direction of the **Minister,** the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister.** The approval holder must not commence the audit until the **Minister** approves the independent auditor and audit criteria in writing. The audit report must address the criteria to the satisfaction of the **Minister.**	No such direction has been received from the Minister. *Evidence: Verbal (Melanie Ballantine).*	NA
20	The approval holder may choose to revise a management plan approved by the **Minister** under condition 3 without submitting it for approval under section 143A of the **EPBC Act,** if the taking of the action in accordance with the revised plan would not be likely to have a **new or increased impact.** If the approval holder makes this choice it must: a. notify the **Department** in writing that the approved plan has been revised and provide the **Department**, at least four (4) weeks before implementing the revised plan, with:	Not Triggered as the SMP has not been revised since approval by DoEE on the 2nd of October 2018. *Evidence: SMP, copy of the letter dated 21st of November 2018 from DoEE.*	NA

Condition Number	Condition	Findings	Compliance Status
	i. an electronic copy of the revised plan; ii. an explanation of the differences between the revised plan and the approved plan; and iii. reasons the approval holder considers that the taking of the action in accordance with the revised plan would not be likely to have a **new or increased impact**.		
20A	The approval holder may revoke its choice under condition 20 at any time by notice to the **Department.** If the approval holder revokes the choice to implement a revised plan, without approval under section 143A of the **EPBC Act,** the plan approved by the **Minister** must be implemented.	Not Triggered as Condition 20 has also not been triggered. *Evidence: SMP, copy of the letter dated 21st of November 2018 from DoEE.*	NA
20B	If the **Minister** gives a notice to the approval holder that the **Minister** is satisfied that the taking of the action in accordance with the revised plan would be likely to have a **new or increased impact,** then: a. condition 20 does not apply, or ceases to apply, in relation to the revised plan; and b. the approval holder must implement the plan approved by the Minister. To avoid any doubt, this condition does not affect any operation of conditions 20 and 20A in the period before the day the notice is given. At the time of giving the notice, the **Minister** may also notify that for a specified period of time condition 20 does not apply for one or more specified plans required under the approval.	Not Triggered as Condition 20 has also not been triggered. *Evidence: SMP, copy of the letter dated 21st of November 2018 from DoEE.*	NA
20C	Conditions 20, 20A and 20B are not intended to limit the operation of section 143A of the **EPBC Act** which allows the approval holder to submit a revised plan to the **Minister** for approval.	Not Triggered as the SMP has not been revised since approval by DoEE on the 2nd of October 2018. *Evidence: SMP, copy of the letter dated 21st of November 2018 from DoEE.*	NA

Condition Number	Condition	Findings	Compliance Status
21	If, at any time after five (5) years from the date of this approval, the approval holder has not **commenced** the action, then the approval holder must not **commence** the action without the written agreement of the **Minister.**	Not Triggered as the action has commenced and is within 5 years of the date of approval. *Evidence: The Approval and action commencement notification Email 27th of May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au. and 27th of June 2018, letter from DoEE to Richard Oldham (Stanmore) acknowledging commencement date.*	NA
22	Unless otherwise agreed to in writing by the **Minister,** the approval holder must publish all management plans referred to in these conditions of approval on its website. Each management plan must be published on the website within one (1) month of being approved by the **Minister** or being submitted under condition 20. All management plans must remain on the website for the lifetime of the approval unless otherwise agreed to in writing by the **Minister.**	The SMP and OMP have been published on the Stanmore website (https://stanmorecoal.com.au/environment-management), as at the 25th of June 2019. The date of publishing to the website was not able to be determined during the audit an therefore there remains uncertainty as to whether publishing was undertaken within one month of approval for the documents (2nd of October 2018) by DoEE. *Evidence: Stanmore website (accessed 25 June 2019).*	C - (Qualified by findings)

5 Reviewed Documentation

AusEcology, 22nd of November 2018. *Nestbox Installation at ML70018 November 2018*. Nest Box Location Plan - 14 nest boxes.

AusEcology, January 2019. *Fauna Capture records 25th of October 2018 to the 17th of January 2019*.

AusEcology, March 2019. *Fauna Capture records 9th of March 2019 to the 17th of March 2019*.

Australian Government Department of Environment, 2014. *Environmental Management Plan Guidelines, Commonwealth of Australia 2014.* https://www.environment.gov.au/system/files/resources/21b0925f-ea74-4b9e-942e-a097391a77fd/files/environmental-management-plan-guidelines.pdf

Australian Government Department of Environment and Energy (DoEE), 21st of November 2018. Letter RE: *Offset Management Plan and Species Management Plan, Extension to Isaac Plain Mine, Moranbah, Qld (EPBC 2016/7827).* Letter corrects errors in preceding letter from DoEE of the 2nd of October 2018.

Australian Government Department of Environment and Energy (DoEE), 23rd of May 2019. Letter RE: *Compliance Monitoring Inspection Isaac Plains Coal Mine (EPBC 2016/7827).* Letter acknowledges compliance with Conditions 1, 2, 3 and 4.

Australian Government Department of Environment and Energy (DoEE), 27th of June 2018. Letter RE: *Commencement of the Action, Extension to the existing Isaac Plains Mine, QLD, EPBC 2016/7827).* Letter acknowledges action commencement notification (9th of June 2018).

BASE Consulting Group, 28th of September 2018. *Isaac Plains East – Matters of National Environmental Significance Fauna Species Management Plan.* https://stanmorecoal.com.au/sites/default/files/2018-12/2016-7827-Species%20Management%20Plan%20Rev%205-Finalv2_reduced%20size_opt.pdf.

BASE Consulting Group, Undated. *Dr Craig Streatfeild, Principal Environmental Scientist – Curriculum Vitae.*

Bernie O'Neill, 28th of September 2018. Email to Graham Wicks (Golding) (Cc'ed x 5) *Clearing at IPE.* (including requirement for Dozer, Tree Grab Excavator, clearing procedure, Spotter Catcher and Hollow tree procedure).

C&R Consulting, June 2018. *Isaac Plains Complex Rehabilitation Monitoring Program*.

C&R Consulting, 18th of July 2019. *Isaac Plains Complex 2019 Annual Groundwater Review.* (**Appendix C**).

C&R Consulting, January 2019. *Isaac Plains Coal Mine Rehabilitation Inspection 2019.*

Department of Environment and Science (DES), 24th of January 2019. *Environmental Authority EPML00932713 Isaac Plains Mine.*

Department of Environment and Science (DES), 6th of June 2019. *Environmental authority EPML00932713*.

Ecological Survey and Management, July 2018. *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring.* (**Appendix D**).

EdenTech, November 2018. *Environmental Authority Audit Report - Isaac Plains Coal Mine Environmental Authorities EPML00932713*.

Golding, 19th of July 2019 (initial issue 3rd of February 2016). *IPSHMS Using Mobile Plant*.

Melanie Ballantine 30th of April 2019. *Email to Chris.Oates@environment.gov.au (Cc'ed x 3) Subject: Isaac River Auto Water Monitoring Station.*

Melanie Ballantine 17th of July 2019. *Email to ptett@slrconsulting.com Subject: Re: Isaac River Auto Water Monitoring Station.*

Melanie Ballantine 23rd of July 2019. *Email to ptett@slrconsulting.com Subject: Re: Isaac River Auto Water Monitoring Station*. Relative to first Data (1 of 2).

Melanie Ballantine 23rd of July 2019. *Email to ptett@slrconsulting.com Subject: Re: Isaac River Auto Water Monitoring Station*. Relative to first Data incl. Graphs(2 of 2).

Richard Oldham 27th of June 2018. *Email to postapproval@environment.gov.au (Cc'ed x 3) Subject: Commencement Date - Isaac Plains Mine, Queensland (EPBC 2016/7827).*

SLR Consulting, 4th of March 2019. *Isaac Plains Coal - Plan of Operations Review*.

Stanmore IP Coal Pty Ltd, 1st of February 2019. *Plan of Operations - Isaac Plains Complex ML 70342, ML 700016, ML 700017, ML 700018, ML 700019 - Plan Period: 01 February 2019 to 31 December 2020. Including topsoil inventory (Appendix C) and 2020 Disturbance Plan).*

Stanmore IP Pty Ltd Survey Department, (Multiple Dates). *Survey records (provided to Senior Advisor HSEC) of clearing planned and completed under Disturbance Permits (Mapinfo),.* Sighted during site visit on the 16th of July 2019.

Stanmore IP Coal Pty Ltd, 30th of April 2018. *Retention of Infrastructure Post Mine Life agreement Letter and Map (signed by Stanmore and background landholder 30th of April 2018*.

Stanmore IP Coal Pty Ltd, 4th of October 2018. *Disturbance Permit 99 (77.86 hectares).* Incl. associated plans.

Stanmore IP Coal Pty Ltd, 2018. GIS (Tab) files - *20180213 Allowable Disturbance IP and IPE.tab*.

Stanmore IP Coal Pty Ltd, 28th of February 2019. *Disturbance Permit 116 (25.4 hectares*). Incl. associated plans and Photographs of clearing activity (x 17) associated with Permit to Disturb 116.

Stanmore IP Coal Pty Ltd, 4th of April 2019. *Disturbance Permit 122 (25.0 hectares).* Incl. associated plans.

Stanmore IP Coal Pty Ltd, 30th of April 2019. *Dust Management Plan IPC-ENV-PLN-02.04*.

Stanmore IP Coal Pty Ltd, 30th of April 2019. *Site Shutdown Procedure Particulate Matter (Dust) Exceedance PC-ENV-PRO-02.04.02.*

Stanmore IP Coal Pty Ltd, 28th of June 2019. *Disturbance Permit 131 (64.0 hectares).* Incl. associated plans.

Stanmore IP Coal Pty Ltd, (Multiple dates). *Site mapping files (multiple) delineating go and no go areas and showing the approved project boundary.* Sighted during site visit on the 16th of July 2019.

Stanmore IP Coal Pty Ltd, (Multiple dates). *Survey Records used in MapInfo by Senior Advisor HSEC (Computer).* Sighted during site visit on the 16th of July 2019.

Stanmore IP Coal Pty Ltd, (Undated). *Environment and Community - Training Package*.

APPENDIX A

Species Management Plan and Offset Management Plan Implementation– Audit Tables

Species Management Plan and Offset Management Plan Implementation– Audit Tables
MB = Melanie Ballantine - Senior Advisor – Health, Safety, Environment and Community (HSEC).
Species Management Plan - Table 7. Measures to avoid/mitigate impacts to EPBC Act listed threatened fauna

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
Limit or avoid loss of MNES and/or habitat for MNES.	• Clearing of habitat for MNES does not occur outside of the approved disturbance limits and does not exceed the disturbance limits detailed in Table 1 of this SMP. • No net loss of habitat for the Koala and Greater Glider outside of the approved disturbance limits. • No loss of permanent water sources for the Squatter Pigeon outside of the approved disturbance limits. • Rehabilitation of disturbed areas will be rehabilitated in accordance with the Project's Rehabilitation Management Plan.	• Infrastructure will be sited in accordance with the State and Commonwealth approval conditions. • Areas requiring vegetation removal will be clearly delineated to ensure disturbance to areas being retained is avoided. Limits of clearing are to be delineated using barricading or temporary fencing and signage prior to works commencing. Exclusion areas are to be clearly shown and labelled on all operational and management drawings and plans. GIS shapefiles will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations. • Where exclusion fencing is required, consideration shall be given to fauna movement, current land uses and worker safety requirements. • Permanent water sources for retention such as farm dams outside of the disturbance limits will be clearly delineated and shown and labelled on all operational and management drawings and plans • Avoid where possible and within the constraints of the mining schedule, impacting on MNES habitat during breeding periods through timing of clearing and creek disturbance activities to avoid the main breeding season of impacted MNES (i.e. mid dry season to wet season for Squatter Pigeon. • Prior to entry to the Project area, all site personnel including contractors shall be made aware via toolbox talks and site information sheets, of the sensitive environs they will be working in and around and be advised of specific limitations to construction works being undertaken in or adjacent to threatened fauna habitat. All staff and contractors will be required to report sightings of SMP relevant fauna in the activity area to the EO immediately. • An internal 'Permit to Disturb' system will be used by the EO to ensure that all clearing activities are authorised prior to disturbance. Conditions listed in the Permit to Disturb must be implemented. • The EO or delegate will routinely inspect the disturbance limit boundaries to ensure that no clearing or disturbance of vegetation or habitat beyond the approved limits has taken place. • Temporary stockpile sites for soil and equipment, access routes, laydown areas and other associated infrastructure will be located in cleared areas and will not be situated in areas of MNES habitat. • Prior to construction activities commencing, signage, including speed limits, will be erected in the vicinity of exclusion areas to warn of the potential presence of threatened fauna in the area.	• Clearing of MNES habitat exceeds the approved disturbance limits in Table 1 of this SMP and/or occurs outside of the Project footprint as outlined in Attachment A of EPBC Act approval. • No disturbance to permanent water sources, which may provide habitat for Squatter Pigeons and Ornamental Snakes, outside of the disturbance areas. • Rehabilitation and decommissioning fails to meet the objectives of the Rehabilitation Management Plan.	• Fauna Spotter will monitor and record clearing activities and all fauna encountered. • The Environmental Officer (EO) will monitor and record the total area of MNES habitat cleared every quarter and assess against the disturbance limits outlined in Table 1 of this SMP and the Project footprint as outlined in EPBC Act approval. • Auditing of the Permit to Disturb will be undertaken quarterly by the EO to ensure any disturbance has been undertaken in accordance with the requirements of the Permit to Disturb, this SMP and approval conditions and to ensure no unauthorised disturbance has occurred. • Rehabilitation monitoring will be undertaken in accordance with Rehabilitation Monitoring Plan that is required to be prepared in accordance with Condition F13 of the Project's EA (Appendix C).	• Should clearing of habitat for MNES exceeds the approved disturbance limits in Table 1 of this SMP and/or occurs outside of the Project footprint, clearing, works are to cease immediately and DotEE notified of the incident within five business days. The incident will be recorded in the Project's environmental and incident reporting system register. • Following clearing, the area will be assessed within 20 business days by a suitably qualified expert with corrective actions provided to the DotEE via a Corrective Action Contingency Plan. • The Plan will include a schedule to implement the corrective actions. • Should rehabilitation and decommissioning fail to meet the objectives and completion criteria of the Rehabilitation Management Plan and the schedule outlined in Table 19 of the Project's EA, the reasons of the failure will be investigated. **Corrective Actions:** • The Corrective Actions identified in the Corrective Action Contingency Plan and approved by DotEE will be implemented and may include additional rehabilitation or offsets or provision of additional permanent water sources for the Squatter Pigeon and/or Ornamental Snake prey.	• Infrastructure as per approvals. (*Field, Survey Records*). • Permits to Disturb prepared and signed off prior to clearing. Post clearing inspections are undertaken by MB to ensure Permit requirements are observed and entered in the Disturbance Permit Register. (*MB, Register*). • Requirements SMP and OMP addressed in the Permits to Disturb. *(Permits to Disturb, Disturbance Permit Register*). • Surveying, Pegging and Flagging of the clearing limits addressed in the Permits to Disturb. Disturbance surveying (including MNES Habitat) is undertaken routinely and GIS files used by the site Senior Advisor HSEC to track clearing (~monthly). (*MB, Field, Survey Records*). • GIS files prepared and viewed. Go and No go zones clearly delineated. (*Field, Survey Records*). • No Go Zones shown on Operational Drawings, including dams on Plan of Operations Drawing. (*Operational Drawings, Permits to Disturb, Plan of Operations*). • Barbed wire fencing retained in place where possible, Pegging delineation, bunting and signing used to define no go areas and clearing limits. (*Field, Disturbance Permits*) • Water infrastructure retention agreement and plan in place. (*Retention of Infrastructure Agreement*). • Timing of disturbance was generally outside breeding (Mid Dry to Wet) season for Squatter Pigeon. However, unavoidably the initial clearing campaign started in October (ended in January) which would have partly coincided with the late breading season. (*Disturbance Permits, Disturbance Permit Register*). • The Environment and Community - Training Induction Package includes MNES considerations and injured fauna reporting. Information Sheets / Posters

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)

		• Pre-clearance surveys will be undertaken by a suitably qualified ecologist using approved State and Commonwealth survey guidelines within 48 hours before clearing activities commencing.
		• The pre-clearance survey will be undertaken in order to:
		  • Record the location of all hollow bearing trees, log piles and nest using a GPS. Features of tree hollows (diameter, number and whether active/inactive) should be recorded in the Environmental Diary/Register; and
		  • Relocate all captured non-breeding animals to suitable habitat adjacent to the disturbance area and within the Project Area.
		• A Fauna Spotter will be present for all clearing activities and will conduct a walk-through survey prior to commencement of clearing and prior to clearing works each day to check vegetation and other fauna habitats.
		• The Fauna Spotter will reinspect the area of cleared vegetation immediately after clearing to locate any potentially injured fauna that should then be taken to a wildlife carer or veterinarian.
		• Vegetation clearing will be undertaken progressively and trees will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat.
		• Hollow bearing trees will be clearly flagged and surrounding vegetation removed with the hollow bearing tree left standing for at least one night to encourage fauna to relocate of its own accord. Hollow bearing trees will be inspected to determine if hollows are occupied.
		• If after one night the resident fauna have not moved on, the hollow entrance will be blocked with a towel or similar and the hollow removed by cutting below the hollow section. The hollow with the animal inside will then be installed in nearby similar and adjoining vegetation to be retained at a similar height and orientation with the entrance unblocked at dusk.
		• If the procedure described above is not possible for any reason, hollow-bearing trees will be felled using a tree grab or similar that can remove the tree in a controlled fashion. If possible and safe to do so, hollow trees will be felled at dusk to allow fauna the opportunity to disperse during their normal activity period. These trees will be felled away from hollow openings. The tree will be knocked at the base several times prior to felling to encourage fauna to relocate of their own accord. Once the tree is felled, it will be inspected for any fauna and any injured fauna rescued and taken to a wildlife carer or veterinarian.
		• Any fauna that is captured will be relocated into the adjacent habitat at least 200 m from the clearing area if clearing works are yet to be completed.
		• Where threatened fauna is identified and delaying the clearing of area is not feasible, (i.e. the clearing is critical to the activity
					• Within 20 business days of a rehabilitation trigger being activated, a Contingency Plan will be developed by a suitably qualified expert to address the reason for the failure and identify appropriate Corrective Actions.	are routinely located in common gathering areas, including office areas such as the Technical Services Alerts Board. These posters are specifically distributed as clearing campaigns are initiated. (*Induction Training Package*, *Information Poster, Future Campaign Bulletin (17 July 2019)*).
						• Permit to disturb system in use. (*Disturbance Permits, Disturbance Permit Register*).
						• Spotter /catcher / Ecologist and (Clearing Contractor) attends site pre clearing (24- 48 hours) and remains on site during clearing, they are provided with the GIS clearing boundaries and direct the clearing machinery. Boundaries are also pegged and bunted. The Site Senior Advisor HSEC is routinely moving around the mine site and observes the cleared areas as a matter of course. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Interview of Clearing contractor for the 17 July 2019 clearing campaign*).
						• Stockpiles are located outside of MNES habitat areas. (*Plan of Operations Disturbance Plan, Field*).
						• The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*MB, Field*).
						• Pre clearance surveys were undertaken by a qualified ecologist (AusEcology) prior to and concurrent with clearing. Clearing activities were planned for the days following the Site visit (Disturbance Permit 131). On 17 July 2019 AusEcology Ecologist attended site to undertake the pre-clearing survey. (MB, *Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Disturbance Permits).*
						• Hollow bearing tree locations, log piles and nests were recorded. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*).
						• Animals were captured and relocated

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
		schedule), a 50 m exclusion zone will be established and the area must not be disturbed for a minimum of 24 hours while clearing is undertaken around the exclusion zone. After 24 hours, a Fauna Spotter/Catcher may relocate the breeding animal to suitable habitat at least 200 m away from the disturbance area. Where survival of young or eggs is unlikely as a result of the disturbance, these are to be handed over to a previously identified wildlife carer or veterinarian.				(and recorded) as required by Spotter catchers during clearing activities. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • Spotter catchers undertook pre and post-clearing inspections. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • Injured wildlife was directed to carers as required and record noted in Fauna Capture Records. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • Records show progressive clearing away from undisturbed habitat. (*Disturbance Permits, Clearing Photographs*, *Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • Hollow bearing trees were flagged and left to stand overnight and inspected by the spotter catcher next day and any resident fauna relocated where possible prior to – felling in accordance with requirements. (*Disturbance Permits, Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • A tree grab was maintained on site during clearing to manage hollow bearing trees. (*Email to contractor requiring Tree-grab, Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign*). • Fauna was relocated a minimum of 200 m away from clearing activities and locations recorded in the Fauna Capture Records. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • No Threatened (EPBC) species delayed

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
						clearing. Only the Squatter Pigeon was located during the clearing and self-relocated. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Fauna Capture Records*). • Rehabilitation monitoring is undertaken annually in accordance with the Rehabilitation Monitoring Plan. (*Plan of Operations, Rehabilitation Monitoring Program, January 2019 Rehabilitation Inspection Report*).
Prevent habitat degradation and a decline in habitat values within the retained habitat within the Project area.	Maintain habitat quality scores within the retained MNES habitat in relation to baseline habitat quality scores.	• Areas of MNES habitat adjacent to the disturbance footprint and within the Project area (i.e. mine lease), will be clearly delineated and shown and labelled on all operational and management drawings and plans. GIS shapefiles will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations. • Site access is only to occur along designated site access tracks. No unauthorised access is permitted. • Prior to commencement of the action signage, including speed limits, will be erected to warn of the potential presence of threatened fauna in the area. • Posters will be developed and displayed in meeting areas that reminds staff and contractors about the MNES present in the Project area. • Prior to entry to the Project area, all site personnel including contractors shall be made aware via toolbox talks and site information sheets, of the sensitive environs they will be working in and around and be advised of specific limitations to construction and/or operational works being undertaken in or adjacent to threatened fauna habitat. All staff and contractors will be required to report sightings of MNES fauna to the EO immediately • Where tree hollows that are suspected as being used by Greater Gliders are identified from within the disturbance area, they are to be salvaged to the greatest extent possible and relocated within retained vegetation. As far as practical, the site of the relocation is to be within retained vegetation and replicate the height and orientation of the original breeding or nesting structure. Sections of hollow branch or log will be secured in the new location by mechanical means deemed appropriate by the Fauna Spotter/Catcher (e.g. bolts, metal bands). Relocation is to be undertaken under the supervision of a spotter/catcher. • Selected trees and/or logs will be salvaged and reused as fauna habitat to enhance retained vegetation habitat values (e.g. within Smoky Creek and Billy's Gully). Trees and other habitat features to be salvaged will be identified and flagged by the Fauna Spotter/Catcher during the walk-through survey	The habitat quality score in areas of retained MNES are not maintained (e.g. habitat falls below the baseline habitat quality score).	• Habitat quality assessments will be undertaken annually for the first three (3) years then every two (2) years thereafter in retained vegetation that provides habitat for MNES including monitoring of the riparian area as required by Condition 10 of the EPBC Act approval. Monitoring will be undertaken in accordance with the Commonwealth survey guidelines and the State guidelines guide for determining terrestrial habitat quality. These methods are outlined in Appendix A and Appendix B.	• Where inadvertent disturbance to MNES habitat occurs, an investigation will be undertaken. • Should a decline in the habitat quality scores be observed, the cause will be investigated, and a Corrective Actions Contingency Plan will be developed by a suitably qualified ecologist within 20 business days of the decline being detected. The Plan will include appropriate corrective actions and an implementation schedule for those actions. The DotEE will be notified within 20 business days of the decline in habitat quality. **Corrective Actions:** • Corrective actions identified in the Plan will be implemented within 30 days of the trigger being detected. Depending on the cause of the decline in habitat quality scores, potential corrective actions may include: o Rehabilitation of MNES habitat. o Additional environmental awareness training to workers regarding	• Site mapping files showing go and no go areas and delineating disturbance boundary have been prepared and are provided to clearing contractors and spotter catchers. *(Disturbance Permits, Operational Mapping Layers (MapInfo)*). • Induction requirements address designated tracks and roads and the requirement for Disturbance Permits for development of new tracks or other disturbance. (*Induction Training Package*). • The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*MB, Field*). • Information Sheets / Posters are routinely located in common gathering areas, including office areas such as the Technical Services Alerts Board. These posters are specifically distributed as clearing campaigns are initiated. (*Information Poster, Future Campaign Bulletin (17 July 2019)*). • The Environment and Community - Training Induction Package includes MNES considerations and injured fauna reporting. Information Sheets / Posters are routinely located in common gathering areas, including office areas such as the Technical Services Alerts Board. These posters are specifically distributed as clearing campaigns are initiated. (*Induction Training Package*, *Information Poster, Future Campaign Bulletin (17 July 2019)*). • To date no hollow trees associated with Greater Gliders have been recorded. (*Fauna Capture Records*). • Logs and hollows with habitat value

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
		and/or clearance activities. • If an occupied tree hollow cannot be relocated the breeding habitat should be replaced nearby and in retained vegetation (but at least 200 m away from the disturbance area) in undisturbed habitat, with an artificial nesting structure at a ratio of 1:1 using current best practice nest box design. • Implementation of dust suppression techniques in accordance with the Dust Management Plan and the CMSHA and the CMSHR. • Maintenance of existing fences. • Pest animals and weeds will be managed in accordance with the Project's Weed and Pest Management Plan. • Light spill we be directed to the open cut pits to minimise light spill. • The use of low wattage lighting with list spill guards.			MNES. o Increasing pest animal and weed control measures or revising the type of measures implemented. o Increasing the frequency of dust suppression techniques. o Repair fences if damaged, or installation of new fencing. • Provision of additional offsets in accordance with the EPBC Act approval Condition 13.	have been salvaged during clearing and are intended to be re-located to rehabilitation and other areas, such as undisturbed riparian zones, to enhance habitat values. (*MB, Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Field*). • 14 nest boxes have been installed in undisturbed habitat. (*Field, Nest Box Map*). • Standard operating procedures require dust management in accordance with Dust management Plan and Health and Safety Legislation. (*Dust Management Plan*). • Fences are maintained in good order. (*Field*). • Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Past management has included 1080 baiting for dogs and pigs and spot spraying for Bellyache Bush and Parthenium. (*MB*). • Light is directed towards operations which is generally away from undisturbed areas. (*MB*). • Riparian Ecological Surveys undertaken, EPBC Approval Condition 10 complied with. (*Baseline Riparian Monitoring Report*).
Minimise risk of weed introduction and/or the spread of existing weed species in habitat area for MNES.	• No new weed species are established in areas of MNES habitat based on baseline data. • Spreading of weeds does not occur relative to baseline data.	• Weeds will be managed in accordance with the Project's Weed and Pest Management Plan. • The Plan will include the following: o A site induction program that provides weed management information to staff, contractors and visitors. o Detailed control measures aimed at eradicating where possible, or otherwise reducing the extent of weeds in accordance with the Queensland Department of Agriculture and Fisheries (DAF) guidelines and the requirements of the *Biosecurity Act 2014*. o Weed washdown procedures for all vehicles brought to site that will be traveling beyond the site office carpark. o Targeted weed control measures within the Project area.	• An increase in the average percent (%) cover score of weed species from baseline and/or previous monitoring events. • Detection of weed species not previously recorded in the Project area during baseline and/or previous monitoring events.	• Monitoring of weeds outside of the disturbance areas will be undertaken during the habitat quality assessment surveys using similar methodology to the baseline ecological survey (Appendix A) and the habitat quality assessment methodology (Appendix B) and will be undertaken annually for the first three (3) years then every two years (refer to Section 5.0 (of SMP)).	• Should an increase in weed cover or presence of new weed species be observed, an investigation will be undertaken to determine the cause. This will involve reviewing adherence to the Weed and Pest Management Plan and an assessment of the distribution of weeds within the Project area in relation to baseline to determine the cause of the incursions. • From the investigation, a Corrective Action Contingency Plan will be developed by a suitably qualified ecologist within	• Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Past management has included 1080 baiting for dogs and pigs and spot spraying for Bellyache Bush and Parthenium. (*MB*). • The Environment and Community - Training Induction Package includes weed and pest management. (*Induction Training Package*). • Machinery entering site is required to be clean and free from dirt. The Senior Advisor HSEC inspects machinery prior to allowing it onsite. A Washbay is located adjacent to the Administration area at the entrance to the mining area. (*MB, Field (Washbay Inspection)*. • Weed treatment is undertaken as

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
					20 business days of the trigger being detected. The Contingency Plan will include appropriate corrective actions and an implementation schedule for those corrective actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected. • Potential corrective actions may include: o Increasing the frequency and/or duration of weed control efforts. o Investigating and/or implementing alternate weed management control actions. o Amending weed hygiene practices. o Updating the Weed and Pest Management Plan.	determined by site inspections and rehabilitation monitoring. (*MB*. • Weeds are assessed during Rehabilitation monitoring and habitat quality assessments. (*MB, January 2019 Rehabilitation Inspection Report).*
Reduce habitat degradation and potential predation on MNES by pest animals.	• No new pest animal species are established in areas of MNES habitat in comparison to baseline data. • Reduction in pest animal numbers in areas of habitat for MNES to below baseline levels.	• Pest animals will be managed in accordance with the Project's Weed and Pest Management Plan. • The Project's Weed and Pest Management Plan includes requirements for: o Appropriate waste management and waste disposal. o A reporting framework to ensure sightings of pest animals are recorded. o Site inductions to include information on pest animals including control requirements, importance of appropriate waste management and reporting requirements when pest animals are observed within the Project area during construction and operation activities. o Control of pest animals. • Pest management actions outlined in the Weed and Pest Management Plan will primarily focus on those pest animals identified within the Project area and include Cane Toads, Feral Cats, Wild Dogs, House Mice and European Rabbits and that have a potential to impact on MNES and their habitat.	• Observed increase in sightings/signs and/or the relative abundance of pest animals in areas of retained MNES habitat above baseline levels. • Direct observation or signs of, a pest animal not identified as occurring within the Project area during the baseline surveys.	• Monitoring of pest animals in the retained MNES habitat will be undertaken using similar methodology (or an alternate methodology proposed by a suitably qualified ecologist) to the baseline ecological survey undertaken for the EPBC referral (Appendix A) as well as the habitat quality assessment methodology (Appendix B) and will be undertaken annually for the first three (3) years then every two (2) years thereafter (refer to Section 5.0(of SMP)). • Potential predation of MNES will also be assessed	• Should evidence of pest animals show an increase compared to baseline, undertake an investigation to assess possible reasons for the increase (e.g. inappropriate waste management leading to increased pest animals). • Should predation of MNES be observed undertake an investigation to assess possible reasons for the incident(s). • Review adherence to the Project's Weed and Pest Management Plan. • From the investigation, a Corrective Actions Contingency Plan will be	• Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Past management has included 1080 baiting for dogs and pigs and spot spraying for Bellyache Bush and Parthenium. (*MB*). • The Environment and Community - Training Induction Package includes weed and pest management. (*Induction Training Package*). • Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Past management has included 1080 baiting for dogs and pigs and spot spraying for Bellyache Bush and Parthenium. (*MB*). • Weeds and pests are assessed during Rehabilitation monitoring and habitat

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
		Additional pests will be included as necessary if identified as occurring within the Project area during the habitat quality monitoring program (European Foxes and Feral Pigs). • Pest management will include a range of best management practice actions including shooting, trapping, fencing and baiting in and will be undertaken in accordance with site safety and health requirements, and DAF guidelines and the requirements of the *Biosecurity Act 2014* and as permitted under the SHMS.		during the habitat quality scoring assessment and the riparian monitoring program (Appendix D) outlined above.	developed by a suitably qualified ecologist within 20 business days of the trigger being detected. The Contingency Plan will include appropriate corrective actions and an implementation schedule for those corrective actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected. • Potential corrective actions may include: o Increasing the frequency and/or duration of pest animal control efforts. o Investigating and/or implementing alternate pest animal control methods in consultation with DAF. o Updating the Weed and Pest Management Plan to include new species where relevant.	quality assessments. (*MB, January 2019 Rehabilitation Inspection Report*).
Minimise impacts of dust deposition on habitat for MNES during construction and operation of the Project.	• Dust deposition does not exceed 120 mg per square metre per day, averaged over one month when measured at any sensitive receptor as outlined in Condition B2 of the Project EA. • Dust is monitored in accordance with the Dust Management Plan which must be developed in accordance with Condition B5 of the Project's EA.	• Dust suppression will be undertaken in accordance with the Dust Management Plan and include the following actions: o Staging vegetation clearing to minimise areas of disturbed and bare ground. o Progressively rehabilitating disturbed areas. o Removal and dumping of overburden as soon as reasonably practical following blasting activities o Regular watering of haul roads and access tracks in accordance with the CMSHR. o Dust suppression spraying of stockpiles. o Limiting grading and/or dozing in high dust generating areas. o Limiting overburden drilling. o Enforcing speed limits in accordance with the requirements of the CMSHA and CMSHR.	• Dust deposition levels exceed 120 mg per square metre per day when averaged over one month at sensitive receptors. • Visual inspections of vegetation adjacent to the disturbance areas show visible signs of dust deposition.	• Monitoring of dust deposition will be undertaken in accordance with Condition B2 and the Project's Dust Management Plan as required under Condition B5 of the Project's EA. • Existing monitoring includes visual inspections of vegetation adjacent to the disturbance areas.	• In accordance with Conditions B3 and B4 of the Project's EA, if dust deposition monitoring exceed the trigger value of 120 mg per square metre averaged over one month, Stanmore must investigate whether the exceedance is a result of Project activities and notify the administering authority within seven days of the exceedance occurring. • Should an exceedance of dust deposition levels be attributed to Project activities Stanmore will implement dust	• Standard operating procedures require dust management in accordance with Dust management Plan and Health and Safety Legislation. (*Dust Management Plan*). • Vegetation Clearing is conducted progressively to minimise bare areas. (*Field, Disturbance Permits, Disturbance Permit Register*). • Rehabilitation is undertaken progressively in accordance with legislative requirements and the Plan of Operations. (*Plan of Operations, Field*). • Blasting and overburden removal are consecutive components of the mining process. (*Field*). • Overburden drilling is undertaken only

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
					abatement measures. **Corrective Actions:** • Corrective actions identified in the Dust Management plan will be implemented within 10 days of the trigger being detected.	as required. (*Field*). • Dust monitoring is undertaken in accordance with the Environmental Authority (EA) (EPML00932713). (*EA Audit*).
Minimise noise and vibration impacts in areas of MNES habitat.	When measured, noise and vibration levels do not exceed criteria set out in Tables 15 and 16 of the Project EA at sensitive receptors.	• Regularly maintaining and servicing all plant equipment to minimise machinery noise. • All engine covers will be kept closed while equipment is operating. • Blasting will only occur between 9am and 7pm.	• When measured at sensitive receptors noise and vibration levels exceed criteria set out in Table 15, Table 16 and Table 17 of the Project's EA. • When blasting occurs outside of the approved blast times.	• Noise and vibration monitoring will be undertaken in accordance with monitoring Conditions outlined in Section D of the Project's EA.	• In accordance with Conditions under Section D of the Project's EA, if noise and vibration monitoring exceed the trigger values outlined, Stanmore must investigate whether the exceedances are the result of the mining activities and notify the administering authority within seven days of the exceedance occurring. • Should exceedance levels be attributed to mining activities, noise and vibration abatement measures will be implemented. **Corrective Actions:** • Corrective actions identified during investigations will be implemented within 10 days of the trigger being detected.	• The Plan of Operations Action Plan addresses noise and vibration management and monitoring requirements of the EA. (*Plan of Operations*).
Minimise degradation of habitat for MNES from an increased risk of fire due resulting from Project activities.	No uncontrolled fires within the Project area resulting from Project related activities.	• Fire management for coal mining operations in Queensland is governed by the CMSHA and the CMSHR with the CMSHR prescribing management of fires for coal mines. • Section 37 of the CMSHR prescribes that the coal mines Safety and Health Management System (SHMS) must include standard operating procedures for action to be taken when a fire is discovered at the mine. • Buffers will be maintained around potential ignition sources such as plant and machinery, haul roads and mine infrastructure areas. • Prior to site entry, all relevant site personnel, including contractors, will be made aware of fire safety and risks. • Fuel loads will be minimised and managed through the weed control measures outlined in the Weed and Pest Management Plan.	• An uncontrolled fire occurs within the Project area that is due to mining activities. • Weed cover exceeds baseline levels and groundcover biomass (e.g. vegetation) exceeds benchmark levels.	• Compliance with the SHMS will be monitored in accordance with the requirements of the CMSHA and CMSHR. • Monitoring of biomass (groundcover including organic litter) for fire management will be undertaken during the habitat quality assessments that will occur annually for the first three (3) years then every two (2) years thereafter (refer to Section (refer to Section 5.0(of SMP)).	• Should an uncontrolled fire occur within the Project area, the Project's Emergency Response Plan will be enacted. Should any corrective actions and changes to fire management be required, they will be done in accordance with the CMSHA and CMSHR and incorporated into the SHMS. • Should biomass monitoring indicate that there is a risk of an uncontrolled fire occurring, biomass control	• Fire management on site is in accordance with Health and Safety Legislation. (*MB*) • Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Past management has included 1080 baiting for dogs and pigs and spot spraying for Bellyache Bush and Parthenium. (*MB*). • Weeds and pests are assessed during Rehabilitation monitoring and habitat quality assessments. (*MB, January 2019 Rehabilitation Inspection Report*).

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
					measures will be assessed by a suitably qualified ecologist within 20 business days and Corrective Actions suggested. Biomass control measures aimed at reducing fuel loads may include controlled burns, strategic grazing or modified weed management measures. **Corrective Actions:** Any corrective actions identified will be implemented within 30 days of the trigger being detected.	
Minimise alteration of Squatter Pigeon, Ornamental Snake and the riparian habitat from changes to water quality and hydraulic activity.	• Water quality does not exceed trigger levels and at any of the monitoring sites listed in the Tables in Condition C – Water. • Water quality monitoring is undertaken in accordance with the Receiving Environment Monitoring Program which must be developed in accordance with Condition C22 of the Project EA. • Erosion and sediment control is undertaken in accordance with the Erosion and Sediment Control Plan (ESCP) as required by Condition C38 of the Project EA.	• Site stormwater management will be undertaken in accordance with the management plans and programs required by the Project's EA including a Receiving Environment Monitoring Program (REMP) required under Condition C22, Water Management Plan (WMP) required under Condition C31 and an ESCP required under Condition C38. • The site specific WMP, REMP and ESCP as well as other water management requirements outlined in Section C of the Project's EA will be prepared by a suitably qualified person. • Required management plans will be developed with the aim of minimising alterations to receiving environment water quality erosion, minimising mobilisation of sediments and minimising erosion related disturbances to the current hydrological regime. • The maintenance and cleaning of any vehicles, plant or equipment must not be carried out in areas from which contaminants can be released into any receiving waters. • Spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or receiving waters.	• Water quality monitoring exceeds the approved receiving environment trigger levels outlined in the REMP and in Table 7 of the Projects EA and mine affected water quality levels exceed the trigger levels outlined in Table 3 of the Project's EA. • Visual inspections of water management infrastructure show signs of failure.	• Water quality monitoring will be undertaken in accordance with the REMP as required by Conditions C22 and C23 of the Project's EA. • Monitoring of the effectiveness of the erosion and sediment control devices and the water management will be undertaken in accordance with Conditions C32 of the Project's EA.	• In accordance with Condition C21 of the Project's EA, if water quality characteristics of the downstream monitoring point exceed trigger levels outlined in Table 7 of the EA, and these levels are higher than upstream monitoring locations, Stanmore must investigate the exceedance and the potential for environmental harm and provide a written report to the administering authority as part of the Project's Annual Return. • Should an exceedance of water quality trigger levels be attributed to Project activities, an assessment on the effectiveness of the WMP and REMP will be undertaken and appropriate Corrective Actions included in Plan revisions and the Annual reports as required under Conditions C24 and C33 of the Project's EA. **Corrective Actions:** • Corrective actions identified will be implemented within 10 days of the trigger being	• The Plan of Operations Action Plan addresses water management and monitoring requirements of the EA. (*Plan of Operations*). • The machinery wash-bay is a closed system and does not discharge offsite. (*MB, Field (Washbay Inspection)*). • Spill response and clean-up procedures and equipment are in place at site. (*MB, Field).*

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July2019 (*Evidence*)
					detected.	
Minimise potential for mortality or injury to MNES from Project activities (e.g. habitat clearing, vehicle strikes etc.).	No mortality of, or injuries to, MNES as a result of Project activities (e.g. from clearing activities, vehicle strikes etc.).	• Environmental awareness training will be provided to all workers as part of site induction and will include specific topics on MNES, risks and protective measures, and identification of the MNES. • Pre-clearance surveys will be undertaken within 48 hours of clearing activities to assess the presence of MNES within the disturbance area to be cleared. • At least one qualified Fauna Spotter/Catcher will be present during clearing activities. • A wildlife carer will be called to collect any injured fauna. • Speed limits of 60 km/hour will be set and enforced on all internal roads including haul roads • Vehicles must abide by vehicle speed limits and access to any restricted areas or exclusion zones must be limited to critical site-specific activities to minimise threats to MNES. • All injured fauna encountered during the construction and operation of the activity will be taken to a wildlife carer/facility or veterinarian within 24 hours. • Where injured fauna is encountered, and it is unsafe to handle the animals, the following should be undertaken; o The location of the injured animal will be identified so it can be located again o The species of animal will be identified if possible and its sex and approximate size determined o The type of injury sustained will be identified if possible o The EO shall immediately contact Queensland's Department of Environment and Science (DES) and report the animal and arrange for its capture and transportation to a wildlife carer or veterinarian.	Injury or mortality to an MNES	• All personnel will be required to be report any interactions between vehicles and/or /machinery and MNES in the Project area. • Visual observations during normal working hours. • Incidental observations during habitat quality assessments.	• Should an injury to, or mortality of, an MNES, an investigation will be undertaken to ascertain the cause of the injury or mortality. • Should the injury or mortality be attributed to mining activities, a Contingency Plan will be developed by a suitably qualified ecologist within 20 business days and will include Corrective Actions and an implementation schedule for the Corrective Actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected.	• The site Induction Package addresses the MNES and fauna reporting requirements. (*Induction Training Package*). • The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*MB, Field*). • Spotter /catcher / Ecologist and (Clearing Contractor) attends site pre clearing (24- 48 hours) and remains on site during clearing, they are provided with the GIS clearing boundaries and direct the clearing machinery. Boundaries are also pegged and bunted. The Site Senior Advisor HSEC is routinely moving around the mine site and observes the cleared areas as a matter of course. (*Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign, Interview of Clearing contractor for the 17 July 2019 clearing campaign*). • Injured fauna is directed to a carer in Moranbah and location found, species, and injury recorded. No incidents of unsafe recovery have occurred to date. (*MB*, *Interview of Ecologist on site to undertake the pre-clearing and spotter catching for the 17 July 2019 clearing campaign*).

Offset Management Plan - Table 21: Proposed monitoring schedule of offset area

Habitat Quality surveys undertaken by suitably qualified ecologists					Audit Comments SLR July2019
Initial habitat quality assessment	Site condition, site context and species stocking rates.	Initial and baseline assessment was completed in May 2018	Visual inspections and detailed habitat quality assessment transects*	Assessment sites outlined in Section 7.3 (of OMP).	Completed as part of the OMP. (*OMP*).
Site Condition	Recruitment of woody perennial species in the ecologically dominant layer (EDL)	2019 (following approval of this OMP), then annually for the first six (6) years, followed by every two (2) years until year 14, then in 2040.	As per the methods outlined in the Guide and in Section 4.1 (of OMP). Visual observations and where relevant, methods outlined in the Guide to determining terrestrial habitat quality. Targeted MNES surveys aimed at assessing the presence of the species within the offset area will be undertaken in accordance with relevant survey		Not applicable to the Period of the Report – Due in October 2019.
	Native plant species richness – trees				
	Native plant species richness – shrubs				
	Native plant species richness – grasses				
	Native plant species richness – forbs				

	Tree canopy height		guidelines and undertaken by suitably qualified ecologists.		
	Tree canopy cover				
	Shrub canopy cover				
	Native perennial grass cover				
	Organic litter				
	Large trees				
	Course woody debris				
	Non-native plant cover (i.e. weeds)				
	Quality and availability of food and foraging habitat (e.g. tree canopy height and cover, organic litter, tree and shrub species richness).				
	Quality and availability of shelter (e.g. presence of tree hollows).				
Site context[1]	Threats to species (e.g. lack of EDL recruitment, presence of feral animals and weeds etc.).				
	Threats to mobility capacity.				
Species stocking rates	Presence/absence of MNES. MNES abundance and density (where relevant).				
Visual inspection surveys undertaken by the landowner or authorised landowner representative and targeted weed and feral animal surveys undertaken by suitably qualified ecologists.					
Photo points	General vegetation condition and vegetation cover.	2019 (following approval of this OMP), then annually for the first six (6) years, followed by every two (2) years until year 14, then in 2040.	Photographs of offset area to be taken from the same location and direction for each monitoring event.	Assessment sites outlined in Section 7.3 (of OMP)..	Not applicable to the Period of the Report – Due in October 2019.
Grazing	Stocking rates and ground cover.	Stocking rates will be routinely monitored until 2040. Biomass will be monitored annually in the early dry season.	Assessments of the offset area will be undertaken by the landowner/land manager or authorised representative to observe and record grass cover, presence of weeds and pest animals. Detailed assessments as outlined in Section 7.0 (of OMP) will also be undertaken in conjunction with the habitat quality assessments	Assessment sites outlined in Section 7.0(of OMP).	
Fire	Presence of fire and extent of burning.	Following fire events. Biomass will be monitored annually in the early dry season.			
Feral animals	Presence of pest animals, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management. 2019 (following approval of this OMP), then annually for the first six (6) years, followed by			

[1] Non-GIS attributes that can be measured in the field.

		every two (2) years until year 14, in 2040.			
Weeds/ pest plants	Presence of weeds, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management. 2019 (following approval of this OMP), then annually for the first six (6) years, followed by every two (2) years until year 14, in 2040.			
Fencing and site access	Condition of fencing and access tracks.	Visual inspections undertaken during routine land management.			

APPENDIX B

Site Visit and Evidence Photos

Approved clearing limit marker a

Approved clearing limit marker b

Approved clearing limit marker c

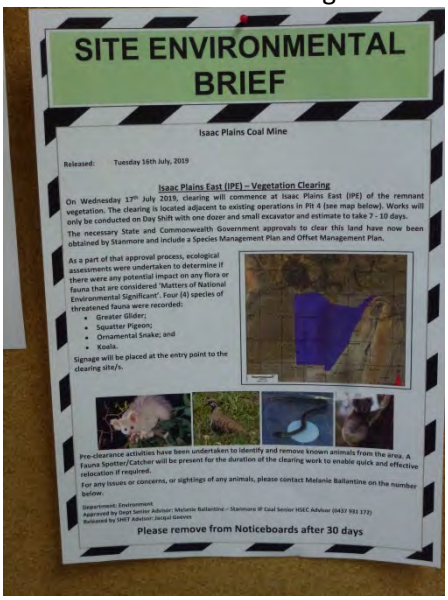
Billys Gully fence Condition a

Billys Gully Fence Condition b

Bunting Clearance Limits

Disturbance Permit Clearing Limit Marker a

Disturbance Permit Clearing Limit marker b



EPBC Poster

Fence Condition a

Disturbance Permit 131 marker a

Disturbance Permit 131 Marker b

Nestbox a

Nestbox b

PTD 125 a

Washbay a

APPENDIX C

Isaac Plains Complex 2019 Annual Groundwater Review – 18 July 2019

C&R CONSULTING
Geochemical & Hydrobiological Solutions Pty Ltd
ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
Environmental Compliance and Monitoring
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ISAAC PLAINS COMPLEX

2019 Annual Groundwater Review

REPORT PREPARED FOR:

STANMORE IP COAL PTY LTD

Date:
18 July 2019

IMPORTANT NOTE

Dr Chris Cuff Director	Dr Cecily Rasmussen Director
18/07/2019	18/07/2019
Date	Date

IMPORTANT INFORMATION

1. This report is prepared and written in the context of the proposals stated in the introduction to this report and its contents should not be used out of context. Furthermore new information, developing practices and changes in legislation may necessitate revised interpretation of the report after its original submission.
2. The copyright in the written materials shall remain the property of C&R Consulting but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to C&R Consulting by the client of the outstanding amounts.
3. The report is provided for sole use by the addressees and is confidential to them and their professional advisors. No responsibility whatsoever for the contents of the report will be accepted to any person other than the Addressees.
4. Where data have been supplied by the client or other sources, including data from previous site audits or investigations, it has been assumed that the information is correct, but no warranty is given to that effect. While reasonable care and skill has been applied in review of these data, no responsibility can be accepted by C&R Consulting for inaccuracies in the data supplied.
5. This report contains only available factual data obtained for the site/s from the sources described in the text. These data were related to the site/s on the basis of the location information made available to C&R Consulting by the client.
6. The assessment of the site/s is based on information supplied by the client, and on-site inspections by C&R Consulting.
7. The report reflects both the information provided to C&R Consulting in documents made available for review and the results of observations and consultations by C&R Consulting staff.

SUMMARY OF RELEVANT INFORMATION

Project Title	2019 Annual Groundwater Review
Property Location	Isaac Plains Complex
Property Description	Open cut coal mine
Project Purpose	Review the Groundwater Management and Monitoring Plan and the data collected in accordance with Environmental Authority Condition C44
Project Number	19010
Client's Details	
Nominated Representative	Melanie Ballantine
Title/Position	Senior Advisor (HSEC)
Company	Stanmore IP Coal
Telephone	0437 931 172
Email	Melanie.Ballantine@stanmorecoal.com.au
Author's Details	
Primary Author	Sian Kennare
Qualifications	Graduate Diploma – Science (Groundwater Hydrology) 2016, Flinders University Masters of Environmental Management 2012, Flinders University
Experience	8+ yrs
Affiliations	International Association of Hydrogeologists Environmental Institute of Australia and New Zealand

DOCUMENT CONTROL

Version	Compiled by	Date issued	Reviewer(s)	Date returned
Draft 1	S Kennare	24/06/2019	Dr C Rasmussen	25/06/2019
Draft 2	S Kennare	25/06/2019	M Ballantine	01/07/2019
FINAL	S Kennare	18/07/2019	-	-

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1. INTRODUCTION

1.1 OBJECTIVES

This document provides a review of the groundwater monitoring results from the Isaac Plains Complex (IPC) from April 2017 to April 2019 (inclusive) as per the current Environmental Authority (EA) (EPML00932713) effective from 8th May 2019.

The EA States that:

Condition C43: Monitoring and reporting

A Groundwater Management and Monitoring Program for all stages of the authorised mining activities on site must:

a) Be developed, certified and implemented by an appropriately qualified person 1 October 2019;

b) Have all determinations of groundwater quality monitoring and groundwater biological monitoring be performed by an appropriately qualified person; and

c) Be able to detect a change in groundwater quality values and levels due to activities that are part of the authorised mining activities.

***Condition C44**:*

The Groundwater Management and Monitoring Program required by Condition C43 and the data collected must be reviewed on an annual basis by an appropriately qualified person. The review must:

a) Include the assessment of groundwater levels and quality data;

b) Assess the suitability of the groundwater monitoring network, including an assessment of whether groundwater parameter trigger values for compliance bores are required for all groundwater aquifers potentially impacted by the authorised mining activities; and

c) Be in a report submitted to the administering authority within twenty-eight (28) days of receiving annual groundwater data.

***Condition C45**:*

*Groundwater must be monitored at the locations and frequencies defined in **Table 11: Groundwater monitoring locations frequency** for the standing water levels and the parameters identified in **Table 12: Groundwater contaminant triggers**. Result and analysis of groundwater monitoring must be submitted annually to the administering authority with the report required by **Condition C44(c)**.*

1.2 MINE LOCATION AND DESIGN

IPC is located within the Isaac Regional Council on both Freehold Land and State Leasehold Land in Central Queensland, approximately 10 km to the northeast of Moranbah and 140 km south-west of Mackay (Figure 1). The project is situated immediately north of the Peak Downs Highway between Moranbah and Coppabella and has a rail loop off the south of the Goonyella Branch Rail Line (Figure 1).

IPC was placed in care and maintenance in December, 2014. In July, 2015 ownership of the mine was transferred from Vale S. A. and Sumitomo Corporation to Stanmore IP Coal Pty Ltd (Stanmore). Mining operations recommenced in January 2016.

The original IPC mining lease (ML70342) comprises of pits N1, N2, S1, S2 and S3. These pits are north of the Isaac River and upstream of the Isaac River-Smoky Creek confluence. Smokey Creek bisects the ML70342 lease area (Figure 1). The majority of mining at IPC is open cut and is based on a strip mining technique with waste removed by a combination of cast blasting, dozing and dragline spoiling or truck and excavator removal. Maximizing dragline usage was targeted in order to reduce costs.

In 2014 the S1 Pit acted as a regulated dam, storing mine-affected water for dust suppression purposes. During the first half of 2015 S1 Pit was drained and water transferred to S3 Pit (Figure 1) for later release.

In 2018 Stanmore was granted the approval to commence operation in mining leases located to the east of the original mining lease. The expansion of IPC operations into ML700016, ML700017, ML700018 and ML700019 commenced in the second half of 2018.

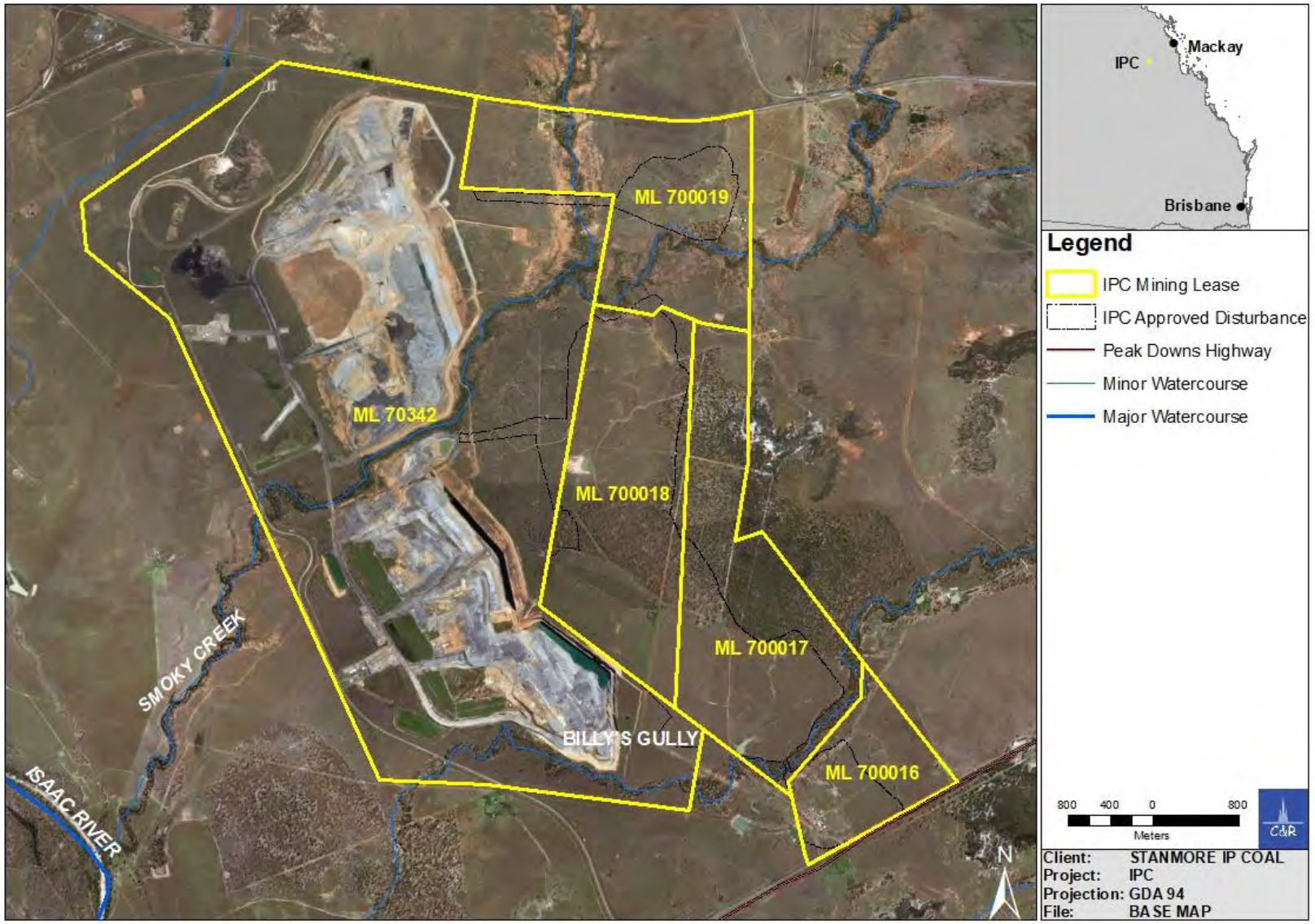

Figure 1: Isaac Plain Complex Location and Mining Leases

2. SITE CONDITIONS

2.1 CLIMATE

The climate in Central Queensland is seasonally arid. Rainfall in the area is notoriously unreliable in its intensity and duration, both temporally and spatially. Intense rainfall events throughout the summer months (wet season) dominate the climate cycle (Figure 2). The majority of these rainfall events occur in distinct, spatially separated cells across the landscape. Intense rainfall events are typically associated with tropical cyclone activity on the coast, and the remnant low pressure systems that move inland.

Far less rainfall is experienced throughout the dry season, with 35% of total rain typically falling in the winter months (May to October). Evaporation tends to exceed rainfall for almost all days of the year except during intense rainfall events (Figure 2). The extended dry season causes baking and crusting of surface soils. These processes lead to greatly reduced infiltration of surface soils unless suitable pre-wetting can be provided by gentle rain prior to the wet season. If pre-wetting rains have not occurred, >90% of rainfall can eventuate as runoff throughout catchments altering stage-discharge relationships within waterways.

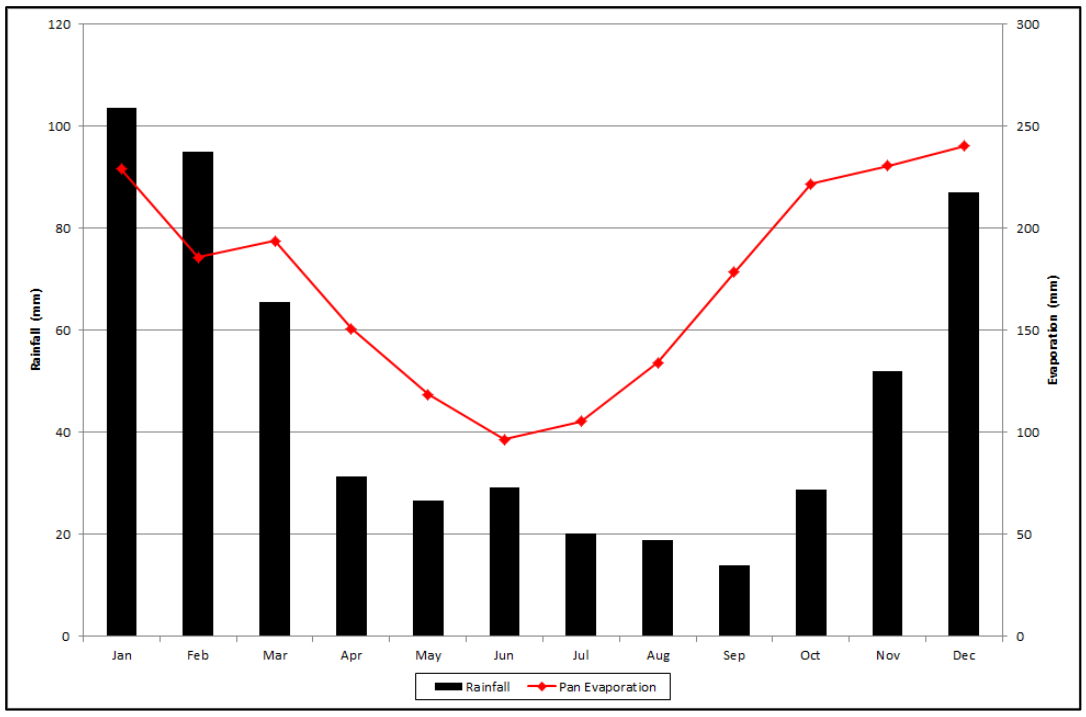

Figure 2: Average monthly rainfall and evaporation values for the region

2.2 SOILS

Several soil types are located within the Isaac Plains Mining Lease. These are described in the Integrated Isaac Plains Project Expansion Area Soil and Land Suitability Study (Matrix Consulting 2009) and include:

- A1 Alluvial sandy duplex soil.
- A2 Red Duplex with thin sandy clay loam overlying hard, coarse structured brown clay.
- B1 Uniform grey/brown clays with areas of gilgai on flat to gently undulating plains.

- B2 Sandy uniform clay or thin red/brown duplex soils overlying weathered shale/mudstone on undulating plains. Sandy surface which is often gravelly.
- B3 Crusting and often gravely sand clays associated with mesa scree slopes.
- B4 Melonholed clay lowlands.
- B5 Hard setting, gravely brown clay.
- E1 Sandy duplex on undulating plains.
- R1 Residual low hill of lateritised basalt.

These soil types can be grouped into the following three broad categories under the Australian Soil Classification system: Brown Sodosols, Red Chromosols and Vertisols.

2.2.1 SODOSOLS (A1 B5 E1)

This soil type occupies older alluvial plains associated with the Isaac River. It occurs on flat plains and is susceptible to occasional flooding. Soils are uniform silty clays and mostly cleared of vegetation. Nutrient levels are strong within the surface 30-40 cm layer. However, levels decrease below this depth. The surface structure is fine sandy clay over a silty clay profile with substantial rooting depth. The soil is not reactive, although the stratified alluvial nature of the medium is such that it should not be used for water holding structures. Material below 30cm with the B2 horizon may be slightly sodic and should therefore be avoided.

2.2.2 CHROMOSOLS (A2 B2 B3)

This soil occupies mid to upper slope positions within undulating lands. The surface structure is firm and sandy with ironstone gravel common. These soils have fairly hard structured light clay subsoils over weathered material but appear to be well drained to at least 40 cm in most instances. There are problems apparent from subsoil sodicity and salinity below 30 cm depth which is not assisted by its coarse structure.

2.2.3 VERTISOLS (B1 & B4)

The soils are brown to grey, moderately well structured, generally non-cracking clays which support abundant Buffel pasture. Saline and sodic conditions prevail immediately below 20 cm depth. Some of the area may include shallow (up to 15 cm deep) gilgai of brown sandy clay interspersed with grey clay depressions. The surface structure is sandy and firm with areas of ironstone gravel. In most instances drainage is not impeded to 40 cm.

2.3 GEOLOGY

The majority of the land surface is made up of deeply weathered profiles of the Permo-Triassic rock with *in situ* weathering and soil development and minor alluvium that, for the most part, conceal these rocks across the lease.

Tertiary-aged, poorly consolidated, sandstone forms part of an earlier thin sequence that covered much of the district. This sequence and older lithologies were eroded down to a flat surface (peneplain) that is capped with duricrust (ferricrete) or carbonate laterites. Locally the sequence has been eroded back to a table top to the north leaving behind mesas of sandstone on and around the lease.

Prior to and during this erosion period in the Tertiary, volcanic activity produced widespread basalt lava flows. At least two basalt flows have taken advantage of an earlier deep river passing down the eastern length of the lease. Remnants of the lava flows persist in mesas east of the lease and part of the northern table top while the remainder has been weathered down to the current alluvial flat developing across the site.

The coal beds exist as layers in packages of sedimentary beds called 'Coal Measures' which reflect the fact that coal seams split, thicken and thin, and are interfingered with other sediments at their time of formation. These sediments can include relatively porous sandstones conducive to groundwater flow. The coal beds themselves are frequently significant conduits to groundwater and provide local aquifer systems.

The economic Coal Measures at Isaac Plains are the Rangal Coal Measures and lower Fort Cooper Coal Measures. Both are part of the Late Permian Blackwater Group. This group of rocks extends throughout the western half of the Bowen Basin.

2.4 HYDROGEOLOGY

There are five principal hydrostratigraphic units within the IPC tenement areas:

1. Quaternary Alluvium;
2. Tertiary Sediments;
3. Cenozoic (Tertiary Basalt);
4. Triassic Rewan Group; and
5. Late Permian Rangal and Fort Cooper Coal Measures: sandstone, siltstone and coal (see Table 1).

The Quaternary Alluvium and Tertiary Sediments are associated with channel deposits of Smoky Creek and the Isaac River (Table 1 and Figure 3). In 2018, KCB completed in field investigations to assess the extent of the Quaternary Alluvium in relation to Smoky Creek. This followed instruction from the Department of Environment and Science that one monitoring bore must be installed to monitor the Alluvium although when drilled occurred, no Alluvium was present. The selection of this target lithology for this monitoring bore location was based on the mapped alluvium presented in the Mount Coolon 1:250,000 map sheet that is mapped as having an extent of up to ~500 m adjacent to Smoky Creek. As per the findings from the field investigation, KCB reported:

The extent of the sediments was identified to be limited to the water course channel as the channel is deeply incised, with the creek banks comprising weathered bedrock. Furthermore, outcrops of weathered bedrock occur within the channel of Smoky Creek, identifying the limited depth of unconsolidated sediments. (KCB, 2018)

Cenozoic basalt crops out to the north-east of tenement ML70342 and particular basalt flows constitute aquifers in several surrounding areas. Confinement of the Late Permian strata is variable locally, depending on pressure distribution and depth. Stratigraphic descriptions for each unit are provided in Table 1. Surface distribution of each unit (**Error! Reference source not found.**) is complicated by several regional structures, including at least one syncline and thrust faults truncating the eastward-dipping target beds. The aquifers of the Isaac Plains area are described in the following sections, with reference made to aquifer characteristics, groundwater flow and groundwater quality for each unit.

Table 1: Stratigraphic units of the Isaac Plains region

Map Sym#	Age	Group	Name/Formation	Short Description
Cza	Quaternary		Alluvium	Alluvium: mud, sand, minor gravel Colluvium and residual soil: mud, sand, gravel##
Czb	Cenozoic		Cenozoic basalt	Basalt flows
Czs*			Suttor Formation*	Sandstone, mudstone, claystone
Ki*	Cretaceous		Unnamed*	Instrusives: granodiorite, diorite, gabbro
TRr	Triassic	Rewan Gp.	Rewan Fm.	Green lithic sandstone, green and red sandstone and mudstone.
Pwj	Permian	Blackwater Group	Rangal Coal Measures	Lithic sandstone, coal, siltstone, carbonaceous shale, mudstone (locally cherty), rare pebbly sandstone.
Pwt			Fort Cooper Coal Measures	Medium to coarse-grained, volcanolithic sandstone, conglomerate, tuff, tuffaceous mudstone, coal, shale.
Pwb*			Moranbah Coal Measures*	Lithic sandstone, siltstone, shale, coal, mudstone, conglomerate.
Pb*		Back Creek Group*		Marine sandstone, siltstone, shale

*Formation/unit is present outside the lease area and is not discussed at length in the text.

#Map symbols as per 1:100, 000 Geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (GSQ, 2014) (see Figure 2).

##Several generations of alluvium and colluvium exist, but only the older, more substantive one is mapped in Figure 2.

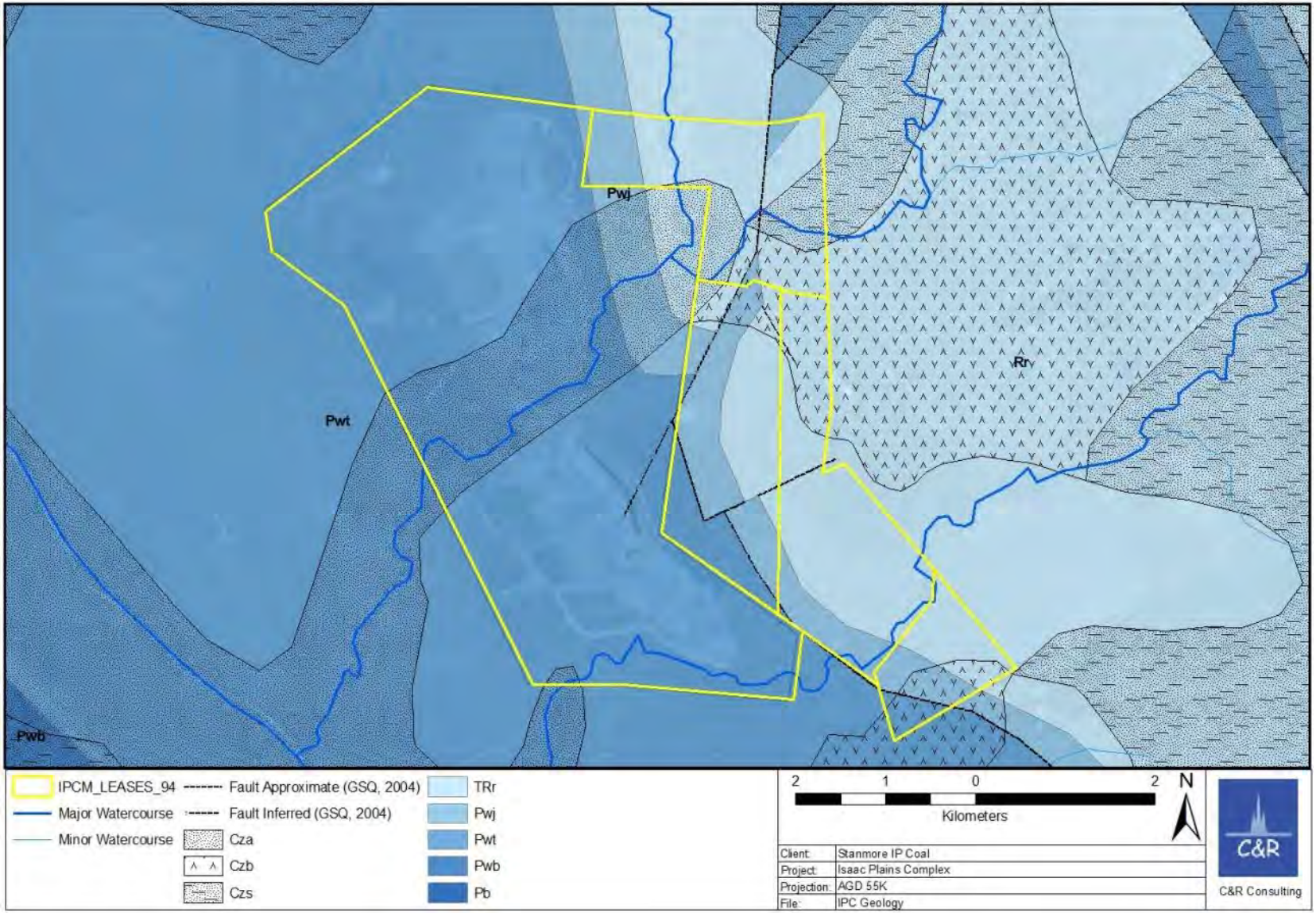

Figure 3: Major geological units for IPC

2.4.1 QUATERNARY DEPOSITS

2.4.1.1 *Lithology*

Several generations of Quaternary palaeochannel sediment deposition resulted in a complex distribution of alluvial aquifers across the region. There are at least three units present:

1. Younger Quaternary alluvium,
2. Quaternary colluvium, and
3. Older Quaternary alluvium (GSQ, 2004).

Of these, only the older Quaternary alluvium, comprising a relatively thick deposit along the Isaac River and Smoky Creek, is shown in Figure 3 (map symbol Cza; see also Table 1). KCB (2018) found the extent of the Quaternary Alluvium was identified to be limited to the water course channel as the channel is deeply incised, with the creek banks comprising weathered bedrock. Furthermore, outcrops of weathered bedrock occur within the channel of Smoky Creek, identifying the limited depth of unconsolidated sediments.

The alluvial aquifers have very heterogeneous lithology reflecting the fluvial depositional environment. Depositional complexity within the alluvial palaeochannel is shown in Figure 3, a cross section of the Isaac River from approximately 10 km southeast of Moranbah (Queensland Irrigation and Water Supply Commission, 1969).

In the IPC area, the alluvial deposits of the Isaac River mainly consists of fining upward packages of gravel, sand, silt and clay (Matrix+, 2009). The grainsize and textural variation of these sediments means that hydraulic properties are very variable, but sandy units are generally of high hydraulic conductivity, hosting groundwater of usable quality. The specific deposits of alluvium within IPC's leases are associated with the Isaac River (Figure 1). The potential resource within these deposits is unknown and groundwater use from them is expected to be only for environmental purposes (i.e. for maintaining groundwater dependent ecosystems). The impacts from mining activities on these aquifers is expected to be limited to water quality impacts from discharge of excess waters from on-site dams.

2.4.1.2 *Quaternary Alluvium Aquifer Properties*

Typical thicknesses of the alluvial aquifers in the IPC mining area range from 5 m to 19 m. However, monitoring bores indicate that the saturated thickness of the alluvial aquifer is generally about 3m, (corresponding to an average water-table elevation of approximately 188m AHD) although this could be greater in areas of thick alluvium. Generally the grain size of the alluvial sediments ranges from fine sand to gravel (i.e. <50mm).

Most exploration holes drilled into alluvial sediments associated with the Isaac River did not encounter significant groundwater supplies. Results from hydraulic testing of the alluvial aquifer show a local hydraulic conductivity of between 2.3 to 3.6m/day. A small number of holes in the Quaternary sediments yield water up to 1 L/sec.

2.4.1.3 *Groundwater Flow in Quaternary Alluvium Aquifers*

The alluvial aquifers, being fluvial sand, silt and clay, represent migrating palaeochannels that incise Late Permian strata. They enable the development of sub-surface flow paths for groundwater in a dendritic pattern that mimics surface drainage. The alluvial groundwater is typically recharged by flows in contemporary waterways during peak flows or floods (SKM, 2009), and/or from direct infiltration during rainy months through overlying soil profiles. Subsequently, the rate of groundwater flow and height of the water table in these alluvial aquifers are variable and annual recharge is not consistent.

Alluvial groundwater quality found in the Isaac River catchment Electrical Conductivity (EC) often greater than 10,000µS/cm), suggests some mixing with groundwater from the

underlying Late Permian units rather than regular recharge via direct rainfall or river flow. The regional flow of groundwater within the Quaternary sediment is expected to be southwards and south-eastward, congruent with surface drainage. Groundwater discharge occurs mainly via evapotranspiration. However, it may also occur locally through base flow to streams during dry periods. During peak river flow in the wet months, "gaining stream" conditions are precluded, meaning that baseflow does not occur (SKM, 2009).

2.4.1.4 *Groundwater Quality in the Quaternary Alluvium*

Groundwater of the alluvium has variable quality, reflecting the highly localised flow paths that dominate this dendritic system. At a regional scale, (e.g. the Isaac River Catchment), the alluvial groundwater EC ranges from below 500µS/cm to over 10,000µS/cm (SKM, 2009).

The salinity within the IPC is not well constrained. However, a groundwater sample from a bore situated directly east of the southern margin of the tenement (ML 70342) has an EC value >10,000µS/cm, with lower values (< 3,000µS/cm) from bores 10–20km north of that (Figure 37 of SKM, 2009). Although not explicitly stated, it is assumed that these samples are from bores screened in the alluvial aquifer. Further south, a single sample reported from the alluvial aquifer provided a Total Dissolved Solids (TDS) value of about 27,000ppm (bore 585, Matrix+, 2009).

These local data are consistent with a regional interpretation that up-gradient areas, including the IPC area, have a fresher composition closely related to rainfall and hence recharge, and down-gradient areas (to the south) are more evolved and saline, reflecting interaction with deeper groundwater (SKM, 2009; Matrix+, 2009).

2.4.2 TERTIARY BASALT

2.4.2.1 *Lithology*

Cenozoic volcanic rocks (Czb) (also referred to as Tertiary basalt) crop out to the east of the Isaac Plains Mine, near the Wotonga homestead (Matrix+, 2009, Section 7, page 2). The volcanics probably represent the most southerly extent of basalt flows from the Nebo Province (Stephenson *et al*., 1980) and are predominantly mafic (basaltic) and also include trachyte, rhyolite, tuff and high level intrusives (not mapped in the lease area) (PW Baker & Associates, 2011). The volcanics mostly overlie the late Permian succession of the Bowen Basin and have inverted topography associated with tributary drainage, locally occupying an ancestral course of the Isaac River. At least 9 flows are encountered in Geological Survey of Queensland (GSQ) drilling (Drake and Grovesnor Boreholes). The basalt regionally underlies Quaternary sediments of the Suttor and Isaac River catchments, except where partially exhumed by weathering (Stephenson et al., 1980).

2.4.2.2 *Basalt Aquifer Properties*

The Tertiary basalt flows in this region constitute shallow fractured rock aquifers, which are known to be used for local supplies of stock and domestic water (SKM, 2009). Typically, basalt aquifers are characterised by a network of cooling fractures that are often not well connected (anisotropy of hydraulic conductivity), and the resultant groundwater yield is unpredictable. There is a productive Cenozoic basalt aquifer to the north-east, adjacent to the Broadlea Mine, which hosts a large volume of groundwater (see below). However, the hydraulic characteristics of the basalt flows proximal to the Isaac Plains Mine area are not yet quantified.

2.4.2.3 *Groundwater Flow in Basalt*

As the lateral extents of the basalt flows of the region are not completely known and they are not spatially contiguous over large areas, groundwater flow in this unit is likely localised

rather than regional. Further, much of the thickness of basalt flows close to the surface may be unsaturated, or only saturated when the watertable rises in response to recharge periods. Ephemeral and local flow, mainly via sub-vertical recharge and discharge, is expected to be the dominant flow mechanism.

2.4.2.4 *Groundwater Quality in Basalt*

Fractures within a basalt flow proximal to the Broadlea North Coal Mine are expected to contain about 11,000ML of relatively good quality water (EC ranging between 760µS/cm and 5,300µS/cm), although the lateral extent is not known. Despite the utility of the basalt aquifer in some areas, yield is usually low and water quality is generally poor.

2.4.3 LATE PERMIAN COAL MEASURES

2.4.3.1 *Lithology*

The two main Late Permian units in the region are the older Fort Cooper Coal Measures and the younger Rangal Coal Measures (Figure 3, Table 1). The Late Permian stratigraphy described below is relevant to the entire area, but pertains directly to rocks intercepted by drilling and mining at IPC. Mining targets the Leichhardt Seam, (Rangal Coal Measures). The Rangal Coal Measures comprise volcano-lithic sandstone, coal, siltstone, carbonaceous shale, mudstone and pebbly sandstone. The Leichhardt seam, between 60m and 230m below ground level, is ~3.5m thick, splitting to an upper and lower seam in the northern part of the lease. Strata dip approximately 6-7° to the east.

2.4.3.1.1 Sandstone and Siltstone Above Target Coal

The regional Late Permian sedimentary rock succession is extensive and underlies the alluvium and basalt cover (PW Baker & Associates, 2011). The succession comprises sandstone, siltstone, mudstone, shale and coal (PW Baker & Associates, 2011). Both the Rangal Coal Measures and the Fort Cooper Coal Measures contain lithic sandstones, the latter having significant volcanolithic content, with some tuff and tuffaceous mudstone; whereas the former contains some carbonaceous shale.

2.4.3.1.2 Target Coal Seam

The Leichardt Coal Seam, the target of the IPC, may arguably be considered an aquifer, given the characteristics below. The coal seam is generally several metres thick and dips to the northeast across the site (Matrix+, 2009, Section 7, page 3).

2.4.3.1.3 Lithic Sandstone Below Target Coal

The typical units that underlie the Leichardt Coal Seam are Late Permian fine to medium quartzo-feldspathic lithic sandstone interbedded with carbonaceous mudstone. The sandstone beds are typically cemented with moderate to high porosity. The siltstone beds within this unit occur as thin interbeds and are predominantly carbonaceous.

2.4.3.2 *Late Permian Aquifer Properties*

The Late Permian Coal Measures provide modest groundwater supplies for livestock and agricultural uses in the region (Matrix+, 2009, Section 7, page 1), and extraction rates are generally limited to approximately 0.5L/sec (PW Baker & Associates, 2011). Borehole logs reveal that V-notch flow rates from sandstones range between 0.15L/sec (78 m depth in bore E7550027R) and 5.0L/sec (126m depth in bore E7550050R). Logs from 2004 monitoring bores penetrating the Leichardt Coal Seam indicate that it had yields ranging from moderate (2.17L/sec at 126m in E755273P-C4) to very poor (0.03L/sec at 42m in E755272P-C3).

Permeability of the Late Permian units is hindered by the intercalation of sandstone with mudstone and siltstone, in contrast to the more permeable alluvium and basalt aquifers (Matrix+, 2009, Section 20, page 39). Generally, coal seams form high hydraulic conductivity zones within these systems, as the bedding planes, fractures and joints allow faster water movement compared to the surrounding sandstone and siltstone. The Leichardt seam has a hydraulic conductivity in the vicinity of 0.0005 m/day, about five times higher than that of the Late Permian host rocks. The deeper Vermont seam has a hydraulic conductivity ranging between 0.22 to 0.2m/day, and there is a coalesced coal seam (adjacent to the Isaac River) with a thickness of 8.5m which has a hydraulic conductivity between 1.5 to 1.8m per day.

2.4.3.3 *Groundwater Flow in Late Permian Aquifers*

The regional flow patterns and recharge and discharge mechanisms of the Late Permian units of the Isaac River region are not well known or constrained. Considering the groundwater flow patterns in the overlying alluvium and basalt, recharge to the Late Permian rocks is expected to be restricted to wet periods, with several sequential wet seasons required for effective recharge. In a previous groundwater review, C&R Consulting surmised that a two-month cumulative rainfall total of approximately 400mm is needed for recharge to occur in the nearby, overlying sandstone of the Triassic Rewan Formation (water level change was detectable at a screen depth of 55m; C&R Consulting, 2013). Recharge may occur through direct infiltration in areas where the Late Permian rocks are exposed or close to the surface, or through inter-aquifer flow if vertical hydraulic gradients allow.

Very little is known about the variation of potentiometric water levels in the region with depth, but the available data can constrain some details of vertical flow. There is evidence for upward vertical gradients during winter (e.g. 2006) to the south of IPC (Matrix+, 2009, section 7, Table 7-1) This indicates that some discharge may occur as upward flow from Late Permian units into the overlying alluvium (or other sediment) and this may support baseflow to streams in winter months. A similar pattern may also exist near some creek reaches in the IPC area.

Lateral flow within the Coal Measures is likely to be slow, given the aquifer characteristics. Flow is assumed to be approximately south-eastward and southward, in keeping with the catchment orientation and the direction of Isaac River drainage. This is consistent with an interpolated map of groundwater levels in the region (Matrix+, 2009 section 7, page 13) and the data relevant to this review. Further, the impacts of geological structure on groundwater flow in the Late Permian units are not yet known. Generally, groundwater ingress into the pits at Isaac Plains is minimal, confirming the slow flow indicated by the low permeability.

2.4.3.4 *Groundwater quality in Late Permian Aquifers*

Groundwater from Late Permian Coal Measures south of IPC is known to be of sodium-chloride-bicarbonate type. There is a southward trend of increasing solute concentration (Matrix+, 2009, Section 7, page 12). This confirms the model of regional groundwater flow from north to south, where length of residence time and degree of water-rock interaction increase along the flow path. The Electrical Conductivity (EC) of groundwater in the Late Permian aquifers ranges from 11,00 µS/cm to 41,000µS/cm, with an average EC of 21,000µS/cm (Matrix+, 2009, Section 7, page 12).

The Leichardt coal seam may be termed an aquifer, but the quality of the groundwater is generally poor (EC of 8,000 – 20,000µS/cm). Combined with poor to moderate flow rates, and thin expression (about 2m thick), the Leichardt seam is an unusable aquifer (PW Baker & Associates, 2011; E3 Consulting Australia Pty Ltd, 2011).

2.5 GROUNDWATER DEPENDENT ECOSYSTEMS

Groundwater Dependent Ecosystems (GDEs) are defined by the Department of Environment and Energy (DoEE) as 'Natural ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson et al. 2011).

The broad type of GDE are: ecosystems dependent on surface expression of groundwater; ecosystems dependent on subsurface presence of groundwater; and, subterranean ecosystems.'

A review of the potential for GDE's in the vicinity of IPC was undertake as part of the Terrestrial Ecology Assessment (Ecological Survey & Management, 2016) to support the Environmental Assessment Report for the IPE Project. The Ecological Survey & Management report identified that the GDE mapping provided in the GDE Atlas produced by the Bureau of Meteorology is not consistent with the hydrogeological setting of the IPA area. The Ecological Survey & Management (2016) states that the IPE area does not contain a suitable shallow groundwater supply and therefore concluded that there are no GDE's within the vicinity of the project area.

3. GROUNDWATER MONITORING NETWORK

Throughout the life of the mine there have been many boreholes drilled on IPC mining leases. However, previous to gaining environmental approval to mine within the new eastern Mining Leases (700016, 700017, 700018 and 700019), only two groundwater bores (Burton Coal Bore 2 and Swamp Bore 1) were monitored as a requirement of the EA. Following approval of an EA amendment for the mining activities on these additional mining leases on the 24th January 2018 a more extensive monitoring network has been developed that targets various aquifer systems present within the eastern Mining Leases. This monitoring network remains unchanged following the minor EA amendment for underground mining activities, approved on 8 May 2019.

The details of the bores included in the groundwater monitoring programme as stipulated in the EA **Condition C43** are summarised in Table 2, with their spatial distribution shown in Figure 4. The bores listed in Table 2 (EA Table 11) are designated as 'Reference Bores' and have been selected to provide ongoing baseline data during mine operations at the IPC.

Bore assessments were completed on Burton Coal Bore 2 and Swamp Bore 1 in June 2018, and included downhole camera surveys for each bore to confirm bore construction details. The construction details of monitoring bores MB1, MB2, MB3, MB4, MB5 and MB6 were sourced from AGE Consultants (2016). Monitoring bores MB3 and MB5 are currently located within the footprint of the proposed IPE open pits and will be mined out as the project develops (Figure 4). Consequently, two new monitoring bores were drilled and constructed east of IPC. These bores are identified as MB8 and MB9 (Figure 4).

The number of bores sampled currently within the IPC groundwater monitoring network is greater than that stipulated within EA Table 11. Additionally, there is currently naming inconsistencies between the EA Table 11, the Groundwater Management and Monitoring Plan and the field data. It is imperative that IPC amend all documents to align with a consistent naming convention for each monitoring bore to improve the integrity of groundwater data collected.

To date, all data referenced as MB9b refers to the bore stated within the EA as MB10, while two monitoring bores currently exist for MB4 and are referred to as MB4a and MB4b.

Installation of monitoring bore MB11 was a requirement of Condition **C45** and **C51** of the IPC EA. Based on the regional geological mapping of the 1:250,000 Mount Coolon geology map sheet, the location of MB11 (identified in the EA) was anticipated to target the Quaternary alluvium. However, during the drilling for this bore alluvium was not encountered. No data has been captured for this bore as it has remained dry throughout the reporting period.

Several additional bores are included within the IPC quarterly groundwater monitoring network, although they are not specifically required under EA conditions. In April 2016, Stanmore installed a new monitoring bore (MB7) located east of the S2S Pit highwall (Figure 4). This groundwater monitoring bore is 137m in depth including 8m of slotted PVC targeting the Coal Measures between 126 m and 132m.

Subsequent to the installation of MB7, Stanmore have undertaken the monitoring of two additional bores (AC1 and C1) located in the same vicinity as bores 240P and BC095 (Figure 4). These two bores will be incorporated within the current groundwater monitoring network, with the intention to cease monitoring 240P and BC095. This proposed change in monitoring bores has been instigated by the lack of construction data for BC095. BC095 is approximately 114m in depth, however, no data are available distinguishing the specific screen interval depths within the borehole, that penetrates the targeted Leichardt coal seam and into the underlying strata. Consequently, the specific geological medium that provides the source of water sampled in BC095 cannot be accurately identified.

Multiple bores within the IPC designated Observation Bore network have ceased to be monitored during the reporting period with mining progressing and consequently destroying the groundwater monitoring bores. MB4b and MB7 remain the only operational monitoring bores, with MB6 and C1 ceasing in January 2019, AC1 in July 2018, while BC095 ceased in October 2019 with the progression of the N2 void.

Table 2: Groundwater Monitoring Bores at IPC

Monitoring Point	Aquifer Type	Easting (GDA 94)[1]	Northing (GDA 94)[1]	Surface RL (mAHD)[1]	Purpose
EA Table 11 – Reference Bores					
Burton Coal Bore 2	Rewan Formation	620614.14	7573946.89	240.67	As per EA C43
Swamp Bore 1	Rewan Formation	621750.30	7569146.43	245.85	As per EA C43
MB1	Coal Measures	618792.07	7572213.34	236.54	Monitoring groundwater in the target coal
MB2	Coal Measures	619073.69	7573129.11	242.88	Monitoring groundwater in the target coal
MB3	Coal Measures	619047.07	7568472.36	253.00	Advance of mine operations
MB4	Quaternary colluvium/Tertiary sediments	620355.06	7567481.37	237.00	No sufficient water column
MB5	Coal Measures	618507.07	7570878.35	241.83	Advance of mine operations
MB8	Coal Measures	618990.97	7570968.22	245.50	MB5 Replacement
MB9	Coal Measures	620254.18	7567865.36	238.95	MB3 Replacement
MB10	Tertiary Basalt	620255.02	7567872.67	238.94	DES request
MB11	Tertiary Sediments/ Weathered Rewan Group	618717.61	7571743.16	231.77	DES Request
IPC Designated Observation Bores					
MB4b	Quaternary colluvium/Tertiary sediments	619625.60	7567072.68	231.44	MB4 Replacement
MB6	Basalt	619260	7567365	235.29	
MB7	Coal Measures	617423	7568883	236.91	
C1	Coal Measures	616544.81	7571999.27	235.68	
AC1	Coal Measures	616572.81	7571996.57	235.83	

Monitoring Point	Aquifer Type	Easting (GDA 94)[1]	Northing (GDA 94)[1]	Surface RL (mAHD)[1]	Purpose
BC095	Coal Measures	616507	7571995	236.73	

1 - Source Klohn Crippen Berger 2018.

Figure 4: IPC Groundwater Monitoring Network

4. GROUNDWATER LEVELS

In accordance with the EA (as approved on 24th January 2018), IPC implemented a Groundwater Management and Monitoring Plan (GMMP) as per EA **Condition C43 b**y 29 June 2019. The current EA (dated 8 May 2019), extended the period for development, certification and implementation of the GMMP to 1 October 2019.

The reporting for this Groundwater Review (June 2017 – April 2019) incorporates water quality characteristics and analyses that were captured prior to the current EA taking effect and therefore only groundwater data captured after the 24th January 2018 will be assessed against the compliance criteria stipulated within the respective EA.

Standing Water Levels (SWL) are measured as part of the groundwater monitoring procedure prior to undertaking water quality sampling. The measurement of standing water levels provide an insight into the nature of the aquifer systems (recharge and discharge points) and any potentially impacts of mining activities. Standing water levels are captured by measuring the depth to water that is then subtracted from the reference datum height of the monitoring bore casing. This calculation provides the ability to gain a relative level in m Australian Height Datum (m AHD).

4.1 REWAN FORMATION

Burton Coal Bore 2 and Swamp Bore 1 are screened within the Rewan Formation to the northeast and east of IPC mining operations. Groundwater flow direction within the aquifer system suggest these bores are considered reference and upstream of any potential impact that could be attributed to IPC. Throughout the reporting period, Swamp Bore 1 has remained stable with very little variation in standing water level, excluding the standing water level recorded in January 2019 (Figure 5). The January 2019 standing water level is considered to be a result of human error, with the standing water level returning to its original level in the following quarter (Figure 5). In comparison, Burton Coal Bore 2 displays a steady downward trend over the reporting period, with the standing water level decreasing by 1.90m (Figure 5). Historically the Burton Coal Bore 2 has shown a greater level of fluctuation than Swamp Bore 1, even though they are considered to target the same aquifer system. This is even more surprising when considering Swamp Bore 1 is located directly beside a farmer's bore that extracts groundwater for stock drinking water. The downward trend in Burton Coal Bore 2 is likely to be impacted by rainfall. Over the 2011 wet season, the standing water level rose sharply following high rainfall totals and then declined steadily in the following years alongside marginal wet seasons. The level rose again following higher rainfall totals in the 2016 and 2017 wet seasons but has subsequently declined following dryer years thereafter.

4.2 COAL MEASURES

The monitoring bores targeting the Coal Measures show a substantial variation in standing water behaviour between the monitoring bores targeting the Coal Measures at IPC (Figure 5). Several bores (MB3 and MB5) during the reporting period were decommissioned with the advancement of mining. MB9 replaced MB3 within the groundwater monitoring network. Interestingly, even though the replacement bore is 1.3km to the south east, the slight drawdown captured in MB3 aligns and continues into the standing water level of MB9. MB9 has decreased 14.31m between the initial record in July 2018 and April 2019 (Figure 5). The large decrease in standing water level is attributed to the advancement of mining and depressurising of the aquifer that has consequently altered the flow direction of the coal seam aquifer. This is further supported by the steady levels recorded in up gradient monitoring bores MB1, MB2 and MB8 that are positioned outside the current impact zone.

Groundwater monitoring bores located between the original mining operations of Isaac Plains and the new eastern mining leases displayed a similar impact to that of MB9, with drawdown increasing with the advancement of mining. Although both C1 and AC1 are located within close proximity to one another and target the Coal Measures, C1 penetrates the target Leichardt Seam, approximately 30m lower than the screen interval in AC1. Consequently, as mining advanced, C1 recorded a far greater drawdown (39.48m) than AC1 (4.08m) over the reporting period (Figure 5).

Located within a similar distance to the mining voids, MB7 is positioned close to the highwall of the southern voids. The southern voids ceased full mining operations in 2018. MB7 has historically displayed steady standing water level with the exception of April 2019 that recorded an increase of 13.30m (Figure 5). It is unclear from a single data point (at the end of the reporting period) whether or not this elevated level is caused by human error or possibly a response to stored water within the southern voids.

4.3 TERTIARY BASALT

IPC monitor two bores (MB9b and MB6) that target the Tertiary Basalt aquifer, both located south-east of mining operations and close to Billy's Gully (Figure 4). Please note, MB10 is referred to in all field documents and Certificate of Analyses as MB9b. MB6 has been monitored since October 2017, while monitoring commenced at MB9b in July 2018. MB6 and MB9b both show a decline in standing water level over the reporting period with 1.72m and 0.45m, respectively (Figure 5). It is anticipated that MB6 may display a greater response to mining operations with its locality down gradient of mining operations. In comparison, MB9b is located on the south-eastern edge of the eastern leases disturbance footprint.

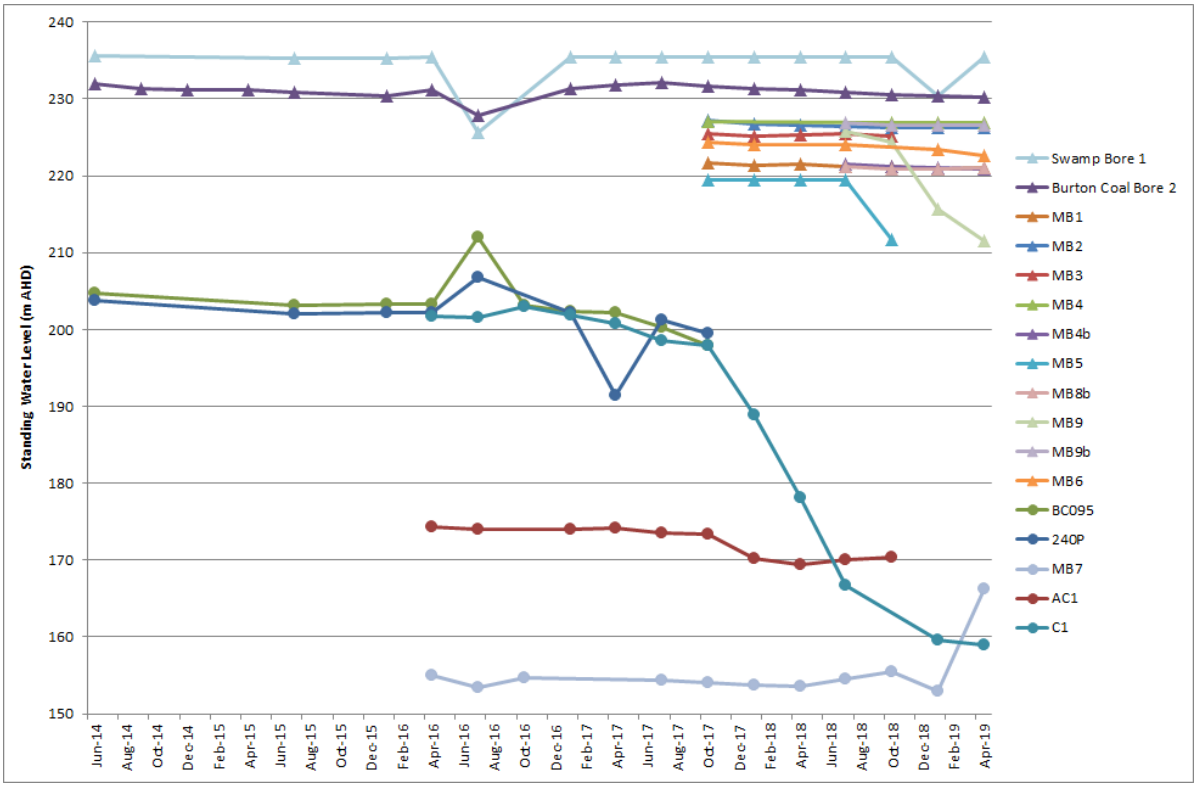

Figure 5: Standing water level variation across the groundwater monitoring network

5. GROUNDWATER CHARACTERISTICS

The IPC groundwater monitoring network currently targets four different aquifer systems across and surrounding the mining operations at IPC with a major focus on activities within the eastern mining leases. Each aquifer system (Rewan Formation, Tertiary Basalt, Quaternary Alluvium and the Coal Measures) displays a different quality groundwater. It should be noted, groundwater monitoring (MB11) targeting the Quaternary Alluvium was unsuccessful with no Quaternary Alluvium intercepted in the drilling process. The variation in water quality characteristics can be attributed to the depth, locality, geology and the nature of its recharge.

The reporting period for this Annual review includes groundwater samples collected between April 2017 and April 2019 (inclusive) with the number of samples collected from each bore/aquifer presented in Table 3. Please refer to Appendix 1 for all Certificate of Analyses referred to within this report.

Table 3: Number of samples collected per bore during the reporting period

Monitoring Point	Aquifer Type	Number of Samples
EA Table 11 – Reference Bores		
Burton Coal Bore 2	Rewan Formation	9
Swamp Bore 1	Rewan Formation	9
MB1	Coal Measures	7
MB2	Coal Measures	7
MB3	Coal Measures	5
MB4	Quaternary Alluvium /Tertiary sediments	4
MB5	Coal Measures	5
MB8	Coal Measures	4
MB9	Coal Measures	4
MB10	Tertiary Basalt	9
MB11	Tertiary Sediments / Weathered Rewan Group	0
IPC Designated Observation Bores		
MB4b	Quaternary colluvium /Tertiary sediments	4
MB6	Tertiary Basalt	6
MB7	Coal Measures	9
C1	Coal Measures	8
AC1	Coal Measures	8
BC095	Coal Measures	4

5.1 REWAN FORMATION

The two monitoring bores that target the Rewan Formation display similar water quality characteristics in terms of dissolved metal concentrations. The majority of the dissolved metals recorded within Burton Coal Bore 2 and Swamp Bore 1 were below the limit of reporting. However, the concentration of total dissolved solids (TDS) and subsequent ionic balance differ.

Burton Coal Bore 2 has historically displayed a more diluted TDS concentration than that consistently recorded in Swamp Bore 1. Monitoring commenced within the two landholder bores in late 2010. Since 2010, the average difference in TDS has been marginally under 4,000mg/L (Table 4). The difference in TDS may be attributed to the locality of each bore within the aquifer. For instance, an increased residence time of groundwater travelling through an aquifer system is likely to have a lower concentration in TDS. Burton Coal Bore 2 is located up gradient within the aquifer system, next to Smoky Creek, while Swamp Bore 1 is down gradient and hence presents a higher TDS.

However, the geochemical difference between Swamp Bore 1 and Burton Coal Bore 2 has decreased over the current reporting period, with concentrations within Burton Coal Bore 2 steadily increasing. The implication of this is discussed further in Section 6.2.1.

Swamp Bore 1 and Burton Coal Bore 2 do not meet the TDS guidelines values stipulated within the ANZECC Livestock Water Drinking Guidelines (<4,000mg/L).

5.2 COAL MEASURES

The largest portion of the groundwater monitoring network (six monitoring bores) targets the Coal Measures across IPC. Across the six monitoring bores, there is a large variation of screen depths, ranging from the shallowest (MB1) at 22.5m depth, compared to the deepest (MB8) starting at 117.3m deep. The differing depths of monitored coal significantly influence the water quality characteristics within the monitoring network. Interestingly, the poorest quality water recorded in the Coal Measures is found at the mid-level depth in MB3 and MB5 that are screened between 30m and 50m deep, within the Leichardt seam. The TDS of MB3 and MB5 is twice as concentrated as the deeper MB8 and MB9, and five times more than the shallowest bore MB1.

Figure 6 displays the ionic composition variation within the Coal Measures, with MB1 and MB2 distinctly different from the other monitoring bores within the same aquifer. The variation recorded within the Coal Measures must be taken into consideration when determining trigger values for the aquifer. As is the case within the Rewan Formation, trigger values may need to be determined individually for each specific bore within the groundwater monitoring network.

MB3 and MB5 were decommissioned through the current reporting period with the advancement of mining. Within the GMMP, monitoring bores MB8 and MB9 have been commissioned and implemented within the monitoring program to compensate for the loss of MB3 and MB5. MB8 and MB9 are outside the proposed mining footprint.

All bores, excluding MB1, within the Coal Measures are non-compliant with the ANZECC Livestock Water Drinking Guidelines value for TDS.

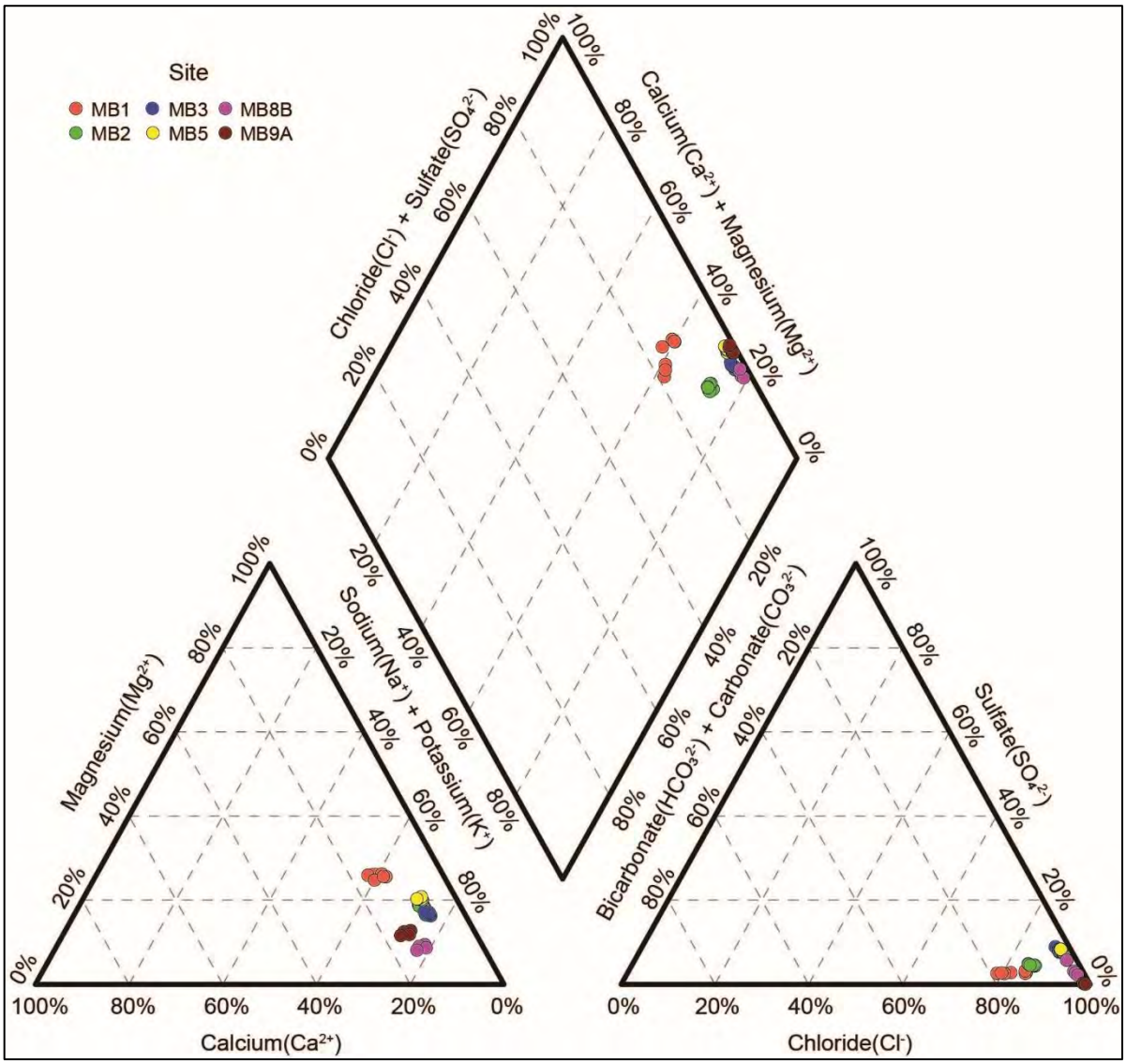

Figure 6: Difference in ionic composition of monitoring bores within the Coal Measures

5.3 QUATERNARY ALLUVIUM / TERTIARY SEDIMENTS

Two monitoring bores have been sampled four times during the reporting period targeting groundwater within the Quaternary aquifer at IPC. MB4 was drilled and sampled in early 2017 as part of the approvals process for Isaac Plain East, it was not sampled again until October 2018. MB4b has been drilled, developed and sampled in preparation for MB4 to be decommissioned with the advancement of mining operations. Both bores have been sampled on a quarterly basis in since October 2018.

The water quality within the Quaternary system is poor, with TDS ranging between 17,000mg/L and 42,000mg/L (Table 4). Although the two bores are in a relatively similar location and depth, there is a considerable difference in TDS between MB4 and MB4b, with MB4 concentrations doubling those recorded in MB4b (Table 4).

Both MB4 and MB4b have displayed increasing trends over the reporting period, with TDS increasing by 7,900mg/L and 2,800mg/L respectively. Although there is minimal change within the standing water level within each bore, it is anticipated this concentrating effect is

caused by the shallow nature of the water essentially evaporating. Both bores are drilled to shallow depths of 11m and 12m respectively with minimal water columns present in each. The depth to water measurements collected in April 2019 were 10.06 (MB4) and 10.57m (MB4b) (Figure 5).

5.4 TERTIARY BASALT

The best quality groundwater across the IPC mining operations with an average TDS of 1,075mg/L is found within the Tertiary Basalt aquifer (Table 4). MB9b targets the Tertiary Basalt aquifer with a screen interval between 21m and 27m. MB9b has been monitored four times over the reporting period, with TDS concentrations compliant with the guideline values provided for Livestock Drinking Water (ANZECC & ARMCANZ, 2000). In comparison to the other aquifer systems present at IPC, the Tertiary Basalt aquifer is relatively stable with only marginal variation in all parameters over the reporting period, evidenced by a small standard deviation values presented in Table 4.

In January 2019 there was a single elevated reading of 3,190 µg/L within the C10 - C36 Fraction (sum) (Table 4). However, several other bores also recorded slightly elevated levels, although not within the same extremely high range of MB9b, during the January 2019 sampling round (Table 4). The samples collected prior and post January 2019 at MB9b returned petroleum hydrocarbon concentrations below the limit of reporting. Consequently, the January 2019 level is determined to be an anomaly within the system most likely caused by human interaction with the water sample during transfer from the sampling vessel to the sample bottle. This value should be eliminated from the dataset when determining trigger values for the Tertiary Basalt aquifer.

Table 4: Groundwater characteristics from each formation monitored at IPC

Aquifer System	Date	pH	Electrical Conductivity	Chloride	Sulphate	Calcium	Magnesium	Sodium	Potassium	TDS @180°C	Suspended Solids	Bicarbonate	Carbonate
	Unit		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L
	LOR	0.01	1	1	1	1	1	1	1	10	5	1	1
Rewan	Count	19	18	19	19	19	19	19	19	19	18	19	19
	Minimum	7.15	3760	405	43	44	57	344	4	1180	3	54	1
	Mean	7.60	7273	2170	105	327	152	916	13	4343	20	389	2
	Maximum	8.28	9330	3320	126	608	315	1180	23	7920	162	803	20
	Standard Deviation	0.33	2020	1019	20	221	67	229	9	1806	37	326	4
Coal	Count	32	32	32	32	32	32	32	32	32	32	32	32
	Minimum	6.92	3360	808	1	85	104	455	3	1840	3	102	1
	Mean	7.45	12571	4162	371	252	273	2176	18	7874	38	506	1
	Maximum	7.92	25000	8700	1040	422	636	4240	44	16900	312	790	1
	Standard Deviation	0.26	7571	2737	408	120	192	1383	14	5179	64	223	0
Quaternary	Count	8	8	8	8	8	8	8	8	8	8	8	8
	Minimum	6.93	30200	10400	375	84	446	6400	2	17600	28	379	1
	Mean	7.42	41238	15250	639	395	1199	8435	4	28213	1759	774	1
	Maximum	7.79	53000	21300	918	734	2070	10400	6	42400	3750	1180	1
	Standard Deviation	0.36	10859	5015	272	318	783	1626	1	10034	1081	403	0
Tertiary Basalt	Count	4.00	4	4	4	4	4	4	4	4	4	4	4
	Minimum	7.87	1780	202	23	37	72	228	4	992	3	566	1
	Mean	7.90	1898	237	89	41	77	305	5	1076	31	599	1
	Maximum	7.94	2080	255	139	47	85	367	5	1140	63	623	1
	Standard Deviation	0.03	130	24	48	4	6	58	1	65	30	24	0

Table 4 continued: Groundwater characteristics from each formation monitored at IPC

Aquifer System	Date	Aluminium	Antimony	Arsenic	Molybdenum	Selenium	Silver	Iron	Mercury	C6 - C9 Fraction	C10 - C36 Fraction (sum)
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	µS/cm
	LOR	0.001	0.001	0.001	0.001	0.01	0.001	0.05	0.0001	20	50
Rewan	Count	18	18	18	18	18	18	16	11	18	18
	Minimum	0.0050	0.0005	0.0005	0.0005	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.0069	0.0005	0.0008	0.0006	0.005	0.0005	0.15	0.00005	10	25
	Maximum	0.0400	0.0005	0.0020	0.0010	0.005	0.0005	0.62	0.00005	10	25
	Standard Deviation	0.0082	0.0000	0.0005	0.0002	0.00	0.00	0.18	0.00	0	0
Coal	Count	32	32	32	32	32	32	19	4	32	32
	Minimum	0.0050	0.0005	0.0005	0.0005	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.0069	0.0006	0.0132	0.0030	0.005	0.0005	0.41	0.00005	10	313
	Maximum	0.0500	0.0030	0.0360	0.0150	0.005	0.0005	2.91	0.00005	10	9230
	Standard Deviation	0.0083	0.0005	0.0109	0.0027	0.00	0.00	0.70	0	0	1627
Quaternary	Count	8	8	8	8	8	8	3	2	8	8
	Minimum	0.0250	0.0025	0.0025	0.0025	0.025	0.0025	0.025	0.00005	10	25
	Mean	0.0250	0.0025	0.0034	0.0043	0.025	0.0030625	0.025	0.00005	10	75
	Maximum	0.0250	0.0025	0.0070	0.0080	0.025	0.007	0.025	0.00005	10	230
	Standard Deviation	0.0000	0.0000	0.0017	0.0025	0.00	0.0016	0.00	0	0	93
Tertiary Basalt	Count	4	4	4	4	4	4	1	1	4	4
	Minimum	0.0050	0.0005	0.0020	0.0040	0.005	0.0005	0.025	0.00001	10	25
	Mean	0.0125	0.0005	0.0023	0.0145	0.005	0.0005	0.025	0.00001	10	816
	Maximum	0.0200	0.0005	0.0030	0.0200	0.005	0.0005	0.025	0.00001	10	3190
	Standard Deviation	0.0087	0.0000	0.0005	0.0072	0	0	0.00	0.00	0	1583

6. EA COMPLIANCE

6.1 GROUNDWATER LEVELS

The IPC EA requires the measurement of standing water level to be captured on a quarterly basis. **Condition C47** states:

If groundwater levels for the bores identifies in Table 13: Groundwater level monitoring exceedance any of the trigger level threshold identifies in Table 13: Groundwater level monitoring the holder of this environmental authority must:

a) Notify the administering authority via WaTERS or the pollution hotline within seven (7) days of receiving the analysis results; and

b) Complete an investigation into the potential for environmental harm.

Table 5: Groundwater level fluctuation trigger threshold (EA Table 13)

Monitoring Location	Trigger Level Threshold (m)
Burton Coal Bore 2	2
Swamp Bore 1	5
MB4	8
MB10	16
MB11	5

The triggers stipulated within Table 5 are only applicable for standing water level measurements recorded after the 24th of January 2018. Subsequently, the period of compliance assessment for this reporting period only takes into consideration standing water levels measured between April 2018 and April 2019.

In accordance with EA Condition C47, IPC exceeded the fluctuation trigger threshold (5m) for Swamp Bore 1 between October 2018 and January 2019 with levels decreasing by 5.04m (results recorded by samplers in the field during water quality sampling; Figure 7). However, monitoring within the subsequent sampling round (April 2019) displayed levels similar to that originally recorded in October 2018 (Figure 7).

Swamp Bore 1 is fitted with a solinst depth datalogger device. Data collected from the depth logger must be calibrated with site-specific barometric data for accuracy. Barometric data was not available for October 2018 – January 2019 as the only barometric logger onsite was lost during the decommissioning of MB5. This resulted in the inability to accurately calibrate the depth logger within Swamp Bore 1 for the period of concern. Consequently, it cannot be confirmed whether or not the single exceedance recorded in January 2019 was due to human error, malfunctioning equipment or an anomaly within the surrounding Rewan formation. The single exceedance and subsequent correction suggest the fluctuation trigger threshold exceedance recorded in Swamp Bore 1 in January 2019 was not a result of any IPC mining operations.

No other exceedance has been recorded during the reporting period and implementation of the current EA.

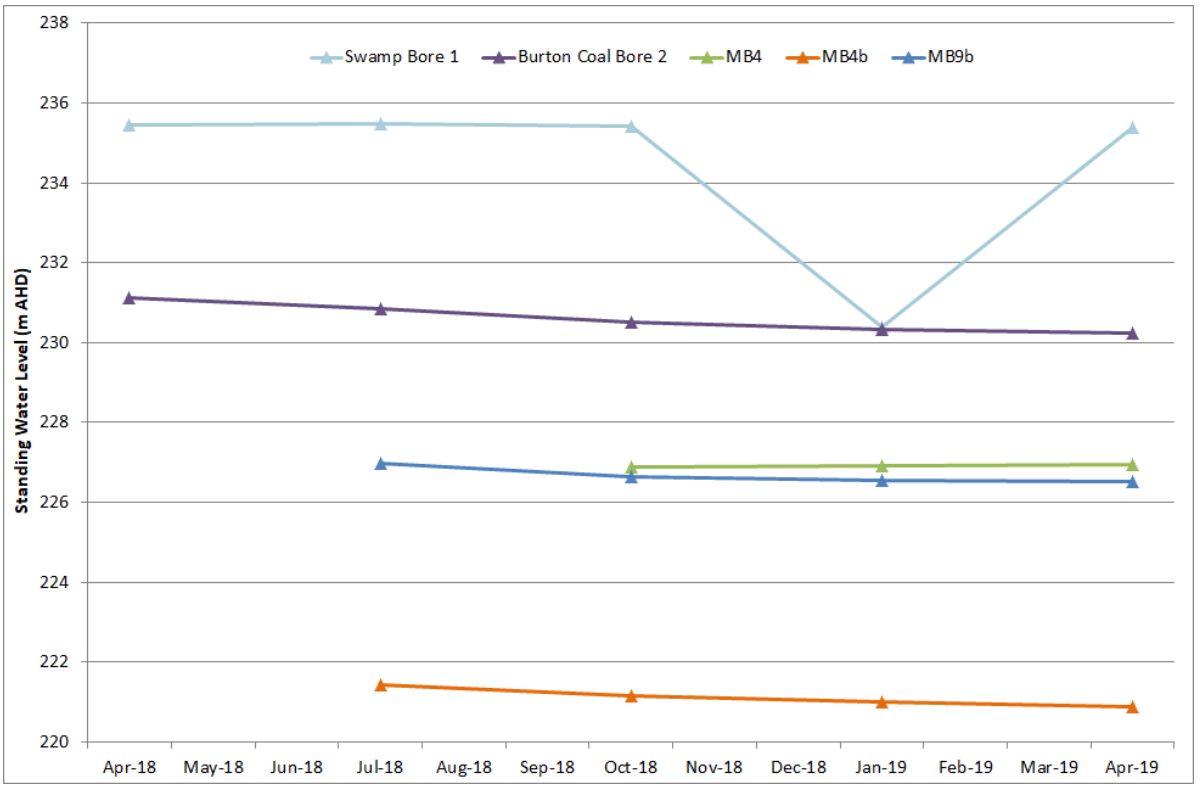

Figure 7: Groundwater level fluctuations for applicable monitoring bores

6.2 GROUNDWATER CHARACTERISTICS

In accordance with EA **Condition C45** that states:

*Groundwater must be monitored at the locations and frequencies defined in **Table 11: Groundwater monitoring locations frequency** for the standing water levels and the parameters identified in **Table 12: Groundwater contaminant triggers**. Results and analysis of groundwater monitoring must be submitted annually to the administering authority with the report required by **Condition C44(c)**.*

6.2.1 BURTON COAL BORE 2

The water quality of Burton Coal Bore 2 has been assessed against the groundwater contaminant trigger limits stipulated for the respective bore within EA Table 12 (Table 6). Since the implementation of the current groundwater contaminant limits on 24 January 2018, several parameters within Burton Coal Bore 2 have exceeded the limits (Table 6). The red line in Table 6 distinguishes the groundwater trigger limits applicable after 24 January 2019, with values after that date and exceeding these limits highlighted in red and bolded.

Throughout the reporting period the TDS within Burton Coal Bore 2 has been steadily increasing, with concentrations in July 2017 at 2,180mg/L far below the most recent record in April 2019 of 4,500mg/L, an overall increase of 2,320mg/L (Table 6). The increase in TDS is an indication of a change within the cation and anion balance within the groundwater surrounding Burton Coal Bore 2. The progression of this concentration can be tracked through the use of the piper diagram in Figure 8, with data points separated into the year of collection. Figure 8 shows the Burton Coal Bore 2 is consistent with a sodium chloride water type. However, the dominance of two elements has increase between 2010 and 2019. Water quality analyses performed in the initial years of IPC display a strong dominance of sodium, while concentrations of chloride and sulfate relatively evenly distributed. In more

recent years the composition has altered to display chloride dominating the system, while calcium and sodium provide a more even share of the ionic balance.

Results from a Pearson Correlation Analysis reveal the observed trends in TDS are significantly and inversely correlated to the standing water levels ($r = -0.776$, $n = 27$, $p < 0.001$). This correlation is charted in Figure 9 and reveals a clear relationship between the two (note: standing water level has been inversed for visual purposes).

The recent years of marginal wet seasons has had the effect of concentrating the dissolved solids in the aquifer system. This effect has been compounded by the fact that the region is currently within an extended dry cycle. The trend of increasing concentration of dissolved solids indicates water is being lost from the system, while salts remain.

The current increasing trend in TDS is therefore inferred to be an expression of the climatic conditions in the area and not resulting from mining impacts. Retrospectively, this may result in the need to recalculate the groundwater contaminant limits for Burton Coal Bore 2 to allow for such natural variations moving forward.

No other parameters exceeded the contaminant trigger values for Burton Coal Bore 2 during the reporting period (Table 6).

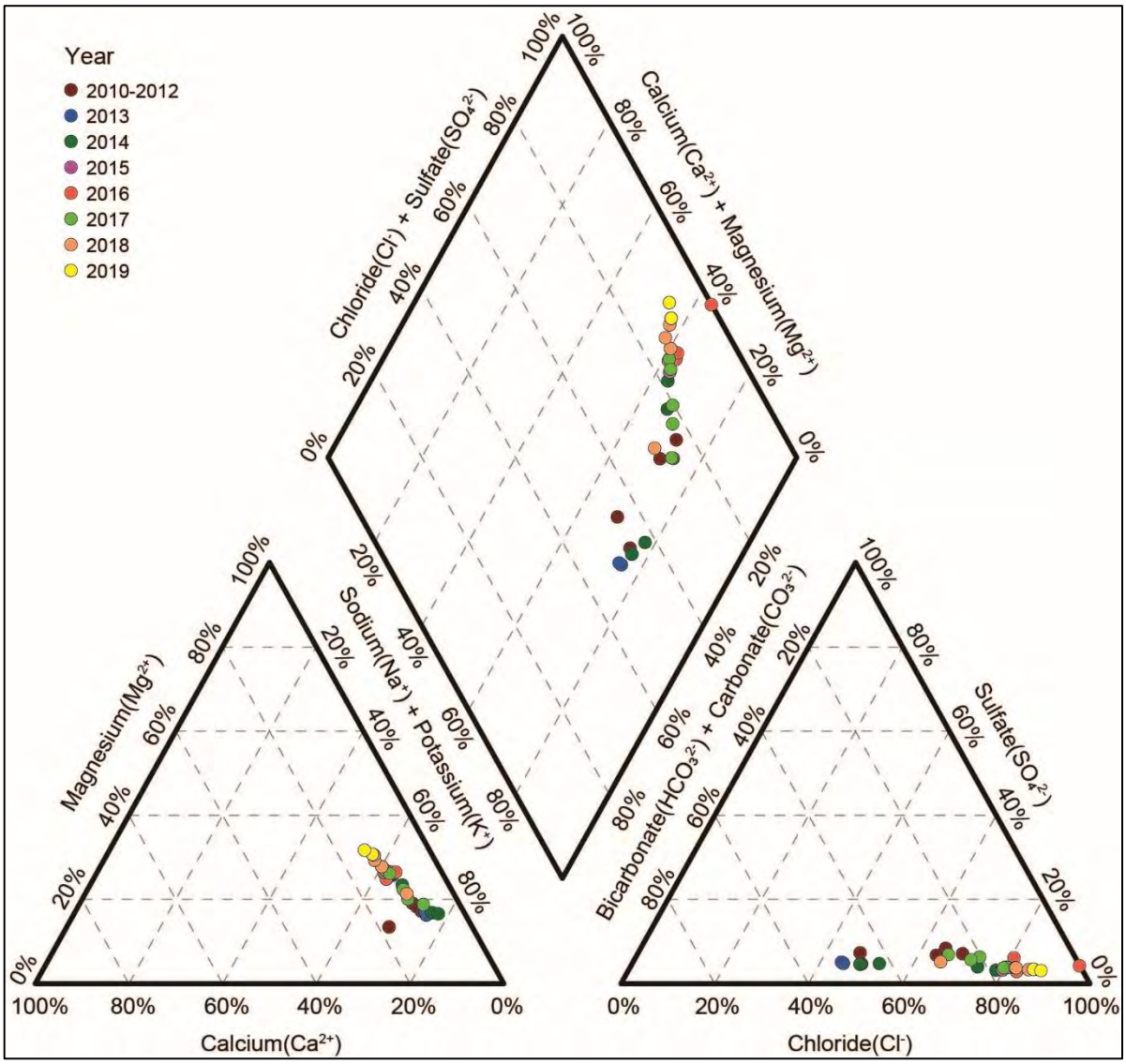

Figure 8: Ionic composition variation within Burton Coal Bore 2

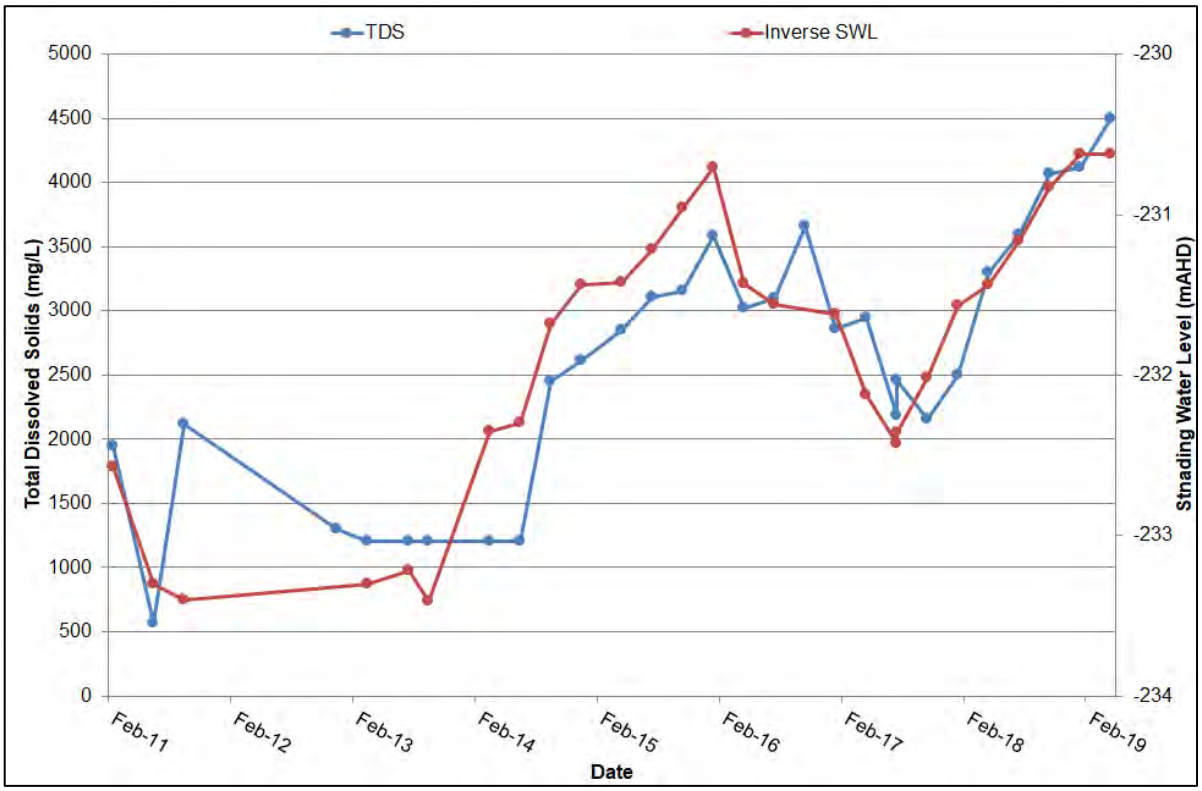

Figure 9: Total dissolved solids and inverse standing water level in Burton Coal Bore 2

Table 6: Burton Coal Bore 2 water quality and compliance with EA Table 12

Parameter	Unit	LOR	**EA Contaminant Trigger**	6/07/2017	25/07/2017	24/10/2017	22/01/2018	18/04/2018	9/07/2018	23/10/2018*	22/01/2019	15/04/2019
pH	pH units	0.01	**7.0 < > 8.6**	8.21	8.28	7.84	7.89	7.95	7.33	7.29	7.27	7.25
EC	µS/cm	1	**6700**	3,810	4,420	3,760	5,470	5,980	6,490	**7,000**	**7,320**	**7280**
Chloride	mg/L	1	**1900**	733	903	910	1,440	1,500	1,780	**2,020**	**1,980**	**2180**
Sulphate	mg/L	1	**123**	103	105	97	89	91	93	98	105	104
Calcium	mg/L	1	**170**	61	96	78	134	151	159	**206**	**192**	**227**
Magnesium	mg/L	1	**230**	89	126	91	186	207	**237**	**270**	**282**	**315**
Sodium	mg/L	1	**931**	655	715	594	760	770	838	919	**983**	**1020**
Potassium	mg/L	1	**8.5**	5	6	5	5	5	5	5	5	5
TDS @180°C	mg/L	10	**3900**	2,180	2,460	2,160	2,500	3,300	3,590	**4,070**	**4,120**	**4500**
TSS	mg/L	5	**30**	2.5	13	14	14	162	2.5	2.5	15	2.5
Bicarbonate	mg/L	1	**800**	746	704	803	692	709	669	648	666	613
Carbonate	mg/L	1	**7.9**	20	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Aluminum	mg/L	0.01	**0.01**	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Antimony	mg/L	0.001	**0.001**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005	0.0005
Arsenic	mg/L	0.001	**0.0048**	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005	0.0005
Molybdenum	mg/L	0.001	**0.0011**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005	0.0005
Selenium	mg/L	0.01	**0.01**	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Silver	mg/L	0.001	**0.001**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.05	**0.27**	0.025	0.16	0.23	0.025	0.025	0.025	0.025	0.025	0.025
Mercury	mg/L	0.0001	**0.0001**	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
C6 - C9 Fraction	µg/L	20	**20**	10	10	10	10	10	10	10	10	10
C10 - C36 Fraction (sum)	µg/L	50	**50**	25	25	25	25	25	25	25	25	25

*Burton Coal Burton 2 referred to as BC1 in Certificate of Analysis.

6.2.2 SWAMP BORE 1

The water quality of Swamp Bore 1 has been assessed against the groundwater contaminant trigger limits stipulated for the respective bore within EA Table 12. Since the implementation of the current groundwater contaminant limits on 24 January 2018, several parameters within Swamp Bore 1 have exceeded the limits (Table 7). The red line in Table 7 distinguishes the groundwater trigger limits applicable after 24 January 2019, with values after that date and exceeding these limits highlighted in red and bold.

Dissolved aluminium recorded an exceedance of the groundwater contaminant trigger limit of 0.01mg/L in October 2018 with an elevated concentration of 0.04mg/L (Table 7). However, upon further analysis of the Certificate of Analyses, the total aluminium is recorded as below the limit of reporting (<0.01mg/L). General comments on the Certificate of Analyses, state it is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. This means there is the potential for such a elevated concentration level to have occurred, although the subsequent monitoring round reported arsenic levels below the limit of reporting. The elevated level of dissolved aluminium in October 2018 is therefore considered to be an anomaly within the analyses and not attributed to any actions undertaken by IPC.

The only other metal to exceed the contaminant trigger limit during the reporting period was dissolved arsenic in January 2019, returning a slightly elevated level of 0.002mg/L that exceeds the trigger value of 0.001mg/L (Table 7). It should be noted the contaminant trigger limit for arsenic is equal to that of the limit of reporting for the same parameter. 0.002mg/L is significantly below the ANZECC Guidelines for 95% species protection level for slightly to moderately disturbed environment of 0.013mg/L. Additionally, 0.002mg/L remains within the historical background levels collected from Swamp Bore 1 previous to mining commencing at IPC within the eastern mining leases. The subsequent, two samples returned levels below the limit of reporting for dissolved arsenic (Table 7). Therefore, the January 2019 exceedance is considered a natural concentration within the Rewan Formation and not associated with IPC mining operations.

Calcium exceeded the contaminant trigger limit (570mg/L) in October 2018 (577mg/L) and again in April 2019 (608mg/L) (Table 7). Swamp Bore 1 has an extensive monitoring history (30 data points) with initial results collected in 2010. The April 2019 calcium result is the highest concentration recorded in Swamp Bore 1. Results above 600mg/L have not been reported in Swamp Bore 1 since 2010. However, Figure 10 shows that the water composition within Swamp Bore 1 remains in a tight cluster, unlike the variation recorded in Burton Coal Bore 2. Therefore, the exceedance of the contaminant trigger limit for calcium is attributed to the stringent methods for calculating the limit (mean + 1 standard deviation) combined with the natural variation observed in the system, instead of a potential influence from mining activities.

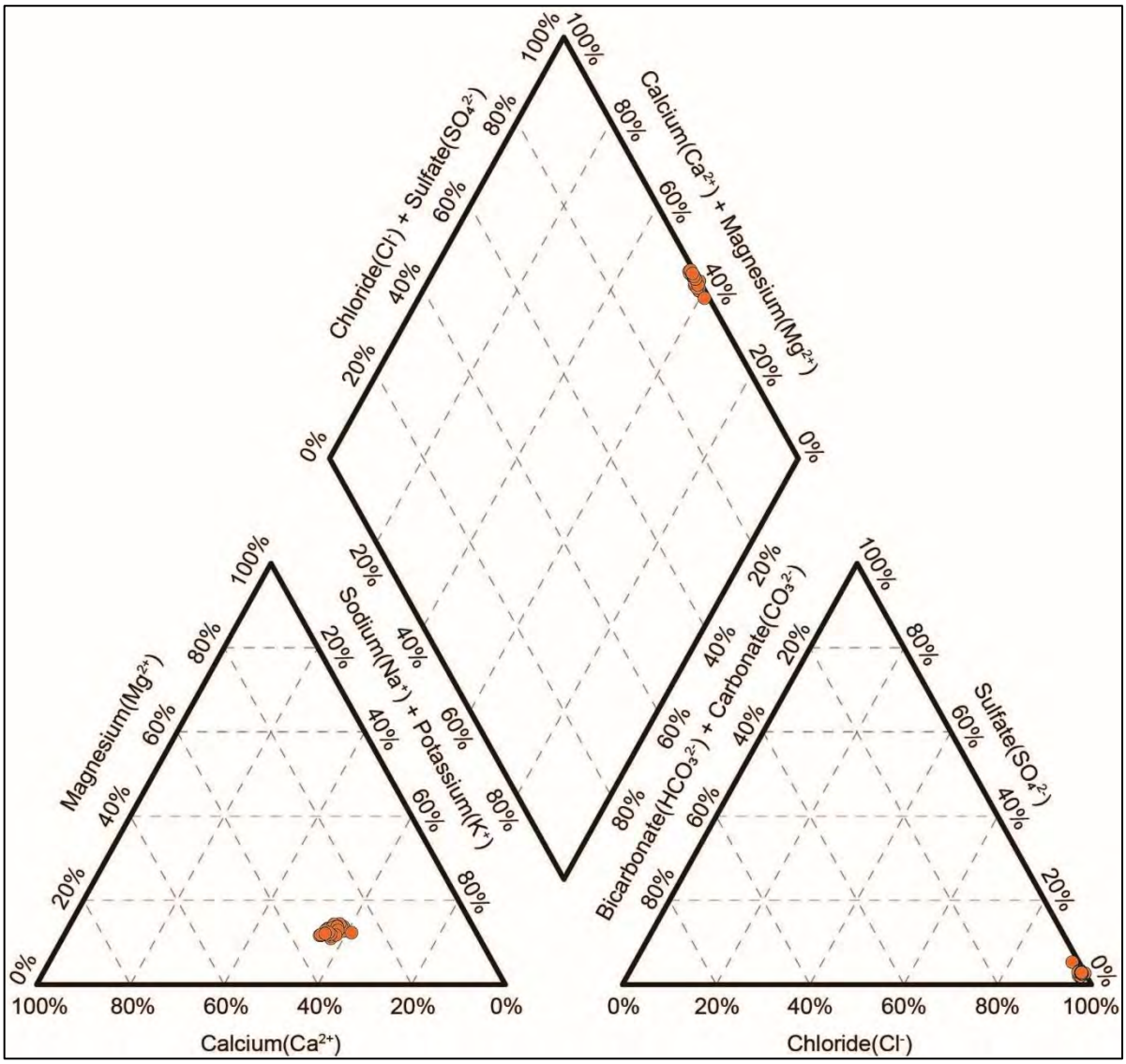

Figure 10: Ionic composition of Swamp Bore 1

Table 7: Swamp Bore 1 water quality and compliance with EA Table 12

Parameter	Unit	LOR	EA Contaminant Trigger	25/07/2017	24/10/2017	22/01/2018	18/04/2018	9/07/2018	23/10/2018	22/01/2019	15/04/2019
pH	pH units	0.01	**7.2 < > 7.8**	7.75	7.5	7.65	7.69	7.43	7.44	7.22	7.15
EC	µS/cm	1	**9500**	9,330	8,680	9,010	9,250	9,000	8,940	9,140	8870
Chloride	mg/L	1	**3500**	2,970	3,320	3,280	3,070	3,170	3,030	3,090	3130
Sulphate	mg/L	1	**155**	122	114	119	121	115	126	126	122
Calcium	mg/L	1	**570**	546	539	535	542	515	**577**	558	**608**
Magnesium	mg/L	1	**170**	129	124	119	120	119	123	133	137
Sodium	mg/L	1	**1300**	1,100	1,100	1,060	1,080	1,060	1,070	1,130	1180
Potassium	mg/L	1	**25**	23	22	20	21	22	21	21	22
TDS @180°C	mg/L	10	**7600**	5,890	5,080	7,920	5,800	5,460	5,640	5,800	6370
TSS	mg/L	5	**43**	34	10	24	19	2.5	11	2.5	2.5
Bicarbonate	mg/L	1	**98**	55	64	57	59	63	54	57	58
Carbonate	mg/L	1	**1**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Aluminum	mg/L	0.01	**0.01**	0.005	0.005	0.005	0.005	0.005	**0.04**	0.005	0.005
Antimony	mg/L	0.001	**0.001**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Arsenic	mg/L	0.001	**0.001**	0.0005	0.002	0.0005	0.0005	0.0005	0.001	**0.002**	0.001
Molybdenum	mg/L	0.001	**0.001**	0.0005	0.0005	0.001	0.001	0.0005	0.001	0.0005	0.001
Selenium	mg/L	0.01	**0.01**	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Silver	mg/L	0.001	**0.001**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.05	**1.00**	0.13	0.025	0.31	0.47	0.62			0.23
Mercury	mg/L	0.0001	**0.0001**								0.00005
C6 - C9 Fraction	µg/L	20	**20**	10	10	10	10	10	10	10	10
C10 - C36 Fraction (sum)	µg/L	50	**50**	25	25	25	25	25	25	25	25

7. GROUNDWATER TRIGGER VALUES

The current EA *Table 12: Groundwater contaminant triggers* were developed for Swamp Bore 1 and Burton Coal Bore 2 from historical data collected between September 2013 and July 2017. The trigger values were determined by calculating the 80th percentile plus one standard deviation. Subsequent monitoring has been able to provide an additional seven data points to the dataset for the respective bores, with a total sample size of 23 data points (Table 8). The majority of parameters have recorded no change with the inclusion of more recent data (Table 8). However, there has been small increases calculated for the TDS and associated cations and anions for each of the bores (Table 8).

This is specifically relevant to Burton Coal Bore 2. The concentrations within this bore have been steadily trending upwards since July 2017. A similar trend was recorded in Burton Coal Bore 2 between 2014 and 2016, although this was not to the same extent with the current trend concentrating the system more than previously recorded. IPC had not commenced any mining within the eastern leases when TDS began to increase and it is therefore not considered to be a result of mining activities. IPC completed an exceedance investigation into the initial exceedance. The investigation concluded the concurrent trends of decreasing standing water level and concentrating water quality was likely a combination of deep tree roots and capillary action drawing water from depths, lowering the zone of saturation and concentrating salts. Please refer to Appendix 2 for further information.

Table 8: Proposed updated EA Table 12 Groundwater Trigger Values

			Swamp Bore		Burton Coal Bore 2	
Parameter	Unit	LOR	**Current Trigger Values**	**Amended Trigger Values**	**Current Trigger Values**	**Amended Trigger Values**
pH	pH units	0.01	7.2 < > 7.8	7.1 < > 7.8	7.0 < > 8.6	7 < > 8.3
EC	µS/cm	1	9500	9500	6700	7320
Chloride	mg/L	1	3500	3500	1900	2050
Sulphate	mg/L	1	155	150	123	130
Calcium	mg/L	1	570	580	170	195
Magnesium	mg/L	1	170	165	230	265
Sodium	mg/L	1	1300	1275	931	990
Potassium	mg/L	1	25	25	8.5	8
TDS @180°C	mg/L	10	7600	7585	3900	4500
TSS	mg/L	5	43	37	30	52
Bicarbonate	mg/L	1	98	94	800	820
Carbonate	mg/L	1	1	1	7.9	7
Aluminum	mg/L	0.01	0.01	0.01	0.01	0.01
Antimony	mg/L	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.001	0.001	0.002	0.0048	0.004
Molybdenum	mg/L	0.001	0.001	0.001	0.0011	0.001
Selenium	mg/L	0.01	0.01	0.01	0.01	0.01
Silver	mg/L	0.001	0.001	0.001	0.001	0.001
Iron	mg/L	0.05	1	1	0.27	0.23
Mercury	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001
C6 - C9 Fraction	µg/L	20	20	20	20	20
C10 - C36 Fraction (sum)	µg/L	50	50	50	50	50

8. CONCLUSION AND RECOMMENDATIONS

IPC EA amendment commence operations within the eastern mining leases was approved on 24 January 2018. Subsequently, IPC implemented an expanded GMMP for the additional operational area, increasing the groundwater monitoring network significantly. Previously Burton Coal Bore 2 and Swamp Bore 1 were the only groundwater monitoring bores referenced in the IPC EA. Accordingly, this has now been increased to eleven monitoring bores and subsequently targets multiple aquifer systems including the Rewan Formation, Coal Measures, Quaternary Alluvium, Tertiary Sediments and Tertiary Basalt.

The 2019 Groundwater Review incorporates all groundwater data collected at IPC from April 2017 to April 2019 (inclusive). IPC was granted an EA Amendment on 24 January 2018 that introduced additional groundwater conditions. The EA amendment, approved on 8 May 2019, did not alter the groundwater conditions. Consequently, only groundwater data collected following the 24 January 2018 is assessed against the groundwater trigger values stated within EA Table 12 and Table 13. Swamp Bore 1 exceeded the trigger value of two metals and calcium. The exceedances were reviewed and assessed against the historic dataset for Swamp Bore 1 and were attributed to natural fluctuations with the system.

Swamp Bore 1 was the only bore to exceed the groundwater level trigger with a decrease of 5.04m between October 2018 and January 2019, exceeding the trigger by 0.04m. However, the level captured in January 2019 was likely caused by equipment malfunctioning providing an incorrect level. The following sampling round recorded a similar level to the October 2018 round, suggesting no drawdown. This is further supported by the historic stability recorded within Swamp Bore 1 which aligned with the level recorded in April 2019.

Burton Coal Bore 2 exceeded the groundwater contaminant limits on consecutive occasions for TDS and multiple associated cations and anions. As per Condition C47, IPC completed an investigation into the exceedance and the ultimate risk of environmental harm. This has been provided within Appendix 2. The long history of Burton Coal Bore 2 has provided a historical record that shows large fluctuating trends have occurred in the past. These have been determined to be associated within climatic variation and a direct result of lower rainfall and associated lower recharge volumes.

Updated groundwater contaminated limits for both Burton Coal Bore 2 and Swamp Bore 1 adopting the same method utilised for the initial values (80^{th} percentile + one standard deviation) were calculated with the new dataset (i.e. an additional 18 months of data). However, the method used remains stringent and consequently IPC will continue to exceed the site-specific limits, especially in the case of Burton Coal Bore 2. It is recommended that IPC discuss a way forward with the Department of Environment and Science if continual exceedances are recorded. This may include undertaking further assessment or utilising a different calculation method when applying contaminant trigger limits (refer to DSITI, 2017).

The current monitoring network nomenclature is not aligned across the relevant documentation including the EA and GMMP as well as the current third party groundwater samplers. To maintain the integrity of the data collected, it is highly recommended that the naming conventions be addressed immediately and aligned within all relevant documentation. Alignment of monitoring bore details should include surveyed coordinate locations, surveyed reduced levels in m AHD for surface and top of casing and naming identification.

The groundwater monitoring network present at IPC extensively covers the aquifer systems that may be potentially impacted by mining operations and therefore meets the requirements stipulated in EA Condition C44.

9. REFERENCES

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APPENDIX 1: CERTIFICATE OF ANALYSIS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1708528**	Page	: 1 of 10
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS SAMANTHA DAVIS	Contact	: Customer Services EB
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3238 1000	Telephone	: +61-7-3243 7222
Project	: Isaac Plains	Date Samples Received	: 28-Apr-2017 12:35
Order number	: ----	Date Analysis Commenced	: 28-Apr-2017
C-O-C number	: ----	Issue Date	: 09-May-2017 10:09
Sampler	: MITCHELL SAXBY		
Site	: ----		
Quote number	: BN/451/16 V2		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
John Pickering	Client Services Officer	Brisbane Microbiological, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS). However, the difference is within experimental variation of the methods.
- MF = membrane filtration
- CFU = colony forming unit
- It has been noted that EK055G (Ammonia as N) is greater than EK061G (Total Kjeldahl Nitrogen as N) for sample EB1708528_002 (MIA STP), however this difference is within the limits of experimental variation.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Isaac Plains STP	MIA STP	CHPP STP	AC1	C1
				Client sampling date / time	27-Apr-2017 06:10	27-Apr-2017 06:20	27-Apr-2017 06:30	26-Apr-2017 10:10	26-Apr-2017 11:00
Compound	CAS Number	LOR	Unit		EB1708528-001	EB1708528-002	EB1708528-003	EB1708528-004	EB1708528-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.62	7.91	7.72	7.55	9.43
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1130	2170	225	11200	8690
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	----	----	6620	4920
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		578	61	7	19	55
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	70
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		268	843	68	318	30
Total Alkalinity as CaCO3	----	1	mg/L		268	843	68	318	100
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		31	64	3	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		42	38	2	1110	136
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		----	----	----	3220	2750
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		----	----	----	229	23
Magnesium	7439-95-4	1	mg/L		----	----	----	118	14
Sodium	7440-23-5	1	mg/L		----	----	----	2310	1760
Potassium	7440-09-7	1	mg/L		----	----	----	20	166
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	----	----	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		----	----	----	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		----	----	----	0.002	<0.001
Barium	7440-39-3	0.001	mg/L		----	----	----	0.069	0.227
Molybdenum	7439-98-7	0.001	mg/L		----	----	----	0.013	0.009
Rubidium	7440-17-7	0.001	mg/L		----	----	----	0.026	0.549
Selenium	7782-49-2	0.01	mg/L		----	----	----	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		----	----	----	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		----	----	----	11.9	4.37
Iron	7439-89-6	0.05	mg/L		----	----	----	0.32	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Isaac Plains STP	MIA STP	CHPP STP	AC1	C1
				Client sampling date / time	27-Apr-2017 06:10	27-Apr-2017 06:20	27-Apr-2017 06:30	26-Apr-2017 10:10	26-Apr-2017 11:00
Compound	CAS Number	LOR	Unit		EB1708528-001	EB1708528-002	EB1708528-003	EB1708528-004	EB1708528-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	----	----	**0.07**	**0.04**
Antimony	7440-36-0	0.001	mg/L		----	----	----	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		----	----	----	**0.002**	<0.001
Barium	7440-39-3	0.001	mg/L		----	----	----	**0.068**	**0.284**
Molybdenum	7439-98-7	0.001	mg/L		----	----	----	**0.014**	**0.006**
Selenium	7782-49-2	0.01	mg/L		----	----	----	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		----	----	----	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		----	----	----	**11.4**	**8.14**
Iron	7439-89-6	0.05	mg/L		----	----	----	**0.47**	**0.13**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	----	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	----	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		----	----	----	**0.8**	**0.1**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**46.2**	**190**	**0.26**	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.35**	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**4.81**	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**5.16**	<0.01	<0.01	----	----
EK060G:Organic Nitrogen as N (TKN-NH3) By Discrete Analyser									
Organic Nitrogen as N	----	0.1	mg/L		**57.8**	<1.0	**0.2**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**104**	**184**	**0.5**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**109**	**184**	**0.5**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**26.6**	**25.4**	<0.01	**0.02**	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		**19.8**	**21.7**	<0.01	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Isaac Plains STP	MIA STP	CHPP STP	AC1	C1
				Client sampling date / time	27-Apr-2017 06:10	27-Apr-2017 06:20	27-Apr-2017 06:30	26-Apr-2017 10:10	26-Apr-2017 11:00
Compound	CAS Number	LOR	Unit		EB1708528-001	EB1708528-002	EB1708528-003	EB1708528-004	EB1708528-005
					Result	Result	Result	Result	Result
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	----	----	120	82.4
Total Cations	----	0.01	meq/L		----	----	----	122	83.1
Ionic Balance	----	0.01	%		----	----	----	0.76	0.42
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		1320	494	16	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		144	86	<2	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	----	----	<20	<20
C10 - C14 Fraction	----	50	µg/L		----	----	----	<50	<50
C15 - C28 Fraction	----	100	µg/L		----	----	----	<100	<100
C29 - C36 Fraction	----	50	µg/L		----	----	----	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		----	----	----	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	----	----	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		----	----	----	<20	<20
>C10 - C16 Fraction	----	100	µg/L		----	----	----	<100	<100
>C16 - C34 Fraction	----	100	µg/L		----	----	----	<100	<100
>C34 - C40 Fraction	----	100	µg/L		----	----	----	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		----	----	----	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		----	----	----	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	----	----	<1	<1
Toluene	108-88-3	2	µg/L		----	----	----	<2	<2
Ethylbenzene	100-41-4	2	µg/L		----	----	----	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	----	----	<2	<2
ortho-Xylene	95-47-6	2	µg/L		----	----	----	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		----	----	----	<2	<2
^ Sum of BTEX	----	1	µg/L		----	----	----	<1	<1
Naphthalene	91-20-3	5	µg/L		----	----	----	<5	<5
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		~200	340000	~20	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Isaac Plains STP	MIA STP	CHPP STP	AC1	C1
				Client sampling date / time	27-Apr-2017 06:10	27-Apr-2017 06:20	27-Apr-2017 06:30	26-Apr-2017 10:10	26-Apr-2017 11:00
Compound	CAS Number	LOR	Unit		EB1708528-001	EB1708528-002	EB1708528-003	EB1708528-004	EB1708528-005
					Result	Result	Result	Result	Result
MW006: Faecal Coliforms & E.coli by MF - Continued									
Escherichia coli	----	1	CFU/100mL		<100	**310000**	**~20**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**----**	**----**	**----**	**110**	**112**
Toluene-D8	2037-26-5	2	%		**----**	**----**	**----**	**99.5**	**100**
4-Bromofluorobenzene	460-00-4	2	%		**----**	**----**	**----**	**96.2**	**95.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	13C095	MB07	SB1	BC2
				Client sampling date / time	26-Apr-2017 11:30	26-Apr-2017 11:45	26-Apr-2017 12:40	26-Apr-2017 09:30	26-Apr-2017 08:30
Compound	CAS Number	LOR	Unit		EB1708528-006	EB1708528-007	EB1708528-008	EB1708528-009	EB1708528-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.51	7.40	7.50	7.41	7.48
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		11500	12600	18900	8870	5300
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		6650	7300	11300	5610	2950
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		14	34	88	5	20
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		565	388	247	74	738
Total Alkalinity as CaCO3	----	1	mg/L		565	388	247	74	738
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		247	223	146	114	80
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3640	4130	6630	3070	1270
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		200	256	546	525	129
Magnesium	7439-95-4	1	mg/L		215	234	268	123	180
Sodium	7440-23-5	1	mg/L		1970	2290	3460	1140	814
Potassium	7440-09-7	1	mg/L		18	21	17	22	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.006	0.002	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		0.066	0.131	0.795	0.540	0.810
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	0.010	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		0.023	0.029	0.031	0.030	0.008
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		9.13	12.2	45.8	8.16	4.15
Iron	7439-89-6	0.05	mg/L		2.48	2.03	1.76	0.08	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.08	0.03	0.23	<0.01	0.18

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	13C095	MB07	SB1	BC2
				Client sampling date / time	26-Apr-2017 11:30	26-Apr-2017 11:45	26-Apr-2017 12:40	26-Apr-2017 09:30	26-Apr-2017 08:30
Compound	CAS Number	LOR	Unit		EB1708528-006	EB1708528-007	EB1708528-008	EB1708528-009	EB1708528-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.002**	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.008**	**0.005**	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.079**	**0.138**	**9.61**	**0.524**	**0.791**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.014**	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.94**	**11.2**	**45.2**	**8.23**	**3.99**
Iron	7439-89-6	0.05	mg/L		**2.96**	**3.16**	**2.41**	**0.08**	**0.29**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.1**	**0.1**	<0.1	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.03**	**0.05**	**0.01**	**0.05**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**119**	**129**	**195**	**90.4**	**52.2**
Total Cations	----	0.01	meq/L		**114**	**132**	**200**	**86.5**	**56.8**
Ionic Balance	----	0.01	%		**2.27**	**1.26**	**1.32**	**2.25**	**4.17**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	13C095	MB07	SB1	BC2
				Client sampling date / time	26-Apr-2017 11:30	26-Apr-2017 11:45	26-Apr-2017 12:40	26-Apr-2017 09:30	26-Apr-2017 08:30
Compound	CAS Number	LOR	Unit		EB1708528-006	EB1708528-007	EB1708528-008	EB1708528-009	EB1708528-010
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**111**	**114**	**111**	**112**	**110**
Toluene-D8	2037-26-5	2	%		**98.4**	**98.5**	**98.3**	**101**	**100**
4-Bromofluorobenzene	460-00-4	2	%		**96.4**	**95.3**	**95.9**	**97.4**	**94.3**

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1715453**	Page	: 1 of 9
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: KIM TUART	Contact	: Customer Services EB
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3238 1000	Telephone	: +61-7-3243 7222
Project	: Isaac Plains	Date Samples Received	: 28-Jul-2017 12:30
Order number	: ----	Date Analysis Commenced	: 31-Jul-2017
C-O-C number	: ----	Issue Date	: 03-Aug-2017 17:17
Sampler	: SCOTT AULSEBROOK		
Site	: ----		
Quote number	: BN/451/16 V2		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	BC095	C1	MB7	AC1
				Client sampling date / time	25-Jul-2017 16:30	25-Jul-2017 17:00	25-Jul-2017 17:20	26-Jul-2017 09:00	25-Jul-2017 16:00
Compound	CAS Number	LOR	Unit		EB1715453-001	EB1715453-002	EB1715453-003	EB1715453-004	EB1715453-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.95	8.01	8.15	7.66	8.07
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		12200	13300	9900	20300	11500
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		7270	7900	5540	13200	6880
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		16	14	698	54	16
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		450	309	108	193	286
Total Alkalinity as CaCO3	----	1	mg/L		450	309	108	193	286
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		241	217	169	188	1050
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3490	4100	3100	6600	3060
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		214	272	104	640	249
Magnesium	7439-95-4	1	mg/L		244	246	93	353	128
Sodium	7440-23-5	1	mg/L		2020	2210	1800	3490	2190
Potassium	7440-09-7	1	mg/L		20	22	44	18	20
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	0.002	0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.006	0.002	<0.001	<0.001	0.003
Barium	7440-39-3	0.001	mg/L		0.077	0.192	0.253	0.776	0.079
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	0.004	0.009	0.014
Rubidium	7440-17-7	0.001	mg/L		0.026	0.033	0.138	0.035	0.031
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		8.77	11.9	9.85	44.5	11.6
Iron	7439-89-6	0.05	mg/L		2.26	2.34	<0.05	0.44	0.79
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.08	0.07	0.23	0.36	0.19

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	BC095	C1	MB7	AC1
				Client sampling date / time	25-Jul-2017 16:30	25-Jul-2017 17:00	25-Jul-2017 17:20	26-Jul-2017 09:00	25-Jul-2017 16:00
Compound	CAS Number	LOR	Unit		EB1715453-001	EB1715453-002	EB1715453-003	EB1715453-004	EB1715453-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.006**	**0.003**	**0.002**
Arsenic	7440-38-2	0.001	mg/L		**0.010**	**0.003**	<0.001	**0.002**	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.092**	**0.294**	**0.340**	**17.2**	**0.156**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.008**	**0.011**	**0.015**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.43**	**12.7**	**10.9**	**46.3**	**11.5**
Iron	7439-89-6	0.05	mg/L		**3.22**	**2.75**	**0.51**	**2.29**	**0.56**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.2**	**0.2**	**0.1**	**1.0**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	**0.12**	**0.22**	**0.03**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**112**	**126**	**93.1**	**194**	**114**
Total Cations	----	0.01	meq/L		**119**	**130**	**92.3**	**213**	**119**
Ionic Balance	----	0.01	%		**2.88**	**1.62**	**0.46**	**4.74**	**2.08**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	240P	BC095	C1	MB7	AC1
				Client sampling date / time	25-Jul-2017 16:30	25-Jul-2017 17:00	25-Jul-2017 17:20	26-Jul-2017 09:00	25-Jul-2017 16:00
Compound	CAS Number	LOR	Unit		EB1715453-001	EB1715453-002	EB1715453-003	EB1715453-004	EB1715453-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**103**	**104**	**104**	**104**	**106**
Toluene-D8	2037-26-5	2	%		**102**	**101**	**103**	**100**	**99.7**
4-Bromofluorobenzene	460-00-4	2	%		**98.8**	**98.2**	**100**	**99.5**	**96.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC2	SB1	SB1-DUP	----	----
				Client sampling date / time	25-Jul-2017 10:50	25-Jul-2017 12:00	25-Jul-2017 12:00	----	----
Compound	CAS Number	LOR	Unit		EB1715453-006	EB1715453-007	EB1715453-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.28	7.75	7.72	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		4420	9330	9680	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2460	5890	5980	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		13	34	20	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		704	55	54	----	----
Total Alkalinity as CaCO3	----	1	mg/L		704	55	54	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		105	122	123	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		903	2970	3000	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		96	546	546	----	----
Magnesium	7439-95-4	1	mg/L		126	129	130	----	----
Sodium	7440-23-5	1	mg/L		715	1100	1110	----	----
Potassium	7440-09-7	1	mg/L		6	23	23	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	0.001	----	----
Barium	7440-39-3	0.001	mg/L		0.115	0.214	0.215	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L		0.010	0.032	0.034	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L		3.26	7.96	7.85	----	----
Iron	7439-89-6	0.05	mg/L		0.16	0.46	0.48	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.15	0.10	0.12	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC2	SB1	SB1-DUP	----	----
				Client sampling date / time	25-Jul-2017 10:50	25-Jul-2017 12:00	25-Jul-2017 12:00	----	----
Compound	CAS Number	LOR	Unit		EB1715453-006	EB1715453-007	EB1715453-008	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.001**	**0.001**	----	----
Barium	7440-39-3	0.001	mg/L		**0.132**	**0.225**	**0.223**	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.001**	**0.001**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L		**3.45**	**7.93**	**8.11**	----	----
Iron	7439-89-6	0.05	mg/L		**0.37**	**0.78**	**0.84**	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	<0.1	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	**0.04**	**0.05**	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**41.7**	**87.4**	**88.3**	----	----
Total Cations	----	0.01	meq/L		**46.4**	**86.3**	**86.8**	----	----
Ionic Balance	----	0.01	%		**5.32**	**0.64**	**0.83**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC2	SB1	SB1-DUP	----	----
				Client sampling date / time	25-Jul-2017 10:50	25-Jul-2017 12:00	25-Jul-2017 12:00	----	----
Compound	CAS Number	LOR	Unit		EB1715453-006	EB1715453-007	EB1715453-008	--------	--------
					Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**104**	**99.6**	**102**	----	----
Toluene-D8	2037-26-5	2	%		**100**	**100**	**99.7**	----	----
4-Bromofluorobenzene	460-00-4	2	%		**96.9**	**98.6**	**97.1**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1722400**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: Isaac Plains	Date Samples Received	: 27-Oct-2017 10:45
Order number	: ----	Date Analysis Commenced	: 27-Oct-2017
C-O-C number	: ----	Issue Date	: 03-Nov-2017 09:02
Sampler	: MITCHELL SAXBY		
Site	: ----		
Quote number	: BN/451/16 V2		
No. of samples received	: 14		
No. of samples analysed	: 14		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Amanda Conkie	Organic Chemist	Brisbane Organics, Stafford, QLD
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- EK067G (Total Phosphorous as P): Sample EB1722400_011 was diluted due to matrix interference. LOR adjusted accordingly.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS). However, the difference is within experimental variation of the methods.
- EG020-T (Total Metals by ICP-MS): Limit of reporting raised for sample EB1722400-004(MB4) due to matrix interference.
- EG020-F (Dissolved Metals by ICP-MS) were found to be higher than EG020-T (Total Metals by ICP-MS) for sample EB1722400-014(C1) . This was confirmed by re-digestion and re-analysis.
- EG035T (Total Mercury): Positive results for Mercury have been confirmed by re-extraction and re-analysis.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised due to matrix interference.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB1	MB2	MB3	MB4	MB5
			Client sampling date / time	24-Oct-2017 12:30	24-Oct-2017 11:30	25-Oct-2017 10:10	25-Oct-2017 13:00	25-Oct-2017 09:20
Compound	CAS Number	LOR	Unit	EB1722400-001	EB1722400-002	EB1722400-003	EB1722400-004	EB1722400-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.76	7.41	6.92	7.79	7.26
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	4040	7680	20600	49700	23300
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	4250	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	2350	----	14300	34500	16000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	312	12	2550	28
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	490	788	656	428	577
Total Alkalinity as CaCO3	----	1	mg/L	490	788	656	428	577
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	53	167	884	877	936
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1210	2490	7740	21300	7930
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	119	126	341	734	380
Magnesium	7439-95-4	1	mg/L	130	178	451	2070	621
Sodium	7440-23-5	1	mg/L	574	1360	3970	10400	4240
Potassium	7440-09-7	1	mg/L	4	8	42	6	34
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.05	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.013	0.026	<0.005	0.010
Barium	7440-39-3	0.001	mg/L	0.092	0.111	0.066	0.279	0.057
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.003	0.002	<0.005	0.001
Rubidium	7440-17-7	0.001	mg/L	0.004	0.011	0.036	0.008	0.033
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.05	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.005	<0.001
Strontium	7440-24-6	0.001	mg/L	3.19	4.93	17.6	21.2	14.0
Iron	7439-89-6	0.05	mg/L	0.20	<0.05	3.99	<0.05	3.12
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1	MB2	MB3	MB4	MB5
				Client sampling date / time	24-Oct-2017 12:30	24-Oct-2017 11:30	25-Oct-2017 10:10	25-Oct-2017 13:00	25-Oct-2017 09:20
Compound	CAS Number	LOR	Unit		EB1722400-001	EB1722400-002	EB1722400-003	EB1722400-004	EB1722400-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L		**0.06**	**3.51**	**0.02**	**47.8**	**0.06**
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.005	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.012**	**0.026**	**0.055**	<0.001
Barium	7440-39-3	0.001	mg/L		**0.101**	**0.456**	**0.074**	**0.541**	**0.064**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.004**	**0.003**	**0.006**	**0.003**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.05	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.005	<0.001
Strontium	7440-24-6	0.001	mg/L		**2.69**	**4.21**	**15.3**	**23.1**	**12.0**
Iron	7439-89-6	0.05	mg/L		**0.36**	**4.81**	**4.13**	**91.9**	**3.16**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**0.0002**	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.4**	**0.2**	**0.3**	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.10**	**0.38**	**0.35**	**1.61**	**0.40**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**45.0**	**89.5**	**250**	**628**	**255**
Total Cations	----	0.01	meq/L		**41.7**	**80.3**	**228**	**660**	**255**
Ionic Balance	----	0.01	%		**3.83**	**5.40**	**4.60**	**2.48**	**0.13**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	**120**	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1	MB2	MB3	MB4	MB5
				Client sampling date / time	24-Oct-2017 12:30	24-Oct-2017 11:30	25-Oct-2017 10:10	25-Oct-2017 13:00	25-Oct-2017 09:20
Compound	CAS Number	LOR	Unit		EB1722400-001	EB1722400-002	EB1722400-003	EB1722400-004	EB1722400-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	**120**	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**107**	**105**	**106**	**107**	**107**
Toluene-D8	2037-26-5	2	%		**99.1**	**98.5**	**99.4**	**98.1**	**98.4**
4-Bromofluorobenzene	460-00-4	2	%		**99.4**	**100.0**	**99.5**	**96.6**	**96.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB6	MB2-DUP	SB1 (Swamp Bore 1)	BC2	240P
				Client sampling date / time	25-Oct-2017 11:40	24-Oct-2017 11:35	24-Oct-2017 13:30	24-Oct-2017 10:30	24-Oct-2017 15:00
Compound	CAS Number	LOR	Unit		EB1722400-006	EB1722400-007	EB1722400-008	EB1722400-009	EB1722400-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.64	7.43	7.50	7.84	7.55
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		6760	7600	8680	3760	11800
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		3860	4330	5080	2160	7390
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		10	289	10	14	92
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		768	790	64	803	465
Total Alkalinity as CaCO3	----	1	mg/L		768	790	64	803	465
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		97	167	114	97	230
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2210	2460	3320	910	4320
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		126	131	539	78	239
Magnesium	7439-95-4	1	mg/L		243	180	124	91	218
Sodium	7440-23-5	1	mg/L		1040	1390	1100	594	2030
Potassium	7440-09-7	1	mg/L		6	8	22	5	21
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.004	0.013	0.002	<0.001	0.007
Barium	7440-39-3	0.001	mg/L		0.152	0.114	0.214	0.100	0.084
Molybdenum	7439-98-7	0.001	mg/L		0.001	0.002	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		0.007	0.011	0.030	0.008	0.025
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		4.11	4.78	8.96	3.37	11.4
Iron	7439-89-6	0.05	mg/L		0.26	<0.05	0.87	0.23	1.74
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.15	3.59	0.02	0.38	0.28

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB6	MB2-DUP	SB1 (Swamp Bore 1)	BC2	240P
				Client sampling date / time	25-Oct-2017 11:40	24-Oct-2017 11:35	24-Oct-2017 13:30	24-Oct-2017 10:30	24-Oct-2017 15:00
Compound	CAS Number	LOR	Unit		EB1722400-006	EB1722400-007	EB1722400-008	EB1722400-009	EB1722400-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.014**	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.171**	**0.526**	**0.220**	**0.120**	**0.110**
Molybdenum	7439-98-7	0.001	mg/L		**0.002**	**0.004**	<0.001	**0.001**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**3.52**	**4.19**	**7.60**	**2.90**	**9.80**
Iron	7439-89-6	0.05	mg/L		**0.63**	**5.60**	**1.02**	**1.02**	**4.19**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.5**	<0.1	**0.2**	**0.1**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.09**	**0.36**	**0.43**	**0.02**	**0.09**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**79.7**	**88.6**	**97.3**	**43.7**	**136**
Total Cations	----	0.01	meq/L		**71.7**	**82.0**	**85.5**	**37.3**	**119**
Ionic Balance	----	0.01	%		**5.30**	**3.89**	**6.45**	**7.88**	**6.77**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		**130**	**120**	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		**70**	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		**200**	**120**	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		**180**	**160**	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		**180**	**160**	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB6	MB2-DUP	SB1 (Swamp Bore 1)	BC2	240P
				Client sampling date / time	25-Oct-2017 11:40	24-Oct-2017 11:35	24-Oct-2017 13:30	24-Oct-2017 10:30	24-Oct-2017 15:00
Compound	CAS Number	LOR	Unit		EB1722400-006	EB1722400-007	EB1722400-008	EB1722400-009	EB1722400-010
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**107**	**108**	**110**	**107**	**108**
Toluene-D8	2037-26-5	2	%		**98.2**	**98.0**	**98.4**	**100**	**99.4**
4-Bromofluorobenzene	460-00-4	2	%		**100.0**	**99.6**	**96.9**	**100**	**102**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC095 Bore	AC1	MB7	C1	----
				Client sampling date / time	24-Oct-2017 14:10	24-Oct-2017 15:45	24-Oct-2017 16:30	24-Oct-2017 15:20	----
Compound	CAS Number	LOR	Unit		EB1722400-011	EB1722400-012	EB1722400-013	EB1722400-014	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.29	7.54	7.46	8.30	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		12400	10700	20100	9490	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		7910	6580	14000	5810	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		14	18	41	75	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		388	318	322	134	----
Total Alkalinity as CaCO3	----	1	mg/L		388	318	322	134	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		226	954	263	170	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		4330	3420	7640	3480	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		258	224	602	131	----
Magnesium	7439-95-4	1	mg/L		218	111	343	88	----
Sodium	7440-23-5	1	mg/L		2160	2060	3430	1810	----
Potassium	7440-09-7	1	mg/L		24	19	18	51	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.002	----
Arsenic	7440-38-2	0.001	mg/L		0.001	0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L		0.084	0.071	0.844	0.213	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	0.013	0.003	0.004	----
Rubidium	7440-17-7	0.001	mg/L		0.029	0.025	0.028	0.145	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		0.004	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		12.8	12.3	49.4	11.8	----
Iron	7439-89-6	0.05	mg/L		1.70	<0.05	0.85	<0.05	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.04	0.10	0.10	0.10	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC095 Bore	AC1	MB7	C1	----
				Client sampling date / time	24-Oct-2017 14:10	24-Oct-2017 15:45	24-Oct-2017 16:30	24-Oct-2017 15:20	----
Compound	CAS Number	LOR	Unit		EB1722400-011	EB1722400-012	EB1722400-013	EB1722400-014	--------
					Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.008**	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L		**0.091**	**0.080**	**5.17**	**0.253**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.017**	**0.004**	**0.011**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**11.1**	**10.6**	**43.1**	**8.65**	----
Iron	7439-89-6	0.05	mg/L		**2.43**	**0.40**	**1.24**	**0.38**	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.8**	**0.1**	**0.2**	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	**0.12**	**0.05**	**0.05**	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**135**	**123**	**227**	**104**	----
Total Cations	----	0.01	meq/L		**125**	**110**	**208**	**93.8**	----
Ionic Balance	----	0.01	%		**3.54**	**5.27**	**4.48**	**5.33**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		**710**	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		**710**	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		**670**	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		**670**	<100	<100	<100	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BC095 Bore	AC1	MB7	C1	----
				Client sampling date / time	24-Oct-2017 14:10	24-Oct-2017 15:45	24-Oct-2017 16:30	24-Oct-2017 15:20	----
Compound	CAS Number	LOR	Unit		EB1722400-011	EB1722400-012	EB1722400-013	EB1722400-014	--------
					Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**109**	**107**	**109**	----
Toluene-D8	2037-26-5	2	%		**98.3**	**98.6**	**98.2**	**99.4**	----
4-Bromofluorobenzene	460-00-4	2	%		**96.2**	**100**	**98.0**	**97.6**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1802594**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: Isaac Plains	Date Samples Received	: 24-Jan-2018 11:43
Order number	: ----	Date Analysis Commenced	: 25-Jan-2018
C-O-C number	: ----	Issue Date	: 01-Feb-2018 17:39
Sampler	: ----		
Site	: ----		
Quote number	: BN/451/16 V2		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB1	MB2	MB3	MB5	MB6
			Client sampling date / time	22-Jan-2018 12:20	22-Jan-2018 11:40	22-Jan-2018 18:30	22-Jan-2018 14:40	22-Jan-2018 17:40
Compound	CAS Number	LOR	Unit	EB1802594-001	EB1802594-002	EB1802594-003	EB1802594-004	EB1802594-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.85	7.82	7.44	7.50	7.82
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	4220	8060	21900	24200	6920
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	2540	4680	14600	16900	4390
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	13	16	19	18	11
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	476	761	628	544	746
Total Alkalinity as CaCO3	----	1	mg/L	476	761	628	544	746
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	48	173	916	1000	89
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1150	2470	7680	8700	1910
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	121	133	350	387	117
Magnesium	7439-95-4	1	mg/L	131	185	459	628	226
Sodium	7440-23-5	1	mg/L	561	1340	3940	4240	931
Potassium	7440-09-7	1	mg/L	3	7	39	30	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.019	0.022	0.011	0.002
Barium	7440-39-3	0.001	mg/L	0.062	0.072	0.084	0.072	0.062
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.002	0.002	0.002	0.004
Rubidium	7440-17-7	0.001	mg/L	0.004	0.012	0.037	0.035	0.006
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	3.06	4.34	16.1	14.8	4.08
Iron	7439-89-6	0.05	mg/L	0.11	1.19	5.44	3.34	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.08	0.07	0.02	0.02	0.12

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1	MB2	MB3	MB5	MB6
				Client sampling date / time	22-Jan-2018 12:20	22-Jan-2018 11:40	22-Jan-2018 18:30	22-Jan-2018 14:40	22-Jan-2018 17:40
Compound	CAS Number	LOR	Unit		EB1802594-001	EB1802594-002	EB1802594-003	EB1802594-004	EB1802594-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.003**	**0.019**	**0.022**	**0.011**	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.060**	**0.073**	**0.081**	**0.069**	**0.091**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.003**	**0.003**	**0.003**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**2.89**	**4.48**	**16.4**	**13.2**	**3.66**
Iron	7439-89-6	0.05	mg/L		**0.53**	**1.77**	**5.37**	**3.25**	**1.06**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.4**	**0.2**	**0.2**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.01**	**0.02**	<0.05	<0.05	**0.02**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**42.9**	**88.5**	**248**	**277**	**70.6**
Total Cations	----	0.01	meq/L		**41.3**	**80.3**	**228**	**256**	**65.1**
Ionic Balance	----	0.01	%		**1.96**	**4.83**	**4.34**	**3.92**	**4.11**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1	MB2	MB3	MB5	MB6
				Client sampling date / time	22-Jan-2018 12:20	22-Jan-2018 11:40	22-Jan-2018 18:30	22-Jan-2018 14:40	22-Jan-2018 17:40
Compound	CAS Number	LOR	Unit		EB1802594-001	EB1802594-002	EB1802594-003	EB1802594-004	EB1802594-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**98.4**	**101**	**104**	**104**	**104**
Toluene-D8	2037-26-5	2	%		**95.0**	**96.3**	**93.0**	**94.6**	**96.6**
4-Bromofluorobenzene	460-00-4	2	%		**96.4**	**95.6**	**99.2**	**103**	**99.7**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2-DUP	SB1 (Swamp Bore 1)	BC2	AC1	MB7
				Client sampling date / time	22-Jan-2018 11:45	22-Jan-2018 13:30	22-Jan-2018 10:50	23-Jan-2018 07:15	23-Jan-2018 08:30
Compound	CAS Number	LOR	Unit		EB1802594-006	EB1802594-007	EB1802594-008	EB1802594-009	EB1802594-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.86	7.65	7.89	8.01	7.79
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		8060	9010	5470	11300	20800
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		4630	7920	2500	7100	16200
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		13	24	14	126	31
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		746	57	692	312	303
Total Alkalinity as CaCO3	----	1	mg/L		746	57	692	312	303
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		172	119	89	1060	247
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2500	3280	1440	3460	7700
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		131	535	134	233	584
Magnesium	7439-95-4	1	mg/L		179	119	186	117	344
Sodium	7440-23-5	1	mg/L		1310	1060	760	2110	3340
Potassium	7440-09-7	1	mg/L		7	20	5	18	16
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.002	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.018	<0.001	<0.001	0.002	<0.001
Barium	7440-39-3	0.001	mg/L		0.072	0.224	0.072	0.063	0.918
Molybdenum	7439-98-7	0.001	mg/L		0.002	0.001	<0.001	0.017	0.003
Rubidium	7440-17-7	0.001	mg/L		0.012	0.031	0.008	0.027	0.030
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		4.09	9.28	3.83	12.9	49.6
Iron	7439-89-6	0.05	mg/L		1.17	1.16	<0.05	<0.05	0.85
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.12	0.06	0.24	1.05	0.10

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2-DUP	SB1 (Swamp Bore 1)	BC2	AC1	MB7
				Client sampling date / time	22-Jan-2018 11:45	22-Jan-2018 13:30	22-Jan-2018 10:50	23-Jan-2018 07:15	23-Jan-2018 08:30
Compound	CAS Number	LOR	Unit		EB1802594-006	EB1802594-007	EB1802594-008	EB1802594-009	EB1802594-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.021**	**0.001**	**0.002**	**0.003**	<0.001
Barium	7440-39-3	0.001	mg/L		**0.083**	**0.208**	**0.071**	**0.095**	**5.42**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.002**	<0.001	**0.015**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**4.97**	**8.40**	**3.87**	**12.1**	**46.6**
Iron	7439-89-6	0.05	mg/L		**2.05**	**3.16**	**2.59**	**1.90**	**1.51**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	<0.1	**0.2**	**0.7**	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.03**	**0.01**	**0.07**	**0.06**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**89.0**	**96.1**	**56.3**	**126**	**228**
Total Cations	----	0.01	meq/L		**78.4**	**83.1**	**55.2**	**113**	**203**
Ionic Balance	----	0.01	%		**6.32**	**7.27**	**1.00**	**5.18**	**5.85**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	**140**
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	**140**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	**150**
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	**150**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2-DUP	SB1 (Swamp Bore 1)	BC2	AC1	MB7
				Client sampling date / time	22-Jan-2018 11:45	22-Jan-2018 13:30	22-Jan-2018 10:50	23-Jan-2018 07:15	23-Jan-2018 08:30
Compound	CAS Number	LOR	Unit		EB1802594-006	EB1802594-007	EB1802594-008	EB1802594-009	EB1802594-010
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	**2**
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	**2**
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	**2**
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**102**	**98.3**	**103**	**104**
Toluene-D8	2037-26-5	2	%		**96.0**	**93.3**	**93.2**	**98.3**	**98.1**
4-Bromofluorobenzene	460-00-4	2	%		**99.0**	**97.2**	**96.2**	**99.6**	**102**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	C1	SB1-DUP	----	----	----
				Client sampling date / time	23-Jan-2018 07:30	22-Jan-2018 13:35	----	----	----
Compound	CAS Number	LOR	Unit		EB1802594-011	EB1802594-012	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**10.0**	**7.76**	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**8890**	**9000**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**4910**	**7700**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**106**	**24**	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		**116**	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**5**	**58**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**121**	**58**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**138**	**120**	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**3090**	**3330**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**22**	**534**	----	----	----
Magnesium	7439-95-4	1	mg/L		**17**	**119**	----	----	----
Sodium	7440-23-5	1	mg/L		**1680**	**1060**	----	----	----
Potassium	7440-09-7	1	mg/L		**146**	**20**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	----	----	----
Antimony	7440-36-0	0.001	mg/L		**0.010**	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.001**	<0.001	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.170**	**0.222**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.008**	**0.002**	----	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.537**	**0.031**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L		**4.87**	**9.19**	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	**1.17**	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.09**	**0.10**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	C1	SB1-DUP	----	----	----
				Client sampling date / time	23-Jan-2018 07:30	22-Jan-2018 13:35	----	----	----
Compound	CAS Number	LOR	Unit		EB1802594-011	EB1802594-012	--------	--------	--------
					Result	Result	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		**0.007**	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.002**	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.274**	**0.210**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.009**	**0.002**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L		**8.55**	**8.39**	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.36**	**3.85**	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	<0.1	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.05**	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**92.4**	**97.6**	----	----	----
Total Cations	----	0.01	meq/L		**79.3**	**83.0**	----	----	----
Ionic Balance	----	0.01	%		**7.66**	**8.04**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	C1	SB1-DUP	----	----	----
				Client sampling date / time	23-Jan-2018 07:30	22-Jan-2018 13:35	----	----	----
Compound	CAS Number	LOR	Unit		EB1802594-011	EB1802594-012	--------	--------	--------
					Result	Result	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**102**	----	----	----
Toluene-D8	2037-26-5	2	%		**96.4**	**94.1**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**98.9**	**96.2**	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1809833**	Page	: 1 of 9
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: Isaac Plains	Date Samples Received	: 20-Apr-2018 13:15
Order number	: ----	Date Analysis Commenced	: 23-Apr-2018
C-O-C number	: ----	Issue Date	: 30-Apr-2018 08:45
Sampler	: MITCHELL SAXBY		
Site	: ----		
Quote number	: BN/451/16 V4		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Organics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- EK067G (Total Phosphorus as P): Sample EB1809833_004 (MB7) was diluted due to matrix interference. LOR adjusted accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	AC1	MB7	C1
				Client sampling date / time	18-Apr-2018 13:30	18-Apr-2018 11:10	17-Apr-2018 16:40	18-Apr-2018 17:45	17-Apr-2018 17:15
Compound	CAS Number	LOR	Unit		EB1809833-001	EB1809833-002	EB1809833-003	EB1809833-004	EB1809833-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.69	7.95	7.99	7.78	8.35
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		9250	5980	11600	21900	10200
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5800	3300	7030	13600	5740
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		19	162	256	24	74
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	4
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		59	709	308	338	90
Total Alkalinity as CaCO3	----	1	mg/L		59	709	308	338	94
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		121	91	1050	319	178
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3070	1500	3270	7420	3300
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		542	151	242	631	108
Magnesium	7439-95-4	1	mg/L		120	207	118	388	61
Sodium	7440-23-5	1	mg/L		1080	770	2110	3540	1810
Potassium	7440-09-7	1	mg/L		21	5	20	18	95
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.006
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	0.002	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		0.223	0.133	0.080	0.628	0.264
Molybdenum	7439-98-7	0.001	mg/L		0.001	<0.001	0.014	0.003	0.008
Rubidium	7440-17-7	0.001	mg/L		0.028	0.007	0.025	0.028	0.315
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		8.03	4.01	11.2	42.2	8.95
Iron	7439-89-6	0.05	mg/L		0.13	<0.05	0.43	0.68	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.07	4.50	2.16	0.21	0.10

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	AC1	MB7	C1
				Client sampling date / time	18-Apr-2018 13:30	18-Apr-2018 11:10	17-Apr-2018 16:40	18-Apr-2018 17:45	17-Apr-2018 17:15
Compound	CAS Number	LOR	Unit		EB1809833-001	EB1809833-002	EB1809833-003	EB1809833-004	EB1809833-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.001**	**0.002**	**0.007**
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.010**	**0.004**	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.212**	**0.185**	**0.121**	**5.61**	**0.314**
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	<0.001	**0.018**	**0.011**	**0.010**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.69**	**4.37**	**12.6**	**47.6**	**10.3**
Iron	7439-89-6	0.05	mg/L		**0.30**	**9.84**	**4.00**	**1.25**	**0.39**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.2**	**0.8**	**0.1**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.10**	**0.10**	<0.05	**0.01**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**90.3**	**58.4**	**120**	**223**	**98.7**
Total Cations	----	0.01	meq/L		**84.4**	**58.2**	**114**	**218**	**91.6**
Ionic Balance	----	0.01	%		**3.36**	**0.16**	**2.64**	**1.10**	**3.73**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	AC1	MB7	C1
				Client sampling date / time	18-Apr-2018 13:30	18-Apr-2018 11:10	17-Apr-2018 16:40	18-Apr-2018 17:45	17-Apr-2018 17:15
Compound	CAS Number	LOR	Unit		EB1809833-001	EB1809833-002	EB1809833-003	EB1809833-004	EB1809833-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**105**	**102**	**101**	**100**
Toluene-D8	2037-26-5	2	%		**100**	**101**	**99.0**	**100**	**98.5**
4-Bromofluorobenzene	460-00-4	2	%		**105**	**107**	**99.4**	**105**	**104**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	IPC-GW-DUP	----	----	----	----
			Client sampling date / time	17-Apr-2018 17:15	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1809833-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.77**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**9260**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5290**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**17**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**57**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**57**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**122**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3090**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**545**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**120**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**1080**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**21**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.221**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.028**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**7.90**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.14**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.09**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPC-GW-DUP	----	----	----	----
				Client sampling date / time	17-Apr-2018 17:15	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1809833-006	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.001**	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.216**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.002**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L		**8.95**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.34**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**90.8**	----	----	----	----
Total Cations	----	0.01	meq/L		**84.6**	----	----	----	----
Ionic Balance	----	0.01	%		**3.57**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPC-GW-DUP	----	----	----	----
				Client sampling date / time	17-Apr-2018 17:15	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1809833-006	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**100**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**99.4**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**106**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1815923**	Page	: 1 of 15
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 12-Jul-2018 12:20
Order number	: P102091	Date Analysis Commenced	: 13-Jul-2018
C-O-C number	: ----	Issue Date	: 18-Jul-2018 15:01
Sampler	: MITCHELL SAXBY		
Site	: Isaac Plains		
Quote number	: BN/451/16 V4		
No. of samples received	: 16		
No. of samples analysed	: 16		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EG020-T (Total Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Groundwater	AC1 Groundwater	MB7 Groundwater	C1 Groundwater
			Client sampling date / time	09-Jul-2018 14:45	09-Jul-2018 11:20	10-Jul-2018 07:00	09-Jul-2018 17:20	10-Jul-2018 07:20
Compound	CAS Number	LOR	Unit	EB1815923-001	EB1815923-002	EB1815923-003	EB1815923-004	EB1815923-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.43**	**7.33**	**7.52**	**7.31**	**8.25**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**9000**	**6490**	**11200**	**19400**	**10700**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5460**	**3590**	**6750**	**11700**	**5940**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	**114**	**51**	**166**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**63**	**669**	**290**	**240**	**148**
Total Alkalinity as CaCO3	----	1	mg/L	**63**	**669**	**290**	**240**	**148**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**115**	**93**	**1000**	**178**	**188**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3170**	**1780**	**3300**	**6970**	**3650**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**515**	**159**	**214**	**542**	**146**
Magnesium	7439-95-4	1	mg/L	**119**	**237**	**115**	**289**	**100**
Sodium	7440-23-5	1	mg/L	**1060**	**838**	**2050**	**3180**	**1860**
Potassium	7440-09-7	1	mg/L	**22**	**5**	**19**	**17**	**46**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.002**
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	**0.203**	**0.125**	**0.074**	**0.941**	**0.259**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.016**	**0.002**	**0.004**
Rubidium	7440-17-7	0.001	mg/L	**0.030**	**0.008**	**0.025**	**0.031**	**0.141**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**8.41**	**4.47**	**11.2**	**44.7**	**13.0**
Iron	7439-89-6	0.05	mg/L	**0.40**	<0.05	**0.26**	**0.94**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Groundwater	AC1 Groundwater	MB7 Groundwater	C1 Groundwater
				Client sampling date / time	09-Jul-2018 14:45	09-Jul-2018 11:20	10-Jul-2018 07:00	09-Jul-2018 17:20	10-Jul-2018 07:20
Compound	CAS Number	LOR	Unit		EB1815923-001	EB1815923-002	EB1815923-003	EB1815923-004	EB1815923-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L		**0.07**	**0.34**	**1.26**	**0.13**	**0.23**
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.001**	**0.001**	**0.003**
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	**0.003**	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.212**	**0.130**	**0.095**	**18.9**	**0.313**
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	<0.001	**0.018**	**0.003**	**0.005**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.45**	**4.57**	**11.5**	**48.4**	**14.5**
Iron	7439-89-6	0.05	mg/L		**0.67**	**0.51**	**2.04**	**1.37**	**0.86**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.2**	**0.7**	<0.1	**0.1**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.01**	**0.05**	<0.01	**0.02**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**93.1**	**65.5**	**120**	**205**	**110**
Total Cations	----	0.01	meq/L		**82.2**	**64.0**	**110**	**190**	**97.6**
Ionic Balance	----	0.01	%		**6.23**	**1.15**	**4.32**	**3.93**	**5.90**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Groundwater	AC1 Groundwater	MB7 Groundwater	C1 Groundwater
				Client sampling date / time	09-Jul-2018 14:45	09-Jul-2018 11:20	10-Jul-2018 07:00	09-Jul-2018 17:20	10-Jul-2018 07:20
Compound	CAS Number	LOR	Unit		EB1815923-001	EB1815923-002	EB1815923-003	EB1815923-004	EB1815923-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**106**	**101**	**105**	**106**	**105**
Toluene-D8	2037-26-5	2	%		**100.0**	**100**	**100**	**102**	**100**
4-Bromofluorobenzene	460-00-4	2	%		**97.4**	**102**	**97.1**	**102**	**97.0**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB1 Groundwater	MB2 Groundwater	MB3 Groundwater	MB5 Groundwater	MB6 Groundwater
			Client sampling date / time	09-Jul-2018 13:45	09-Jul-2018 12:30	09-Jul-2018 16:20	10-Jul-2018 08:45	09-Jul-2018 17:05
Compound	CAS Number	LOR	Unit	EB1815923-006	EB1815923-007	EB1815923-008	EB1815923-010	EB1815923-011
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.45**	**7.45**	**7.11**	**6.96**	**7.38**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3440**	**8150**	**21800**	**24500**	**6980**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1910**	**4480**	**12700**	**15500**	**3860**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**7**	**8**	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**512**	**773**	**612**	**543**	**743**
Total Alkalinity as CaCO3	----	1	mg/L	**512**	**773**	**612**	**543**	**743**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**37**	**172**	**941**	**1040**	**87**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**866**	**2420**	**7500**	**8590**	**1950**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**85**	**126**	**336**	**366**	**121**
Magnesium	7439-95-4	1	mg/L	**104**	**184**	**465**	**636**	**244**
Sodium	7440-23-5	1	mg/L	**455**	**1300**	**3880**	**4160**	**978**
Potassium	7440-09-7	1	mg/L	**3**	**8**	**42**	**33**	**6**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.005**	**0.030**	**0.030**	**0.015**	**0.002**
Barium	7440-39-3	0.001	mg/L	**0.125**	**0.127**	**0.063**	**0.047**	**0.161**
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	**0.002**	**0.002**	**0.001**	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.003**	**0.012**	**0.039**	**0.035**	**0.008**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**2.05**	**4.37**	**16.0**	**12.8**	**3.62**
Iron	7439-89-6	0.05	mg/L	**0.16**	**1.50**	**5.12**	**2.91**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1 Groundwater	MB2 Groundwater	MB3 Groundwater	MB5 Groundwater	MB6 Groundwater
				Client sampling date / time	09-Jul-2018 13:45	09-Jul-2018 12:30	09-Jul-2018 16:20	10-Jul-2018 08:45	09-Jul-2018 17:05
Compound	CAS Number	LOR	Unit		EB1815923-006	EB1815923-007	EB1815923-008	EB1815923-010	EB1815923-011
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L		**0.01**	**0.21**	<0.01	<0.01	**0.01**
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.005**	**0.032**	**0.031**	**0.015**	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.128**	**0.136**	**0.062**	**0.048**	**0.159**
Molybdenum	7439-98-7	0.001	mg/L		**0.002**	**0.003**	**0.002**	**0.002**	**0.001**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**2.12**	**4.55**	**16.1**	**12.8**	**3.46**
Iron	7439-89-6	0.05	mg/L		**0.18**	**1.82**	**4.83**	**2.86**	<0.05
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.4**	**0.2**	**0.2**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.04**	<0.05	<0.05	**0.04**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**35.4**	**87.3**	**243**	**275**	**71.7**
Total Cations	----	0.01	meq/L		**32.7**	**78.2**	**225**	**252**	**68.8**
Ionic Balance	----	0.01	%		**4.05**	**5.50**	**3.95**	**4.25**	**2.03**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1 Groundwater	MB2 Groundwater	MB3 Groundwater	MB5 Groundwater	MB6 Groundwater
				Client sampling date / time	09-Jul-2018 13:45	09-Jul-2018 12:30	09-Jul-2018 16:20	10-Jul-2018 08:45	09-Jul-2018 17:05
Compound	CAS Number	LOR	Unit		EB1815923-006	EB1815923-007	EB1815923-008	EB1815923-010	EB1815923-011
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**111**	**107**	**106**	**105**	**105**
Toluene-D8	2037-26-5	2	%		**102**	**101**	**100**	**97.7**	**104**
4-Bromofluorobenzene	460-00-4	2	%		**98.3**	**96.9**	**98.6**	**98.9**	**95.5**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A Groundwater	MB9B Groundwater	MB4B Groundwater	MB8B Groundwater	IPCM GW Duplicate 1 Groundwater
				Client sampling date / time	10-Jul-2018 13:10	10-Jul-2018 14:50	10-Jul-2018 12:00	10-Jul-2018 09:45	[09-Jul-2018]
Compound	CAS Number	LOR	Unit		EB1815923-012	EB1815923-013	EB1815923-014	EB1815923-015	EB1815923-017
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.59	7.87	7.62	7.55	6.96
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		10400	1780	31400	12600	24400
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		6040	992	17600	7400	14700
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		30	<5	28	18	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		132	600	1130	272	542
Total Alkalinity as CaCO3	----	1	mg/L		132	600	1130	272	542
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		10	23	385	361	1020
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3750	241	10800	4290	8520
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		262	39	88	294	370
Magnesium	7439-95-4	1	mg/L		149	79	456	136	632
Sodium	7440-23-5	1	mg/L		1620	228	7050	2150	4120
Potassium	7440-09-7	1	mg/L		20	4	4	15	33
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.02	<0.05	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.005	0.003	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.007	0.002	0.005	0.004	0.015
Barium	7440-39-3	0.001	mg/L		6.78	0.105	0.210	0.587	0.048
Molybdenum	7439-98-7	0.001	mg/L		0.004	0.004	<0.005	0.015	0.002
Rubidium	7440-17-7	0.001	mg/L		0.030	0.007	<0.005	0.025	0.036
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		11.1	0.762	7.10	16.3	13.0
Iron	7439-89-6	0.05	mg/L		0.06	<0.05	<0.05	<0.05	2.88
EG020T: Total Metals by ICP-MS									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A Groundwater	MB9B Groundwater	MB4B Groundwater	MB8B Groundwater	IPCM GW Duplicate 1 Groundwater
				Client sampling date / time	10-Jul-2018 13:10	10-Jul-2018 14:50	10-Jul-2018 12:00	10-Jul-2018 09:45	[09-Jul-2018]
Compound	CAS Number	LOR	Unit		EB1815923-012	EB1815923-013	EB1815923-014	EB1815923-015	EB1815923-017
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L		**1.10**	**0.28**	**1.07**	**0.43**	**0.01**
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.005	**0.003**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.008**	**0.003**	<0.005	**0.005**	**0.016**
Barium	7440-39-3	0.001	mg/L		**6.93**	**0.113**	**0.214**	**0.601**	**0.050**
Molybdenum	7439-98-7	0.001	mg/L		**0.004**	**0.004**	<0.005	**0.018**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**11.1**	**0.777**	**7.39**	**16.6**	**13.3**
Iron	7439-89-6	0.05	mg/L		**1.27**	**0.39**	**2.24**	**0.36**	**3.01**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.2**	**0.5**	**0.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.10**	**0.05**	<0.01	<0.05
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**109**	**19.3**	**335**	**134**	**272**
Total Cations	----	0.01	meq/L		**96.3**	**18.5**	**349**	**120**	**250**
Ionic Balance	----	0.01	%		**6.01**	**2.11**	**1.96**	**5.60**	**4.18**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A Groundwater	MB9B Groundwater	MB4B Groundwater	MB8B Groundwater	IPCM GW Duplicate 1 Groundwater
				Client sampling date / time	10-Jul-2018 13:10	10-Jul-2018 14:50	10-Jul-2018 12:00	10-Jul-2018 09:45	[09-Jul-2018]
Compound	CAS Number	LOR	Unit		EB1815923-012	EB1815923-013	EB1815923-014	EB1815923-015	EB1815923-017
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**107**	**107**	**108**	**106**
Toluene-D8	2037-26-5	2	%		**100**	**97.9**	**102**	**101**	**98.8**
4-Bromofluorobenzene	460-00-4	2	%		**97.6**	**96.8**	**98.0**	**101**	**96.1**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	IPCM GW Duplicate 2 Groundwater	----	----	----	----
			Client sampling date / time	[10-Jul-2018]	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1815923-018	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.31**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**6510**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**3610**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**674**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**674**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**93**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1790**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**160**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**237**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**841**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**5**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.128**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.008**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**4.38**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate 2 Groundwater	----	----	----	----
				Client sampling date / time	[10-Jul-2018]	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1815923-018	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L		**0.33**	----	----	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.131**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L		**4.50**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.56**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**65.9**	----	----	----	----
Total Cations	----	0.01	meq/L		**64.2**	----	----	----	----
Ionic Balance	----	0.01	%		**1.30**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate 2 Groundwater	----	----	----	----
				Client sampling date / time	[10-Jul-2018]	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1815923-018	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**103**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**101**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**99.3**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1825293**	Page	: 1 of 15
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 26-Oct-2018 10:45
Order number	: P102091	Date Analysis Commenced	: 29-Oct-2018
C-O-C number	: ----	Issue Date	: 05-Nov-2018 18:04
Sampler	: ----		
Site	: ----		
Quote number	: BN/451/16 V4		
No. of samples received	: 16		
No. of samples analysed	: 16		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- EG020-T (Total Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC1	MB7	C1	MB1
				Client sampling date / time	23-Oct-2018 13:30	23-Oct-2018 09:45	24-Oct-2018 08:15	24-Oct-2018 07:30	23-Oct-2018 12:15
Compound	CAS Number	LOR	Unit		EB1825293-001	EB1825293-002	EB1825293-004	EB1825293-005	EB1825293-006
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.44	7.29	7.40	8.01	7.50
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		8940	7000	19700	10200	4370
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5640	4070	12300	5900	2460
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		11	<5	36	30	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		54	648	257	123	468
Total Alkalinity as CaCO3	----	1	mg/L		54	648	257	123	468
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		126	98	192	205	58
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3030	2020	6840	3380	1150
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		577	206	633	141	138
Magnesium	7439-95-4	1	mg/L		123	270	328	88	136
Sodium	7440-23-5	1	mg/L		1070	919	3320	1900	620
Potassium	7440-09-7	1	mg/L		21	5	18	77	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.04	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.005	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.001	<0.001	<0.001	<0.001	0.002
Barium	7440-39-3	0.001	mg/L		0.201	0.120	0.738	0.218	0.093
Molybdenum	7439-98-7	0.001	mg/L		0.001	<0.001	0.002	0.007	0.003
Rubidium	7440-17-7	0.001	mg/L		0.030	0.009	0.031	0.232	0.008
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		7.96	5.01	44.2	10.6	3.01
Iron	7439-89-6	0.05	mg/L		0.31	<0.05	0.86	<0.05	0.06
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.10	0.12	0.08	0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC1	MB7	C1	MB1
				Client sampling date / time	23-Oct-2018 13:30	23-Oct-2018 09:45	24-Oct-2018 08:15	24-Oct-2018 07:30	23-Oct-2018 12:15
Compound	CAS Number	LOR	Unit		EB1825293-001	EB1825293-002	EB1825293-004	EB1825293-005	EB1825293-006
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.005**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.211**	**0.119**	**6.69**	**0.244**	**0.092**
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	<0.001	**0.002**	**0.008**	**0.003**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.41**	**4.97**	**45.8**	**11.0**	**2.91**
Iron	7439-89-6	0.05	mg/L		**0.22**	**0.24**	**1.30**	**0.46**	**0.07**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.2**	<0.1	**0.2**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	<0.01	<0.05	<0.05	**0.01**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**89.2**	**72.0**	**202**	**102**	**43.0**
Total Cations	----	0.01	meq/L		**86.0**	**72.6**	**203**	**98.9**	**45.2**
Ionic Balance	----	0.01	%		**1.82**	**0.44**	**0.34**	**1.58**	**2.47**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC1	MB7	C1	MB1
				Client sampling date / time	23-Oct-2018 13:30	23-Oct-2018 09:45	24-Oct-2018 08:15	24-Oct-2018 07:30	23-Oct-2018 12:15
Compound	CAS Number	LOR	Unit		EB1825293-001	EB1825293-002	EB1825293-004	EB1825293-005	EB1825293-006
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**80.3**	**80.5**	**81.0**	**80.3**	**80.8**
Toluene-D8	2037-26-5	2	%		**97.7**	**98.6**	**98.0**	**97.8**	**96.8**
4-Bromofluorobenzene	460-00-4	2	%		**104**	**104**	**105**	**105**	**102**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB2	MB3	MB4A	MB5	MB6
			Client sampling date / time	23-Oct-2018 11:30	24-Oct-2018 09:50	24-Oct-2018 10:50	23-Oct-2018 16:30	24-Oct-2018 12:10
Compound	CAS Number	LOR	Unit	EB1825293-007	EB1825293-008	EB1825293-009	EB1825293-010	EB1825293-011
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.41**	**6.96**	**6.93**	**6.96**	**7.42**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**7820**	**21500**	**51900**	**23100**	**6960**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**4500**	**14000**	**36000**	**15100**	**4050**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**16**	<5	**1870**	**20**	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**764**	**611**	**379**	**503**	**720**
Total Alkalinity as CaCO3	----	1	mg/L	**764**	**611**	**379**	**503**	**720**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**158**	**835**	**856**	**968**	**94**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2160**	**7030**	**19800**	**7710**	**1930**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**140**	**391**	**726**	**422**	**147**
Magnesium	7439-95-4	1	mg/L	**180**	**484**	**1840**	**616**	**259**
Sodium	7440-23-5	1	mg/L	**1310**	**3940**	**9660**	**4080**	**1070**
Potassium	7440-09-7	1	mg/L	**8**	**44**	**6**	**34**	**6**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.033**	**0.030**	<0.005	<0.001	**0.002**
Barium	7440-39-3	0.001	mg/L	**0.132**	**0.061**	**0.210**	**0.054**	**0.167**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.004**	<0.005	**0.002**	**0.001**
Rubidium	7440-17-7	0.001	mg/L	**0.012**	**0.040**	<0.005	**0.036**	**0.007**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**4.28**	**15.7**	**20.7**	**12.9**	**3.86**
Iron	7439-89-6	0.05	mg/L	**1.41**	**4.42**	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.32**	**0.02**	**29.6**	**0.06**	**0.04**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB3	MB4A	MB5	MB6
				Client sampling date / time	23-Oct-2018 11:30	24-Oct-2018 09:50	24-Oct-2018 10:50	23-Oct-2018 16:30	24-Oct-2018 12:10
Compound	CAS Number	LOR	Unit		EB1825293-007	EB1825293-008	EB1825293-009	EB1825293-010	EB1825293-011
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.034**	**0.028**	**0.028**	**0.002**	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.144**	**0.062**	**0.300**	**0.054**	**0.166**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.004**	**0.005**	**0.003**	**0.001**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**4.40**	**15.9**	**20.5**	**13.0**	**4.09**
Iron	7439-89-6	0.05	mg/L		**2.06**	**4.64**	**48.6**	**3.37**	**0.15**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.2**	**0.3**	**0.3**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	<0.05	**1.00**	**0.06**	**0.05**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**79.5**	**228**	**584**	**248**	**70.8**
Total Cations	----	0.01	meq/L		**79.0**	**232**	**608**	**250**	**75.3**
Ionic Balance	----	0.01	%		**0.31**	**0.86**	**2.02**	**0.48**	**3.12**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB3	MB4A	MB5	MB6
				Client sampling date / time	23-Oct-2018 11:30	24-Oct-2018 09:50	24-Oct-2018 10:50	23-Oct-2018 16:30	24-Oct-2018 12:10
Compound	CAS Number	LOR	Unit		EB1825293-007	EB1825293-008	EB1825293-009	EB1825293-010	EB1825293-011
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**80.4**	**80.1**	**82.6**	**81.7**	**79.9**
Toluene-D8	2037-26-5	2	%		**99.1**	**96.5**	**99.0**	**97.8**	**96.8**
4-Bromofluorobenzene	460-00-4	2	%		**104**	**103**	**106**	**103**	**103**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A	MB9B	MB4B	MB8B	IPCM GW Duplicate 1
				Client sampling date / time	24-Oct-2018 16:00	24-Oct-2018 15:10	24-Oct-2018 13:40	23-Oct-2018 15:05	23-Oct-2018 00:00
Compound	CAS Number	LOR	Unit		EB1825293-012	EB1825293-013	EB1825293-014	EB1825293-015	EB1825293-017
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.56	7.94	7.76	7.59	7.33
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		10400	1840	31200	12300	7000
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		6140	1060	18900	7460	4140
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		26	63	1590	87	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		130	607	1140	231	650
Total Alkalinity as CaCO3	----	1	mg/L		130	607	1140	231	650
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		10	101	375	181	95
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3560	202	10400	4160	1940
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		304	42	124	335	203
Magnesium	7439-95-4	1	mg/L		152	72	460	135	273
Sodium	7440-23-5	1	mg/L		1660	318	6950	2190	934
Potassium	7440-09-7	1	mg/L		20	5	4	14	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.05	0.05	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.005	0.002	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.007	0.002	<0.005	0.003	<0.001
Barium	7440-39-3	0.001	mg/L		6.21	0.012	0.230	0.581	0.127
Molybdenum	7439-98-7	0.001	mg/L		0.005	0.016	0.007	0.008	<0.001
Rubidium	7440-17-7	0.001	mg/L		0.029	0.007	<0.005	0.024	0.009
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		10.9	0.593	7.11	17.6	5.17
Iron	7439-89-6	0.05	mg/L		0.43	<0.05	<0.05	0.17	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.63	1.77	30.0	1.20	0.07

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A	MB9B	MB4B	MB8B	IPCM GW Duplicate 1
				Client sampling date / time	24-Oct-2018 16:00	24-Oct-2018 15:10	24-Oct-2018 13:40	23-Oct-2018 15:05	23-Oct-2018 00:00
Compound	CAS Number	LOR	Unit		EB1825293-012	EB1825293-013	EB1825293-014	EB1825293-015	EB1825293-017
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.005	**0.002**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.008**	**0.002**	**0.019**	**0.004**	<0.001
Barium	7440-39-3	0.001	mg/L		**6.72**	**0.027**	**0.434**	**0.644**	**0.117**
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	**0.016**	**0.011**	**0.008**	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.05	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.005	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**11.1**	**0.632**	**7.48**	**19.1**	**5.42**
Iron	7439-89-6	0.05	mg/L		**1.32**	**2.79**	**83.0**	**1.27**	**0.20**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.3**	**0.5**	**0.1**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.15**	**0.68**	<0.05	<0.01
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**103**	**19.9**	**324**	**126**	**69.7**
Total Cations	----	0.01	meq/L		**100**	**22.0**	**346**	**123**	**73.4**
Ionic Balance	----	0.01	%		**1.39**	**4.90**	**3.36**	**0.92**	**2.56**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB9A	MB9B	MB4B	MB8B	IPCM GW Duplicate 1
				Client sampling date / time	24-Oct-2018 16:00	24-Oct-2018 15:10	24-Oct-2018 13:40	23-Oct-2018 15:05	23-Oct-2018 00:00
Compound	CAS Number	LOR	Unit		EB1825293-012	EB1825293-013	EB1825293-014	EB1825293-015	EB1825293-017
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**78.8**	**81.8**	**82.2**	**78.3**	**79.6**
Toluene-D8	2037-26-5	2	%		**95.8**	**99.2**	**96.5**	**99.4**	**98.0**
4-Bromofluorobenzene	460-00-4	2	%		**104**	**105**	**105**	**106**	**106**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	IPCM GW Duplicate 2	----	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1825293-018	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.94**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1840**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1060**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**72**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**614**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**614**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**89**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**203**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**39**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**71**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**300**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**4**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.012**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.015**	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.007**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.586**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.29**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate 2	----	----	----	----
				Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1825293-018	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.002**	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.024**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.015**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L		**0.591**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**1.95**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.15**	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**19.8**	----	----	----	----
Total Cations	----	0.01	meq/L		**20.9**	----	----	----	----
Ionic Balance	----	0.01	%		**2.68**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate 2	----	----	----	----
				Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1825293-018	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**79.3**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**97.7**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**103**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1900945**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 25-Jan-2019 12:25
Order number	: P102091	Date Analysis Commenced	: 25-Jan-2019
C-O-C number	: ----	Issue Date	: 04-Feb-2019 15:33
Sampler	: SCOTT AULSEBROOK		
Site	: ----		
Quote number	: BN/451/16 V4		
No. of samples received	: 18		
No. of samples analysed	: 13		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised for some samples due to matrix interference.
- EG020T (Total Metals by ICP-MS): Limit of reporting raised for some samples due to matrix interference.
- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.22	7.27	7.30	9.55	7.46
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		9140	7320	23000	9070	3420
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5800	4120	14200	4990	1910
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	15	8	12	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	64	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		57	666	393	18	535
Total Alkalinity as CaCO3	----	1	mg/L		57	666	393	82	535
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		126	105	459	145	36
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3090	1980	7960	3020	808
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		558	192	727	32	96
Magnesium	7439-95-4	1	mg/L		133	282	553	22	120
Sodium	7440-23-5	1	mg/L		1130	983	4140	1900	549
Potassium	7440-09-7	1	mg/L		21	5	20	146	4
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.009	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.001	<0.001	<0.001	0.008
Barium	7440-39-3	0.001	mg/L		0.202	0.110	0.371	0.221	0.137
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	0.011	0.002
Rubidium	7440-17-7	0.001	mg/L		0.029	0.009	0.032	0.466	0.005
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		8.27	4.95	46.6	4.95	2.24
Iron	7439-89-6	0.05	mg/L		0.47	<0.05	0.91	<0.05	0.21
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.02	0.14	0.02	0.13	0.04

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.010**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	**0.001**	<0.001	**0.007**
Barium	7440-39-3	0.001	mg/L		**0.215**	**0.122**	**1.03**	**0.260**	**0.125**
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	<0.001	**0.003**	**0.014**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.02**	**5.11**	**46.8**	**6.13**	**2.22**
Iron	7439-89-6	0.05	mg/L		**0.51**	**0.37**	**1.03**	**0.30**	**0.24**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.2**	**0.1**	**0.2**	**0.5**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	<0.05	<0.05	<0.05	<0.01
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**90.9**	**71.3**	**242**	**89.8**	**34.2**
Total Cations	----	0.01	meq/L		**88.5**	**75.7**	**262**	**89.8**	**38.6**
Ionic Balance	----	0.01	%		**1.36**	**2.94**	**4.05**	**0.03**	**6.06**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**107**	**104**	**107**	**107**	**101**
Toluene-D8	2037-26-5	2	%		**100**	**98.3**	**98.9**	**100**	**101**
4-Bromofluorobenzene	460-00-4	2	%		**109**	**109**	**112**	**110**	**112**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.44	7.08	7.37	7.45	7.91
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		7940	53000	7020	11000	2080
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		4460	36400	3970	6550	1140
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		20	1810	946	8	50
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		790	386	735	107	623
Total Alkalinity as CaCO3	----	1	mg/L		790	386	735	107	623
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		169	917	86	2	139
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2220	19500	1870	3820	248
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		135	683	128	320	37
Magnesium	7439-95-4	1	mg/L		188	1970	262	160	72
Sodium	7440-23-5	1	mg/L		1410	10400	1070	1890	367
Potassium	7440-09-7	1	mg/L		8	3	6	20	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.024	<0.005	0.004	0.003	0.003
Barium	7440-39-3	0.001	mg/L		0.126	0.200	0.207	8.59	0.020
Molybdenum	7439-98-7	0.001	mg/L		0.001	<0.005	0.001	0.002	0.018
Rubidium	7440-17-7	0.001	mg/L		0.011	0.007	0.007	0.028	0.007
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		4.64	20.4	3.55	12.4	0.636
Iron	7439-89-6	0.05	mg/L		0.32	<0.05	<0.05	0.62	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.48	43.0	25.8	0.21	0.18

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.035**	**0.036**	**0.010**	**0.004**	**0.003**
Barium	7440-39-3	0.001	mg/L		**0.142**	**0.408**	**2.07**	**8.56**	**0.022**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.006**	**0.002**	**0.002**	**0.020**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	**0.008**	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**4.21**	**21.8**	**3.90**	**12.2**	**0.672**
Iron	7439-89-6	0.05	mg/L		**1.61**	**75.3**	**72.6**	**0.92**	**0.39**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**0.0002**	**0.0002**	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.3**	**0.5**	**0.2**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	**1.26**	**1.13**	<0.05	**0.06**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**81.9**	**577**	**69.2**	**110**	**22.3**
Total Cations	----	0.01	meq/L		**83.7**	**649**	**74.6**	**112**	**23.9**
Ionic Balance	----	0.01	%		**1.10**	**5.86**	**3.77**	**0.87**	**3.30**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		**790**	<50	**150**	<50	**130**
C15 - C28 Fraction	----	100	µg/L		**6140**	**140**	**8230**	<100	**2310**
C29 - C36 Fraction	----	50	µg/L		**2300**	**80**	**8890**	<50	**750**
^ C10 - C36 Fraction (sum)	----	50	µg/L		**9230**	**220**	**17300**	<50	**3190**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		**2150**	<100	**200**	<100	**210**
>C16 - C34 Fraction	----	100	µg/L		**6500**	**190**	**15500**	<100	**2850**
>C34 - C40 Fraction	----	100	µg/L		**1640**	<100	**4130**	<100	**450**
^ >C10 - C40 Fraction (sum)	----	100	µg/L		**10300**	**190**	**19800**	<100	**3510**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		**2150**	<100	**200**	<100	**210**
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**110**	**107**	**106**	**104**
Toluene-D8	2037-26-5	2	%		**100.0**	**98.0**	**103**	**99.9**	**103**
4-Bromofluorobenzene	460-00-4	2	%		**112**	**110**	**115**	**113**	**110**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
			Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.67**	**7.54**	**7.45**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**31700**	**12100**	**11000**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**19500**	**7350**	**6640**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**3750**	**154**	**13**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**1180**	**218**	**107**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**1180**	**218**	**107**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**396**	**154**	**3**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**10700**	**4150**	**3900**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**101**	**314**	**323**	----	----
Magnesium	7439-95-4	1	mg/L	**521**	**134**	**160**	----	----
Sodium	7440-23-5	1	mg/L	**7610**	**2310**	**1880**	----	----
Potassium	7440-09-7	1	mg/L	**4**	**14**	**20**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.05	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.005	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.007**	**0.005**	**0.003**	----	----
Barium	7440-39-3	0.001	mg/L	**0.252**	**0.616**	**8.61**	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.008**	**0.006**	**0.002**	----	----
Rubidium	7440-17-7	0.001	mg/L	<0.005	**0.021**	**0.028**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.05	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.005	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**7.29**	**19.9**	**12.7**	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**0.64**	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**55.3**	**1.97**	**0.22**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
				Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.005	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.020**	**0.007**	**0.004**	----	----
Barium	7440-39-3	0.001	mg/L		**0.870**	**0.665**	**8.78**	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.015**	**0.006**	**0.002**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.05	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L		<0.005	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L		**8.09**	**18.6**	**12.5**	----	----
Iron	7439-89-6	0.05	mg/L		**113**	**3.12**	**0.96**	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.6**	**0.2**	**0.2**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.68**	**0.08**	<0.05	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**334**	**125**	**112**	----	----
Total Cations	----	0.01	meq/L		**379**	**128**	**112**	----	----
Ionic Balance	----	0.01	%		**6.37**	**1.15**	**0.29**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L		**60**	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L		**170**	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		**230**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L		**180**	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		**180**	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
				Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
					Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**106**	**107**	----	----
Toluene-D8	2037-26-5	2	%		**98.8**	**101**	**102**	----	----
4-Bromofluorobenzene	460-00-4	2	%		**109**	**111**	**112**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1909239**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Anna Riddell
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61 7 4952 5795
Project	: IPCM	Date Samples Received	: 16-Apr-2019 08:20
Order number	: P102091	Date Analysis Commenced	: 18-Apr-2019
C-O-C number	: ----	Issue Date	: 02-May-2019 09:50
Sampler	: SCOTT AULSEBROOK		
Site	: ----		
Quote number	: TV/005/19		
No. of samples received	: 17		
No. of samples analysed	: 11		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EG020-T (Total Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- It is recognised that EG020T (Total Metals) is less than EG020F (Dissolved Metals) for some samples. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1	BC2	MB7	MB1	MB2
				Client sampling date / time	15-Apr-2019 13:35	15-Apr-2019 08:40	15-Apr-2019 15:00	15-Apr-2019 10:45	15-Apr-2019 09:50
Compound	CAS Number	LOR	Unit		EB1909239-001	EB1909239-002	EB1909239-004	EB1909239-006	EB1909239-007
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.15	7.25	7.30	7.34	7.32
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		8870	7280	18400	3360	7840
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		6370	4500	12700	1840	4550
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	54	<5	30
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		58	613	201	526	776
Total Alkalinity as CaCO3	----	1	mg/L		58	613	201	526	776
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		122	104	100	38	159
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3130	2180	6530	849	2220
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		608	227	610	97	154
Magnesium	7439-95-4	1	mg/L		137	315	232	116	198
Sodium	7440-23-5	1	mg/L		1180	1020	3190	525	1460
Potassium	7440-09-7	1	mg/L		22	5	18	3	8
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.02
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	0.006	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.001	<0.001	<0.001	0.008	0.036
Barium	7440-39-3	0.001	mg/L		0.217	0.148	0.803	0.125	0.135
Molybdenum	7439-98-7	0.001	mg/L		0.001	<0.001	0.129	0.001	0.002
Rubidium	7440-17-7	0.001	mg/L		0.032	0.010	0.039	0.003	0.012
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		8.37	5.52	47.8	2.11	4.57
Iron	7439-89-6	0.05	mg/L		0.23	<0.05	<0.05	0.05	0.43
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.06	0.03	0.70	0.02	0.65

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1	BC2	MB7	MB1	MB2
				Client sampling date / time	15-Apr-2019 13:35	15-Apr-2019 08:40	15-Apr-2019 15:00	15-Apr-2019 10:45	15-Apr-2019 09:50
Compound	CAS Number	LOR	Unit		EB1909239-001	EB1909239-002	EB1909239-004	EB1909239-006	EB1909239-007
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.010**	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	**0.001**	**0.007**	**0.034**
Barium	7440-39-3	0.001	mg/L		**0.227**	**0.135**	**3.59**	**0.114**	**0.141**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.162**	**0.002**	**0.003**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.49**	**5.50**	**51.0**	**2.17**	**4.67**
Iron	7439-89-6	0.05	mg/L		**0.19**	**0.08**	**3.97**	**0.08**	**1.35**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.1**	**0.1**	**0.4**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	**0.01**	**0.03**	<0.01	**0.04**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**92.0**	**75.9**	**190**	**35.2**	**81.4**
Total Cations	----	0.01	meq/L		**93.5**	**81.7**	**189**	**37.3**	**87.7**
Ionic Balance	----	0.01	%		**0.82**	**3.70**	**0.41**	**2.83**	**3.70**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1	BC2	MB7	MB1	MB2
				Client sampling date / time	15-Apr-2019 13:35	15-Apr-2019 08:40	15-Apr-2019 15:00	15-Apr-2019 10:45	15-Apr-2019 09:50
Compound	CAS Number	LOR	Unit		EB1909239-001	EB1909239-002	EB1909239-004	EB1909239-006	EB1909239-007
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**96.7**	**94.3**	**94.3**	**95.0**	**91.8**
Toluene-D8	2037-26-5	2	%		**99.0**	**100**	**102**	**102**	**100**
4-Bromofluorobenzene	460-00-4	2	%		**99.0**	**95.1**	**97.1**	**98.9**	**97.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4A	MB4B	MB8B	MB9A	MB9B
				Client sampling date / time	15-Apr-2019 08:37	15-Apr-2019 07:15	15-Apr-2019 12:20	15-Apr-2019 15:10	15-Apr-2019 16:00
Compound	CAS Number	LOR	Unit		EB1909239-009	EB1909239-010	EB1909239-013	EB1909239-014	EB1909239-015
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.95	7.55	7.45	7.38	7.87
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		50800	30200	12000	10800	1890
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		42400	20400	7880	7170	1110
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		1180	1290	133	<5	8
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		398	1150	183	102	566
Total Alkalinity as CaCO3	----	1	mg/L		398	1150	183	102	566
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		918	384	126	<1	91
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19000	10500	4180	3860	255
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		622	84	374	360	47
Magnesium	7439-95-4	1	mg/L		1830	446	126	155	85
Sodium	7440-23-5	1	mg/L		9010	6400	2270	1820	306
Potassium	7440-09-7	1	mg/L		2	3	14	20	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.05	<0.05	<0.01	<0.01	0.02
Antimony	7440-36-0	0.001	mg/L		<0.005	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.005	<0.005	0.005	0.002	0.002
Barium	7440-39-3	0.001	mg/L		0.204	0.173	0.637	8.38	0.171
Molybdenum	7439-98-7	0.001	mg/L		<0.005	0.007	0.005	<0.001	0.020
Rubidium	7440-17-7	0.001	mg/L		0.007	<0.005	0.026	0.032	0.008
Selenium	7782-49-2	0.01	mg/L		<0.05	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		0.007	<0.005	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		20.5	6.62	20.5	13.6	0.752
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	0.45	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		6.02	11.9	1.79	0.14	0.27

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4A	MB4B	MB8B	MB9A	MB9B
				Client sampling date / time	15-Apr-2019 08:37	15-Apr-2019 07:15	15-Apr-2019 12:20	15-Apr-2019 15:10	15-Apr-2019 16:00
Compound	CAS Number	LOR	Unit		EB1909239-009	EB1909239-010	EB1909239-013	EB1909239-014	EB1909239-015
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.005	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.007**	**0.008**	**0.005**	**0.001**	**0.002**
Barium	7440-39-3	0.001	mg/L		**0.249**	**0.294**	**0.736**	**9.53**	**0.222**
Molybdenum	7439-98-7	0.001	mg/L		<0.005	**0.008**	**0.005**	<0.001	**0.021**
Selenium	7782-49-2	0.01	mg/L		<0.05	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.005	<0.005	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**22.6**	**7.34**	**20.0**	**13.2**	**0.748**
Iron	7439-89-6	0.05	mg/L		**9.89**	**26.2**	**1.90**	**0.72**	**0.46**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.6**	**0.2**	**0.1**	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.16**	**0.26**	**0.04**	**0.01**	**0.07**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**563**	**327**	**124**	**111**	**20.4**
Total Cations	----	0.01	meq/L		**574**	**319**	**128**	**110**	**22.8**
Ionic Balance	----	0.01	%		**0.93**	**1.21**	**1.56**	**0.24**	**5.52**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4A	MB4B	MB8B	MB9A	MB9B
				Client sampling date / time	15-Apr-2019 08:37	15-Apr-2019 07:15	15-Apr-2019 12:20	15-Apr-2019 15:10	15-Apr-2019 16:00
Compound	CAS Number	LOR	Unit		EB1909239-009	EB1909239-010	EB1909239-013	EB1909239-014	EB1909239-015
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**99.9**	**94.7**	**91.4**	**90.0**	**94.7**
Toluene-D8	2037-26-5	2	%		**97.4**	**104**	**104**	**98.1**	**101**
4-Bromofluorobenzene	460-00-4	2	%		**97.2**	**102**	**98.9**	**95.4**	**97.6**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	IPCM GW Duplicate	----	----	----	----
			Client sampling date / time	15-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1909239-017	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.30**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**8890**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**6100**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**51**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**51**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**122**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3120**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**608**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**133**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**1150**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**22**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.226**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.034**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**8.85**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.30**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate	----	----	----	----
				Client sampling date / time	15-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1909239-017	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.235**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L		**8.51**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.26**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**91.6**	----	----	----	----
Total Cations	----	0.01	meq/L		**91.9**	----	----	----	----
Ionic Balance	----	0.01	%		**0.16**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	IPCM GW Duplicate	----	----	----	----
				Client sampling date / time	15-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1909239-017	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**90.5**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**103**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**96.0**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

APPENDIX 2: IPC EXCEEDANCE INVESTIGATION

C&R CONSULTING
Geochemical & Hydrobiological Solutions Pty Ltd
ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
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ISAAC PLAINS COMPLEX

Groundwater Exceedance Investigation

REPORT PREPARED FOR:

stanmore IP Coal

Date: 1st May 2019

IMPORTANT NOTE

Dr Chris Cuff
Director

01/05/2019
Date

Dr Cecily Rasmussen
Director

01/05/2019
Date

IMPORTANT INFORMATION

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5. This report contains only available factual data obtained for the site/s from the sources described in the text. These data were related to the site/s on the basis of the location information made available to C&R Consulting by the client.
6. The assessment of the site/s is based on information supplied by the client, and on-site inspections by C&R Consulting.
7. The report reflects both the information provided to C&R Consulting in documents made available for review and the results of observations and consultations by C&R Consulting staff.

SUMMARY OF RELEVANT INFORMATION

Project Title	Groundwater Exceedance Investigation
Property Location	Isaac Plains Complex
Property Description	Open cut coal mine
Project Purpose	Undertake an investigation into the potential for environmental harm in accordance with EA Condition C46
Project Number	19010
Client's Details	
Nominated Representative	Melanie Ballantine
Title/Position	Senior Advisor – Health, Safety, Environment and Community
Company	Stanmore IP Coal Pty Ltd
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Author's Details	
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DOCUMENT CONTROL

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Draft 1	S Kennare	23/04/2019	Dr C Rasmussen	23/04/2019
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FINAL	S Kennare	01/05/2019	-	-

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1. INTRODUCTION

Stanmore IP Coal Pty Ltd (Stanmore) operates the Isaac Plains Complex (IPC) under Environmental Authority (EA) EPML00932713 dated 24 January 2018. The IPC includes both the Isaac Plains Mine (IPM) and Isaac Plains East (IPE) open-cut coal projects.

In accordance with EA Condition **C45**, IPC monitor groundwater levels and water quality on a quarterly basis from a network of 11 groundwater monitoring bores within close proximity to the mining leases. Two of the monitoring bores, Burton Coal Bore 2 and Swamp Bore 1, are assessed against Groundwater Contaminant Triggers (GCTs) defined in EA Table 12.

During January 2019 quarterly water quality monitoring results from Burton Coal Bore 2 exceeded the GCT for Electrical Conductivity (EC), Total Dissolved Solids (TDS), calcium, chloride, magnesium and sodium. In accordance with EA Condition **C46**, Stanmore have enlisted C&R Consulting Pty Ltd (C&R) to investigate the potential for environmental harm resulting from the exceedances.

1.1 SCOPE

This investigation will investigate the potential for environmental harm from the January 2019 groundwater exceedances through:

- Statistical analysis of the standing water levels and water quality of Burton Coal Bore 2 since March 2010;
- Examination of the climatic conditions influencing groundwater levels and quality;
- Assessment of mining activities on groundwater levels and quality.

If/as required, this investigation will also make recommendations for appropriate actions to prevent further exceedances.

2. BACKGROUND

2.1 MINE DETAILS AND LOCATION

IPC is located within the Isaac Regional Council on both Freehold Land and State Leasehold Land in Central Queensland, approximately 10 km to the northeast of Moranbah and 140 km south-west of Mackay (Figure 1). The project is situated immediately north of the Peak Downs Highway between Moranbah and Coppabella and has a rail loop off the south of the Goonyella Branch Rail Line (Figure 1).

Historically IPC operations have been conducted on ML70342, separated into five primary pits, N1, N2, S1, S2 and the S3 Pits. The N pits are north of Smoky Creek which bisects the mining lease area. The three S pits are south of this watercourse, with the S3 Pit currently acting as the main water storage for the site.

IPE operations were granted approval in 2018, involving the expansion of IPC operations into ML700016, ML700017, ML700018 and ML700019. Initial on-ground works commenced in the second half of 2018.

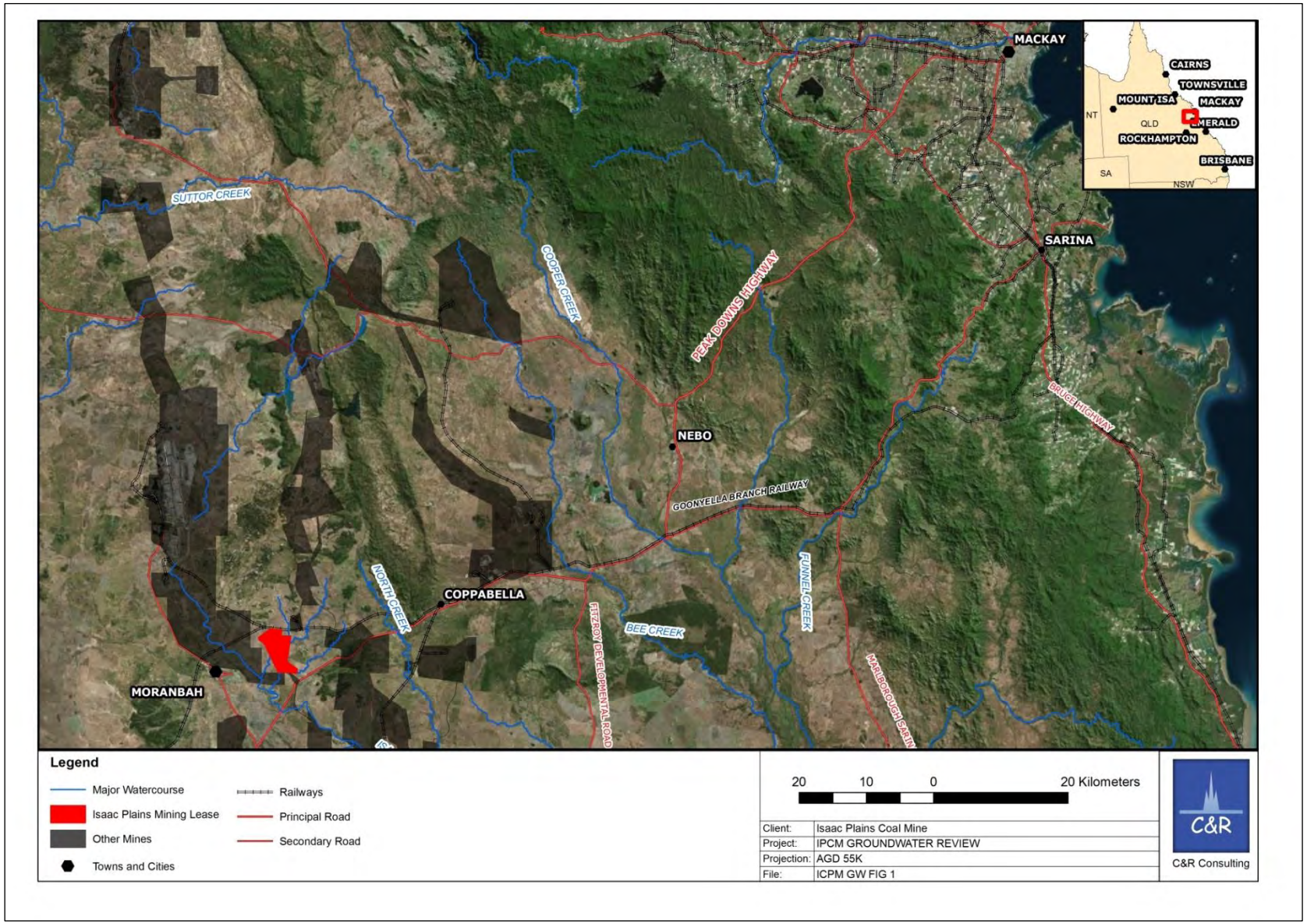

Figure 1: IPC location within Central Queensland

2.2 RAINFALL

Rainfall in Central Queensland's seasonally arid tropics is notoriously inconsistent in its intensity, duration and location. The climate of the area is dominated by intense rainfall events throughout the summer months (wet season). These rainfall events are often highly variable in their spatial and temporal distribution, with the majority of the rain falling in distinct, spatially separated cells across the landscape.

Minimal rain falls throughout the dry season, with an occasional shower in June or July. Evaporation tends to exceed rainfall for almost all days of the year except during intense rainfall events. The extended dry season causes baking and crusting of surface soils. These processes cause greatly reduced infiltration of surface soils unless suitable pre-wetting is provided by gentle rain prior to the wet season. During the onset of the wet season, in the absence of gentle pre-wetting rains, >90% of rainfall can eventuate as runoff throughout catchments, reporting to waterways and altering stage-discharge relationships beyond modelled capacities. Even in the event of pre-wetting, the rainfall intensity is often high enough to exceed the infiltration capacity of the soils, generating significant runoff. This increased runoff has the potential to increase the volume of sediments delivered to waterways and result in sediment movement throughout waterways.

Rainfall data from the Bureau of Meteorology stations at the Moranbah water treatment plant (April 1972 to January 2012) and the Moranbah airport (February 2012 to present) are displayed in Figure 2. Application of a 5 year running average shows a cyclicity of wet and dry periods over the last 47 years. The cycle appears to peak every 10-15 years. The chart shows that over the most recent 7 years (since 2012), the dry period can be characterised as both lasting longer than usual and the driest on record.

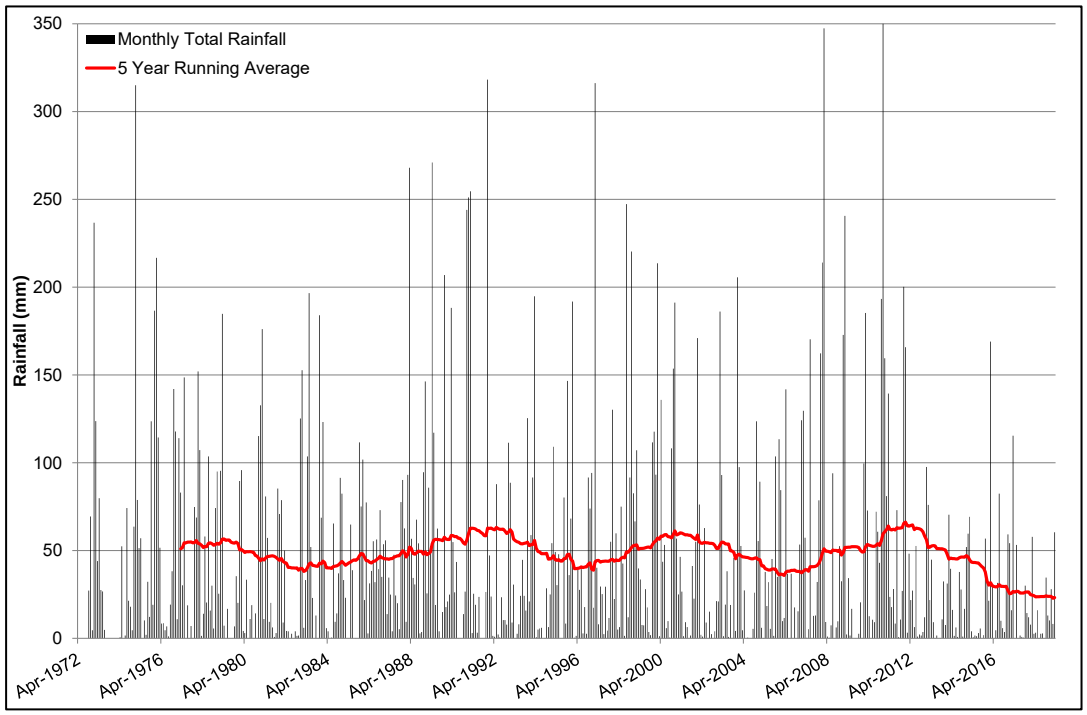

Figure 2: Monthly rainfall totals

2.3 REGIONAL HYDROGEOLOGY

There are three principal hydrostratigraphic units within the Isaac Plains tenement areas:

- Recent sediments (alluvium and colluvium).
- Cenozoic (formerly Tertiary) basalt.
- Late Permian Rangal and Fort Cooper Coal Measures: sandstone, siltstone and coal (see Table 1).

The alluvium and colluvium are associated with channel deposits of Smoky Creek and the Isaac River (Table 1). Cenozoic basalt crops out to the north-east of tenement ML70342 and particular basalt flows constitute aquifers in several surrounding areas. Confinement of the Late Permian strata is variable locally, depending on pressure distribution and depth. Stratigraphic descriptions for each unit are provided in Table 1.

Surface distribution of each unit is complicated by several regional structures, including at least one syncline, and thrust faults truncating the eastward-dipping target beds. The aquifers of the Isaac Plains area are described in the following sections, with reference made to aquifer characteristics, groundwater flow and groundwater quality for each unit.

Table 1: Stratigraphic units of the Isaac Plains region

Map Sym[#]	Age	Group	Name/Formation	Short Description
Cza	Quaternary		Alluvium	Alluvium: mud, sand, minor gravel Colluvium and residual soil: mud, sand, gravel[##]
Czb	Cenozoic		Cenozoic basalt	Basalt flows
Czs*			Suttor Formation*	Sandstone, mudstone, claystone
Ki*	Cretaceous		Unnamed*	Instrusives: granodiorite, diorite, gabbro
TRr	Triassic	Rewan Gp.	Rewan Fm.	Green lithic sandstone, green and red sandstone and mudstone.
Pwj	Permian	Blackwater Group	Rangal Coal Measures	Lithic sandstone, coal, siltstone, carbonaceous shale, mudstone (locally cherty), rare pebbly sandstone.
Pwt			Fort Cooper Coal Measures	Medium to coarse-grained, volcanolithic sandstone, conglomerate, tuff, tuffaceous mudstone, coal, shale.
Pwb*			Mooranbah Coal Measures*	Lithic sandstone, siltstone, shale, coal, mudstone, conglomerate.
Pb*		Back Creek Group*		Marine sandstone, siltstone, shale

*Formation/unit is present outside the lease area and is not discussed at length in the text.

[#]Map symbols as per 1:100, 000 Geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (GSQ, 2014).

[##]Several generations of alluvium and colluvium exist, but only the older, more substantive one is mapped in 1:100, 000 Geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (GSQ, 2014).

3. GROUNDWATER MONITORING NETWORK

The details of the bores included in the groundwater monitoring programme as stipulated in the EA Condition **C43** are summarised in Table 2, with their spatial distribution shown in Figure 3. The bores listed in Table 2 (EA Table 11) are designated as 'Reference Bores' and have been selected to provide ongoing baseline data during mine operations at the IPC.

Bore assessments were completed on Burton Coal Bore 2 and Swamp Bore 1 in June 2018, and included downhole camera surveys for each bore to confirm bore construction details. The construction details of monitoring bores MB1, MB2, MB3, MB4, MB5 and MB6 were sourced from AGE Consultants (2016). Monitoring bores MB3 and MB5 are currently located within the footprint of the proposed IPE open pitsand will be mined out as part of the project development. Consequently, two new monitoring bores were drilled and constructed east of IPC during May to June 2018, These bores are identified as MB8 and MB9.

Installation of monitoring bore MB11 was a requirement of Condition **C45** and **C51** of the IPC EA. Based on the regional geological mapping of the 1:250,000 Mount Coolon geology map sheet, the location of MB11 (identified in the EA) was anticipated to be within the target aquifer of the Quaternary alluvium. However, during the drilling for this bore alluvium was not encountered.

Table 2: Groundwater Monitoring Bores at IPC

Monitoring Point	Aquifer Type	Easting (GDA 94)[1]	Northing (GDA 94)[1]	Surface RL (mAHD)[1]
Burton Coal Bore 2	Rewan Formation	620614.14	7573946.89	240.67
Swamp Bore 1	Rewan Formation	621750.30	7569146.43	245.85
MB1	Coal Measures	618792.07	7572213.34	236.54
MB2	Coal Measures	619073.69	7573129.11	242.88
MB3	Coal Measures	619047.07	7568472.36	253.00
MB4a	Quaternary colluvium/Tertiary sediments	620355.06	7567481.37	237.00
MB4b		619625.60	7567072.68	231.44
MB5	Coal Measures	618507.07	7570878.35	241.83
MB8	Coal Measures	618990.97	7570968.22	245.50
MB9	Coal Measures	620254.18	7567865.36	238.95
MB10	Tertiary Basalt	620255.02	7567872.67	238.94
MB11	Tertiary Sediments/Weathered Rewan Group	618717.61	7571743.16	231.77

1 - Source Klohn Crippen Berger 2018.

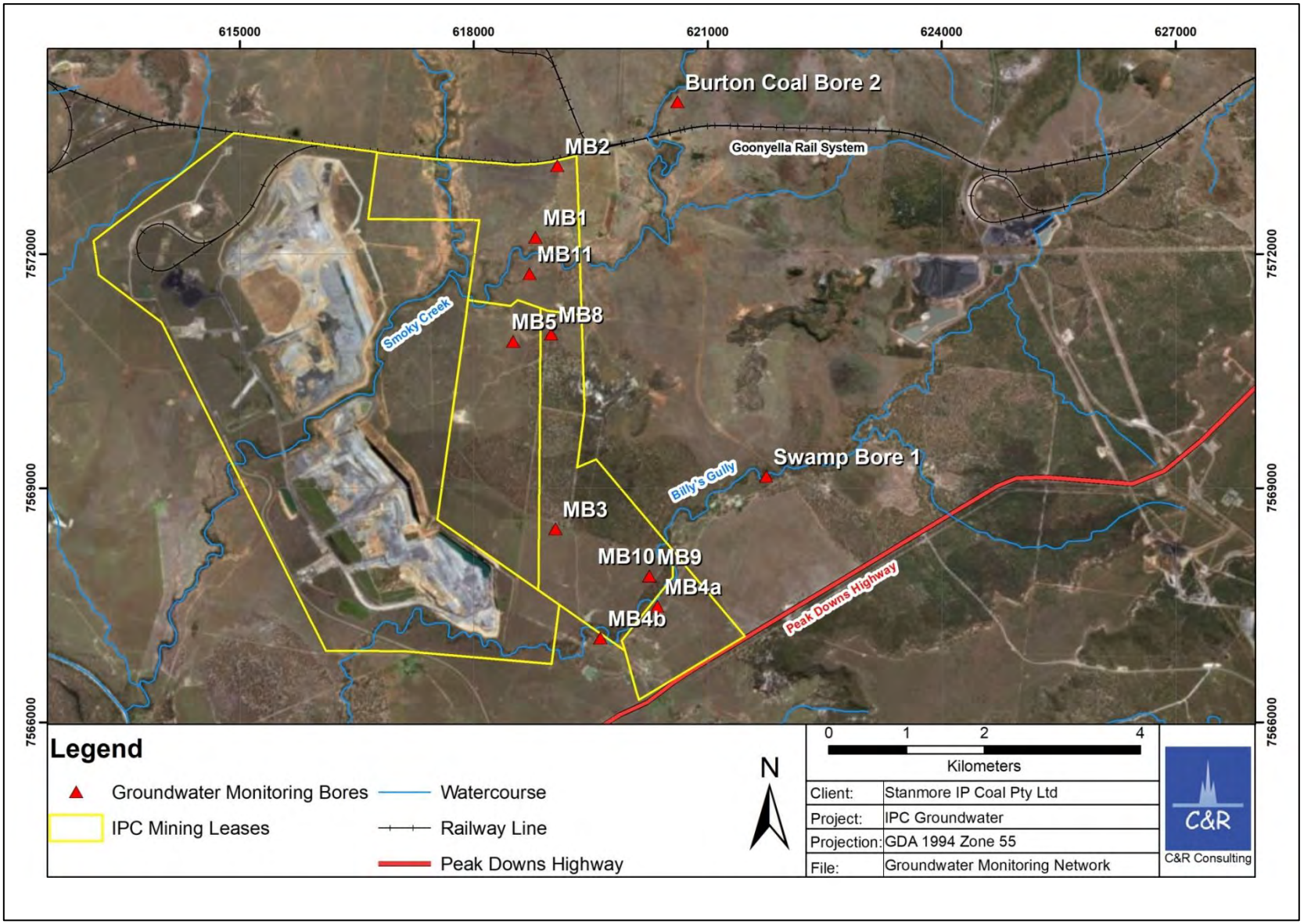

Figure 3: Groundwater Monitoring Network at IPC

4. EXCEEDANCE INVESTIGATION

4.1 BURTON COAL BORE 2

Groundwater in the vicinity of the IPC generally follows surface topography in a southwest direction (KCB 2016). The Burton Coal Bore 2 is positioned hydraulically up-gradient of mining at the IPC, adjacent to Smoky Creek and the Goonyella Rail System.

The bore targets the Rewan Group stratigraphic unit characterised by saline water quality associated with the low hydraulic conductivity and long residence time of the groundwater (KCB 2016). The aquifer is recharged via rainfall infiltration in areas where the unit outcrops, as well as from seepage from the overlying stratigraphic units (KCB 2016).

The Burton Coal Bore 2 is not currently used as a water supply (KCB 2016).

4.2 DATA ANALYSIS

Data supplied to C&R for the purpose of this investigation included excel spreadsheets, Laboratory Certificates of Analysis and groundwater field sheets. Multiple exceedances with Burton Coal Bore 2 were noted in the January 2019 round of groundwater monitoring (Table 3). Time series charts were generated for each exceeding parameter to identify the potential for trending results. The IBM SPSS software package was used to undertake bivariate correlation analysis between parameters to quantify any observed relationships.

Standing water levels and water quality are currently measured on a quarterly basis and have been recorded from Burton Coal Bore 2 (BCB2) on 33 occasions since June 2008.

Table 3: Burton Coal Bore 2 exceedance values in January 2019

Parameter	Unit	EA Trigger Value	BCB2 Jan 2019 Value
Calcium	mg/L	170	192
Chloride	mg/L	1900	1980
Total Dissolved Solids	mg/L	3900	4120
Electrical Conductivity	µS/cm	6700	7320
Magnesium	mg/L	230	282
Sodium	mg/L	931	983

4.3 DATA QUALITY CONTROL

Raw data for the investigation was provided by Stanmore and cross-checked against Laboratory Certificates of Analysis where provided. Outliers were not addressed as part of this investigation. No data were removed nor added.

A previously identified error in bore identification (C&R 2016) between March 2013 and March 2014 was addressed during the data analysis stage of the investigation. Between these dates, the EA compliance bores Burton Coal Bore 2 and Swamp Bore 1 were cross-labelled on field sheets and laboratory certificates. The erroneous sampling results were identified for this investigation through analysis of standing water levels and major ion compositions.

4.4 STANDING WATER LEVEL

Standing water levels in Burton Coal Bore 2 have been recorded since June 2008 (Figure 4). When the standing water levels are overlayed with local rainfall, the bore appears to be highly influenced by rain (or lack thereof), supporting the claim that the aquifer is recharged via rainfall infiltration.

Over the 2011 wet season, the standing water level rose sharply following high rainfall totals and then declined steadily in the following years alongside marginal wet seasons. The level rose again following higher rainfall totals in the 2016 and 2017 wet seasons, but has subsequently declined following dryer years thereafter (Figure 4).

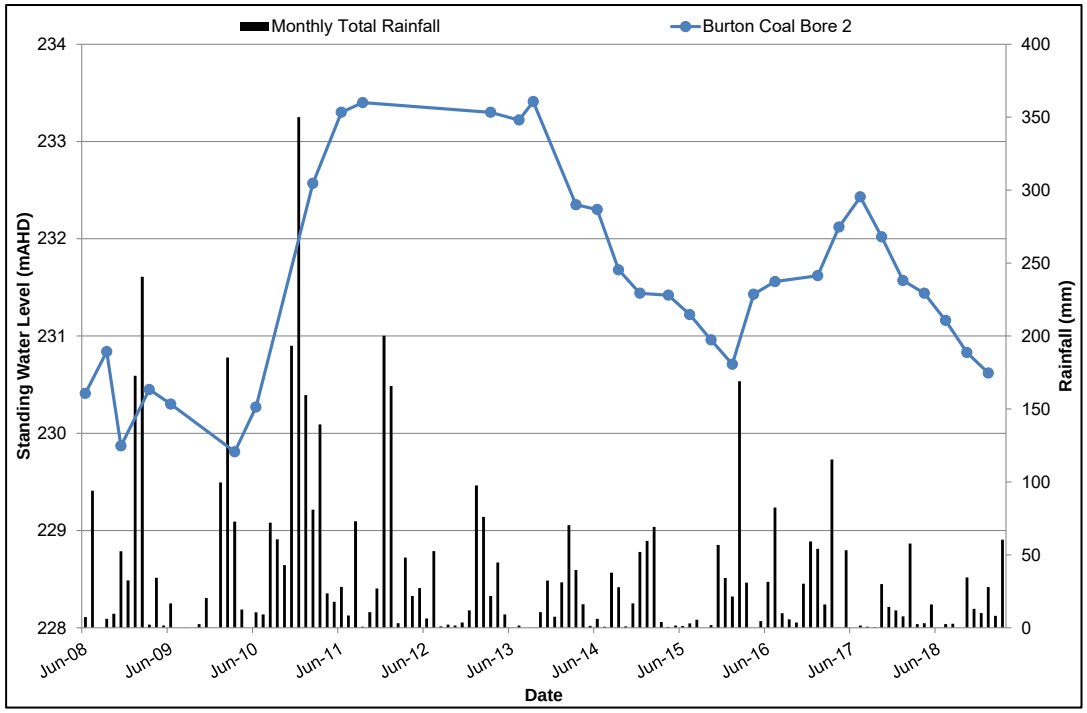

Figure 4: Local rainfall and standing water level in Burton Coal Bore 2

EA Condition **C47** and EA Table 13 state that the groundwater levels in Burton Coal Bore 2 must not exceed the trigger level threshold of 2 m. The EA fails to define a time period for the threshold to be measured. Historic records of the bore have reported standing water levels as high as 233.41 mAHD and as low as 229.81 mAHD; a range of 3.60 m. These historic levels suggest the natural variability in groundwater exceeds the threshold, and that the 2 m trigger may not be suitable for detecting mining impacts.

Further, Burton Coal Bore 2 falls within the 1-10 m groundwater depressurisation zone predicted through groundwater modelling undertaken for the IPE Environmental Assessment Report (Hansen Bailey 2016). If the model is accurate, standing water levels could decline by an additional 10 m in excess of natural variability, further suggesting the threshold trigger may not be suitable.

4.5 WATER QUALITY

Six water quality parameters exceeded the GCTs in Burton Coal Bore 2 during the January 2019 sampling round (Table 1). TDS and EC are interrelated measures of dissolved ions in water. Therefore, the exceedances of TDS and EC are a representation of elevated major ions (calcium, magnesium, sodium and chloride).

No metals or hydrocarbons exceeded the GCTs during the January 2019 sampling round. Dissolved metals were also below the ANZECC trigger values for 95% species protection.

TDS and EC were also above the ANCECC salinity tolerance for beef cattle, although the bore is not currently used as a water supply (KCB 2016).

Table 4: January 2019 exceedances in Burton Coal Bore 2

Parameter	Unit	Jan 2019 Value	EA Trigger Value	ANZECC livestock	ANZECC freshwater 95 % species protection
Aluminium	mg/L	<0.01	0.01	5	0.055
Antimony	mg/L	<0.001	0.001	-	-
Arsenic	mg/L	<0.001	0.0048	0.5	0.013
Calcium	mg/L	192	170	1000	-
Chloride	mg/L	1980	1900	-	-
Carbonate	mg/L	<1	7.9	-	-
Total Dissolved Solids	mg/L	4120	3900	4000	-
Electrical Conductivity	µS/cm	7320	6700	5970	-
Bicarbonate	mg/L	666	800	-	-
Iron	mg/L	<0.05	270	-	-
Magnesium	mg/L	282	230	-	-
Mercury	mg/L	<0.0001	0.0001	0.002	0.0006
Molybdenum	mg/L	<0.001	0.0011	0.15	-
Hydrocarbons C6-C9	µg/L	<20	20	-	-
Hydrocarbons C10-C36	µg/L	<50	50	-	-
pH	-	7.27	7.0-8.6	-	-
Potassium	mg/L	5	8.5	-	-
Selenium	mg/L	<0.01	0.01	0.02	0.011
Silver	mg/L	<0.001	0.001	-	0.00005
Sulphate	mg/L	105	123	1000	-
Sodium	mg/L	983	931	-	-
Suspended Solids	mg/L	15	30	-	-

4.6 EXCEEDED GROUNDWATER CONTAMINANT TRIGGERS

TDS recorded in Burton Coal Bore 2 since 2010 are occasionally characterised by high variability and both increasing and decreasing trends (Figure 5). The most recent trend has seen an increase in TDS to the point of exceeding the GCT (3,900 mg/L) in October 2018 and again in January 2019.

Results from a Pearson Correlation Analysis reveal the observed trends in TDS are significantly and inversely correlated to the standing water levels ($r = -0.776$, $n = 27$, $p < 0.001$). This correlation is charted in Figure 6 and reveals a clear relationship between the two (note: standing water level has been inversed for visual purposes).

The recent years of marginal wet seasons has had the effect of concentrating the dissolved solids in the aquifer system. This effect has been compounded by the fact that the region is currently within an extended dry cycle (identified in Section 2.2). The trend of increasing concentration of dissolved solids indicates water is being lost from the system, while salts remain.

The observed trends are highly indicative of evapotranspiration processes; the sum of evaporation and plant transpiration. The Burton Coal Bore 2 is located within the riparian corridor of Smoky Creek, surrounded by remnant vegetation consisting of large, deep rooted trees. Standing water levels in the bore are known to be relatively shallow, with water levels as shallow as 7.26 m below ground level. The combination of deep tree roots and capillary action can draw water from depths, lowering the zone of saturation and concentrating salts.

The current increasing trend in TDS is therefore inferred to be an expression of the climatic conditions in the area and not resulting from mining impacts.

As the TDS and EC are interrelated, similar observations are made for EC (Figure 7). The trigger value of 6700 µS/cm was exceeded in October 2018 and again in January 2019.

Four major ions exceeded the trigger values in Burton Coal Bore 2; calcium, magnesium, sodium and chloride. Time series charts for these ions are displayed in Figure 8 through Figure 11. Each chart shows both the increasing and decreasing periods closely related to TDS trends.

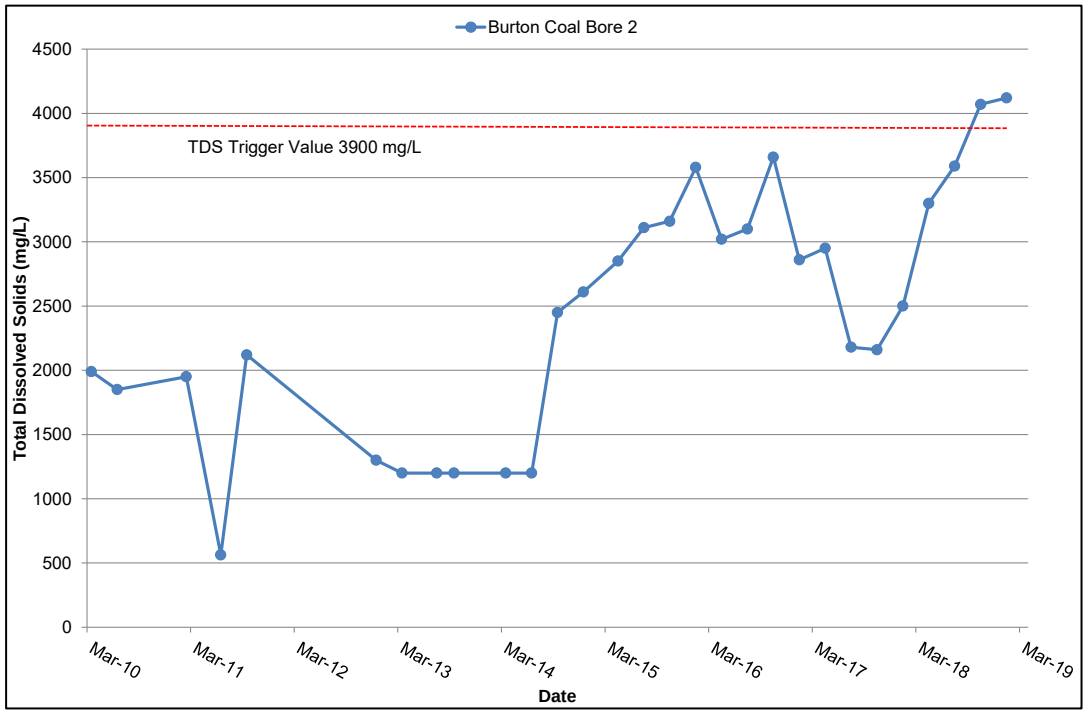

Figure 5: Total dissolved solids in Burton Coal Bore 2

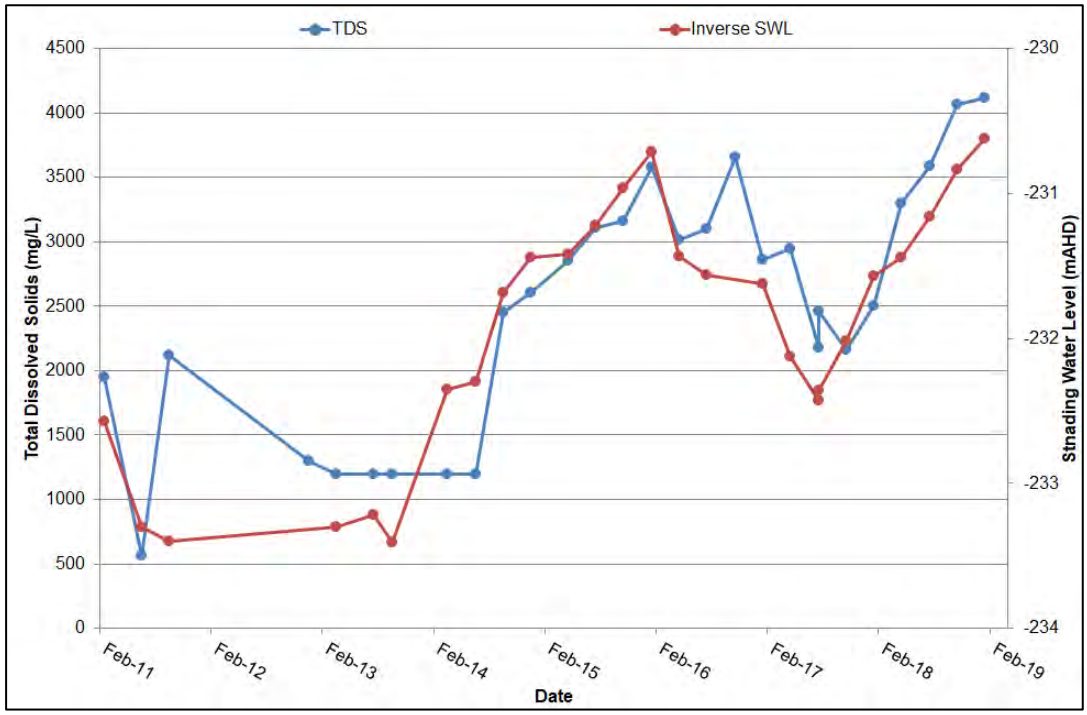

Figure 6: Total dissolved solids and inverse standing water level in Burton Coal Bore 2

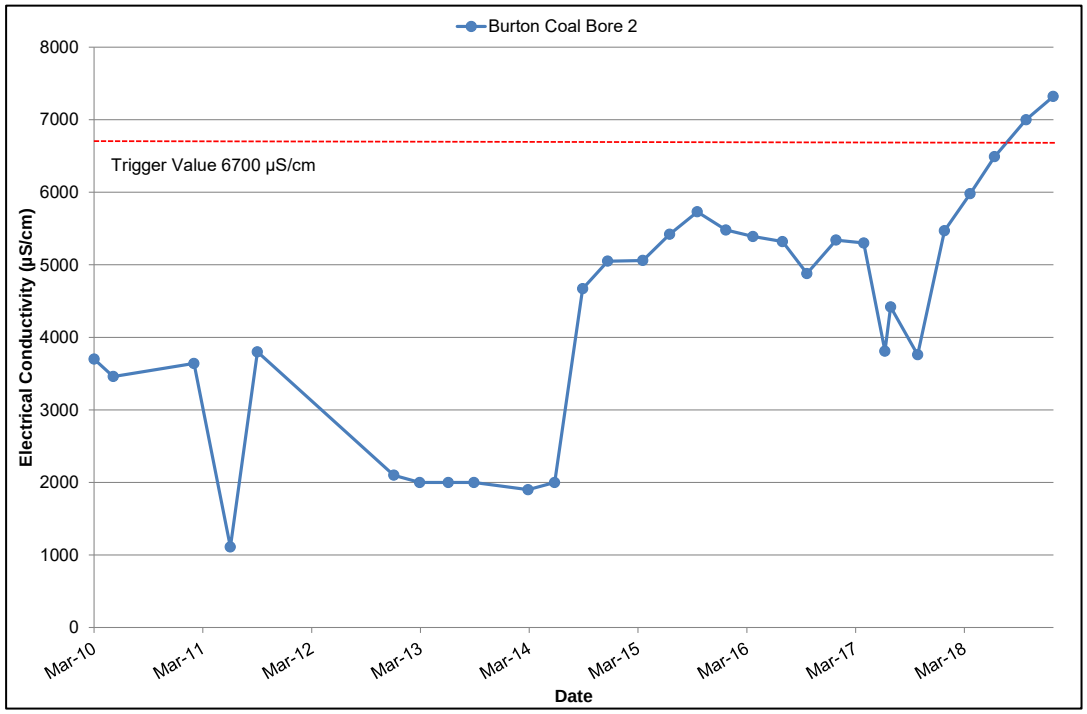

Figure 7: Electrical conductivity in Burton Coal Bore 2

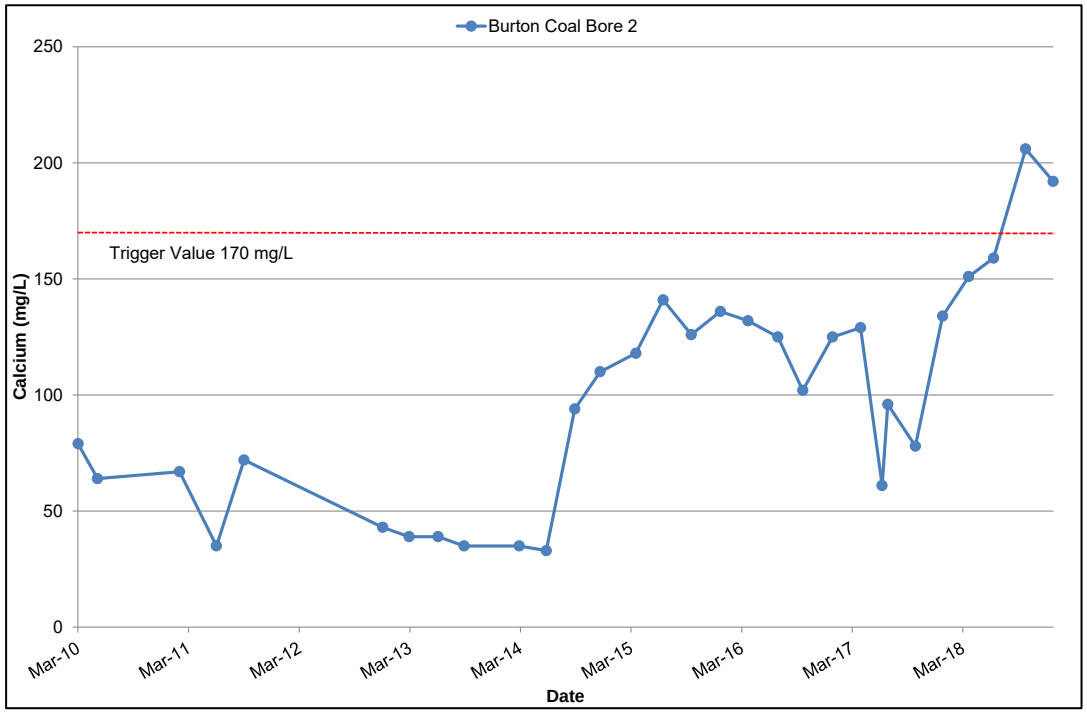

Figure 8: Calcium in Burton Coal Bore 2

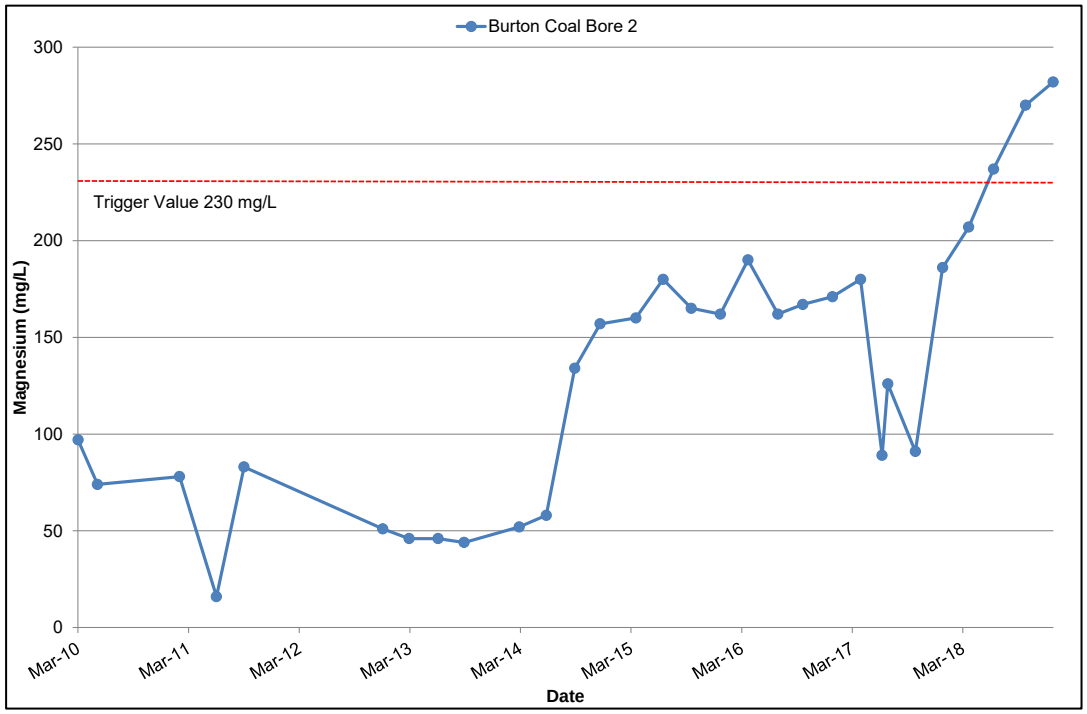

Figure 9: Magnesium in Burton Coal Bore 2

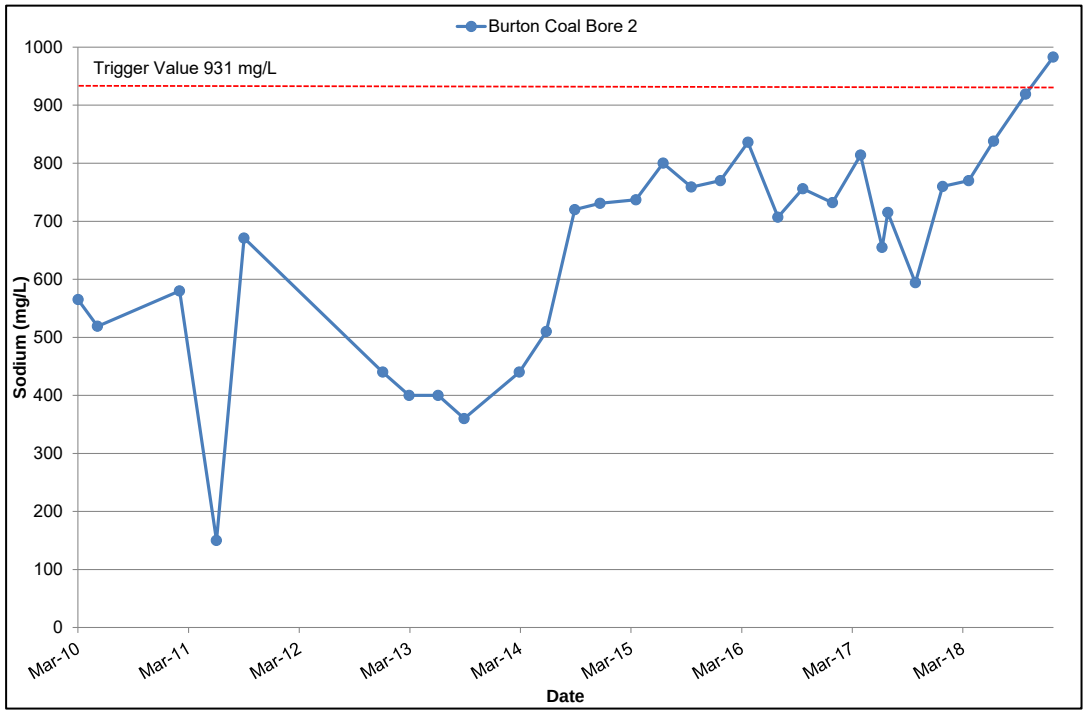

Figure 10: Sodium in Burton Coal Bore 2

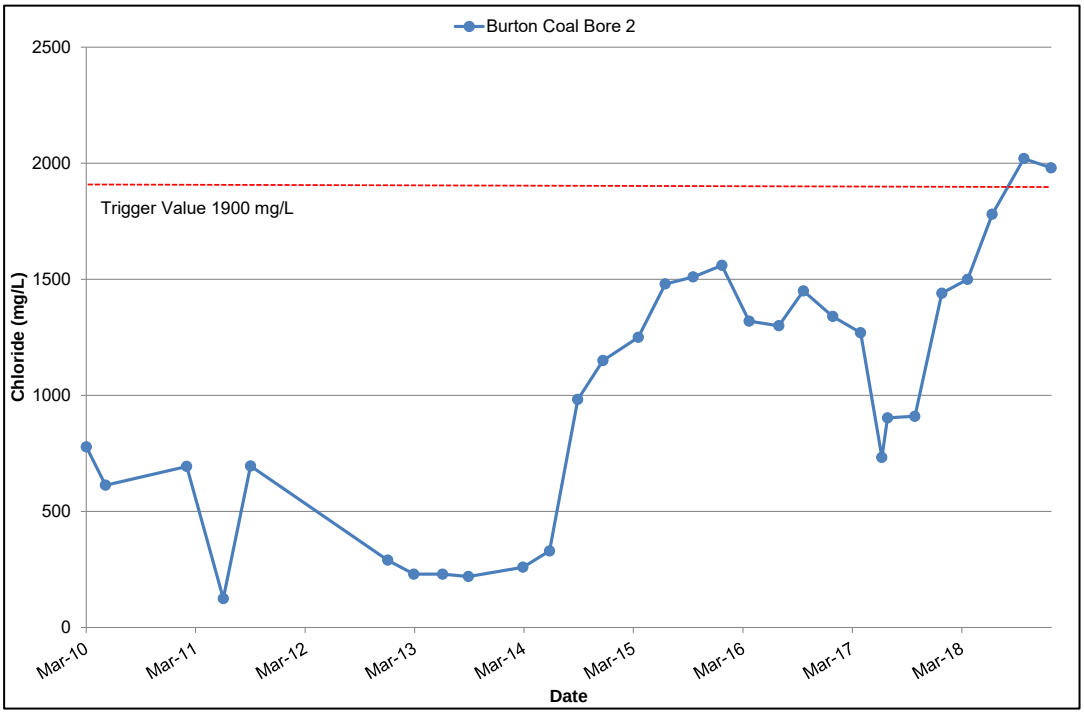

Figure 11: Chloride in Burton Coal Bore 2

5. CONCLUSIONS AND RECOMMENDATIONS

Groundwater in the vicinity of the IPC generally follows surface topography in a southwest direction (KCB 2016). The Burton Coal Bore 2 is positioned hydraulically up-gradient of mining at the IPC. The bore targets the Rewan Group stratigraphic unit which is characterised by saline water quality resulting from the low hydraulic conductivity and long residence time of the groundwater (KCB 2016). The aquifer is recharged via rainfall infiltration in areas where the unit outcrops, as well as from seepage from the overlying stratigraphic units (KCB 2016).

Examination of local rainfall data dating back to 1972 has identified a 10-year cyclical trend of wet and dry periods. The past 7 years has witnessed an extended dry period, with the 5-year average rainfall dropping to the lowest observed over the 47-year record.

The standing water level in the Burton Coal Bore 2 has been shown to be strongly influenced by local rainfall (Figure 6). Subsequently, standing water level in the bore has shown a downward trend in the recent years of marginal rainfall totals. . Statistical analysis has also determined a significant and inverse correlation between the standing water level and total dissolved solids in the bore. From this observation, it is inferred that the system is losing water through processes of evapotranspiration and not seepage or mine dewatering.

Increasing TDS and EC are driven by the increase of the major contributing ions to water quality. Thus the exceedances of TDS and EC are a representation of the increasing trends in the major ions associated with evapotranspiration.

The current groundwater trigger levels for both water quality and standing water levels fail to account for the long-term variability in climatic systems governing groundwater conditions. C&R was unable to determine the methodology used in the calculation of the current EA GCT values.

Recommendations:

- Groundwater contaminant triggers for compliance bores be reviewed to take into account the long-term variability within the targeted aquifer systems.
- Review and update current GCT compliance methods (if applicable) to current best practice methods that require consecutive exceedances of a defined limit.

Metals or hydrocarbons all reported below the associated GCT during the January 2019 sampling round. Dissolved metals were also found to be below the ANZECC trigger values for 95% species protection. While TDS in Burton Coal Bore 2 is above the ANCECC salinity tolerance for beef cattle (4,000 mg/L), the bore is not currently used as a water supply (KCB 2016) and therefore has no projected impacts on groundwater users.

As the processes observed are determined to be the result of natural climatic variation, along with results for metals and hydrocarbons compliant with the GCTs, exceedances have been determined to have minimal potential to cause environmental harm.

6. REFERENCES

ANZECC (Australian and New Zealand Environment and Conservation Council) and ARMCANZ (Agricultural and Resource Management Council of Australia and New Zealand) (2000). *Australian and New Zealand guidelines for fresh and marine water quality.* National Water Quality Management Strategy. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

C&R Consulting (2016). *Isaac Plains Coal Mine 2016 Groundwater Review.* Prepared for Stanmore IP Coal Pty Ltd.

EHP (2009). Department of Environment and Heritage Protection (2009) Monitoring and Sampling Manual 2009, Version 2, July 2013 format edits. This document contains the common techniques, methods and standards for sample collection, handling and data management for use by Queensland Government agencies, relevant persons and other organisations for release and impact monitoring and to assess the condition and trend of Queensland waters.

Hansen Bailey (2016). *Environmental Assessment Report – Isaac Plains East Project.*

Klohn Crippen Berger (2016). *Isaac Plains East Project – Groundwater Report.*

Klohn Crippen Berger (2018). *Isaac Plains Mine Groundwater Monitoring and Management Plan.*

QWQG (2009). *Queensland Water Quality Guidelines,* Version 3. Department of Environment and Resource Management, Queensland. ISBN 978-0-9806986-0-2.

APPENDIX 1: JANUARY 2019 COA

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1900945**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Customer Services EB
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 25-Jan-2019 12:25
Order number	: P102091	Date Analysis Commenced	: 25-Jan-2019
C-O-C number	: ----	Issue Date	: 04-Feb-2019 15:33
Sampler	: SCOTT AULSEBROOK		
Site	: ----		
Quote number	: BN/451/16 V4		
No. of samples received	: 18		
No. of samples analysed	: 13		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

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

- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised for some samples due to matrix interference.
- EG020T (Total Metals by ICP-MS): Limit of reporting raised for some samples due to matrix interference.
- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.22	7.27	7.30	9.55	7.46
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		9140	7320	23000	9070	3420
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5800	4120	14200	4990	1910
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	15	8	12	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	64	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		57	666	393	18	535
Total Alkalinity as CaCO3	----	1	mg/L		57	666	393	82	535
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		126	105	459	145	36
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3090	1980	7960	3020	808
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		558	192	727	32	96
Magnesium	7439-95-4	1	mg/L		133	282	553	22	120
Sodium	7440-23-5	1	mg/L		1130	983	4140	1900	549
Potassium	7440-09-7	1	mg/L		21	5	20	146	4
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.009	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.001	<0.001	<0.001	0.008
Barium	7440-39-3	0.001	mg/L		0.202	0.110	0.371	0.221	0.137
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	0.011	0.002
Rubidium	7440-17-7	0.001	mg/L		0.029	0.009	0.032	0.466	0.005
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		8.27	4.95	46.6	4.95	2.24
Iron	7439-89-6	0.05	mg/L		0.47	<0.05	0.91	<0.05	0.21
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.02	0.14	0.02	0.13	0.04

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.010**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	**0.001**	<0.001	**0.007**
Barium	7440-39-3	0.001	mg/L		**0.215**	**0.122**	**1.03**	**0.260**	**0.125**
Molybdenum	7439-98-7	0.001	mg/L		**0.001**	<0.001	**0.003**	**0.014**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**8.02**	**5.11**	**46.8**	**6.13**	**2.22**
Iron	7439-89-6	0.05	mg/L		**0.51**	**0.37**	**1.03**	**0.30**	**0.24**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.2**	**0.1**	**0.2**	**0.5**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	<0.05	<0.05	<0.05	<0.01
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**90.9**	**71.3**	**242**	**89.8**	**34.2**
Total Cations	----	0.01	meq/L		**88.5**	**75.7**	**262**	**89.8**	**38.6**
Ionic Balance	----	0.01	%		**1.36**	**2.94**	**4.05**	**0.03**	**6.06**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SB1 (Swamp Bore 1)	BC2	MB7	C1	MB1
				Client sampling date / time	22-Jan-2019 15:30	22-Jan-2019 10:40	23-Jan-2019 15:30	23-Jan-2019 16:45	22-Jan-2019 14:00
Compound	CAS Number	LOR	Unit		EB1900945-001	EB1900945-002	EB1900945-004	EB1900945-005	EB1900945-006
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**107**	**104**	**107**	**107**	**101**
Toluene-D8	2037-26-5	2	%		**100**	**98.3**	**98.9**	**100**	**101**
4-Bromofluorobenzene	460-00-4	2	%		**109**	**109**	**112**	**110**	**112**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.44	7.08	7.37	7.45	7.91
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		7940	53000	7020	11000	2080
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		4460	36400	3970	6550	1140
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		20	1810	946	8	50
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		790	386	735	107	623
Total Alkalinity as CaCO3	----	1	mg/L		790	386	735	107	623
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		169	917	86	2	139
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2220	19500	1870	3820	248
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		135	683	128	320	37
Magnesium	7439-95-4	1	mg/L		188	1970	262	160	72
Sodium	7440-23-5	1	mg/L		1410	10400	1070	1890	367
Potassium	7440-09-7	1	mg/L		8	3	6	20	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.024	<0.005	0.004	0.003	0.003
Barium	7440-39-3	0.001	mg/L		0.126	0.200	0.207	8.59	0.020
Molybdenum	7439-98-7	0.001	mg/L		0.001	<0.005	0.001	0.002	0.018
Rubidium	7440-17-7	0.001	mg/L		0.011	0.007	0.007	0.028	0.007
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		4.64	20.4	3.55	12.4	0.636
Iron	7439-89-6	0.05	mg/L		0.32	<0.05	<0.05	0.62	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.48	43.0	25.8	0.21	0.18

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.005	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.035**	**0.036**	**0.010**	**0.004**	**0.003**
Barium	7440-39-3	0.001	mg/L		**0.142**	**0.408**	**2.07**	**8.56**	**0.022**
Molybdenum	7439-98-7	0.001	mg/L		**0.003**	**0.006**	**0.002**	**0.002**	**0.020**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.05	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	**0.008**	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**4.21**	**21.8**	**3.90**	**12.2**	**0.672**
Iron	7439-89-6	0.05	mg/L		**1.61**	**75.3**	**72.6**	**0.92**	**0.39**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**0.0002**	**0.0002**	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.3**	**0.5**	**0.2**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	**1.26**	**1.13**	<0.05	**0.06**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**81.9**	**577**	**69.2**	**110**	**22.3**
Total Cations	----	0.01	meq/L		**83.7**	**649**	**74.6**	**112**	**23.9**
Ionic Balance	----	0.01	%		**1.10**	**5.86**	**3.77**	**0.87**	**3.30**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		**790**	<50	**150**	<50	**130**
C15 - C28 Fraction	----	100	µg/L		**6140**	**140**	**8230**	<100	**2310**
C29 - C36 Fraction	----	50	µg/L		**2300**	**80**	**8890**	<50	**750**
^ C10 - C36 Fraction (sum)	----	50	µg/L		**9230**	**220**	**17300**	<50	**3190**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		**2150**	<100	**200**	<100	**210**
>C16 - C34 Fraction	----	100	µg/L		**6500**	**190**	**15500**	<100	**2850**
>C34 - C40 Fraction	----	100	µg/L		**1640**	<100	**4130**	<100	**450**
^ >C10 - C40 Fraction (sum)	----	100	µg/L		**10300**	**190**	**19800**	<100	**3510**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB2	MB4A	MB6	MB9A	MB9B
				Client sampling date / time	22-Jan-2019 12:40	23-Jan-2019 13:50	23-Jan-2019 13:30	23-Jan-2019 16:20	23-Jan-2019 09:30
Compound	CAS Number	LOR	Unit		EB1900945-007	EB1900945-009	EB1900945-011	EB1900945-012	EB1900945-013
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		**2150**	<100	**200**	<100	**210**
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**110**	**107**	**106**	**104**
Toluene-D8	2037-26-5	2	%		**100.0**	**98.0**	**103**	**99.9**	**103**
4-Bromofluorobenzene	460-00-4	2	%		**112**	**110**	**115**	**113**	**110**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
			Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.67**	**7.54**	**7.45**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**31700**	**12100**	**11000**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**19500**	**7350**	**6640**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**3750**	**154**	**13**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**1180**	**218**	**107**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**1180**	**218**	**107**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**396**	**154**	**3**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**10700**	**4150**	**3900**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**101**	**314**	**323**	----	----
Magnesium	7439-95-4	1	mg/L	**521**	**134**	**160**	----	----
Sodium	7440-23-5	1	mg/L	**7610**	**2310**	**1880**	----	----
Potassium	7440-09-7	1	mg/L	**4**	**14**	**20**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.05	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.005	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.007**	**0.005**	**0.003**	----	----
Barium	7440-39-3	0.001	mg/L	**0.252**	**0.616**	**8.61**	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.008**	**0.006**	**0.002**	----	----
Rubidium	7440-17-7	0.001	mg/L	<0.005	**0.021**	**0.028**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.05	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.005	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**7.29**	**19.9**	**12.7**	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**0.64**	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**55.3**	**1.97**	**0.22**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
				Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Antimony	7440-36-0	0.001	mg/L		<0.005	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.020**	**0.007**	**0.004**	----	----
Barium	7440-39-3	0.001	mg/L		**0.870**	**0.665**	**8.78**	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.015**	**0.006**	**0.002**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.05	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L		<0.005	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L		**8.09**	**18.6**	**12.5**	----	----
Iron	7439-89-6	0.05	mg/L		**113**	**3.12**	**0.96**	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.6**	**0.2**	**0.2**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.68**	**0.08**	<0.05	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**334**	**125**	**112**	----	----
Total Cations	----	0.01	meq/L		**379**	**128**	**112**	----	----
Ionic Balance	----	0.01	%		**6.37**	**1.15**	**0.29**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L		**60**	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L		**170**	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		**230**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L		**180**	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		**180**	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB4B	MB8B	IPCM GW Duplicate 1	----	----
				Client sampling date / time	23-Jan-2019 11:30	22-Jan-2019 16:20	23-Jan-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1900945-014	EB1900945-015	EB1900945-017	--------	--------
					Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**106**	**107**	----	----
Toluene-D8	2037-26-5	2	%		**98.8**	**101**	**102**	----	----
4-Bromofluorobenzene	460-00-4	2	%		**109**	**111**	**112**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

APPENDIX D

Isaac Plains East Project EPBC Act Baseline Riparian Monitoring – July 2018

ISAAC PLAINS EAST PROJECT
EPBC ACT BASELINE RIPARIAN MONITORING

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July 2018

Disclaimer

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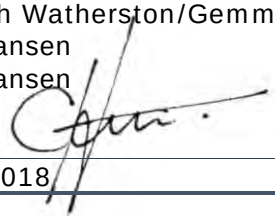
Signed :	
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Symbols and Abbreviations

*	(Preceding a plant species name) plant species not native to Australia
AU	Assessment units
BAMM	Biodiversity Assessment and Mapping Methodology
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
DBH	Diameter at breast height
DES	(Queensland) Department of Environment and Science
DSITI	(Queensland) Department of Science, Information Technology and Innovation
EHP	Former (Queensland) Department of Environment and Heritage Protection
EMZ	Environmental management zone
GIS	Geospatial information systems
GPS	Global positioning system
ha	Hectares
HQ	Habitat Quality
km	Kilometres
OMP	Offset Management Plan
QEOP	Queensland Environmental Offset Policy
RE	Regional Ecosystem as defined under the Queensland Vegetation Management Regulation 2000

Glossary

Term	Definition
Benchmark condition	Benchmark condition describes the standard or typical condition of a particular RE in an undisturbed condition and is determined from an average value from mature and long undisturbed reference of 'Best on Offer' sites (Eyre et al. 2011). Benchmarks are developed by the EHP for various vegetation communities, but not all at this stage.
Bioregion	A geographically distinct biological region, which is a reporting unit for assessing the status of native ecosystems and their level of protection. Australia is divided into 89 bioregions. Bioregions form part of the regional ecosystem classification code system. The study area is located in the Northern Bowen Basin sub-region of the Brigalow Belt Bioregion.
Broad vegetation group	Broad vegetation groups were developed by the Queensland Herbarium to group vegetation communities at a high level, and are included in the regional ecosystem spatial dataset.
High value regrowth	Non-remnant regrowth vegetation that has not been cleared within the last 15 years.
Riparian monitoring area	The riparian monitoring area is that conditioned by the Commonwealth Department of the Environment and Energy in their approval for the Isaac Plains East project (EPBC 2016/7827) and shown on Figure 1.
Region	The local area surrounding the riparian monitoring area, including the landscape within 25 km of the riparian monitoring area.
Regional ecosystem	A vegetation community within a bioregion that is consistently associated with a particular combination of geology, landform and soils.
Remnant vegetation	Defined under the Queensland *Vegetation Management Act 1999* as, woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

1 Introduction

In 2018 the Isaac Plains East (IPE) mining leases and the Department of Environment and Energy (DoEE) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals were granted allowing the extension of the life of the Isaac Plains Complex (IPC). As outlined in condition 10 of the approval, prior to commencement of the action, ecological surveys are required to determine the extent (in hectares) and habitat condition for four EPBC Act listed threatened species in the riparian area. The four EPBC Act listed species are:

- Greater Glider (*Petauroides volans*)
- Koala (*Phascolarctos cinereus*)
- Ornamental Snake (*Denisonia maculata*)
- Squatter Pigeon (southern) (*Geophaps scripta scripta*).

These baseline surveys will allow for ongoing monitoring of habitat for the four listed species, to identify potential impacts to habitat condition as a result of the project, particularly potential post-mining draw down.

1.1 Description of the riparian monitoring area

The riparian monitoring area is located within the non-operational areas of the Isaac Plains Complex, as well as within Fitzroy Australia Resources tenements. The riparian monitoring area is located approximately 170 km south-west of Mackay in central Queensland. The Kerlong and Carborough Ranges are located to the north-east and the region is part of the Northern Bowen Basin sub-region within the Brigalow Belt (North) Bioregion. Smoky Creek and its tributaries form the riparian monitoring area and are a sub-catchment of the Isaac River Catchment (Figure 1).

The riparian monitoring area was defined through groundwater modelling undertaken for the IPE Project and which is shown in Plate A.

1.2 Objectives

The purpose of this monitoring survey is to measure the baseline condition of vegetation communities within the riparian monitoring area during optimal conditions by installing a suitable number of habitat quality plots.

This baseline survey will also define the extent of habitat (in hectares) and habitat condition for each of the four listed threatened species being the Greater Glider, Koala, Ornamental Snake and Squatter Pigeon.

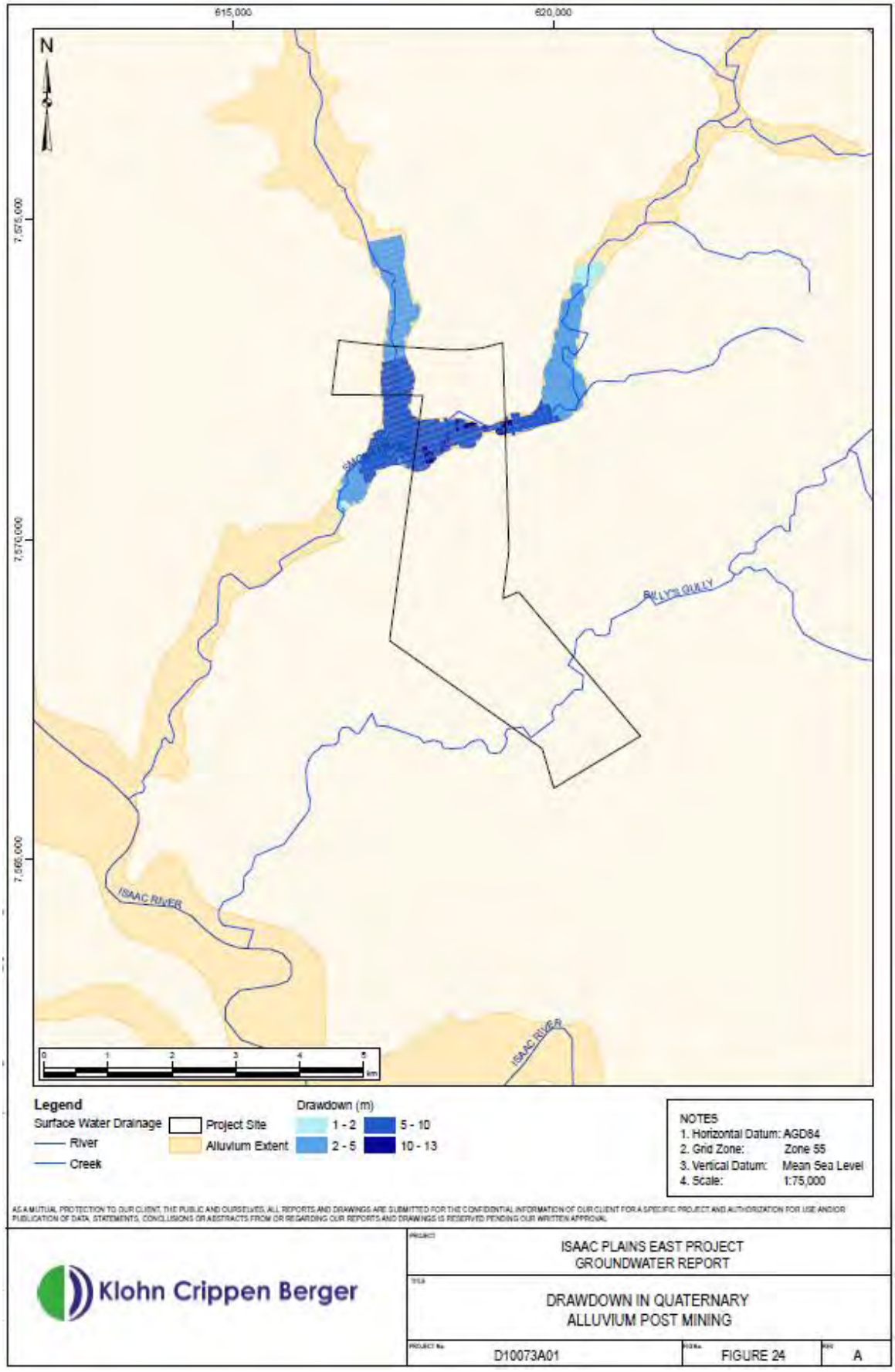

Plate A: Post-mining drawdown modelling for Smoky Creek

2 Methodology

2.1 Field methods

In order to determine the baseline condition of vegetation and habitat for the four listed threatened species within the riparian monitoring area the field methods involved two components:

1. validating and mapping remnant vegetation and habitat areas by undertaking a number of vegetation assessment sites throughout the riparian monitoring area
2. establishing assessment units in which a suitable number of habitat quality plots are installed and which can then be used to undertake habitat quality scoring.

Assessment units (AUs) are relatively homogenous and defined by a distinct RE.

2.1.1 Timing

Two ecologists undertook the ecological monitoring of the 2018 riparian monitoring area over four days between and including 17 and 20 April 2018. A number of survey sites undertaken as part of previous studies for the IPE project were used to supplement this assessment.

2.1.2 Vegetation assessment sites

Field surveys were carried out in compliance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 4.0* (Neldner et al. 2017). Vegetation validation, which has previously been undertaken for the IPE project area (Figures 1 and 2), was also used for portions of the riparian monitoring area that overlap. Assessment sites were performed throughout the riparian monitoring area so as to thoroughly assess the Queensland Government mapped remnant vegetation and allow habitat mapping for the four listed species.

The field validation and mapping was undertaken at a total of 11 secondary, 37 tertiary sites, 39 quaternary sites and 29 supplementary photo points (Figure 2). It is worth noting that 8 tertiary sites, 11 quaternary sites and 5 supplementary photo points were conducted outside but in close proximity to the riparian monitoring area.

Data recorded at each secondary site included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- condition and disturbance of existing vegetation communities (including distribution of weed species)

- quantitative and qualitative species composition within a 1,000 m^2 quadrat, and documentation of ancillary species identified within the immediate area or during foot traverse
- basal area of vegetation (Bitterlich Stick methodology)
- photographs of the community (north, east, south, west, groundcover and soils).

Data recorded at each tertiary site included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- basal area of vegetation (Bitterlich Stick methodology)
- condition and disturbance of existing vegetation communities (including distribution of weed species)
- photographs of the community.

Data recorded at each quaternary site included:

- date and precise location (with reference to handheld GPS)
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics of the ecologically dominant layer (EDL)
- condition
- limited photographs of the community.

Photographs of the vegetation within the assessment plot were taken at the ends of the plot (i.e. the 0 and 100 m mark), and in the directions of north (0^O), east (90^O), south (180^O) and west (270^O) at the centre of the plot (i.e. the 50 m mark). Photos of the groundcover intersected by the centreline tape and soils were also taken at the 50 m mark along the plot. Photo monitoring sites were also undertaken to capture supplementary field information or record a noteworthy landscape, vegetation or habitat feature. Relevant observations and a series of photos are taken at these sites.

2.1.3 Habitat quality assessment plots

In addition to the survey sites described in Section 2.1.2, the 11 secondary sites were upgraded to habitat quality plots. The location of habitat quality plots was chosen to represent the primary REs and habitat within the riparian monitoring area and to provide the best chance of early detection of potential impacts on riparian areas, as a result of potential drawdown. Therefore, habitat quality plots focused on the riparian communities of RE 11.3.2 and 11.3.25, as these are considered most likely to show early evidence of impacts from potential drawdown. The location of habitat quality plots is shown on Figure 2 and the coordinates for each location is provided in Table 1.

Table 1: Coordinates for each of the 11 habitat quality plots

Habitat Quality Plot	Start		End	
	Easting	Northing	Easting	Northing
1	616958	7571107	616900	7571024
2	617793	7571677	617711	7571735
3	621082	7575305	621116	7575211
4	620633	7574184	620729	7574158
5	620332	7573034	620356	7573138
6	617359	7574493	617417	7574411
7	617601	7572898	617680	7572960
8	620300	7572289	620217	7572341
9	618183	7571512	618150	7571607
10	619334	7571952	619284	7571866
11	618743	7572033	618719	7571937

RE 11.3.4 was too small to sample, however comprises the same broad vegetation group as RE 11.3.25 and therefore has been included with that RE in calculations. Table 2 shows the number of habitat quality plots in each assessment unit.

Table 2: Habitat quality plots measured per assessment unit

Assessment Unit	RE	Area (ha)	Number of habitat quality plots
AU 1	11.3.2	8.0	1 (#5)
AU 2	11.3.4	0.5	0
	11.3.25	105.9	10 (# 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11)
Total			11

Data recorded at these sites complied with the *Guide to Determining Terrestrial Habitat Quality – a toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy, Version 1.2* (Habitat Quality Guide) (EHP 2017).

This guideline aligns with the requirements of the Commonwealth offset policy by determining an overall habitat quality score. Each habitat quality plot involved a 100 m x 50 m plot in which a series of attributes were recorded in accordance with the Habitat Quality Guide. Attributes recorded are outlined in Table 3 and are in addition to those recorded as part of the secondary survey methodology described in Section 2.1.2. The height of woody vegetation was measured using a laser rangefinder (hypsometer) and the diameter of large trees was measured at breast height (nominally 1.3 m above the ground) with a diameter at breast height (DBH) tape. The orientation of each habitat quality plot was also recorded.

Table 3: Attributes assessed within habitat quality plots

Sub Plot	Attributes
100 m transect	▪ Tree canopy cover ▪ Tree sub-canopy cover ▪ Native shrub cover Measured as percentage of living foliage cover that intercepts the transect line.
100 m x 50 m plot	▪ Number of large eucalypt trees ▪ Number of large non-eucalypt trees ▪ Tree canopy height - median canopy height ▪ Recruitment of woody perennial species in the ecologically dominant layer (EDL) ▪ Native tree species richness - number of species present
50 m x 20 m plot	▪ Coarse woody debris - length of all logs >10 cm diameter, 0.5 m in length
50 m x 10 m plot	▪ Native shrub, grass and forbs/other species richness ▪ Non-native plant cover - cover of exotic species as a component of the overall vegetation cover
1 m x 1 m quadrats	▪ Native perennial grass cover ▪ Organic litter cover ▪ Native forbs and other species ▪ Native shrubs (<1 m in height) ▪ Non-native grass ▪ Non-native forbs and shrubs [Note: Not all of the above attributes are used in the Habitat Quality score. Assessing all attributes improves the reliability of cover estimates for the assessable attributes, namely native perennial grass cover and organic litter cover.]

2.1.4 Co-ordinate system and map datum

Locations were recorded using the UTM coordinate system. All locations presented in this report are within zone 55K. The map datum used was WGS84.

2.1.5 Climatic conditions

Weather conditions during and leading up to the survey period were relatively dry and warm, with maximum day time temperatures reaching in the high 20s to mid-30s and night time temperatures in the mid-teens to low 20s at Moranbah Airport Weather Station (BoM 2018). Total rainfall for the region leading up to the field survey, was substantially less than average, except in October 2017 and February 2018, as shown in Table 4 below.

Table 4: Monthly rainfall (mm) for Moranbah prior to and following the survey

Month	2017							2018			
	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April
Average	22.1	18.0	25.0	9.1	35.7	69.3	103.9	103.8	100.7	55.4	36.4
Actual Rainfall Total 2017/2018	0.0	1.6	1.2	0.4	86.0	39.4	16.2	20.4	183.4	13.0	8.0

Source: BoM (Date accessed 10 May 2018)

2.2 Habitat mapping

Habitat mapping for each of the four listed species within the riparian monitoring area was undertaken using vegetation mapping in combination with the individual species habitat criteria conditioned by the DoEE as part of the EPBC Act approval for the IPE project (DoEE 2018a).

2.3 Habitat quality scoring

The field data recorded at each of the habitat quality plots for each AU was used in combination with geospatial information to determine a habitat quality sore for habitat in the riparian monitoring area, using the methodology outlined in the Habitat Quality Guide.

2.3.1 Site ecological condition

The attributes collected as part of each habitat quality plot will be used to populate the 10 ecological condition indicators required to compare each RE/AU against benchmark values and determine the habitat quality score in the Habitat Quality Guide:

- recruitment of woody perennial species
- native plant species richness - trees
- tree canopy height
- tree canopy cover
- shrub canopy cover
- native perennial grass cover
- organic litter
- large trees
- coarse woody debris
- weed cover (EHP 2017).

2.3.2 Site context

The landscape context in which the AUs are located is also measured as part of developing the habitat quality score. The riparian monitoring area is located within a 'fragmented' landscape according to Figure 7 in the Habitat Quality Guide. The landscape scale attributes measured within the riparian monitoring area therefore included:

- size of the patch in which each AU is located
- connectedness of the riparian monitoring area by measuring the percentage of the perimeter of each AU that is connected with adjacent remnant vegetation
- context of each AU in terms of the percentage of remnant or cleared areas within a 1 km radius of each polygon in which a habitat quality plot is located
- proximity of the polygon, in which a habitat quality plot is located, to state, bioregional, regional or sub-regional corridors (terrestrial or riparian) (EHP 2017).

Landscape scale attributes were measured for each polygon, in which a habitat quality plot was located, by using the Queensland Government's Globe.

2.3.3 Habitat indices

The following habitat indices were assessed for each of the four species at each habitat quality plot in accordance with the Habitat Quality Guide:

- threats to species
- quality and availability of food and foraging habitat
- quality and availability of shelter
- species mobility capacity
- role of site location to species overall population in the state (EHP 2017).

It is noted, that while habitat mapping encompassed all communities that originate within the riparian monitoring area, only riparian REs, i.e. REs 11.3.2, 11.3.4 and 11.3.25, were used as part of the habitat quality scoring methodology.

3 Monitoring results and discussion

3.1 Vegetation mapping

Six regional ecosystems (REs) have been mapped within the riparian monitoring area, including remnant and non-remnant areas as shown in Figure 3 and outlined in Table 5. Table 5 provides the area of each RE that originates within the riparian monitoring area, but may extend beyond the riparian monitoring area.

Table 5: Regional ecosystems in the riparian monitoring area

RE	Short Description (Queensland Herbarium 2018)	VM Act Status	Area (ha)
Remnant			
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of concern	7.9
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains	Of concern	0.5
11.3.25	*Eucalyptus camaldulensis* or *Eucalyptus tereticornis* open forest to woodland	Least concern	105.9
11.9.7a	*Eucalyptus populnea* on gently undulating to sloping plains	Of concern	8.5
11.8.11	*Dichanthium sericeum* grassland on Cainozoic igneous rocks	Of concern	4.5
High value regrowth			
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	Endangered	13.2
n/a	*Eucalyptus cambageana* regrowth not representing an RE	*n/a*	3.0

Note: Areas indicate total area of RE polygons that originate within the riparian monitoring area

3.2 Habitat mapping

The majority of REs listed in Table 4 are considered to form habitat for one or more of the listed threatened fauna species; Greater Glider, Koala, Ornamental Snake and Squatter Pigeon. The habitat mapping undertaken as part of this baseline riparian monitoring draws on the vegetation mapping undertaken as part of this baseline assessment and habitat criteria condition by the DoEE as part of the IPE project EPBC Act approval (DoEE 2018a).

3.2.1 Squatter Pigeon

Suitable habitat for the Squatter Pigeon is categorised as grassy woodland habitat in REs on land zones 3, 5 or 7, which are either: within 1 km of a permanent water body; or within 1 km of a Queensland Government mapped wetland or ≥3rd order stream (DoEE 2018a). Smoky Creek is a 4th order stream and the western tributary is a 3rd order stream, therefore, REs 11.3.2, 11.3.4 and 11.3.25 along both watercourses are mapped as habitat on Figure 5. A total of 103.8 ha of Squatter Pigeon habitat is mapped within the riparian monitoring area.

3.2.2 Greater Glider

The habitat criteria condition by the DoEE as part of the EPBC Act approval for the IPE Project describes Greater Glider habitat as; 'forest, woodland or emerging shrubland, including riparian and non-riparian environments, containing one or more of *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* tree species' (DoEE 2018a).

Habitat for the Greater Glider is mapped on Figure 6 and comprises 107.2 ha within the riparian monitoring area.

3.2.3 Ornamental Snake

Habitat for the Ornamental Snake is conditioned in the DoEE EPBC Act approval for the IPE project as; 'fringing riparian vegetation associated with Smoky Creek, Smoky Creek Northern Tributary and Billy's Gully' (DoEE 2018a).

Therefore, riparian REs 11.3.2, 11.3.4 and 11.3.25 fringing these watercourses within the riparian monitoring area are mapped as habitat for the Ornamental Snake (Figure 7). There is 103.8 ha of Ornamental Snake habitat mapped within the riparian monitoring area.

3.2.4 Koala

In line with the IPE project EPBC Act approval conditions, habitat mapping criteria, any 'forest, woodland or emerging shrubland, including riparian and non-riparian environments, containing one or more of *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* tree species' is considered potential habitat for the Koala (DoEE 2018a).

Therefore, REs 11.3.2, 11.3.4, 11.3.25, 11.9.7a, regrowth RE 11.9.5 (that contains emergent food trees) and a small patch of non-remnant Dawson River Gum (*Eucalyptus cambageana*) in the western portion of the riparian monitoring area is considered to provide potential habitat for the Koala (Figure 8). There is 107.2 ha of Koala habitat within the riparian monitoring area.

The patch of RE 11.8.11 and two patches of regrowth RE 11.9.5, in the east, are not considered to provide potential habitat for this species, as these communities do not support emergent food trees.

3.3 Site condition

Data collected from each of the 11 habitat quality plots was compared with the corresponding bio-condition benchmarks for the corresponding REs. These benchmarks were sourced from the Queensland Government (DSITI 2016). The highest possible site condition score attainable, is a score of 80 in accordance with the Habitat Quality Guide (EHP 2017).

The overall ecological condition of the sampled vegetation types was found to be moderate. This was largely due to generally near or greater than 50% weed infiltration, less than 100% recruitment, generally low abundance of coarse woody debris and low perennial native grass cover. Large eucalypt trees were generally lacking throughout the habitat quality plots.

Habitat quality plots 6, 8 and 9 were of slightly better condition due to species richness and cover in the tree and shrub layers. Table 6 provides a summary of the ecological condition scores for each of the AUs in the riparian monitoring area. A detailed breakdown of the habitat quality scores for each of the AUs is presented in Appendix A.

Representative photos of each of the monitoring sites are provided in Appendix B.

Table 6: Habitat quality scores for each of the habitat quality plots in the riparian monitoring area

Parameters	Assessment Unit (AU)										
	1	2									
Area (ha)	8.0	106.4									
RE	11.3.2	11.3.25/11.3.4									
BVG	17a	16a/c									
EEM Site	*5*	*1*	*2*	*3*	*4*	*6*	*7*	*8*	*9*	*10*	*11*
Site Condition Score	44	58	55.5	57	58.5	69	61.5	66.5	63.5	56.5	61.5
Site Context Score	15	17	17	20	10	5	11	17	17	17	17

3.4 Site context

Most habitat quality plots are located within one polygon that extends along the majority of Smoky Creek and its tributary within the riparian monitoring area. However, there is some fragmentation of Smoky Creek, particularly by the Goonyella Branch Railway Line in the northern extent of the riparian monitoring area.

There is extensive clearing in the local landscape, i.e. within 10 km of the riparian monitoring area. This is evidenced in the patch size scores for each habitat quality plot, whereby all except plot 3 are located in patches less than 200 ha.

All habitat quality plots, except 5, achieve a connectedness score of only 0 or 2 due to the narrow width and therefore high perimeter to area ratio of riparian vegetation in the patches within which the plots are located. Habitat quality plot 5 (RE 11.3.2) achieves a score of 5 because it is almost wholly encompassed within riparian vegetation associated with a bend of Smokey Creek (RE 11.3.25) (Figure 3).

As with connectedness, all habitat quality plots, except 3 (RE 11.3.2), achieved a score of 0 or 2 with regard to context due to the extent of clearing that has occurred in the immediate region. Large patches of remnant vegetation occur to the north-east of the riparian monitoring area, which likely accounts for the higher score for plot 3 as it is the most north-easterly plot within the riparian monitoring area and closest to this larger remnant.

Smoky Creek is identified as a regional riparian corridor on the Queensland Globe and therefore, habitat quality plots located in this corridor (all except plots 6 and 7) score highly for ecological corridors (DES 2018).

A summary of scores for each of the habitat quality plots is provided in Table 5 and a full breakdown of the connectivity and context scores is provided in Appendix A. The highest attainable site context score for fragmented landscapes is a score of 26 in accordance with the Habitat Quality Guide (EHP 2017).

Distance from water is not applicable to the riparian monitoring area as it is located in a fragmented landscape according to the Habitat Quality Guide.

3.5 Species habitat indices

The following habitat indices (Tables 7-10) were applied to each of the four listed species based on:

- SPRAT Profiles, referral guidelines, Threatened Species Scientific Committee Conservation and Listing Advice
- field observations and data recorded during the monitoring survey
- assessment of the species as part of the IPE project Terrestrial Ecology Assessment
- geospatial and aerial photo analysis.

The highest attainable habitat index score is a score of 50 in accordance with the Habitat Quality Guide (EHP 2017).

Table 7: Species habitat index scoring for the Squatter Pigeon

Habitat Indices	Score	Rationale
1. Threat to species	7	There are few local or main roads in the region and vehicle movements are irregular. Predators are present in the landscape, but there is no evidence to suggest they are high in numbers or putting considerable pressure on the Squatter Pigeon. Nonetheless, riparian areas have a higher abundance of taller denser grasses, including exotic grasses, providing better cover and ambush areas for introduced predators (such as foxes and feral cats). Riparian areas are also targeted by native predators, such as raptors.
2. Quality and availability of food and foraging habitat	5	The local landscape (i.e. within 10 km of the riparian monitoring area) has been largely cleared of native vegetation for cattle grazing, mining and exploration activities. Native habitat is predominantly confined to watercourses, although this species is known to use disturbed or partly modified areas (DoEE 2018b).
3. Quality and availability of shelter	5	Shelter habitat for the Squatter Pigeon is not well defined in the SPRAT Profile. This species shelters in nearby trees as described in the SPRAT Profile and requires a combination of open forest or woodlands habitats within close proximity (i.e. up to 3 km) to water sources. The riparian monitoring area would provide this when the watercourses support flowing or ponded water. However, these are ephemeral streams and do not provide a permanent water source.
4. Species mobility capacity	7	The Squatter Pigeon is a mobile bird, however, it is considered to be sedentary or locally nomadic (DoEE 2018b). It is thought to persist where food and water resources are available, but move through vegetated corridors in search of these resources when necessary. This species will largely keep within or in close proximity to wooded or remnant areas for protection from predators, but will move out into modified and degraded

Habitat Indices	Score	Rationale
		environments a short distance, e.g. (100 m) to forage (DoEE 2018b).
5. Role of site location to species overall population in the state	1	The riparian monitoring area is unlikely to be critical to the survival of the Squatter Pigeon as the species remains common in its northern distribution, the riparian monitoring area is unlikely to support an important population and it uses a range of habitats, included modified and degraded habitats, which are relatively common in the landscape (Ecological Survey & Management 2016).
Total Score	25	

Table 8: Species habitat index scoring for the Greater Glider

Habitat Indices	Score	Rationale
1. Threat to species	7	There are few main or local roads in the region, although clearing has likely resulted in narrowing of habitat areas and restricting habitat closely to riparian areas. They are thought to require native forests patches of at least 160 km^2 (TSSC 2016). Predators are present in the landscape, but there is no evidence to suggest they are high in numbers or putting considerable pressure on the Greater Glider.
2. Quality and availability of food and foraging habitat	5	The Greater Glider prefers taller montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC 2016). Riparian areas generally provide more fertile and higher productivity areas in a rural landscape and therefore are more likely to provide the taller, older, hollow-bearing and diversity of eucalypt species required by the Greater Glider. This type of habitat is restricted in the landscape and often cleared to the high banks of watercourses, as is the case within the riparian monitoring area. However, riparian areas are often retained in an otherwise cleared or thinned landscape providing refuges and connectivity.
3. Quality and availability of shelter	5	Shelter habitat is defined in the Conservation Advice for the Greater Glider as tree hollows used during the day, and particularly large hollows in large, old trees (TSSC 2008). Due to the restricted nature of riparian habitat and remnant vegetation generally within the landscape, availability of this type of shelter is limited. However, a relatively high abundance of hollows was observed in the riparian areas of Smoky Creek and its tributary.
4. Species mobility capacity	4	While this is a mobile arboreal species, it is thought to have low dispersal ability and typically small home ranges of 1-4 ha. They are thought to have relatively low persistence in small forest fragments and disperse poorly across vegetation that is not native forest (TSSC 2016).
5. Role of site location to species overall population in the state	1	The riparian monitoring area is unlikely to be critical to the survival of the species as the population present is unlikely to be an important population and the riparian monitoring area does not provide a particularly unique, large or important area of habitat for this species.
Total Score	22	

Table 9: Species habitat index scoring for the Ornamental Snake

Habitat Indices	Score	Rationale
1. Threat to species	7	There is a moderate level of threat from vegetation clearing and fragmentation in the local area. Mining and petroleum exploration activities, involving clearing and track construction, occurs throughout the region, causing modification and fragmentation of habitat in the region. Cattle grazing is considered a potential threat to habitat areas, particularly during the wet season (DoEE 2018c). Predators are present in the landscape, but there is no evidence to suggest they are high in numbers or likely to be putting considerable pressure on the Ornamental Snake.
2. Quality and availability of food and foraging habitat	1	There is limited habitat availability for this species in the landscape and it is restricted to marginal riparian habitat that changes in abundance of microhabitat features in response to weather and particularly local and upstream rainfall events. There are no gilgai depressions or mounds in the riparian monitoring area or the IPE project area, which is identified in the *Draft referral guidelines for the nationally listed Brigalow Belt reptiles*, as known important habitat for this species (SEWPaC 2011).
3. Quality and availability of shelter	1	Shelter habitat is described broadly for nationally listed Brigalow Belt reptiles as coarse woody debris, leaf litter, rocks or artificial materials on or in topsoil, cracks in alluvial clay soils (SEWPaC 2011). cracking clay soils in gilgai mounds are specifically described for the Ornamental Snake as refuge habitat (DoEE 2018c). While the riparian areas support some coarse woody debris, which varies in abundance depending on the extent of flood debris in the channels, there are no other substantial shelter micro-habitat features in the riparian monitoring area or IPE project area that would likely support this species.
4. Species mobility capacity	4	The Ornamental Snake is thought to disperse between suitable habitat areas, perhaps some kilometres. However, connectivity between gilgais and other suitable habitat is considered important for this species (SEWPaC 2011). Overall, the species' habitat requirements are fairly restrictive and dispersal is probably fairly limited.
5. Role of site location to species overall population in the state	1	Given the lack of gilgai or other prey supporting wetland habitat and marginal suitability of riparian areas as habitat for the Ornamental Snake in the riparian monitoring area or IPE project area, it is considered highly unlikely that the riparian monitoring area is critical to the species survival.
Total Score	14	

Table 10: Species habitat index scoring for the Koala

Habitat Indices	Score	Rationale
1. Threat to species	7	There is a moderate level of threat from the Goonyella Railway and local Broadlea Road. There is limited vegetation in the local area, which is mostly confined to the watercourses. Mining and petroleum exploration activities, involving clearing and track construction, occurs throughout the region, reducing availability of food trees and increasing irregular vehicle movements in the local area. Predators are present in the landscape, but there is no evidence to suggest they are high in numbers or putting considerable pressure on the Koala.

Habitat Indices	Score	Rationale
2. Quality and availability of food and foraging habitat	5	The local landscape (i.e. within 10 km of the riparian monitoring area) has been largely cleared of native vegetation for cattle grazing, mining and exploration activities. Habitat is predominantly confined to watercourses.
3. Quality and availability of shelter	5	The Koala referral guideline indicates shelter habitat is likely to be 'riparian environments and other areas with reliable soil moisture and fertility'. There is a moderate availability of shelter habitat within the riparian monitoring area and surrounding landscapes in the form of Smoky Creek, its tributary and more broadly, the Isaac River and its tributaries to the north, west and south of the riparian monitoring area.
4. Species mobility capacity	7	The Koala is considered to be a highly mobile species with large home ranges recorded between 8 - 135 ha depending on the location and the environment. The species is known to disperse up to 16 km in certain landscapes and several kilometres within largely cleared landscapes (DoEE 2018d). The mobility of this species within the riparian monitoring area is somewhat restricted to the riparian areas due to the extent of clearing outside this zone and steep sided banks and dense grass cover in some places would make moving along the ground between trees more difficult.
5. Role of site location to species overall population in the state	1	The riparian monitoring area has the potential to provide habitat critical to the survival of the species as outlined in the IPE Project Terrestrial Ecology Assessment report. This is because, although the species has not been recorded as part of the project, it is highly likely to occur and the riparian monitoring area provides connectivity with large tracts of habitat in the surrounding landscape, there are a diversity of potential food trees present and the riparian areas provide potential refuge habitat for the Koala (Ecological Survey & Management 2016).
Total Score	25	

4 Overall habitat quality scores and future monitoring

Detailed habitat quality scoring spreadsheets have been included with this report, for each of the four listed species using the Habitat Quality Guide methodology. Scores have been calculated for each species for each of the two assessment units as well as for individual habitat quality plots.

A summary of scores is provided in Table 11. A detailed breakdown of the condition and context scores is provided in Appendix A. Habitat scoring is lowest for the Ornamental Snake and Greater Glider, most likely to due to their relatively low mobility and dispersal capability and the narrow or sparse nature of micro-habitat habitat features within the riparian corridors.

Table 11: Habitat quality scores for each species

Assessment unit	AU 1	AU 2									
RE	11.3.2	11.3.25/11.3.4									
Habitat Quality Plot	*5*	*1*	*2*	*3*	*4*	*6*	*7*	*8*	*9*	*10*	*11*
Squatter Pigeon											
Habitat Quality Score (measured)	84	100	97.5	102	93.5	99	97.5	108.5	105.5	98.5	103.5
Assessment unit habitat quality score (out of 10)	5.38	6.45									
Greater Glider											
Habitat Quality Score (measured)	81	97	94.5	99	90.5	96	94.5	105.5	102.5	95.5	100.5
Assessment unit habitat quality score (out of 10)	5.19	6.25									
Ornamental Snake											
Habitat Quality Score (measured)	73	89	86.5	91	82.5	88	86.5	87.5	94.5	87.5	92.5
Assessment unit habitat quality score (out of 10)	4.68	5.74									
Koala											
Habitat Quality Score (measured)	84	100	97.5	102	93.5	99	97.5	108.5	105.5	98.5	103.5
Assessment unit habitat quality score (out of 10)	5.38	6.45									

4.1 Ongoing monitoring

Habitat quality scoring for each of the species is useful to gain a simplistic and overall appraisal of habitat quality within the riparian area. However, measuring ecological condition parameters will be most useful in identifying slight changes to condition that may provide early signs of decline. This would allow time for more intensive monitoring if necessary and investigation of potential causes of decline in condition.

Site context may change drastically as a result of actions off site and as part other projects, and so may not be particular useful for measuring potential effects of drawdown. Habitat indices are unlikely to improve substantially in the short to medium term but may decline also as a result of habitat clearing nearby. Therefore, habitat indices are also not particularly useful for measuring potential effects of drawdown should they occur.

Effects of drawdown in particular are likely to be most evident in parameters such as recruitment of woody perennial species, tree canopy cover (i.e. being influenced by dieback of the canopy) and number of trees per hectare (i.e. also being influenced by dieback). Coarse woody debris may also indicate mortality of larger trees and dieback, although, coarse woody debris in riparian areas is also subject to flooding, and therefore less reliable.

The following monitoring regime is proposed and should be revised should mining activities change from that conditioned as part of EPBC Act approval EPBC 2016/7827, or modelling indicate change in potential drawdown depth and extent.

Plate A indicates areas of predicted greatest drawdown from the IPE project and therefore monitoring of habitat quality plots within these areas should be more frequent. Habitat quality monitoring should follow the Habitat Quality Guide methodology described in this baseline report and use the 11 habitat quality plots established as part of this baseline monitoring event. Each monitoring event should be undertaken in the post-wet season to replicate baseline conditions as far as possible and to capture data during what should be the most favourable floristic conditions.

Table 12 outlines the proposed monitoring regime for the life of the EPBC Act approval, i.e. until 1 November 2040.

Table 12: Proposed monitoring program for the riparian monitoring area

HQ Plots	Year										
	2020	*2022*	*2024*	*2026*	*2028*	*2030*	*2032*	*2034*	*2036*	*2038*	*2040*
2, 7, 8, 9, 10, 11	●	●	●	●	●	●	●	●	●	●	●
1, 3, 4, 5, 6	●	●			●			●			●

In addition to the habitat quality monitoring described in this report and Table 11, additional on-site management monitoring should be undertaken quarterly, using photo monitoring points to identify significant and rapid changes to vegetation in between habitat quality monitoring events. These should be undertaken by the

site environmental advisor, who should have background in environmental monitoring, including simple vegetation monitoring.

5 References

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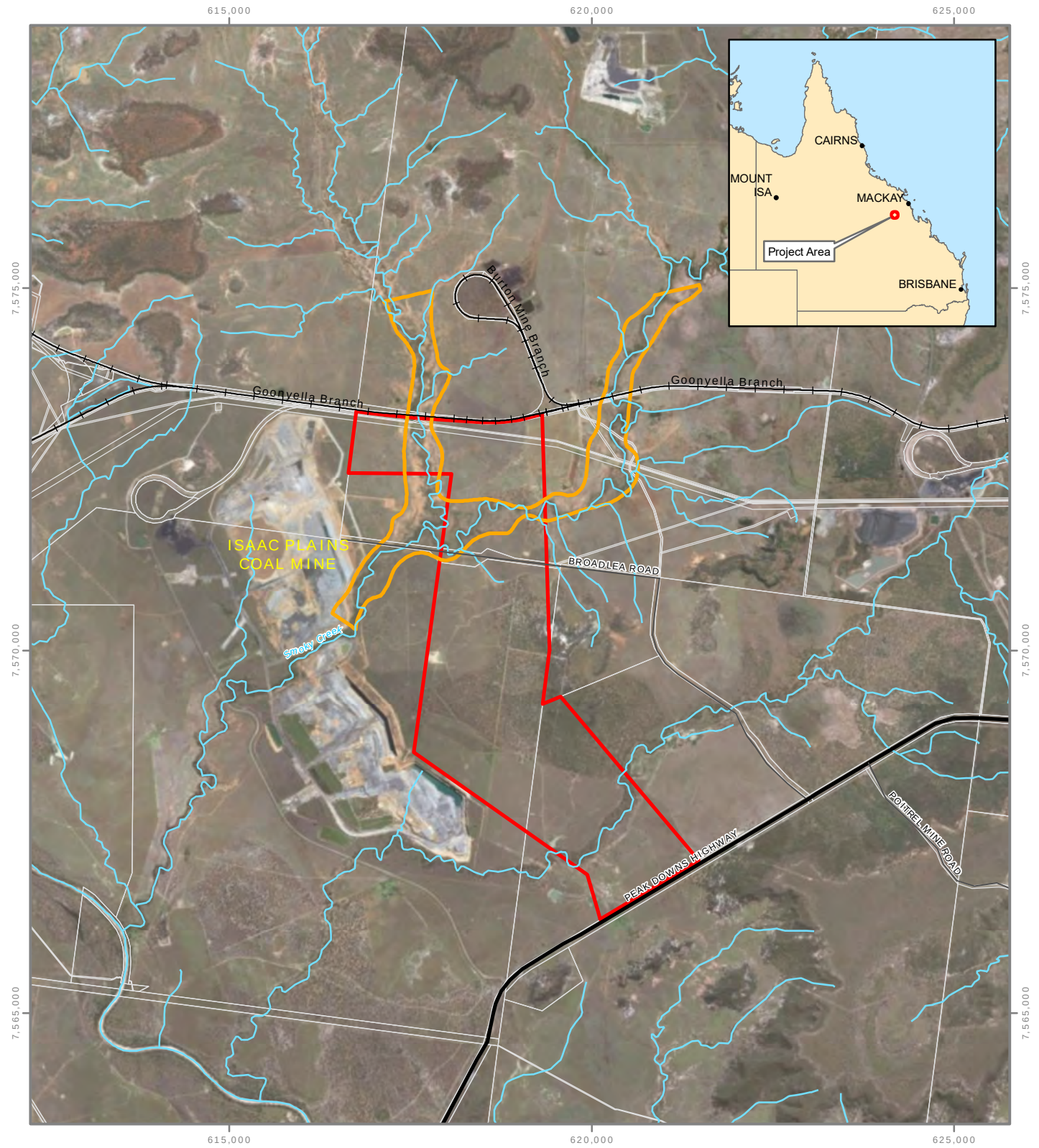
Figures



Legend

- Project Site
- Riparian Monitoring Area
- Highway
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Figure 1 : Location of the Isaac Plains East Project riparian monitoring area

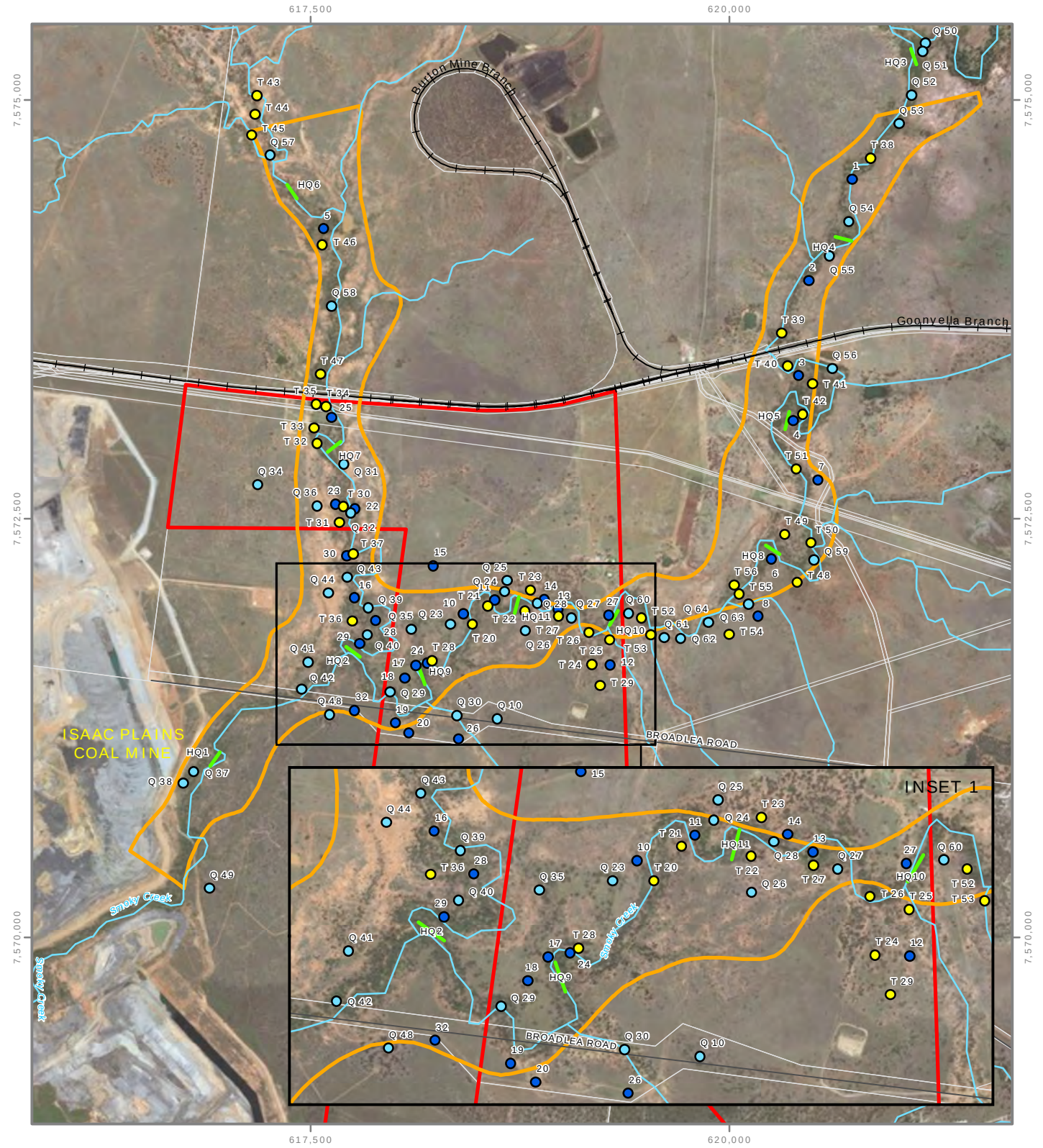
Isaac Plains East Project EPBC Act Baseline Riparian Monitoring

Map Number: 18017_01_B
Date: 06 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2016

0 1 2 4
Kilometres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Vegetation Assessment Sites

- Tertiary Assessment Site
- Quaternary Assessment Site
- Quaternary Assessment Site (Photo Point)
- Habitat Quality Plots

Note: Survey site numbering is not consecutive

Figure 2 : Location of habitat quality plots

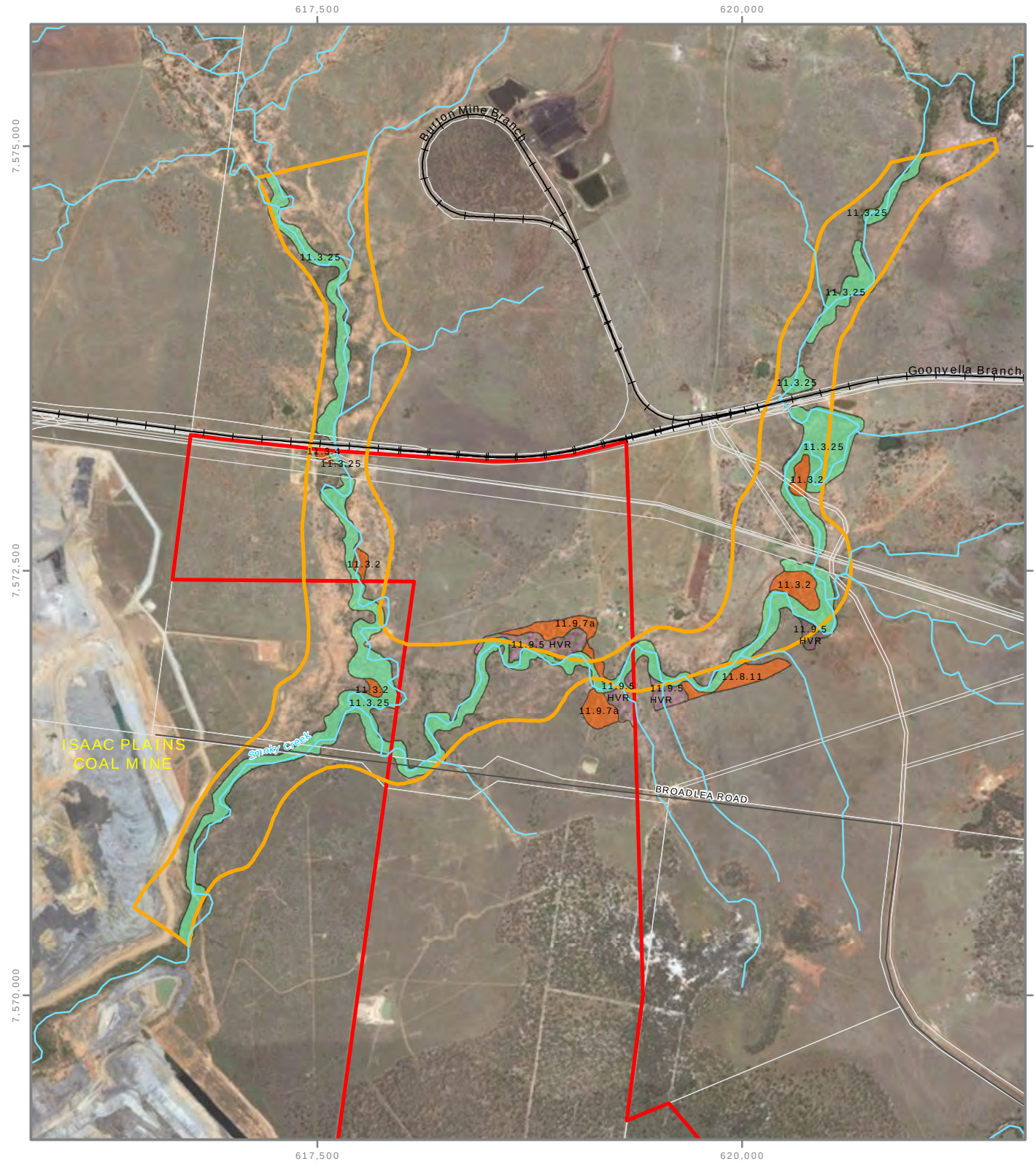
Isaac Plains East Project EPBC
Act Baseline Riparian Monitoring

Map Number: 18017_02_B
Date: 06 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2016

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Remnant Vegetation

- Of concern
- Least concern

High Value Regrowth

- Endangered

Figure 3 : Field-validated regional ecosystem mapping

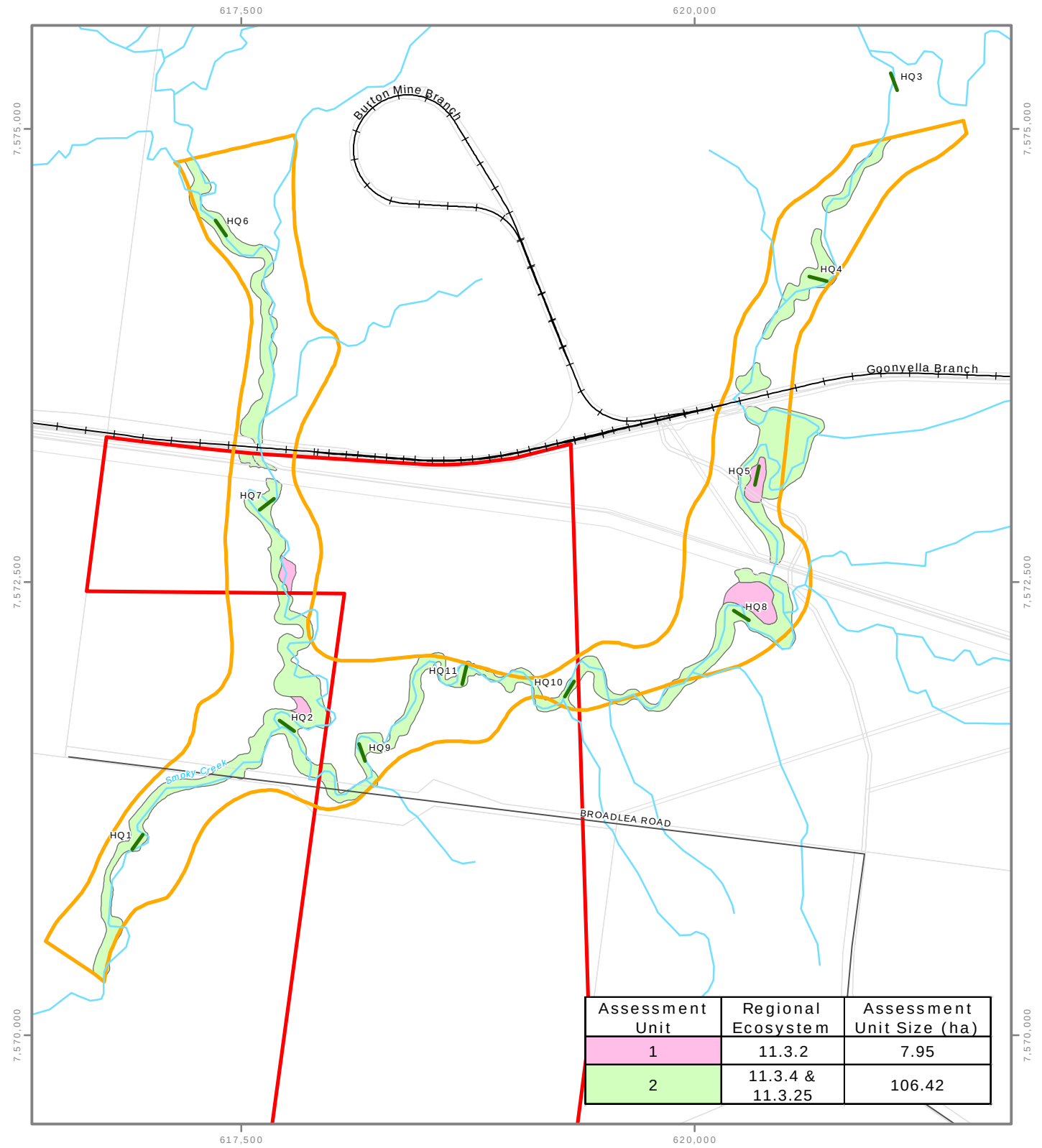
Isaac Plains East Project EPBC
Act Baseline Riparian Monitoring

Map Number: 18017_03_B
Date: 06 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2018

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Assessment Unit	Regional Ecosystem	Assessment Unit Size (ha)
1	11.3.2	7.95
2	11.3.4 & 11.3.25	106.42

Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary
- Habitat Quality Plots

Figure 4 : Assessment units

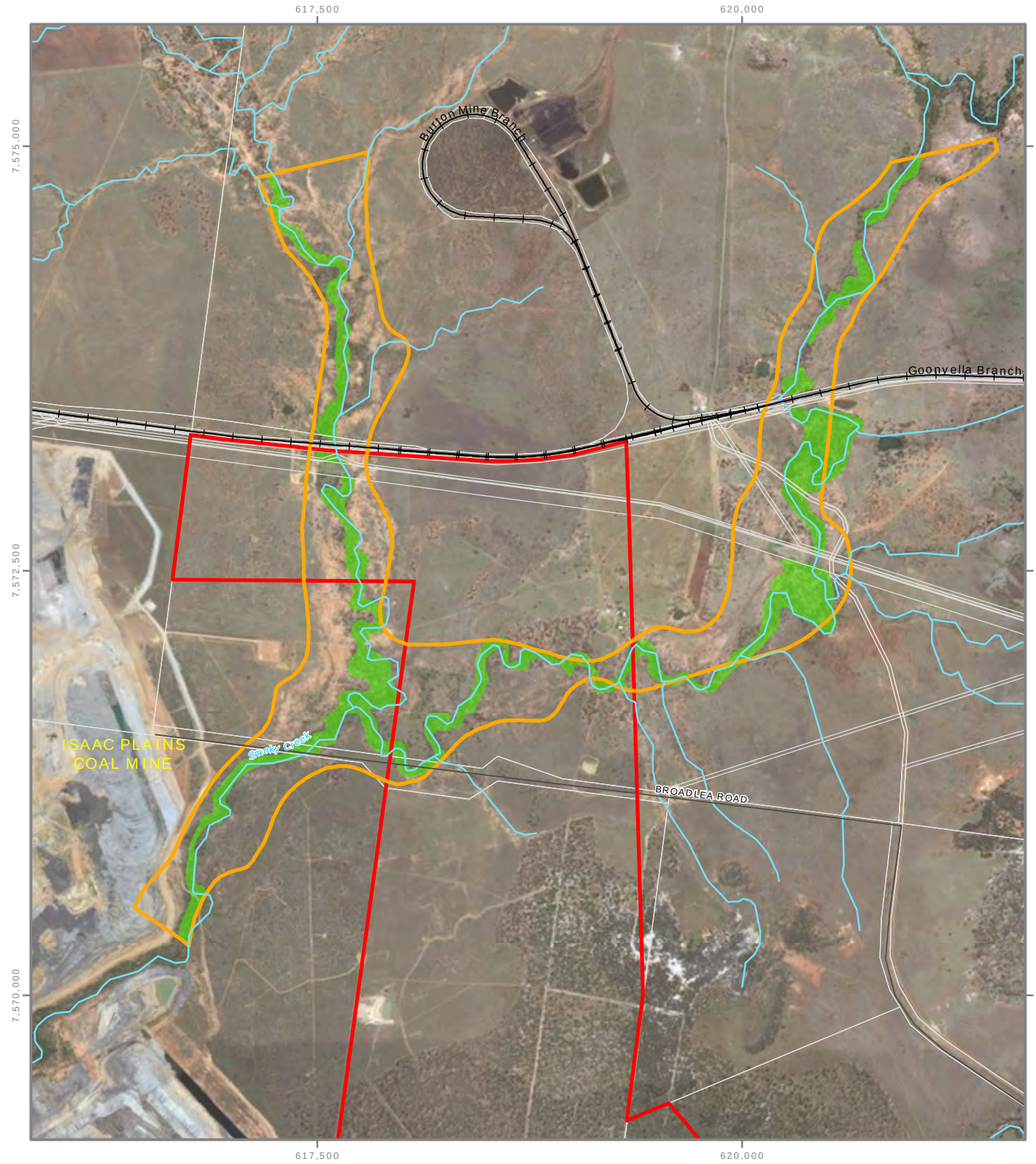
Isaac Plains East Project EPBC Act Baseline Riparian Monitoring

Map Number: 18017_04_E
Date: 21 June 2018
Map Projection: GDA 1994 MGA Zone 55
Data: Roads, Watercourse, DCDB - (c)DNRM 2018

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Habitat Mapping

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPBC Act and NC Act)

Figure 5 : Squatter Pigeon (southern) habitat mapping

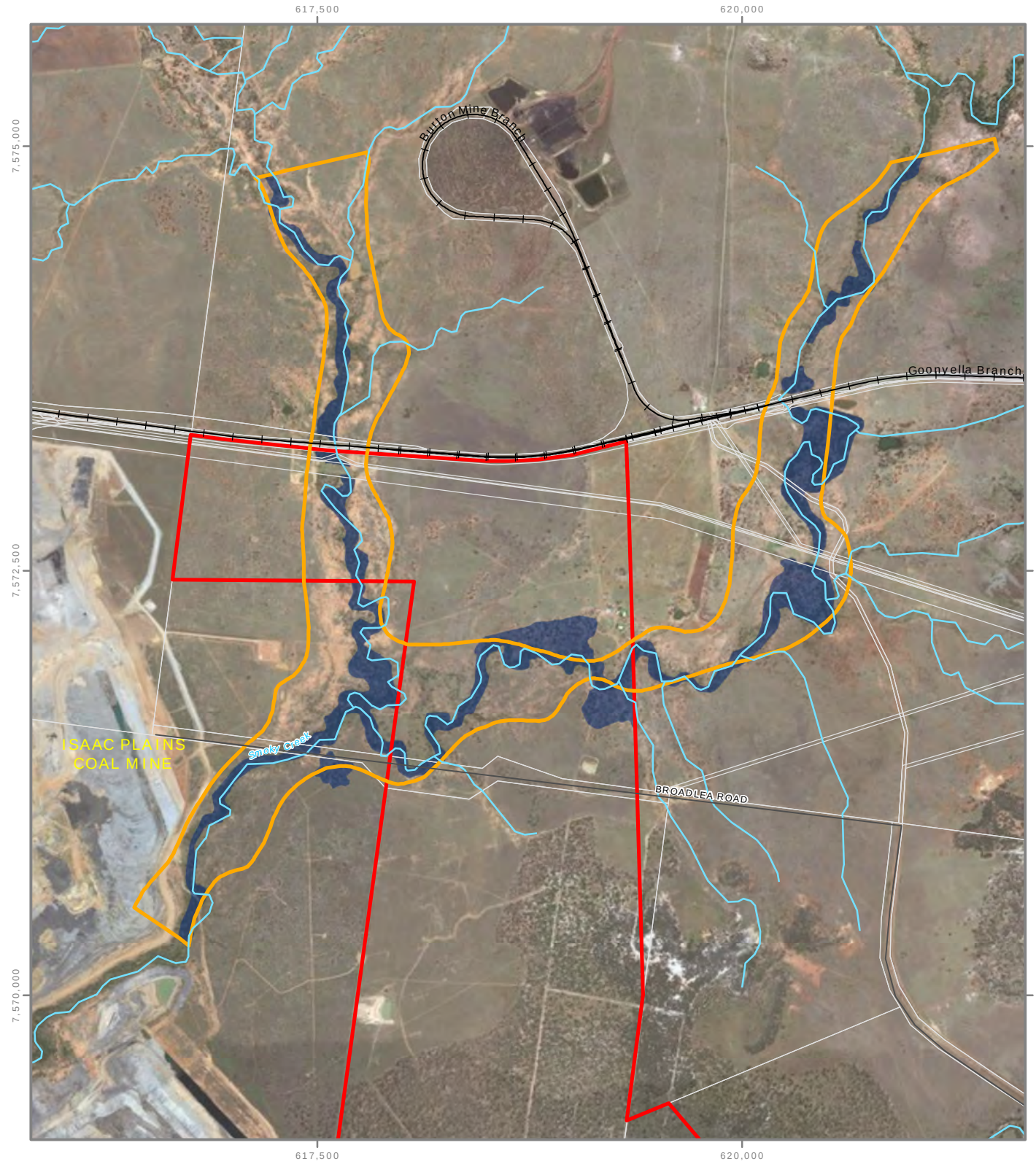
Isaac Plains East Project EPBC Act Baseline Riparian Monitoring

Map Number: 18017_05_B
Date: 06 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2018

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Habitat Mapping

- Greater Glider (*Petauroides volans*) – Vulnerable (EPBC Act and NC Act)

Figure 6 : Greater Glider habitat mapping

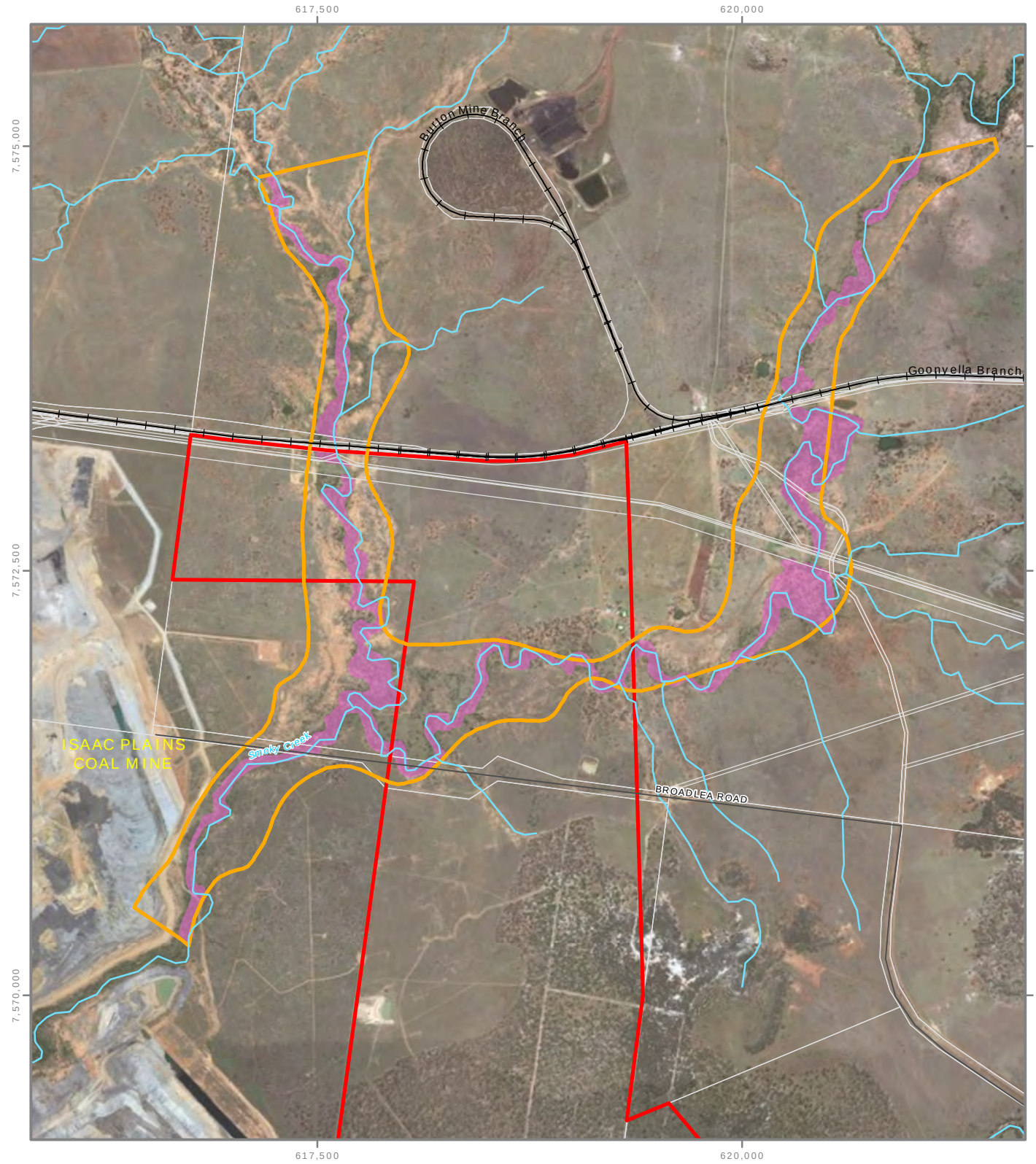
Isaac Plains East Project EPBC
Act Baseline Riparian Monitoring

Map Number: 18017_06_C
Date: 28 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2016

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Habitat Mapping

- Ornamental Snake (*Denisonia maculata*) – Vulnerable (EPBC Act and NC Act)

Figure 7 : Ornamental Snake habitat mapping

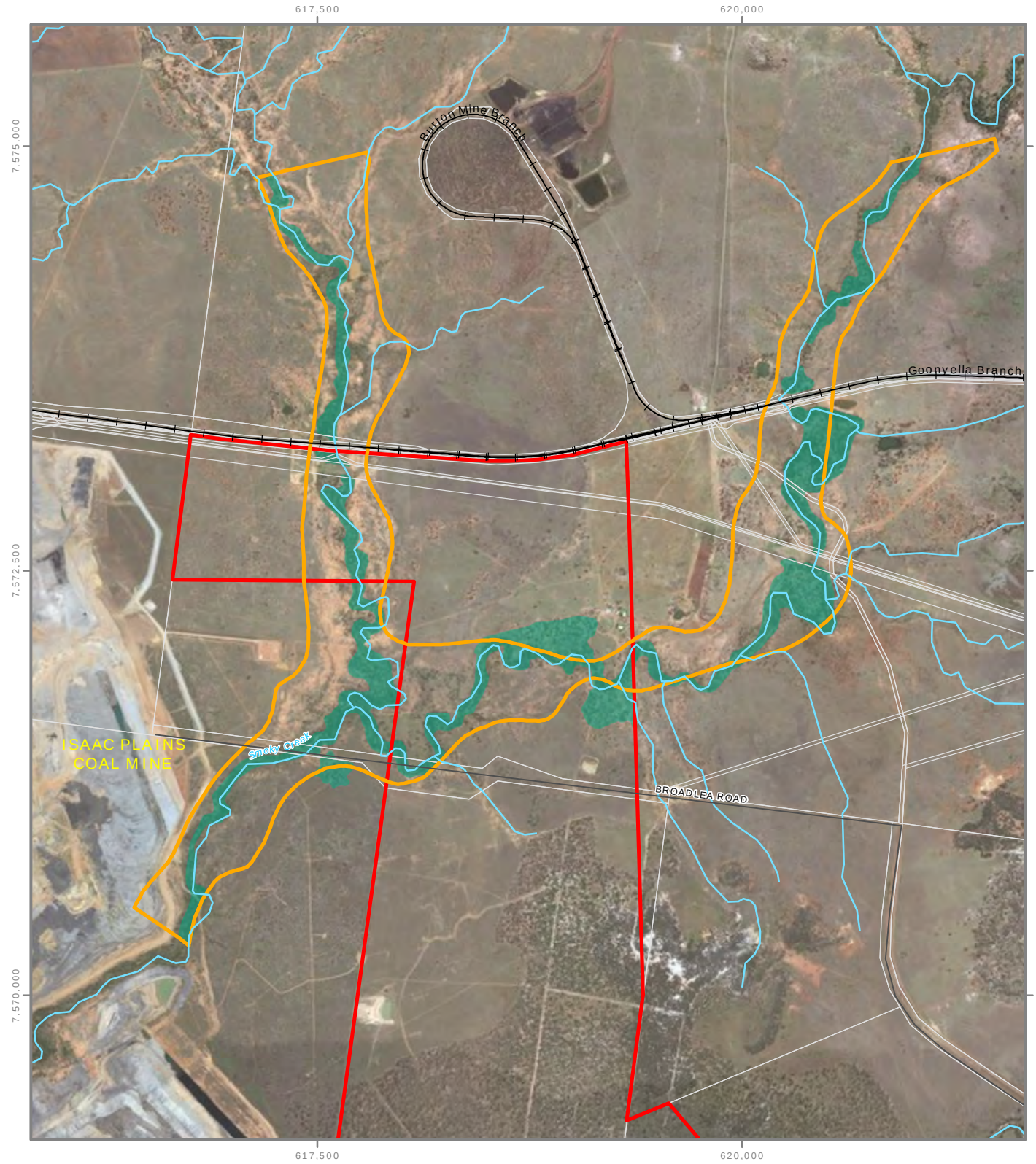
Isaac Plains East Project EPBC Act Baseline Riparian Monitoring

Map Number: 18017_07_C
Date: 28 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2016

0 250 500 1,000 1,500
Metres

N

ecological survey & management



Legend

- Project Site
- Riparian Monitoring Area
- Street/Local Road
- Railway
- Vegetation Management Act Watercourse
- Cadastral Boundary

Habitat Mapping

- Koala (*Phascolarctos cinereus*) – Vulnerable (EPBC Act and NC Act)

Figure 8 : Koala habitat mapping

Isaac Plains East Project EPBC
Act Baseline Riparian Monitoring

Map Number: 18017_08_A
Date: 06 June 2018
Map Projection: GDA 1994 MGA Zone 55
Imagery: Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2018

0 250 500 1,000 1,500
Metres

N

ecological survey & management

Appendix A

Breakdown of habitat quality scores
for each fauna species in the riparian monitoring area

Habitat quality scoring for Squatter Pigeon

Assessment Unit			1 (Squatter Pigeon)		
Habitat Quality Plot			*5*		
Area of assessment unit (ha)			7.9		
Regional Ecosystem	11.3.2		11.3.2		
BVG (1M)	17a		17a		
Ecological Condition Indicator	Benchmark		Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		100.0	*1.0*	*5*
2. Native plant species richness - Trees (No.)	2		3.0	*1.5*	*5*
3. Shrubs (No.)	2		8.0	*4.0*	*5*
4. Grasses (No.)	9		6.0	*0.7*	*2.5*
5. Forbs and Other (No.)	17		14.0	*0.8*	*2.5*
6. Tree canopy height (m)	18		18.4	*1.0*	*5*
7. Tree canopy cover (%)	40		12.5	*0.3*	*2*
8. Shrub canopy cover (%)	2		15.9	*7.9*	*3*
9. Native perennial grass cover (%)	35		13.8	*0.4*	*1*
10. Organic litter (%)	30		10.1	*0.3*	*3*
11. Large Euc. trees/ha (40cm dbh)	22		6.0	*0.3*	*5*
11. Large Non-Euc trees/ha (0cm dbh)	0		0.0	*0.0*	*0*
12. Coarse woody debris (m/ha)	307		325.0	*1.1*	*5*
13. Non-native plant cover (%)	0		69.0	*69.0*	*0*
Site Condition Score			*44*		
1. Size of patch (Fragmented)	*n/a*		20	-	*2*
2. Connectedness (Fragmented)	*n/a*		97	-	*5*
3. Context (Fragmented)	*n/a*		16	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	*0*
5. Ecological Corridors	*n/a*		Within (whole or part)	-	*6*
Site Context Score:			*15*		

Assessment Unit			2 (Squatter Pigeon)																												
Habitat Quality Plot			*1*			*2*			*3*			*4*			*6*			*7*			*8*			*9*			*10*			*11*		
Assessment Unit Area (ha)			106.4																												
Regional Ecosystem	11.3.25		11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25		
BVG (1M)			16a			16a			16a			16a			16a			16a			16a			16a			16a			16a		
Ecological Condition Indicator	Bench-mark		Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	66.0	*0.7*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	50.0	*0.5*	*3*
2. Native plant species richness - Trees (No.)	4		3.0	*0.8*	*2.5*	7.0	*1.8*	*5*	2.0	*0.5*	*2.5*	5.0	*1.3*	*5*	7.0	*1.8*	*5*	5.0	*1.3*	*5*	6.0	*1.5*	*5*	6.0	*1.5*	*5*	3.0	*0.8*	*2.5*	7.0	*1.8*	*5*
3. Shrubs (No.)	2		7.0	*3.5*	*5*	9.0	*4.5*	*5*	10.0	*5.0*	*5*	9.0	*4.5*	*5*	14.0	*7.0*	*5*	14.0	*7.0*	*5*	6.0	*3.0*	*5*	10.0	*5.0*	*5*	6.0	*3.0*	*5*	12.0	*6.0*	*5*
4. Grasses (No.)	8		4.0	*0.5*	*2.5*	2.0	*0.3*	*2.5*	1.0	*0.1*	*0*	2.0	*0.3*	*2.5*	9.0	*1.1*	*5*	6.0	*0.8*	*2.5*	4.0	*0.5*	*2.5*	3.0	*0.4*	*2.5*	1.0	*0.1*	*0*	4.0	*0.5*	*2.5*
5. Forbs and Other (No.)	12		26.0	*2.2*	*5*	17.0	*1.4*	*5*	7.0	*0.6*	*2.5*	11.0	*0.9*	*5*	13.0	*1.1*	*5*	21.0	*1.8*	*5*	17.0	*1.4*	*5*	14.0	*1.2*	*5*	17.0	*1.4*	*5*	12.0	*1.0*	*5*
6. Tree canopy height (m)	23		22.8	*1.0*	*5*	17.9	*0.8*	*5*	23.0	*1.0*	*5*	19.2	*0.8*	*5*	23.4	*1.0*	*5*	20.0	*0.9*	*5*	21.3	*0.9*	*5*	24.9	*1.1*	*5*	24.0	*1.0*	*5*	22.5	*1.0*	*5*
7. Tree canopy cover (%)	22		16.4	*0.7*	*5*	59.4	*2.7*	*3*	13.6	*0.6*	*5*	40.8	*1.9*	*5*	14.5	*0.7*	*5*	29.5	*1.3*	*5*	30.2	*1.4*	*5*	40.4	*1.8*	*5*	13.1	*0.6*	*5*	53.7	*2.4*	*3*
8. Shrub canopy cover (%)	1		38.0	*38.0*	*3*	45.7	*45.7*	*3*	18.7	*18.7*	*3*	17.7	*17.7*	*3*	10.0	*10.0*	*3*	16.5	*16.5*	*3*	31.3	*31.3*	*3*	23.0	*23.0*	*3*	2.4	*2.4*	*3*	30.1	*30.1*	*3*
9. Native perennial grass cover (%)	12		0.0	*0.0*	*0*	1.4	*0.1*	*1*	0.0	*0.0*	*0*	44.0	*3.7*	*5*	5.1	*0.4*	*1*	0.0	*0.0*	*0*	15.5	*1.3*	*5*	0.0	*0.0*	*0*	0.9	*0.1*	*0*	0.4	*0.0*	*0*
10. Organic litter (%)	15		26.4	*1.8*	*5*	41.9	*2.8*	*3*	32.6	*2.2*	*3*	36.1	*2.4*	*3*	23.6	*1.6*	*5*	49.3	*3.3*	*3*	24.6	*1.6*	*5*	38.6	*2.6*	*3*	4.9	*0.3*	*3*	36.1	*2.4*	*3*
11. Large Euc. trees/ha (49cm dbh)	14		3.0	*0.2*	*5*	6.0	*0.4*	*5*	2.0	*0.1*	*5*	4.0	*0.3*	*5*	7.0	*0.5*	*5*	3.0	*0.2*	*5*	5.0	*0.4*	*5*	10.0	*0.7*	*10*	1.0	*0.1*	*5*	11.0	*0.8*	*10*
11. Large Non-Euc trees/ha (29cm dbh)	7		19.0	*2.7*	*15*	4.0	*0.6*	*10*	41.0	*5.9*	*15*	4.0	*0.6*	*10*	13.0	*1.9*	*15*	13.0	*1.9*	*15*	14.0	*2.0*	*15*	15.0	*2.1*	*15*	42.0	*6.0*	*15*	10.0	*1.4*	*15*
12. Coarse woody debris (m/ha)	375		50.0	*0.1*	*2*	170.0	*0.5*	*2*	275.0	*0.7*	*5*	160.0	*0.4*	*2*	130.0	*0.3*	*2*	210.0	*0.6*	*5*	35.0	*0.1*	*0*	145.0	*0.4*	*2*	400.0	*1.1*	*5*	162.5	*0.4*	*2*
13. Non-native plant cover (%)	0		51.0	*51.0*	*0*	50.0	*50.0*	*3*	47.0	*47.0*	*3*	61.1	*61.1*	*0*	23.1	*23.1*	*5*	59.1	*59.1*	*0*	47.0	*47.0*	*3*	69.3	*69.3*	*0*	51.0	*51.0*	*0*	79.8	*79.8*	*0*
Site Condition Score			*58*			*55.5*			*57*			*58.5*			*69*			*61.5*			*66.5*			*63.5*			*56.5*			*61.5*		
1. Size of patch (Fragmented)	*n/a*		143	-	*7*	143	-	*7*	524	-	*10*	6	-	*2*	28	-	*5*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*
2. Connectedness (Fragmented)	*n/a*		20	-	*2*	20	-	*2*	4	-	*0*	0	-	*0*	1	-	*0*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*
3. Context (Fragmented)	*n/a*		11	-	*2*	11	-	*2*	32	-	*4*	25	-	*2*	4	-	*0*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0
5. Ecological Corridors	*n/a*		With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6	Not within	-	0	Not within	-	0	With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6
Site Context Score:			*17*			*17*			*20*			*10*			*5*			*11*			*17*			*17*			*17*			*17*		

Habitat quality scoring for Greater Glider

Assessment Unit			1 (Greater Glider)		
Habitat Quality Plot			*5*		
Area of assessment unit (ha)			7.9		
Regional Ecosystem	11.3.2		11.3.2		
BVG (1M)	17a		17a		
Ecological Condition Indicator	Benchmark		Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		100.0	*1.0*	*5*
2. Native plant species richness - Trees (No.)	2		3.0	*1.5*	*5*
3. Shrubs (No.)	2		8.0	*4.0*	*5*
4. Grasses (No.)	9		6.0	*0.7*	*2.5*
5. Forbs and Other (No.)	17		14.0	*0.8*	*2.5*
6. Tree canopy height (m)	18		18.4	*1.0*	*5*
7. Tree canopy cover (%)	40		12.5	*0.3*	*2*
8. Shrub canopy cover (%)	2		15.9	*7.9*	*3*
9. Native perennial grass cover (%)	35		13.8	*0.4*	*1*
10. Organic litter (%)	30		10.1	*0.3*	*3*
11. Large Euc. trees/ha (40cm dbh)	22		6.0	*0.3*	*5*
11. Large Non-Euc trees/ha (0cm dbh)	0		0.0	*0.0*	*0*
12. Coarse woody debris (m/ha)	307		325.0	*1.1*	*5*
13. Non-native plant cover (%)	0		69.0	*69.0*	*0*
Site Condition Score			*44*		
1. Size of patch (Fragmented)	*n/a*		20	-	*2*
2. Connectedness (Fragmented)	*n/a*		97	-	*5*
3. Context (Fragmented)	*n/a*		16	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	*0*
5. Ecological Corridors	*n/a*		Within (whole or part)	-	*6*
Site Context Score:			*15*		

Assessment Unit			2 (Greater Glider)																																		
Habitat Quality Plot			*1*			*2*			*3*			*4*			*6*			*7*			*8*			*9*			*10*			*11*							
Assessment Unit Area (ha)			*106.4*																																		
Regional Ecosystem	11.3.25		11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25							
BVG (1M)			16a			16a			16a			16a			16a			16a			16a			16a			16a			16a							
Ecological Condition Indicator	Bench-mark		Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*						
1. Recruitment of woody perennial species (%)	100		50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	66.0	*0.7*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	50.0	*0.5*	*3*						
2. Native plant species richness - Trees (No.)	4		3.0	*0.8*	*2.5*	7.0	*1.8*	*5*	2.0	*0.5*	*2.5*	5.0	*1.3*	*5*	7.0	*1.8*	*5*	5.0	*1.3*	*5*	6.0	*1.5*	*5*	6.0	*1.5*	*5*	3.0	*0.8*	*2.5*	7.0	*1.8*	*5*						
3. Shrubs (No.)	2		7.0	*3.5*	*5*	9.0	*4.5*	*5*	10.0	*5.0*	*5*	9.0	*4.5*	*5*	14.0	*7.0*	*5*	14.0	*7.0*	*5*	6.0	*3.0*	*5*	10.0	*5.0*	*5*	6.0	*3.0*	*5*	12.0	*6.0*	*5*						
4. Grasses (No.)	8		4.0	*0.5*	*2.5*	2.0	*0.3*	*2.5*	1.0	*0.1*	*0*	2.0	*0.3*	*2.5*	9.0	*1.1*	*5*	6.0	*0.8*	*2.5*	4.0	*0.5*	*2.5*	3.0	*0.4*	*2.5*	1.0	*0.1*	*0*	4.0	*0.5*	*2.5*						
5. Forbs and Other (No.)	12		26.0	*2.2*	*5*	17.0	*1.4*	*5*	7.0	*0.6*	*2.5*	11.0	*0.9*	*5*	13.0	*1.1*	*5*	21.0	*1.8*	*5*	17.0	*1.4*	*5*	14.0	*1.2*	*5*	17.0	*1.4*	*5*	12.0	*1.0*	*5*						
6. Tree canopy height (m)	23		22.8	*1.0*	*5*	17.9	*0.8*	*5*	23.0	*1.0*	*5*	19.2	*0.8*	*5*	23.4	*1.0*	*5*	20.0	*0.9*	*5*	21.3	*0.9*	*5*	24.9	*1.1*	*5*	24.0	*1.0*	*5*	22.5	*1.0*	*5*						
7. Tree canopy cover (%)	22		16.4	*0.7*	*5*	59.4	*2.7*	*3*	13.6	*0.6*	*5*	40.8	*1.9*	*5*	14.5	*0.7*	*5*	29.5	*1.3*	*5*	30.2	*1.4*	*5*	40.4	*1.8*	*5*	13.1	*0.6*	*5*	53.7	*2.4*	*3*						
8. Shrub canopy cover (%)	1		38.0	*38.0*	*3*	45.7	*45.7*	*3*	18.7	*18.7*	*3*	17.7	*17.7*	*3*	10.0	*10.0*	*3*	16.5	*16.5*	*3*	31.3	*31.3*	*3*	23.0	*23.0*	*3*	2.4	*2.4*	*3*	30.1	*30.1*	*3*						
9. Native perennial grass cover (%)	12		0.0	*0.0*	*0*	1.4	*0.1*	*1*	0.0	*0.0*	*0*	44.0	*3.7*	*5*	5.1	*0.4*	*1*	0.0	*0.0*	*0*	15.5	*1.3*	*5*	0.0	*0.0*	*0*	0.9	*0.1*	*0*	0.4	*0.0*	*0*						
10. Organic litter (%)	15		26.4	*1.8*	*5*	41.9	*2.8*	*3*	32.6	*2.2*	*3*	36.1	*2.4*	*3*	23.6	*1.6*	*5*	49.3	*3.3*	*3*	24.6	*1.6*	*5*	38.6	*2.6*	*3*	4.9	*0.3*	*3*	36.1	*2.4*	*3*						
11. Large Euc. trees/ha (49cm dbh)	14		3.0	*0.2*	*5*	6.0	*0.4*	*5*	2.0	*0.1*	*5*	4.0	*0.3*	*5*	7.0	*0.5*	*5*	3.0	*0.2*	*5*	5.0	*0.4*	*5*	10.0	*0.7*	*10*	1.0	*0.1*	*5*	11.0	*0.8*	*10*						
11. Large Non-Euc trees/ha (29cm dbh)	7		19.0	*2.7*	*15*	4.0	*0.6*	*10*	41.0	*5.9*	*15*	4.0	*0.6*	*10*	13.0	*1.9*	*15*	13.0	*1.9*	*15*	14.0	*2.0*	*15*	15.0	*2.1*	*15*	42.0	*6.0*	*15*	10.0	*1.4*	*15*						
12. Coarse woody debris (m/ha)	375		50.0	*0.1*	*2*	170.0	*0.5*	*2*	275.0	*0.7*	*5*	160.0	*0.4*	*2*	130.0	*0.3*	*2*	210.0	*0.6*	*5*	35.0	*0.1*	*0*	145.0	*0.4*	*2*	400.0	*1.1*	*5*	162.5	*0.4*	*2*						
13. Non-native plant cover (%)	0		51.0	*51.0*	*0*	50.0	*50.0*	*3*	47.0	*47.0*	*3*	61.1	*61.1*	*0*	23.1	*23.1*	*5*	59.1	*59.1*	*0*	47.0	*47.0*	*3*	69.3	*69.3*	*0*	51.0	*51.0*	*0*	79.8	*79.8*	*0*						
Site Condition Score			*58*			*55.5*			*57*			*58.5*			*69*			*61.5*			*66.5*			*63.5*			*56.5*			*61.5*							
1. Size of patch (Fragmented)	*n/a*		143	-	*7*	143	-	*7*	524	-	*10*	6	-	*2*	28	-	*5*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*						
2. Connectedness (Fragmented)	*n/a*		20	-	*2*	20	-	*2*	4	-	*0*	0	-	*0*	1	-	*0*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*						
3. Context (Fragmented)	*n/a*		11	-	*2*	11	-	*2*	32	-	*4*	25	-	*2*	4	-	*0*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*						
4. Distance from water (Intact)	*n/a*		n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0						
5. Ecological Corridors	*n/a*		With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6	Not within	-	0	Not within	-	0	With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6						
Site Context Score:			*17*			*17*			*20*			*10*			*5*			*11*			*17*			*17*			*17*			*17*							

Habitat quality scoring for Ornamental Snake

Assessment Unit			1 (Ornamental Snake)		
Habitat Quality Plot			*5*		
Area of assessment unit (ha)			7.9		
Regional Ecosystem	11.3.2		11.3.2		
BVG (1M)	17a		17a		
Ecological Condition Indicator	Benchmark		Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		100.0	*1.0*	*5*
2. Native plant species richness - Trees (No.)	2		3.0	*1.5*	*5*
3. Shrubs (No.)	2		8.0	*4.0*	*5*
4. Grasses (No.)	9		6.0	*0.7*	*2.5*
5. Forbs and Other (No.)	17		14.0	*0.8*	*2.5*
6. Tree canopy height (m)	18		18.4	*1.0*	*5*
7. Tree canopy cover (%)	40		12.5	*0.3*	*2*
8. Shrub canopy cover (%)	2		15.9	*7.9*	*3*
9. Native perennial grass cover (%)	35		13.8	*0.4*	*1*
10. Organic litter (%)	30		10.1	*0.3*	*3*
11. Large Euc. trees/ha (40cm dbh)	22		6.0	*0.3*	*5*
11. Large Non-Euc trees/ha (0cm dbh)	0		0.0	*0.0*	*0*
12. Coarse woody debris (m/ha)	307		325.0	*1.1*	*5*
13. Non-native plant cover (%)	0		69.0	*69.0*	*0*
Site Condition Score			*44*		
1. Size of patch (Fragmented)	*n/a*		20	-	*2*
2. Connectedness (Fragmented)	*n/a*		97	-	*5*
3. Context (Fragmented)	*n/a*		16	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	*0*
5. Ecological Corridors	*n/a*		Within (whole or part)	-	*6*
Site Context Score:			*15*		

Assessment Unit			2 (Ornamental Snake)																																				
Habitat Quality Plot			*1*			*2*			*3*			*4*			*6*			*7*			*8*			*9*			*10*			*11*								
Assessment Unit Area (ha)			106.4																																				
Regional Ecosystem	11.3.25		11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25								
BVG (1M)	16a		16a			16a			16a			16a			16a			16a			16a			16a			16a			16a								
Ecological Condition Indicator	Bench-mark		Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*							
1. Recruitment of woody perennial species (%)	100		50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	66.0	*0.7*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	50.0	*0.5*	*3*							
2. Native plant species richness - Trees (No.)	4		3.0	*0.8*	*2.5*	7.0	*1.8*	*5*	2.0	*0.5*	*2.5*	5.0	*1.3*	*5*	7.0	*1.8*	*5*	5.0	*1.3*	*5*	6.0	*1.5*	*5*	6.0	*1.5*	*5*	3.0	*0.8*	*2.5*	7.0	*1.8*	*5*							
3. Shrubs (No.)	2		7.0	*3.5*	*5*	9.0	*4.5*	*5*	10.0	*5.0*	*5*	9.0	*4.5*	*5*	14.0	*7.0*	*5*	14.0	*7.0*	*5*	6.0	*3.0*	*5*	10.0	*5.0*	*5*	6.0	*3.0*	*5*	12.0	*6.0*	*5*							
4. Grasses (No.)	8		4.0	*0.5*	*2.5*	2.0	*0.3*	*2.5*	1.0	*0.1*	*0*	2.0	*0.3*	*2.5*	9.0	*1.1*	*5*	6.0	*0.8*	*2.5*	4.0	*0.5*	*2.5*	3.0	*0.4*	*2.5*	1.0	*0.1*	*0*	4.0	*0.5*	*2.5*							
5. Forbs and Other (No.)	12		26.0	*2.2*	*5*	17.0	*1.4*	*5*	7.0	*0.6*	*2.5*	11.0	*0.9*	*5*	13.0	*1.1*	*5*	21.0	*1.8*	*5*	17.0	*1.4*	*5*	14.0	*1.2*	*5*	17.0	*1.4*	*5*	12.0	*1.0*	*5*							
6. Tree canopy height (m)	23		22.8	*1.0*	*5*	17.9	*0.8*	*5*	23.0	*1.0*	*5*	19.2	*0.8*	*5*	23.4	*1.0*	*5*	20.0	*0.9*	*5*	21.3	*0.9*	*5*	24.9	*1.1*	*5*	24.0	*1.0*	*5*	22.5	*1.0*	*5*							
7. Tree canopy cover (%)	22		16.4	*0.7*	*5*	59.4	*2.7*	*3*	13.6	*0.6*	*5*	40.8	*1.9*	*5*	14.5	*0.7*	*5*	29.5	*1.3*	*5*	30.2	*1.4*	*5*	40.4	*1.8*	*5*	13.1	*0.6*	*5*	53.7	*2.4*	*3*							
8. Shrub canopy cover (%)	1		38.0	*38.0*	*3*	45.7	*45.7*	*3*	18.7	*18.7*	*3*	17.7	*17.7*	*3*	10.0	*10.0*	*3*	16.5	*16.5*	*3*	31.3	*31.3*	*3*	23.0	*23.0*	*3*	2.4	*2.4*	*3*	30.1	*30.1*	*3*							
9. Native perennial grass cover (%)	12		0.0	*0.0*	*0*	1.4	*0.1*	*1*	0.0	*0.0*	*0*	44.0	*3.7*	*5*	5.1	*0.4*	*1*	0.0	*0.0*	*0*	15.5	*1.3*	*5*	0.0	*0.0*	*0*	0.9	*0.1*	*0*	0.4	*0.0*	*0*							
10. Organic litter (%)	15		26.4	*1.8*	*5*	41.9	*2.8*	*3*	32.6	*2.2*	*3*	36.1	*2.4*	*3*	23.6	*1.6*	*5*	49.3	*3.3*	*3*	24.6	*1.6*	*5*	38.6	*2.6*	*3*	4.9	*0.3*	*3*	36.1	*2.4*	*3*							
11. Large Euc. trees/ha (49cm dbh)	14		3.0	*0.2*	*5*	6.0	*0.4*	*5*	2.0	*0.1*	*5*	4.0	*0.3*	*5*	7.0	*0.5*	*5*	3.0	*0.2*	*5*	5.0	*0.4*	*5*	10.0	*0.7*	*10*	1.0	*0.1*	*5*	11.0	*0.8*	*10*							
11. Large Non-Euc trees/ha (29cm dbh)	7		19.0	*2.7*	*15*	4.0	*0.6*	*10*	41.0	*5.9*	*15*	4.0	*0.6*	*10*	13.0	*1.9*	*15*	13.0	*1.9*	*15*	14.0	*2.0*	*15*	15.0	*2.1*	*15*	42.0	*6.0*	*15*	10.0	*1.4*	*15*							
12. Coarse woody debris (m/ha)	375		50.0	*0.1*	*2*	170.0	*0.5*	*2*	275.0	*0.7*	*5*	160.0	*0.4*	*2*	130.0	*0.3*	*2*	210.0	*0.6*	*5*	35.0	*0.1*	*0*	145.0	*0.4*	*2*	400.0	*1.1*	*5*	162.5	*0.4*	*2*							
13. Non-native plant cover (%)	0		51.0	*51.0*	*0*	50.0	*50.0*	*3*	47.0	*47.0*	*3*	61.1	*61.1*	*0*	23.1	*23.1*	*5*	59.1	*59.1*	*0*	47.0	*47.0*	*3*	69.3	*69.3*	*0*	51.0	*51.0*	*0*	79.8	*79.8*	*0*							
Site Condition Score			*58*			*55.5*			*57*			*58.5*			*69*			*61.5*			*66.5*			*63.5*			*56.5*			*61.5*								
1. Size of patch (Fragmented)	*n/a*		143	-	*7*	143	-	*7*	524	-	*10*	6	-	*2*	28	-	*5*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*							
2. Connectedness (Fragmented)	*n/a*		20	-	*2*	20	-	*2*	4	-	*0*	0	-	*0*	1	-	*0*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*							
3. Context (Fragmented)	*n/a*		11	-	*2*	11	-	*2*	32	-	*4*	25	-	*2*	4	-	*0*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*							
4. Distance from water (Intact)	*n/a*		n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0							
5. Ecological Corridors	*n/a*		With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6	Not within	-	0	Not within	-	0	With-in	-	6	With-in	-	6	With-in	-	6	Within (whole or part)	-	6							
Site Context Score:			*17*			*17*			*20*			*10*			*5*			*11*			*17*			*17*			*17*			*17*								

Habitat quality scoring for Koala

Assessment Unit			1 (Koala)		
Habitat Quality Plot			*5*		
Area of assessment unit (ha)			7.9		
Regional Ecosystem	11.3.2		11.3.2		
BVG (1M)	17a		17a		
Ecological Condition Indicator	Benchmark		Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		100.0	*1.0*	*5*
2. Native plant species richness - Trees (No.)	2		3.0	*1.5*	*5*
3. Shrubs (No.)	2		8.0	*4.0*	*5*
4. Grasses (No.)	9		6.0	*0.7*	*2.5*
5. Forbs and Other (No.)	17		14.0	*0.8*	*2.5*
6. Tree canopy height (m)	18		18.4	*1.0*	*5*
7. Tree canopy cover (%)	40		12.5	*0.3*	*2*
8. Shrub canopy cover (%)	2		15.9	*7.9*	*3*
9. Native perennial grass cover (%)	35		13.8	*0.4*	*1*
10. Organic litter (%)	30		10.1	*0.3*	*3*
11. Large Euc. trees/ha (40cm dbh)	22		6.0	*0.3*	*5*
11. Large Non-Euc trees/ha (0cm dbh)	0		0.0	*0.0*	*0*
12. Coarse woody debris (m/ha)	307		325.0	*1.1*	*5*
13. Non-native plant cover (%)	0		69.0	*69.0*	*0*
Site Condition Score			*44*		
1. Size of patch (Fragmented)	*n/a*		20	-	*2*
2. Connectedness (Fragmented)	*n/a*		97	-	*5*
3. Context (Fragmented)	*n/a*		16	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	*0*
5. Ecological Corridors	*n/a*		Within (whole or part)	-	*6*
Site Context Score:			*15*		

Assessment Unit			2 (Koala)																												
Habitat Quality Plot			*1*			*2*			*3*			*4*			*6*			*7*			*8*			*9*			*10*			*11*		
Assessment Unit Area (ha)			106.4																												
Regional Ecosystem	11.3.25		11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25			11.3.25		
BVG (1M)	16a		16a			16a			16a			16a			16a			16a			16a			16a			16a			16a		
Ecological Condition Indicator	Bench-mark		Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*	Field Value	*% of Bench.*	*Score*
1. Recruitment of woody perennial species (%)	100		50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	75.0	*0.8*	*3*	66.0	*0.7*	*3*	75.0	*0.8*	*3*	50.0	*0.5*	*3*	50.0	*0.5*	*3*
2. Native plant species richness - Trees (No.)	4		3.0	*0.8*	*2.5*	7.0	*1.8*	*5*	2.0	*0.5*	*2.5*	5.0	*1.3*	*5*	7.0	*1.8*	*5*	5.0	*1.3*	*5*	6.0	*1.5*	*5*	6.0	*1.5*	*5*	3.0	*0.8*	*2.5*	7.0	*1.8*	*5*
3. Shrubs (No.)	2		7.0	*3.5*	*5*	9.0	*4.5*	*5*	10.0	*5.0*	*5*	9.0	*4.5*	*5*	14.0	*7.0*	*5*	14.0	*7.0*	*5*	6.0	*3.0*	*5*	10.0	*5.0*	*5*	6.0	*3.0*	*5*	12.0	*6.0*	*5*
4. Grasses (No.)	8		4.0	*0.5*	*2.5*	2.0	*0.3*	*2.5*	1.0	*0.1*	*0*	2.0	*0.3*	*2.5*	9.0	*1.1*	*5*	6.0	*0.8*	*2.5*	4.0	*0.5*	*2.5*	3.0	*0.4*	*2.5*	1.0	*0.1*	*0*	4.0	*0.5*	*2.5*
5. Forbs and Other (No.)	12		26.0	*2.2*	*5*	17.0	*1.4*	*5*	7.0	*0.6*	*2.5*	11.0	*0.9*	*5*	13.0	*1.1*	*5*	21.0	*1.8*	*5*	17.0	*1.4*	*5*	14.0	*1.2*	*5*	17.0	*1.4*	*5*	12.0	*1.0*	*5*
6. Tree canopy height (m)	23		22.8	*1.0*	*5*	17.9	*0.8*	*5*	23.0	*1.0*	*5*	19.2	*0.8*	*5*	23.4	*1.0*	*5*	20.0	*0.9*	*5*	21.3	*0.9*	*5*	24.9	*1.1*	*5*	24.0	*1.0*	*5*	22.5	*1.0*	*5*
7. Tree canopy cover (%)	22		16.4	*0.7*	*5*	59.4	*2.7*	*3*	13.6	*0.6*	*5*	40.8	*1.9*	*5*	14.5	*0.7*	*5*	29.5	*1.3*	*5*	30.2	*1.4*	*5*	40.4	*1.8*	*5*	13.1	*0.6*	*5*	53.7	*2.4*	*3*
8. Shrub canopy cover (%)	1		38.0	*38.0*	*3*	45.7	*45.7*	*3*	18.7	*18.7*	*3*	17.7	*17.7*	*3*	10.0	*10.0*	*3*	16.5	*16.5*	*3*	31.3	*31.3*	*3*	23.0	*23.0*	*3*	2.4	*2.4*	*3*	30.1	*30.1*	*3*
9. Native perennial grass cover (%)	12		0.0	*0.0*	*0*	1.4	*0.1*	*1*	0.0	*0.0*	*0*	44.0	*3.7*	*5*	5.1	*0.4*	*1*	0.0	*0.0*	*0*	15.5	*1.3*	*5*	0.0	*0.0*	*0*	0.9	*0.1*	*0*	0.4	*0.0*	*0*
10. Organic litter (%)	15		26.4	*1.8*	*5*	41.9	*2.8*	*3*	32.6	*2.2*	*3*	36.1	*2.4*	*3*	23.6	*1.6*	*5*	49.3	*3.3*	*3*	24.6	*1.6*	*5*	38.6	*2.6*	*3*	4.9	*0.3*	*3*	36.1	*2.4*	*3*
11. Large Euc. trees/ha (49cm dbh)	14		3.0	*0.2*	*5*	6.0	*0.4*	*5*	2.0	*0.1*	*5*	4.0	*0.3*	*5*	7.0	*0.5*	*5*	3.0	*0.2*	*5*	5.0	*0.4*	*5*	10.0	*0.7*	*10*	1.0	*0.1*	*5*	11.0	*0.8*	*10*
11. Large Non-Euc trees/ha (29cm dbh)	7		19.0	*2.7*	*15*	4.0	*0.6*	*10*	41.0	*5.9*	*15*	4.0	*0.6*	*10*	13.0	*1.9*	*15*	13.0	*1.9*	*15*	14.0	*2.0*	*15*	15.0	*2.1*	*15*	42.0	*6.0*	*15*	10.0	*1.4*	*15*
12. Coarse woody debris (m/ha)	375		50.0	*0.1*	*2*	170.0	*0.5*	*2*	275.0	*0.7*	*5*	160.0	*0.4*	*2*	130.0	*0.3*	*2*	210.0	*0.6*	*5*	35.0	*0.1*	*0*	145.0	*0.4*	*2*	400.0	*1.1*	*5*	162.5	*0.4*	*2*
13. Non-native plant cover (%)	0		51.0	*51.0*	*0*	50.0	*50.0*	*3*	47.0	*47.0*	*3*	61.1	*61.1*	*0*	23.1	*23.1*	*5*	59.1	*59.1*	*0*	47.0	*47.0*	*3*	69.3	*69.3*	*0*	51.0	*51.0*	*0*	79.8	*79.8*	*0*
Site Condition Score			*58*			*55.5*			*57*			*58.5*			*69*			*61.5*			*66.5*			*63.5*			*56.5*			*61.5*		
1. Size of patch (Fragmented)	*n/a*		143	-	*7*	143	-	*7*	524	-	*10*	6	-	*2*	28	-	*5*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*	143	-	*7*
2. Connectedness (Fragmented)	*n/a*		20	-	*2*	20	-	*2*	4	-	*0*	0	-	*0*	1	-	*0*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*	20	-	*2*
3. Context (Fragmented)	*n/a*		11	-	*2*	11	-	*2*	32	-	*4*	25	-	*2*	4	-	*0*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*	11	-	*2*
4. Distance from water (Intact)	*n/a*		n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0	n/a	-	0
5. Ecological Corridors	*n/a*		With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6	Not within	-	0	Not within	-	0	With-in	-	6	With-in	-	6	With-in	-	6	With-in	-	6
Site Context Score:			*17*			*17*			*20*			*10*			*5*			*11*			*17*			*17*			*17*			*17*		

Appendix B

Photo monitoring points in the riparian monitoring area

Habitat quality plot 1

Plate B-01: HQP 1, 0 m - looking along plot

Plate B-02: HQP 1, 100 m - looking along plot

Plate B-03: HQP 1, 50 m - looking north

Plate B-04: HQP 1, 50 m - looking east

Plate B-05: HQP 1, 50 m - looking south

Plate B-06: HQP 1, 50 m - looking west

Plate B-07: HQP 1, 50 m - ground cover

Habitat quality plot 2

Plate B-08: HQP 2, 0 m - looking along plot

Plate B-09: HQP 2, 100 m - looking along plot

Plate B-10: HQP 2, 50 m - looking north

Plate B-11: HQP 2, 50 m - looking east

Plate B-12: HQP 2, 50 m - looking south

Plate B-13: HQP 2, 50 m - looking west

Plate B-14: HQP 2, 50 m - ground cover

Habitat quality plot 3

Plate B-15: HQP 3, 0 m - looking along plot

Plate B-16: HQP 3, 100 m - looking along plot

Plate B-17: HQP 3, 50 m - looking north

Plate B-18: HQP 3, 50 m - looking east

Plate B-19: HQP 3, 50 m - looking south

Plate B-20: HQP 3, 50 m - looking west

Plate B-21: HQP 3, 50 m - ground cover

Habitat quality plot 4

Plate B-22: HQP 4, 0 m - looking along plot

Plate B-23: HQP 4, 100 m - looking along plot

Plate B-24: HQP 4, 50 m - looking north

Plate B-25: HQP 4, 50 m - looking east

Plate B-26: HQP 4, 50 m - looking south

Plate B-37: HQP 4, 50 m - looking west

Plate B-28: HQP 4, 50 m - ground cover

Habitat quality plot 5

Plate B-29: HQP 5, 0 m - looking along plot

Plate B-30: HQP 5, 100 m - looking along plot

Plate B-31: HQP 5, 50 m - looking north

Plate B-32: HQP 5, 50 m - looking east

Plate B-33: HQP 5, 50 m - looking south

Plate B-34: HQP 5, 50 m - looking west

Plate B-35: HQP 5, 50 m – soils

Habitat quality plot 6

Plate B-36: HQP 6, 0 m - looking along plot

Plate B-37: HQP 6, 100 m - looking along plot

Plate B-38: HQP 6, 50 m - looking north

Plate B-39: HQP 6, 50 m - looking east

Plate B-40: HQP 6, 50 m - looking south

Plate B-41: HQP 6, 50 m - looking west

Plate B-42: HQP 6, 50 m - ground cover

Habitat quality plot 7

Plate B-43: HQP 7, 0 m - looking along plot

Plate B-44 HQP 7, 100 m - looking along plot

Plate B-45: HQP 7, 50 m - looking north

Plate B-46: HQP 7, 50 m - looking east

Plate B-47: HQP 7, 50 m - looking south

Plate B-48: HQP 7, 50 m - looking west

Plate B-49: HQP 7, 50 m - ground cover

Habitat quality plot 8

Plate B-50: HQP 8, 0 m - looking along plot

Plate B-51: HQP 8, 100 m - looking along plot

Plate B-52: HQP 8, 50 m - looking north

Plate B-53: HQP 8, 50 m - looking east

Plate B-54: HQP 8, 50 m - looking south

Plate B-55: HQP 8, 50 m - looking west

Plate B-56: HQP 8, 50 m - ground cover

Habitat quality plot 9

Plate B-57: HQP 9, 0 m - looking along plot

Plate B-58: HQP 9, 100 m - looking along plot

Plate B-59: HQP 9, 50 m - looking north

Plate B-60: HQP 9, 50 m - looking east

Plate B-61: HQP 9, 50 m - looking south

Plate B-62: HQP 9, 50 m - looking west

Plate B-63: HQP 9, 50 m - ground cover

Habitat quality plot 10

Plate B-64: HQP 10, 0 m - looking along plot

Plate B-65: HQP 10, 100 m - looking along plot

Plate B-66: HQP 10, 50 m - looking north

Plate B-67: HQP 10, 50 m - looking east

Plate B-68: HQP 10, 50 m - looking south

Plate B-69: HQP 10, 50 m - looking west

Plate B-70: HQP 10, 50 m - ground cover

Habitat quality plot 11

Plate B-71: HQP 11, 0 m - looking along plot

Plate B-72: HQP 11, 100 m - looking along plot

Plate B-73: HQP 11, 50 m - looking north

Plate B-74: HQP 11, 50 m - looking east

Plate B-75: HQP 11, 50 m - looking south

Plate B-76: HQP 11, 50 m - looking west

Plate B-77: HQP 11, 50 m - ground cover

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