ROCKINGHAM INDUSTRY ZONE

COMPLIANCE REPORT 2019 / 2020
EPBC 2010/5337

Prepared for:	DevelopmentWA
Report Date:	12 October 2020
Version:	1
Report No.	2020-531

pgv ENVIRONMENTAL

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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) FRANK MARRA

Position (please print) Chief Executive Officer

Organisation (please print including ABN/ACN if applicable):

Western Australian Land Authority (DevelopmentWA)

ABN:34 868 192 835 ACN: 614 976 117

Date 14 / 10 / 2020

1 INTRODUCTION

The Rockingham Industry Zone (RIZ) is an area zoned for industrial development adjacent to the Kwinana Industrial Area.

As a result of portions of the RIZ containing Matters of National Environmental Significance, the proposed development was referred to the Australian Government's Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment and Energy) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal was assessed as a Controlled Action (EPBC 2010/5337) and was approved on 30 November 2011 with conditions (Appendix 1).

An amendment to Condition 14 of EPBC referral 2010/5337 was requested on 18 March 2014 and approved on 19 June 2014 (Appendix 2). A second request to vary Conditions 3, 9, 10 and 12 was approved on 9 May 2016 (Appendix 3). A third request to update the timing for the vesting of the Conservation Area was approved on 13 December 2016 (Appendix 4).

Condition 3 of the EPBC approval requires DevelopmentWA to publish an annual compliance report. Specifically Condition 3 states:

> *Within three months of every 12-month anniversary of the **commencement** of the action, the person taking the action must publish a compliance report on its website and provide a copy of the compliance report to the **Department** in writing. The compliance report must address compliance with: each of the conditions of this approval; any management plans required under this approval; and whether outcomes and milestones required by these conditions and commitments made in management plans required under this approval have been met or are on track to being met. The compliance report must include any actual or potential contraventions and must consider the **Department's** Annual Compliance Report Guidelines. Documentary evidence providing proof of the date of publication must be provided to the **Department** within 7 days after the compliance report is published. All compliance reports must remain on the website for the period this approval has effect. The person taking the action may cease preparing and publishing compliance reports required by this condition with written agreement of the **Minister** to do so.*

This Compliance Report has been prepared by PGV Environmental on behalf of the Western Australian Land Authority trading as DevelopmentWA in accordance with Condition 3 of the EPBC approval.

2 DESCRIPTION OF ACTIVITIES

2.1 Project Details

EPBC number:	2010/5337
Project name:	Rockingham Industry Zone
Approval holder:	Western Australian Land Authority (DevelopmentWA)
ACN or ABN:	34 868 192 835
Approved action:	Industrial Development
Location of the project:	City of Rockingham
Responsible Person:	Jonathan Roach
Reporting period:	11 October 2019 to 12 October 2020
Date of preparation:	12 October 2020

2.2 Current Status

Development within the portion of the RIZ approved under the EPBC Act commenced on 14 July 2014. In 2014 clearing was undertaken for development. No further clearing was undertaken in 2015 or 2016 (Appendix 5). The newly created Lot 102 Alumina Road was cleared in August 2017. The lot is 1.88ha in size and contained approximately 0.3ha of the Threatened Ecological Community (TEC) Sedgelands in Holocene Dune Swales.

Development within the RIZ Strategic Environmental Assessment (SEA) area commenced on 14 July 2014. During the 2019-2020 compliance period, clearing was undertaken in the Development Area, shown by comparison in Appendix 5 (Landgate, 2020) for the following:

- A 4m firebreak adjacent to Patterson Road and Ward Road (approximately 800m^2);
- Site compound Charles Street (approximately 5537m^2);
- Construction of the extension of Alloy Avenue and Alumina Road (approximately 26448m^2); and
- Site compound Charles Street (approx. 9000m^2).

The total clearing footprint in the 2019-2020 compliance period was approximately 4.18ha (Appendix 5).

Significant management works have been undertaken in the Conservation Area and the completion criteria have been met. The Department of Conservation and Attractions (DBCA) has acknowledged completion and the handover process is underway. Maintenance works are ongoing while the

administrative process is completed. Black Cockatoo habitat has been successfully established in areas of the Rockingham Lakes Regional Park and the program was completed in the 2017-2018 compliance period. The Water Management Strategy is being implemented with monitoring results provided in Appendix 6. The Threatened Ecological Community Re-establishment Trial is ongoing with the trial basins constructed and planted in 2016, monitoring undertaken in 2016, 2017, 2018 and 2019 and is scheduled for 2020. The trial is due to be completed in 2021.

3 COMPLIANCE

3.1 Condition 1

*Within 30 days after the **commencement** of the action, the person taking the action must advise the **Department** in writing of the actual date of **commencement**.*

In compliance with Condition 1 DevelopmentWA advised the Department through a letter dated 11 July 2014 that the actual date of commencement of action is to be 14 July 2014 as reported in 2014. Compliance with this condition is complete.

3.2 Condition 2

*The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans or strategy 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.*

Condition 2 is being implemented through the preparation of this report. This Compliance Report for the 2018-2019 period, will be retained electronically using DevelopmentWA's document management system and report library and made publicly available on DevelopmentWA's website (http://www.DevelopmentWA.com.au/Industrial-and-Commercial/Rockingham-Industry-Zone/Downloads/). Information lodged in the document management system and associated library is backed up and will be retained for the duration of the project.

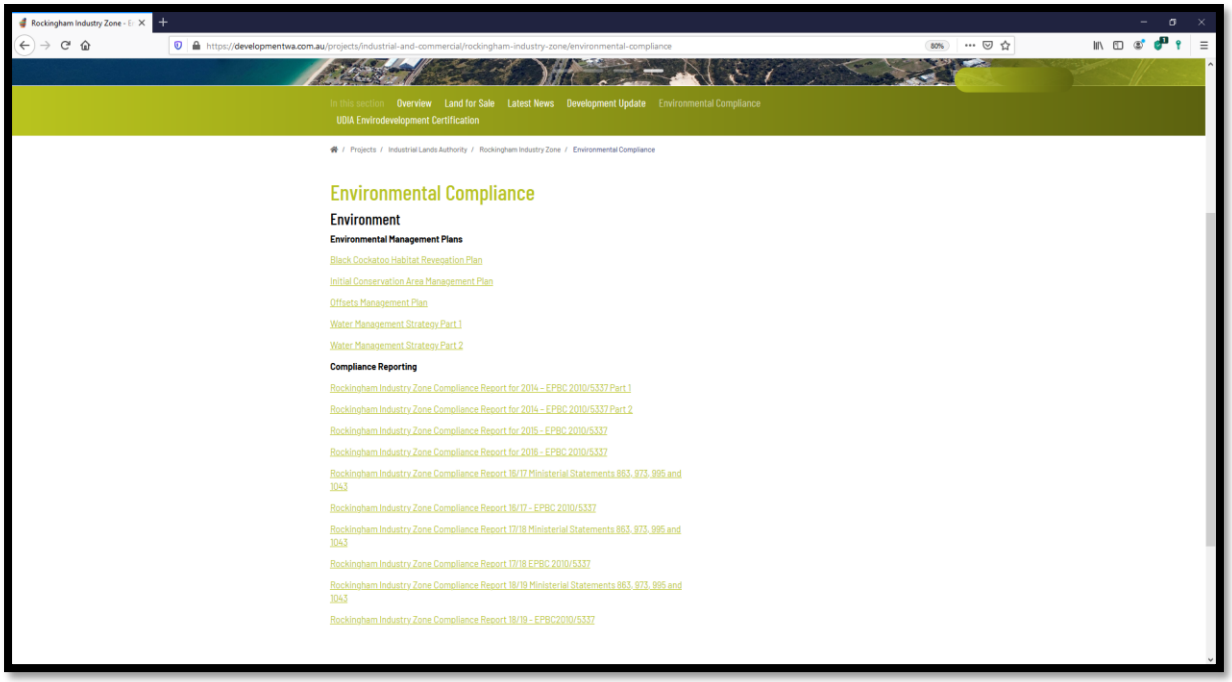
3.3 Condition 3

*Within three months of every 12 month anniversary of the **commencement** of the action, the person taking the action must publish a compliance report on its website, and provide a copy of the compliance report to the **Department** in writing. The compliance report must address compliance with: each of the conditions of this approval; any management plans required under this approval; and whether outcomes and milestones required by these conditions and commitments made in management plans required under this approval have been met or are on track to being met. The compliance report must include any actual or potential contraventions, and must consider the **Department's** Annual Compliance Report Guidelines. Documentary evidence providing proof of the date of publication must be provided to the **Department** within 7 days after the compliance report is published. All compliance reports must remain on the website for the period this approval has effect. The person taking the*

*action may cease preparing and publishing compliance reports required by this condition with written agreement of the **Minister** to do so.*

This Compliance Report has been prepared to satisfy the requirements of this condition. The Compliance Report will be published and remain on DevelopmentWA's website for the duration of the approval (http://www.landcorp.com.au/Industrial-and-Commercial/Rockingham-Industry-Zone/Downloads/). Evidence of publication is shown on the screenshot of the DevelopmentWA Website address (Plate 1).

Plate 1: Screenshot of links to Compliance Reports



3.4 Condition 4

*Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the **commencement** of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.*

An independent audit of compliance has not been requested by the Minister.

3.5 Condition 5

*If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plans or strategy, as specified in the conditions, the person taking the action must submit to the **Department** for the **Minister's** written approval a revised version of that management plans or strategy. The varied activity shall not commence until the **Minister** has approved the varied management plan or strategy in writing. The **Minister** will*

*not approve a varied management plan or strategy unless the revised management plans or strategy would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised management plans or strategy, that management plan or strategy, must be implemented in place of the management plans or strategy originally approved.*

There are no variations to activities during this compliance period.

3.6 Condition 6

*If the **Minister** believes that it is necessary or convenient for the better protection of Listed threatened species and communities (sections 18 & 18A) to do so, the **Minister** may request that the person taking the action make specified revisions to the management plans or strategy specified in the conditions and submit the revised management plans or strategy for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved management plans or strategy must be implemented. Unless the **Minister** has approved the revised management plans or strategy, then the person taking the action must continue to implement the management plan or strategy originally approved, as specified in the conditions.*

The Minister has not requested for revisions to be made to the management plans or strategy.

3.7 Condition 7

*If, at any time after 5 years from the date of this approval, the person taking the action has not commenced the action, then the person taking the action must not **commence** the action without the written agreement of the **Minister**.*

The action commenced (14 July 2014) within the 5-year period from the date of approval (30 November 2011). Compliance with this condition is complete.

3.8 Condition 8

*Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans and strategies referred to in these conditions of approval on their website. Each management plan and strategy must be published on the website within 1 month of being approved.*

The management plans and strategy are published on DevelopmentWA's website (http://www.landcorp.com.au/Industrial-and-Commercial/Rockingham-Industry-Zone/Downloads/) (Plate 1).

3.9 Condition 9

Potential or actual contraventions of the approval conditions (including contravention with a commitment in a management plan) must be reported in writing / by email to the

Department *within 2 business days of the person taking the action becoming aware of the actual or potential contravention.*

No potential or actual contraventions have occurred in this compliance period. Any instances of non-compliance will be reported to the Department within the 2-business day timeframe as specified.

3.10 Condition 10 – Conservation Area

To protect the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) and habitat for ***Black Cockatoos*** *the person taking the action must establish a Conservation Area of at least 89.1 ha in the area designated as 'Conservation Area' on the map provided at Attachment A prior to the* ***commencement*** *of* ***construction****. The person taking the action must:*

a) Include at least 19.5 ha of the TEC within the Conservation Area;
b) Prior to ***commencement*** *of* ***construction****, provide the* ***Department*** *with written evidence that the Conservation Area will be protected and managed in perpetuity by a* ***recognised conservation organisation****;*
c) By 30 November 2021, vest management and ownership of the conservation area with a ***recognised conservation organisation****.*

A Conservation Area was established at the RIZ prior to the commencement of construction. The boundary was updated in Attachment A of the Notice of Approval on 9 May 2016. The current boundary reflects the area shown on Attachment A of the current Approval (Appendix 3).

a) The Conservation Area includes 19.5ha of the Threatened Ecological Community (TEC) 19b in Good to Very Good condition;
b) The Initial Conservation Area Management Plan (ICAMP) was provided to the Department prior to commencement of construction and confirms that the Conservation Area will be protected and vested to DBCA for management;
c) Compliance with this condition is not required at this stage, however the process for vesting is underway in compliance with this condition.

The action is currently compliant with Condition 10. DevelopmentWA has now transferred most of the Conservation Area to Crown Land and administrative details are being finalised prior to formal vesting of the site with DBCA.

3.11 Condition 11 – Conservation Area Management Plan

To protect and enhance the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) and habitat for ***Black Cockatoos*** *within the Conservation Area the person taking the action must prepare and submit a Conservation Area Management Plan (CAMP) for the Minister's approval. The person taking the action must not* ***commence construction*** *unless the* ***Minister*** *has approved the CAMP. The Camp*

*must be prepared in consultation with **DPaW** and the WA Office of the Environmental Protection Authority (EPA) prior to being submitted for approval by the **Minister**.*

The CAMP must include the following requirements:

*a) Management measures to protect and enhance the TEC and **Black Cockatoo** habitat;*
*b) Measures to determine the effectiveness of all management measures for the TEC and **Black Cockatoo** habitat;*
c) Construction of a permanent fence around the perimeter of the conservation area;
d) Management of weeds and feral animals, including monitoring requirements to determine the effectiveness of the weed and feral animal management;
e) Management of fire regime and monitoring requirements to determine the effectiveness of fire management; and
f) Rehabilitation works for degraded areas, including monitoring requirements to determine the effectiveness of the rehabilitation.

*If the **Minister** approves the CAMP then the approved CAMP must be implemented.*

The Conservation Area Management Plan (CAMP) is called the ICAMP to be consistent with State Approvals and will be referred to as the ICAMP in this Compliance Report. The ICAMP was prepared with advice from DBCA (then the Department of Parks and Wildlife (DPaW)). The ICAMP was approved by the Commonwealth Minister for the Environment on 18 June 2014. The ICAMP was approved by the Minister prior to construction commencing on 14 July 2014 as per Condition 11.

The ICAMP has been successfully implemented as reported in the 2018 to 2019 compliance period and ongoing maintenance is discussed Section 4.1.

3.12 Condition 12 – Black Cockatoo Habitat

To protect the habitat for Black Cockatoos, the person taking the action:

*a) Must not clear more than 830 Tuart trees (Eucalyptus gomphocephala) that are greater than 500 mm diameter at breast height (DBH) from within the project area of the Rockingham Industry Zone, designated as 'SEA Boundary' on the map provided at Attachment A. The person taking the action must ensure that no trees are cleared within the Conservation Area referred to in Condition 10. Within 12 months of the **commencement** of **construction**, the person taking the action must, in consultation with **DPaW**, plant in the revegetation area within the **DPaW** managed land at Rockingham Lakes Regional Park up to 4,980 Tuart seedling trees (Eucalyptus gomphocephala) at a ratio of 6 seedling trees for every tree greater than 500 mm DBH removed from the project area. The seedling trees must be planted at a density of 200- 250 per hectare in cleared or degraded areas where Tuart density has previously been reduced. In consultation with the **Department** the person taking the action must ensure these seedling trees are protected in perpetuity.*

b) *Must, within 12 months of the **commencement** of **construction**, commence a Tuart revegetation project as described below:*
   i. *If, after two years from the date of planting trees, a survival rate of at least 80% seedling trees is not achieved, all seedling trees that have not survived must be replaced within 12 months, and the replacements maintained to achieve a survival rate of at least 80% for at least a further three years;*
   ii. *The person taking the action must fund and manage the Tuart revegetation project in consultation with DPaW until such a time as management responsibility has been formally transferred to a **recognised conservation organisation**; and*
   iii. *The revegetation project must be at least partially undertaken in the Rockingham Lakes Regional Park. If there is insufficient appropriate land in the Rockingham Lakes Regional Park to receive the required revegetation, the person taking the action, in consultation with **DPaW** and the **Department**, must find alternative locations to undertake the revegetation within the Rockingham region.*

c) *Prepare and submit a **Black Cockatoo** Habitat Revegetation Plan (BCHRP) for the **Minister's** approval, that describes how approval condition 12b) will be implemented. The plan must be prepared in consultation with the DPaW. The person taking the action must not **commence construction** unless the Minister has approved the BCHRP.*

   The BCHRP must address the following matters:
   i. *The location of the revegetation areas;*
   ii. *Planting methodology, including soil preparation;*
   iii. *What flora species that will be planted;*
   iv. *Monitoring program (including how survival rates and success criteria will be determined);*
   v. *Construction of a temporary fence around the perimeter of the revegetation areas;*
   vi. *Management of weeds and feral animals in the revegetation area;*
   vii. *How the performance of the plan will be reported to the **Minister**; and*
   viii. *Who will be responsible for implementing all aspects of the plan.*

If the Minister approves the BCHRP then the approved BCHRP must be implemented.

The Black Cockatoo Habitat Revegetation Plan (BCHRP) was prepared in consultation with DPaW. Comments from DPaW were received during preparation of the report in 2013 and changes incorporated into the document. It was approved by the Minister on 18 June 2014. The BCHRP was approved by the Minister prior to construction commencing on 14 July 2014 as per Condition 12.

The Black Cockatoo Habitat Revegetation Program was completed in June 2018 as reported in the 2017-2018 compliance period. There have been a total of 38 significant cleared.

3.13 Condition 13 – Water Management Strategy

*To protect the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) and habitat for **Black Cocka**toos the person taking the action must prepare and submit a Water Management Strategy (WMS) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the WMS. The WMS must be prepared in consultation with the **DPaW** and the EPA.*

The WMS must include:

a) *arrangements for the long term monitoring of groundwater levels in the site;*
b) *a pre-construction baseline for surface water and groundwater quality data and a monitoring program for these parameters to maintain stormwater and groundwater quality and hydrology to pre-development levels;*
c) *an adaptive management plan, including contingency measures, to ensure construction does not affect groundwater levels beyond normal seasonal variation, with the aim of ensuring that the TEC persists and thrives in perpetuity;*
d) *maintaining or improving groundwater balance;*
e) *managing the salt wedge, Cockburn Sound interface;*
f) *preventing abstraction of shallow groundwater during construction or for future industry use; and*
g) *managing drainage into the conservation site.*

If the Minister approves the WMS then the approved WMS must be implemented.

The Water Management Strategy (WMS) was prepared and submitted to the Department of Water (DoW) and DPaW. The WMS was endorsed by DoW and by the OEPA. The Minister approved the WMS on 1 August 2013. The WMS was approved by the Minister prior to construction commencing on 14 July 2014 as per Condition 13.

The WMS is currently being implemented and is discussed in detail in Section 4.3.

3.14 Condition 14 – Offsets Management Plan

*To protect the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) the person taking the action must prepare and submit an Offsets Management Plan (OMP) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the OMP. The OMP must be prepared in consultation with DPaW.*

The OMP must include:

a) *The rehabilitation of a minimum of 18ha of the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain that required active management in land managed by **DPaW** at other priority sites (as*

*agreed by **DPaW** and the **Department**) in the Rockingham region. The rehabilitation must commence within 6 months of the **commencement** of **construction**.*

b) *A research trial for the re-establishment of TEC in the onsite TEC re-establishment lot outlined in Attachment B, in accordance with the following requirements:*
   i. *The method and deliverables of the research trial must be prepared in consultation with **DPaW**;*
   ii. *The research trial must consider the existing TEC within the Conservation Area;*
   iii. *The research trial must commence within 12 months of the **commencement** of **construction** and must be undertaken for no less than five years;*
   iv. *The research trial must include an annual program for the monitoring and reporting.*
   v. *Within 12 months of completing the research trial a report documenting the results of the trial must be submitted to **DPaW** and the **Department**.*

*If the **Minister** approves the OMP then the approved OMP must be implemented. The annual report referred to in condition 9 detailing performance against the plan must include the following information;*

- *Areas of the Rockingham Industry Zone cleared for development and revegetation;*
- *Areas of TEC cleared and areas of TEC recreated/rehabilitated and their protection arrangements; and*
- *Areas of the TEC rehabilitated at other occurrences of the TEC in the Rockingham region.*

An amendment to EPBC 2010/5337 Condition 14 was requested by DevelopmentWA on 18 March 2014 and approved by the Department on 19 June 2014 (Appendix 2). An Offsets Management Plan (OMP) was prepared in accordance with the amended condition. The plan was prepared in consultation with DBCA and approved by the Minister on 18 June 2014. The OMP was approved by the Minister prior to construction commencing on 14 July 2014 as per Condition 14.

The OMP is currently being implemented and is discussed in detail in Section 4.4.

4 COMPLIANCE WITH ENVIRONMENTAL MANAGEMENT PLANS

4.1 Initial Conservation Area Management Plan

The management works in the Conservation Area have been successful, reaching the completion criteria as outlined in the ICAMP. Completion has been acknowledged by DBCA and DoEE. DevelopmentWA is currently facilitating the administrative details for the handover of the Conservation Area to the management of DBCA. Ongoing management works are being undertaken to ensure the Conservation Area is managed to the completion criteria and handover is expected in December 2020/January 2021.

4.1.1 Fencing

In accordance with the ICAMP the fence around the Conservation Area is required to be inspected every two months. From June 2015, the fence inspections were undertaken by Greening Australia, Western Australia (GAWA). Inspections are ongoing until handover at which time the fence will be intact.

4.1.2 Rubbish

Access into the Conservation Area has been reduced through the construction of the fence and installation of limestone boulders along the fence line. Rubbish inspections have determined that the fence has significantly reduced the amount of illegal rubbish dumped within the Conservation Area. The site is inspected to record any additional rubbish that has been dumped on the site and rubbish removal, including asbestos removal near tracks is ongoing. DevelopmentWA has committed to a final rubbish removal prior to handing over the Conservation Area to remove any newly dumped rubbish.

4.1.3 Weed Control

The weed control has been effective with a good level of control being taken over most of the weeds and healthy inroads into the control of some of the more stubborn species. In October 2018, a detailed weed survey was undertaken to direct final weed control efforts to meet the completion criteria. Although the completion criteria have been met DevelopmentWA have been maintaining the Conservation Area until formal handover is complete. Weeding works have been undertaken over the 2019/2020 period to ensure the completion of works is maintained with Cotton Bush (*Gomphocarpus fruticosus*) being treated in areas where additional infestations have been located. This involved an initial weed treatment in September 2019 and then monthly treatments until January 2020. In June 2020 a site inspection was undertaken to direct maintenance weed control efforts for winter weeds including Cotton Bush, which had a very low number of scattered individuals in the northern part of the site. A 1 to 2 month weed control program has been commissioned to target:

- Cotton bush;
- One leafed cape tulip;

- Freesia;
- Paterson's curse;
- Geraldton Carnation;
- Bridal Creeper;
- Geranium;
- Castor Oil;
- Tambookie;
- European Olive;
- Brazilian Pepper;
- Buckthorn; and
- Purple pincushion.

4.1.4 Rehabilitation

The planting of tubestock and direct seeding commenced in Autumn 2016. The rehabilitation was inspected in June 2020 and continues to mature and is in good condition. The rehabilitated area is showing good structure with a stratified vegetation cover as shown in the before and after photos (Plate 2 and 3).

Plate 2: Northern Area 2015

Plate 3: Rehabilitated Northern Area 2020

4.1.5 Native Fauna Management

No suitable hollows were in the 38 Tuart tree cleared to be used for habitat for Black Cockatoos. Two kangaroos were observed within the Conservation Area in the 2018-2019 Compliance Reporting period. In accordance with the management plan kangaroos only need to be managed if there is damage to the vegetation, rehabilitation or fencing in the Conservation Area. No damage caused by kangaroos has been recorded in the 2019 to 2020 compliance period.

4.1.6 Pest Fauna Management

There was little evidence of impact of rabbits and foxes on the site during the June 2020 inspection.

4.2 Water Management Strategy

4.2.1 Development in the Referral Area

Development has been undertaken in accordance with the WMS.

4.2.2 Installation of Bores

All bores have been installed in the RIZ in compliance with the WMS.

4.2.3 Groundwater Monitoring

Monitoring in the RIZ commenced in February 2015 with the groundwater levels measured along the transect of bores originally installed by JDA during the initial studies in the RIZ. An increase in water level across all bores was seen in 2017 and 2018, higher than previous years in response to above average rainfall received in 2017 and 2018. Bore levels were average in 2019 (Appendix 6).

Nutrient levels were not significantly different from pre-development concentrations (Appendix 6) Heavy metal concentrations are all within or less than median pre-development levels (Appendix 6).

There is no direct flow of stormwater into the Conservation Area from the developed area.

4.2.4 Conclusion

The development is being implemented and monitoring undertaken in accordance with the WMS.

4.3 Offsets Management Plan

4.3.1 Offsets Packages

Offsets Packages 1 and 2 were implemented in 2014 and reported in the 2014 Compliance Report. Part A of Condition 14 has been completed.

4.3.2 TEC Re-establishment Trial

The research trial commenced prior to 14 July 2015. The research trial consists of a series of six basins constructed to be three different depths from groundwater and planted with species typical to the TEC to measure the impact on depth to groundwater and determine if vegetation resembling the TEC could be created in drainage swales.

The site was selected for its proximity to where the TEC occurs naturally. Landform and substrate close to the TEC swales in the RIZ is on land vested with the City of Rockingham (the City) and therefore the trial implementation has been undertaken in consultation with the City. The earthworks for the trial commenced 5 July 2016 and planting started on 17 August 2016. The basins, fencing, firebreaks, mulching and planting were completed on 19 August 2016. Monitoring was completed in 2016 and 2017 and included recording the height, density and survival in the TEC Trial basins

Monitoring of the site undertaken in late October 2018 in the 2018-2019 compliance period. The different depths to groundwater appeared to have impacted on the growth of the species in the TEC, with an increase in height and coverage in basins closest to the groundwater in the 2017 monitoring.

This trend was more pronounced in the 2018 monitoring, more so in 2019 and highly visible during a site inspection in June 2020 (Plate 4 and 5).

Ongoing management of the TEC Trial has included the repair of fences when they are cut and weed management. The coverage of weeds in the 2019 monitoring was moderate. Winter weeds were observed in 2020 during a site inspection in June and have been managed by an appropriately qualified weed contractor. The coverage of weeds will be measured in the 2020 monitoring period and if required, further weed management will be scheduled.

Plate 4: Basin 2.1, 1m from Groundwater

Plate 5: TEC Trial Basin 1.1, 2m from Groundwater

Complete results and statistical analysis will be compiled at the conclusion of the five-year monitoring period as per the OMP.

4.3.3 TEC Research

Approximately 0.3ha of TEC was cleared during the 2017 Compliance Reporting period. Some paperbarks (*Melaleuca rhaphiophylla*) and grasstrees (*Xanthorrhoea preissii*) were salvaged from an area of wetland in the development footprint. The opportunity was taken to examine the root morphology of TEC species within a wetland swale as per the OMP. No further clearing of TEC took place in the 2019 to 2020 compliance period.

4.3.4 Areas of Clearing

As outlined in Section 2.2 clearing within the RIZ in the 2019 to 2020 compliance period consisted of:

- A 4m firebreak adjacent to Patterson Road and Ward Road (approximately 800m^2);
- Site compound Charles Street (approximately 5537m^2);
- Construction of the extension of Alloy Avenue and Alumina Road (approximately 26448m^2); and
- Site compound Charles Street (approx. 9000m^2).

The total clearing footprint in the 2019-2020 compliance period was approximately 4.18ha (Appendix 5). A total of 38 significant Tuarts were cleared during the compliance period and to date.

4.3.5 Conclusion

The Off-site and On-site offsets required by the OMP are being implemented in compliance with the OMP.

5 AUDIT TABLE

Note:
'Department' refers to the Australian Government Department administering the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Currently the Department of the Environment (DoE).
'Minister' refers to the Minister administering the EPBC Act and includes a delegate of the Minister.
RIZ: Rockingham Industry Zone
BCHRP: Black Cockatoo Habitat Revegetation Plan
DBCA: Department of Biodiversity, Conservation and Attractions (Formerly DPaW)
DBH: Diameter at Breast Height
DoE: Department of the Environment
DoEE: Department of the Environment and Energy (Formerly DoE)
DoW: Department of Water
DPaW: Department of Parks and Wildlife
ICAMP: Initial Conservation Area Management Plan
OEPA: Office of the Environmental Protection Authority
OMP: Offsets Management Plan
SEA: Strategic Environmental Assessment
TEC: Threatened Ecological Community
WMS: Water Management Strategy

EPBC Condition Number	Condition	Comments	Requirement	Evidence	When	Status
1	Within 30 days after the **commencement** of the action, the person taking the action must advise the **Department** in writing of the actual date of **commencement**.	The date of commencement of action was 14 July 2014.	DevelopmentWA to notify in writing of the commencement date.	Letter of notification sent to DoE on 11 July 2014.	Within 30 days after the commencement of the action	Compliant - Complete
2	The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans or strategy 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.	In accordance with Condition 2 of the approval, records of all activities relating to the conditions of approval are being maintained by DevelopmentWA and on behalf of DevelopmentWA by PGV Environmental. This Compliance Report provides an overview of all the actions relating to each condition.	DoE has not requested records from DevelopmentWA.	N/A	When requested	Compliant
3	Within three months of every 12 month anniversary of the **commencement** of the action, the person taking the action must publish a compliance report on its website, and provide a copy of the compliance report to the **Department** in writing. The compliance report must address compliance with: each of the conditions of this approval; any management plans required under this approval; and whether outcomes and milestones required by these conditions and commitments made in management plans required under this approval have been met or are on track to being met. The compliance report must include any actual or potential contraventions, and must consider the **Department's** Annual Compliance Report Guidelines. Documentary evidence providing proof of the date of publication must be provided to the **Department** within 7 days after the compliance report is published. All compliance reports must remain on the website for the period this approval has effect. The person taking the action may cease preparing and publishing compliance reports required by this condition with written agreement of the **Minister** to do so.	This report will be published on the project website and updated annually for the duration of the approval.	Evidence of publication and letter to DoE in the case of non-compliance	N/A	By 14 October annually	Compliant
4	Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the **commencement** of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.	An independent audit of compliance has not been requested by the Minister.	N/A	N/A	When requested by the Minister	Not Applicable - Complaint

EPBC Condition Number	Condition	Comments	Requirement	Evidence	When	Status
5	If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plans or strategy, as specified in the conditions, the person taking the action must submit to the **Department** for the **Minister's** written approval a revised version of that management plans or strategy. The varied activity shall not commence until the **Minister** has approved the varied management plan or strategy in writing. The **Minister** will not approve a varied management plan or strategy unless the revised management plans or strategy would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised management plans or strategy, that management plan or strategy, must be implemented in place of the management plans or strategy originally approved.	DevelopmentWA do not wish to carry out any activities not in accordance with the strategy and management plans approved by the Minister on 1 August 2013 and 18 June 2014.	N/A	Current strategy and management plans being implemented published on DevelopmentWA's website	Life of the proposal	Compliant
6	If the **Minister** believes that it is necessary or convenient for the better protection of Listed threatened species and communities (sections 18 & 18A) to do so, the **Minister** may request that the person taking the action make specified revisions to the management plans or strategy specified in the conditions and submit the revised management plans or strategy for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved management plans or strategy must be implemented. Unless the **Minister** has approved the revised management plans or strategy, then the person taking the action must continue to implement the management plan or strategy originally approved, as specified in the conditions.	The Minister has not requested for revisions to be made to the management plans or strategy.	N/A	N/A	When requested by the Minister	Not Applicable
7	If, at any time after 5 years from the date of this approval, the person taking the action has not **commenced** the action, then the person taking the action must not commence the action without the written agreement of the **Minister**	The action has commenced within the 5-year period from the date of approval.	N/A	Letter of notification sent to DoE on 11 July 2014.	N/A	Compliant – Complete
8	Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans and strategies referred to in these conditions of approval on their website. Each management plan and strategy must be published on the website within 1 month of being approved.	No additional management plans have been required. All Management Plans are available on http://www.DevelopmentWA.com.au/Industrial-and-Commercial/Rockingham-Industry-Zone/Downloads/	Verify management plans are on the website	Screen Dump of links (Plate 1)	Within 1 month of being approved	Complete
9	Potential or actual contraventions of the approval conditions (including contravention with a commitment in a management plan) must be reported in writing / by email to the **Department** within 2 business days of the person taking the action becoming aware of the actual or potential contravention.	There were no potential or actual contraventions in the 2018-2019 compliance period.	Report complies with this requirement	Compliance Report published on DevelopmentWA's website.	Within 2 business days of becoming aware	Compliant
10	Conservation Area Coastal Plain (TEC) and habitat for **Black Cockatoos** the person taking the action must establish a Conservation Area of at least 89.1 ha in the area designated as 'Conservation Area' on the map provided at Attachment A prior to the **commencement** of **construction**. The person taking the action must: a) Include at least 19.5 ha of the TEC within the Conservation Area; b) Prior to **commencement** of **construction**, provide the **Department** with written evidence that the Conservation Area will be protected and managed in perpetuity by a **recognised conservation organisation**; c) By 30 November 2021, vest management and ownership of the conservation area with a **recognised conservation organisation**.	A Conservation Area of was established at the RIZ prior to the commencement of construction and was updated in 2016 and currently reflects the area as shown in the Variation to Conditions dated 9 May 2016 Approval. a) The Conservation Area includes 19.5ha of TEC 19b in Good to Very Good condition; b) The ICAMP was provided to the Department prior to commencement of construction and confirms that the Conservation Area will be protected and vested to DPaW for management; c) Compliance with this condition is not required at this stage.	Establish a Conservation Area prior to commencement of construction. Vest management and ownership to DBCA.	2014 Compliance Report	Prior to construction. Prior 31 November 2021	Compliant – Complete Not required at this stage - Compliant

EPBC Condition Number	Condition	Comments	Requirement	Evidence	When	Status
11	To protect and enhance the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) and habitat for **Black Cockatoos** within the Conservation Area the person taking the action must prepare and submit a Conservation Area Management Plan (CAMP) for the Minister's approval. The person taking the action must not **commence construction** unless the **Minister** has approved the CAMP. The Camp must be prepared in consultation with **DPaW** and the WA Office of the Environmental Protection Authority (EPA) prior to being submitted for approval by the **Minister**. The CAMP must include the following requirements: a. Management measures to protect and enhance the TEC and **Black Cockatoo** habitat; b. Measures to determine the effectiveness of all management measures for the TEC and **Black Cockatoo** habitat; c. Construction of a permanent fence around the perimeter of the conservation area; d. Management of weeds and feral animals, including monitoring requirements to determine the effectiveness of the weed and feral animal management; e. Management of fire regime and monitoring requirements to determine the effectiveness of fire management; and f. Rehabilitation works for degraded areas, including monitoring requirements to determine the effectiveness of the rehabilitation. If the **Minister** approves the CAMP then the approved CAMP must be implemented	Comments from DPaW and OEPA were received during preparation of the report in 2013 and changes incorporated into the document. The ICAMP was approved prior to commencement of construction which was 14 July 2014. The ICAMP has been successfully implemented.	Preparation of an ICAMP and approval of ICAMP by the Minister prior to construction Approved ICAMP to be implemented	ICAMP approved by the OEPA on 23 December 2013 and by the Minister on 18 June 2014 – 2014 Compliance Report. As reported in the 2018 to 2019 Compliance Report	Prior to construction Following approval by the Minister	Compliant - Complete Compliant - Complete
12	<u>Black Cockatoo Habitat</u> To protect the habitat for Black Cockatoos, the person taking the action: a) Must not clear more than 830 Tuart trees (Eucalyptus gomphocephala) that are greater than 500 mm diameter at breast height (DBH) from within the project area of the Rockingham Industry Zone, designated as 'SEA Boundary' on the map provided at Attachment A. The person taking the action must ensure that no trees are cleared within the Conservation Area referred to in Condition 10. Within 12 months of the **commencement** of **construction**, the person taking the action must, in consultation with **DPaW**, plant in the revegetation area within the **DPaW** managed land at Rockingham Lakes Regional Park up to 4,980 Tuart seedling trees (Eucalyptus gomphocephala) at a ratio of 6 seedling trees for every tree greater than 500 mm DBH removed from the project area. The seedling trees must be planted at a density of 200- 250 per hectare in cleared or degraded areas where Tuart density has previously been reduced. In consultation with the **Department** the person taking the action must ensure these seedling trees are protected in perpetuity.	To date there have been 38 Tuart trees (*Eucalyptus gomphocephala*) that are greater than 500 mm DBH cleared in the RIZ referral area. There have been no trees cleared within the Conservation Area.	Do not clear more than 830 Tuart trees with a DBH of greater than 500 mm from the RIZ SEA area and no Tuart trees from the Conservation Area.	Aerial photography of cleared areas pre and post clearing Appendix 4.	Life of the proposal	Compliant
	d) Must, within 12 months of the **commencement** of **construction**, commence a Tuart revegetation project as described below: iv. If, after two years from the date of planting trees, a survival rate of at least 80% seedling trees is not achieved, all seedling trees that have not survived must be replaced within 12 months, and the replacements maintained to achieve a survival rate of at least 80% for at least a further three years; v. The person taking the action must fund and manage the Tuart revegetation project in consultation with DPaW until such a time as management responsibility has been formally transferred to a **recognised conservation organisation**; and vi. The revegetation project must be at least partially undertaken in the Rockingham Lakes Regional Park. If there is insufficient appropriate land in the Rockingham Lakes Regional Park to receive the required revegetation, the person taking the action, in consultation with **DPaW** and the **Department**, must find alternative locations to undertake the revegetation within the Rockingham region.	The Tuart revegetation project has been undertaken with the planting of 5000 Tuarts in areas all located within the Rockingham Lakes Regional Park. The project was undertaken in accordance with the approved BCHRP	Tuart revegetation project.	Appendix 7 of the 2017 Compliance Report	Prior to 14 July 2015	Compliant - Complete

EPBC Condition Number	Condition	Comments	Requirement	Evidence	When	Status
	c) Prepare and submit a **Black Cockatoo** Habitat Revegetation Plan (BCHRP) for the **Minister's** approval, that describes how approval condition 12b) will be implemented. The plan must be prepared in consultation with the **DPaW**. The person taking the action must not **commence construction** unless the Minister has approved the BCHRP. The BCHRP must address the following matters: i. The location of the revegetation areas; ii. Planting methodology, including soil preparation; iii. What flora species that will be planted; iv. Monitoring program (including how survival rates and success criteria will be determined); v. Construction of a temporary fence around the perimeter of the revegetation areas; vi. Management of weeds and feral animals in the revegetation area; vii. How the performance of the plan will be reported to the **Minister**; and viii. Who will be responsible for implementing all aspects of the plan. If the **Minister** approves the BCHRP then the approved BCHRP must be implemented.	DPaW were consulted and endorsed the BCHRP prior to the plan being submitted to DoE. The plan addresses all matters required. The Plan was approved by the Minister on 18 June 2014 prior to commencement on 14 July 2014. The BCHRP has been successfully implemented.	Preparation of a BCHRP and approval of BCHRP by the Minister prior to construction. Approved BCHRP has been implemented	BCHRP approved by the Minister on 18 June 2014. Construction commenced on 14 July 2014 as per letter submitted to DoE – 2014 Compliance Report 2017-2018 Compliance Report documents completion	Prior to Construction Prior to 14 July 2015 and Ongoing	Compliant – Complete Compliant – Complete
13	<u>Water Management Strategy</u> To protect the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) and habitat **for Black Cockatoos** the person taking the action must prepare and submit a Water Management Strategy (WMS) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the WMS. The WMS must be prepared in consultation with the **DPaW** and the EPA. The WMS must include: a) arrangements for the long term monitoring of groundwater levels in the site; b) a pre-construction baseline for surface water and groundwater quality data and a monitoring program for these parameters to maintain stormwater and groundwater quality and hydrology to pre-development levels; c) an adaptive management plan, including contingency measures, to ensure construction does not affect groundwater levels beyond normal seasonal variation, with the aim of ensuring that the TEC persists and thrives in perpetuity; d) maintaining or improving groundwater balance; e) managing the salt wedge, Cockburn Sound interface; f) preventing abstraction of shallow groundwater during construction or for future industry use; and g) managing drainage into the conservation site. If the **Minister** approves the WMS then the approved WMS must be implemented	The WMS was prepared and submitted to the DoW and DPaW. It was endorsed by the DoW on 5 July 2013 and by the OEPA on 23 December 2013. The WMS was approved by the Minister prior to construction commencing on 14 July 2014. The WMS is being implemented. In accordance with the WMS post development monitoring will be conducted monthly for groundwater level measurements and quarterly for groundwater quality analysis.	Preparation of a WMS and approval of WMS by the Minister prior to construction. Approved WMS to be implemented.	The Minister approved the WMS on 1 August 2013. Groundwater Monitoring Report (Appendix 7)	Prior to construction Following approval by the Minister Five year period completed	Compliant – Complete Compliant

EPBC Condition Number	Condition	Comments	Requirement	Evidence	When	Status
14	<u>Offsets Management Plan</u> To protect the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain (TEC) the person taking the action must prepare and submit an Offsets Management Plan (OMP) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the OMP. The OMP must be prepared in consultation with DPaW. The OMP must include: a) The rehabilitation of a minimum of 18ha of the threatened ecological community Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain that required active management in land managed by DPaW at other priority sites (as agreed by **DPaW** and the Department) in the Rockingham region. The rehabilitation must commence **within** 6 months of the **commencement** of **construction**.	An OMP was prepared in consultation with DPaW and in accordance with the amended condition. The OMP was approved by the Minister prior to construction commencing on 14 July 2014. Funding was provided to DPaW to manage at least 18ha of TEC	Preparation of an OMP and approval of OMP by the Minister prior to construction. Rehabilitation of a minimum of 18ha of TEC 19 at other sites in the region, to be managed by DPaW.	The OMP was approved by the Minister on 18 June 2014. . Offsets statements issued by DPaW on 6 September 2013 and 1 April 2014 and proof of payment to DPaW in 2014 Compliance Report	Prior to construction To commence by 14 January 2015 – responsibility of DPaW	Compliant - Complete Compliant – Complete
	b) A research trial for the re-establishment of TEC in the onsite TEC re-establishment lot outlined in <u>Attachment B</u>, in accordance with the following requirements: i. The method and deliverables of the research trial must be prepared in consultation with DPaW; ii. The research trial must consider the existing TEC within the Conservation Area; iii. The research trial must commence within 12 months of the commencement of construction and must be undertaken for no less than five years; iv. The research trial must include an annual program for the monitoring and reporting. v. Within 12 months of completing the research trial a report documenting the results of the trial must be submitted to **DPaW** and the **Department**.	The Research Trial was included in the OMP and endorsed by DPaW that was approved by the Minister.	Research trial: Re-establishment of TEC Annual monitoring and reporting Completion report to be submitted to DPaW and the Department	The OMP was approved by the Minister on 18 June 2014 – approval in 2014 Compliance Report	Prior to Commencement	Compliant – Complete
	If the **Minister** approves the OMP then the approved OMP must be implemented.	The OMP is being implemented. The TEC trial basins were constructed and planted in 2016 in accordance with the OMP. Monitoring commenced in November 2016, was undertaken in November 2017 and is scheduled for November 2018	Approved OMP to be implemented	This Compliance Report TEC Re-establishment Trial Monitoring – Section 4.3.2	Ongoing	Compliant
	The annual report referred to in condition 9 detailing performance against the plan must include the following information; • Areas of the Rockingham Industry Zone cleared for development and revegetation; • Areas of TEC cleared and areas of TEC recreated/rehabilitated and their protection arrangements; and • Areas of the TEC rehabilitated at other occurrences of the TEC in the Rockingham region.	No TEC vegetation was cleared during the 2019-2020 compliance period. The TEC Trial as outlined in the OMP resulted in 4,043m^2 of basin and a total of 2.83ha within the trial area which will is vested in the City of Rockingham within designated reserves as per the OMP. The areas of TEC 19 to be rehabilitated at other areas in the Rockingham region is the responsibility of DBCA.	Inclusion of additional information in this report	Aerial Photography (Appendix 5)	Prior to 14 October 2017	Compliant

6 COMPLIANCE STATEMENT

No non-compliance with regards to EPBC referral 2010/5337 were identified during the period covered by this 2019 to 2020 EPBC Compliance Report.

The RIZ development is therefore compliant with the requirements of EPBC referral 2010/5337.

7 PUBLIC AVAILABILITY OF COMPLIANCE REPORT

In accordance with Condition 2 of EPBC referral 2010/5337 accurate records of all activities are being retained for the life of the Project and can be made available when requested by the Department of the Environment.

In accordance with Condition 3 of EPBC referral 2010/5337 this Compliance Report will be published on DevelopmentWA's website (http://www.DevelopmentWA.com.au/Industrial-and-Commercial/Rockingham-Industry-Zone/Downloads/) and will remain available for the duration of the approval.

APPENDIX 1

Approval under the EPBC Act
EPBC 2010/5337

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Approval

Rockingham Industrial Zone, WA (EPBC 2010/5337)

This decision is made under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

Proposed action

person to whom the approval is granted	Western Australian Land Authority
proponent's ACN (if applicable)	34 868 192 835
proposed action	The development of 339 ha of land in Rockingham, WA, for industrial purposes (the Rockingham Industry Zone, [See EPBC Act referral 2010/5337].

Approval decision

Controlling Provision	Decision
Listed threatened species and communities (sections 18 & 18A)	**Approved**

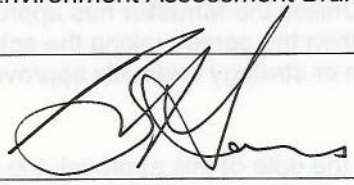
conditions of approval

This approval is subject to the conditions specified below.

expiry date of approval

This approval has effect until 31 December 2035.

Decision-maker

name and position	Barbara Jones Assistant Secretary Environment Assessment Branch
signature	
date of decision	30 November 2011

Conditions attached to the approval

1. Within 30 days after the **commencement** of the action, the person taking the action must advise the **Department** in writing of the actual date of **commencement**.

2. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans or strategy 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.

3. Within three months of every 12 month anniversary of the **commencement** of the action, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans or strategies as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the **Department** at the same time as the compliance report is published.

4. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the **commencement** of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.

5. If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plans or strategy, as specified in the conditions, the person taking the action must submit to the **Department** for the **Minister's** written approval a revised version of that management plans or strategy. The varied activity shall not commence until the **Minister** has approved the varied management plan or strategy in writing. The **Minister** will not approve a varied management plan or strategy unless the revised management plans or strategy would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised management plan or strategy, that management plan or strategy, must be implemented in place of the management plans or strategy originally approved.

6. If the **Minister** believes that it is necessary or convenient for the better protection of Listed threatened species and communities (sections 18 & 18A) to do so, the **Minister** may request that the person taking the action make specified revisions to the management plans or strategy specified in the conditions and submit the revised management plans or strategy for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved management plans or strategy must be implemented. Unless the **Minister** has approved the revised management plans or strategy, then the person taking the action must continue to implement the management plan or strategy originally approved, as specified in the conditions.

7. If, at any time after 5 years from the date of this approval, the person taking the action has not commenced the action, then the person taking the action must not **commence** the action without the written agreement of the **Minister**.

8. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans and strategies referred to in these conditions of approval on their website. Each management plan and strategy must be published on the website within 1 month of being approved.

9. By 31 December of each year after the commencement of the action, the person taking the action must publish a report on their website addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plans as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the **Department** at the same time as the compliance report is published. These reports must remain available on the internet for at least 5 years after they are published.

10. Conservation Area

To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) and habitat for **Black Cockatoos** the person taking the action must establish a Conservation Area of at least 90.5 ha prior to the **commencement** of **construction,** as identified by the area within the blue line on the map (at Attachment A)**.** The person taking the action must:

(a) include at least 18.72 ha of the TEC within the Conservation Area;

(b) prior to **commencement** of **construction**, provide the **Department** with written evidence that the Conservation Area will be protected and managed in perpetuity by a **recognised conservation organisation**;

(c) within five years of the date of this approval, vest management and ownership of the conservation area with a **recognised conservation organisation**.

11. Conservation Area Management Plan

To protect and enhance the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) and habitat for **Black Cockatoos** within the Conservation Area the person taking the action must prepare and submit a Conservation Area Management Plan (CAMP) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the CAMP. The CAMP must be prepared in consultation with DEC and the WA Office of the Environmental Protection Authority (EPA).

The CAMP must include the following requirements:

(a) Management measures to protect and enhance the TEC and **Black Cockatoo** habitat;

(b) Measures to determine the effectiveness of all management measures for the TEC and **Black Cockatoo** habitat;

(c) Construction of a permanent fence around the perimeter of the conservation area;

(d) Management of weeds and feral animals, including monitoring requirements to determine the effectiveness of the weed and feral animal management;

(e) Management of fire regime, and monitoring requirements to determine the effectiveness of the fire management, and

(f) Rehabilitation works for degraded areas, including rubbish removal, and including monitoring requirements to determine the effectiveness of the rehabilitation.

If the **Minister** approves the CAMP then the approved CAMP must be implemented.

12. Black Cockatoo Habitat

To protect and enhance habitat for **Black Cockatoos**, the person taking the action:

(a) May not clear more than 830 Tuart trees (*Eucalyptus gomphocephala*) that are greater than 500 mm diameter at breast height (DBH) from within the project area of the Rockingham Industry Zone ('Strategic Environmental Assessment Area' identified by the pink highlighted area on the map at Attachment A). No trees are permitted to be cleared within the Conservation Area referred to in condition 10.

(b) Must, within 12 months of the **commencement** of **construction**, commence a Tuart revegetation project as described below:

i. At least six Tuart trees must be planted for every Tuart tree greater than 500 mm DBH removed.

ii. The seedling trees must be planted at a rate of no greater than 250 stems per hectare in cleared or highly degraded areas where Tuart density has been greatly reduced.

iii. If after two years from the date of planting trees, a survival rate of 80% trees is not achieved, all planted trees that have not survived must be replaced within 12 months, and maintained with a survival rate of at least 80% for a minimum of a further three years.

iv. The person taking the action must fund and manage the Tuart revegetation project in consultation with the DEC until such a time as management responsibility has been formally transferred to a **recognised conservation organisation**.

v. The revegetation project must be at least partially undertaken in the Rockingham Lakes Regional Park. If there is insufficient land in the Rockingham Lakes Regional Park to undertake the required revegetation, the person taking the action, in consultation with DEC and the **Department**, must find alternate locations to undertake the revegetation within the Rockingham region.

(c) Prepare and submit a **Black Cockatoo** Habitat Revegetation Plan (BCHRP) for the **Minister's** approval, that describes how approval condition 12 b) will be implemented. The plan must be prepared in consultation with the DEC. The person taking the action must not **commence construction** unless the **Minister** has approved the BCHRP.

The BCHRP must address the following matters:

i. The location of revegetation areas;

ii. Planting methodology, including soil preparation;

iii. What flora species that will be planted;

iv. A monitoring program (including how survival rates and success criteria will be determined);

v. Construction of a temporary fence around the perimeter of the revegetation areas;

vi. Management of weeds and feral animals in the revegetation area;

vii. How the performance of the plan will be reported to the **Minister**; and

viii. Who will be responsible for implementing all aspects of the plan.

If the **Minister** approves the BCHRP then the approved BCHRP must be implemented.

13. Water Management Strategy

To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) and habitat for **Black Cockatoos** the person taking the action must prepare and submit a Water Management Strategy (WMS) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the WMS. The WMS must be prepared in consultation with the DEC and the EPA.

The WMS must include:

(a) arrangements for the long term monitoring of groundwater levels in the site;

(b) a pre-construction baseline for surface water and groundwater quality data and a monitoring program for these parameters to maintain stormwater and groundwater quality and hydrology to pre-development levels;

(c) an adaptive management plan, including contingency measures, to ensure **construction** does not affect groundwater levels beyond normal seasonal variation, with the aim of ensuring that the TEC persists and thrives in perpetuity;

(d) maintaining or improving groundwater balance;

(e) managing the salt wedge, Cockburn Sound interface;

(f) preventing abstraction of shallow groundwater during **construction** or for future industry use; and

(g) managing drainage into the conservation site.

If the **Minister** approves the WMS then the approved WMS must be implemented.

14. Offsets Management Plan

To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) the person taking the action must prepare and submit an Offsets Management Plan (OMP) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the OMP. The OMP must be prepared in consultation with DEC and the EPA. The OMP must address the rehabilitation of 9 hectares of threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* that requires active management in land managed by the DEC at other priority sites (as agreed by DEC and the **Department**) in the Rockingham region.

The OMP must include:

(a) Within 12 months of clearing any areas of TEC, 1.5 ha for every 1 ha of TEC cleared must be re-established onsite and protected in perpetuity; and

(b) A program for the monitoring of vegetation regeneration in the areas of TEC rehabilitated. After 2 years of monitoring, consult with DEC and undertake further rehabilitation in areas of the TEC where natural regeneration is not successful.

If the **Minister** approves the OMP then the approved OMP must be implemented.

The annual report referred to in condition 9 detailing performance against the plan must include the following information:

i. Areas of the Rockingham Industry Zone cleared for development and revegetation;

ii. Areas of the TEC cleared and areas of TEC recreated/rehabilitated and their protection arrangements; and

iii. Areas of the TEC rehabilitated at other occurrences of the TEC in the Rockingham region.

Definitions

a) Black Cockatoo.
The endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*).

b) Department.
The Australian Government Department administering the *Environment Protection and Biodiversity Conservation Act 1999*.

c) Minister.
The Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* and includes a delegate of the Minister.

d) Construction.
Includes any preparatory works required to be undertaken including clearing vegetation, the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for buildings or infrastructure.

e) Clearance of native vegetation.
The cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native vegetation.

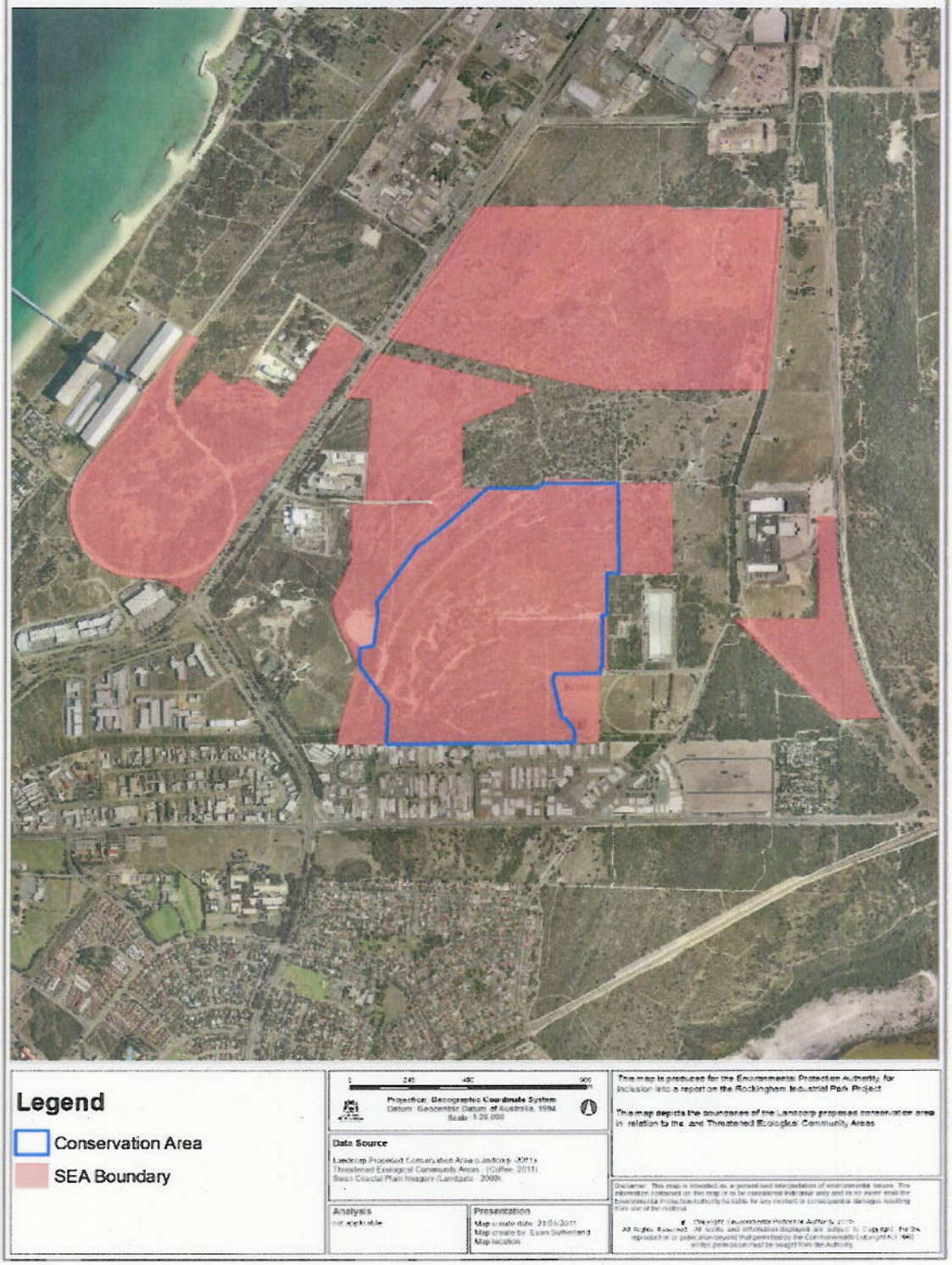
f) Commencement
The construction of any infrastructure, excluding fences and signage, associated with the proposed action, including preparatory works such as clearing vegetation to begin construction.

g) Recognised conservation organisation
The WA Department of Environment and Conservation, or an alternative conservation organisation that has been approved in writing by the **Department**.

Attachment A

Office of the Environmental Protection Authority

Figure 1: SEA Boundary and Conservation Area Boundary



APPENDIX 2

Notice of Variation to Conditions 2014 (EPBC 2010/5337)

Australian Government
Department of the Environment

VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Rockingham Industrial Zone, WA (EPBC 2010/5337)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Western Australian Land Authority **ABN: 34 868 192 835**
Approved action	The development of 339 ha of land in Rockingham, WA, for industrial purposes (the Rockingham Industry Zone), [See EPBC Act referral 2010/5337].

Variation

Variation of conditions of approval	The variation is: Delete condition 14 attached to the approval dated 30 November 2011 and substitute with the condition specified below. Delete 'DEC' in conditions 11, 12 and 13, and substitute with 'DPaW'. Delete definition for 'recognised conservation organisation' in the approval dated 30 November 2011 and substitute with the definition (g) specified below. Also add the definition (h) specified below. Add Attachment B to the approval dated 30 November 2011, as attached to this instrument.
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

name and position	Shane Gaddes Assistant Secretary Compliance and Enforcement Branch
Signature	S. Gaddes
Date of decision	19 June 2014

Condition attached to the approval

14. Offsets Management Plan
To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan coastal Plain* (TEC) the person taking the action must prepare and submit an Offsets Management Plan (OMP) for the **Minister's** approval. The person taking the action must not **commence construction** unless the **Minister** has approved the OMP. The OMP must be prepared in consultation with DPaW.

The OMP must include:

a) The rehabilitation of a minimum of 18ha of the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan coastal Plain* that requires active management in land managed by DPaW at other priority sites (as agreed by DPaW and the **Department)** in the Rockingham region. The rehabilitation must commence within 6 months of the commencement of **construction**.

b) A research trial for the re-establishment of TEC in the onsite TEC re-establishment lot outlined in Attachment B, in accordance with the following requirements:

   i. The method and deliverables of the research trial must be prepared in consultation with DPaW;
   ii. The research trial must consider the existing TEC within the Conservation Area
   iii. The research trial must commence within 12 months of the commencement of **construction** and must be undertaken for no less than five years;
   iv. The research trial must include an annual program for the monitoring and reporting.
   v. Within 12 months of completing the research trial a report documenting the results of the trial must be submitted to DPaW and the **Department**.

If the **Minister** approves the OMP then the approved OMP must be implemented. The annual report referred to in condition 9 detailing performance against the plan must include the following information;

- Areas of the Rockingham Industry Zone cleared for development and revegetation;
- Areas of TEC cleared and areas of TEC recreated/rehabilitated and their protection arrangements; and
- Areas of the TEC rehabilitated at other occurrences of the TEC in the Rockingham region.

Definition attached to the approval

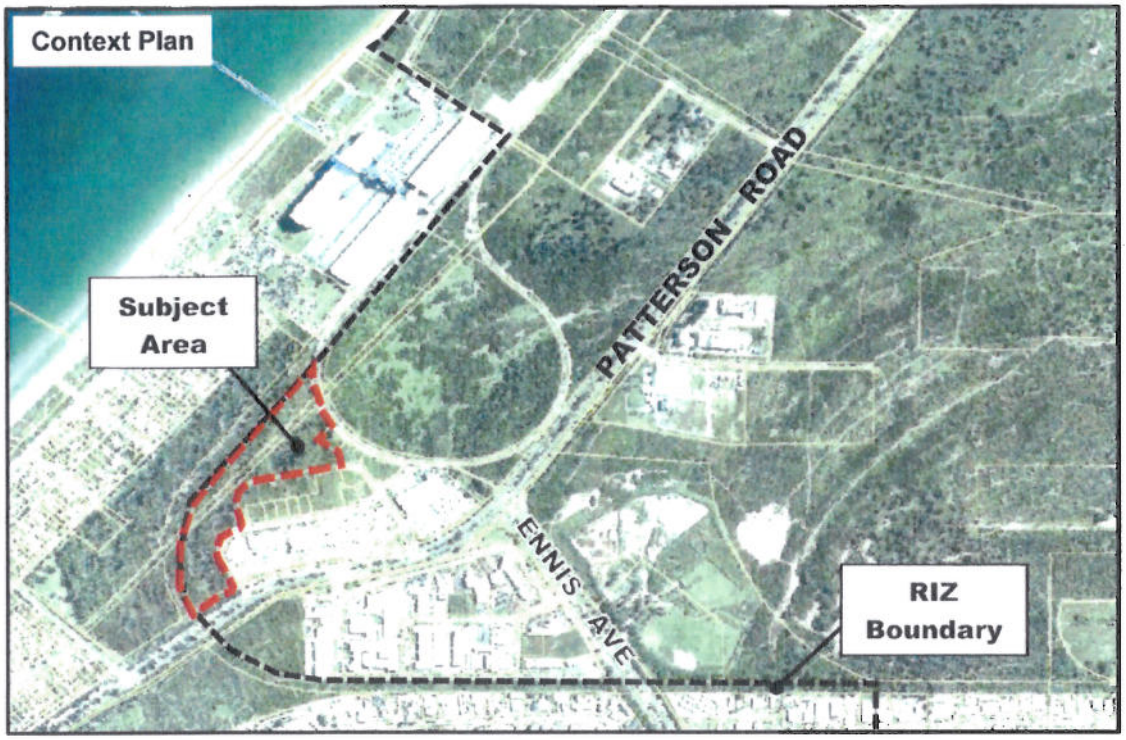
g) Recognised conservation organisation

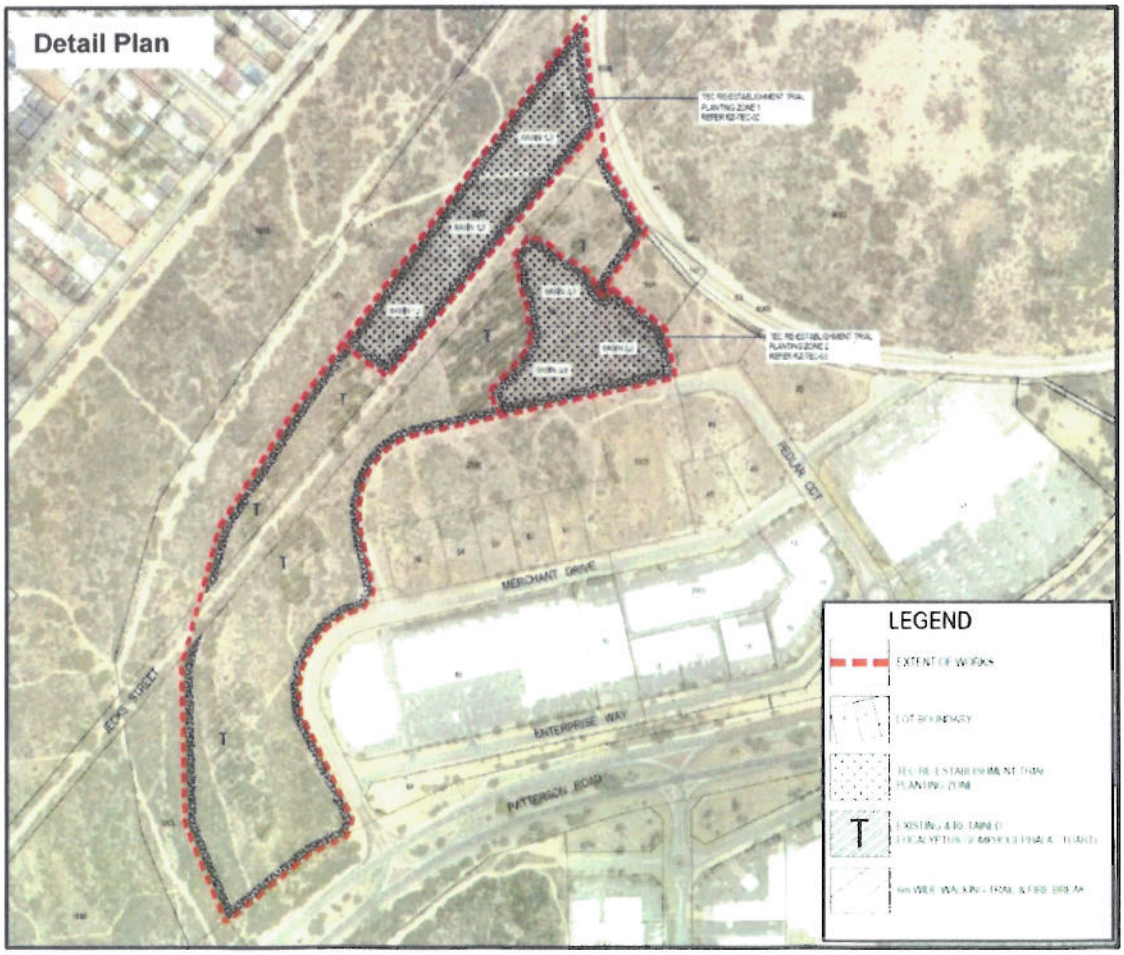
The WA Department of Parks and Wildlife (or any successor agency), or an alternative conservation organisation that has been approved in writing by the **Department**.

h) DPaW

The Western Australian Department of Parks and Wildlife or any successor agency.

Attachment B





APPENDIX 3

Notice of Variation to Conditions 2016 (EPBC 2010/5337)

Australian Government
Department of the Environment

VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Rockingham Industrial Zone, WA (EPBC 2010/5337)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Western Australian Land Authority ABN: 34 868 192 835
Approved action	The development of 339 ha of land in Rockingham, WA, for industrial purposes (the Rockingham Industry Zone) [See EPBC Act referral 2010/5337]

Variation

Variation of conditions of approval	The variation is: Delete conditions 3, 9, 10 and 12 attached to the approval dated 30 November 2011 and substitute with the conditions specified below. Delete Attachment A attached to the approval dated 30 November 2011 and substitute with Attachment A specified below. **Note:** All other conditions including the definitions in the approval dated 30 November 2011 and variations dated 19 June 2014 remain unchanged.
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

name and position	Shane Gaddes Assistant Secretary Compliance & Enforcement Branch
Signature	S. Gaddes
Date of decision	9 May 2016

Conditions attached to the approval

3. Within three months of every 12 month anniversary of the **commencement** of the action, the person taking the action must publish a compliance report on its website, and provide a copy of the compliance report to the **Department** in writing. The compliance report must address compliance with: each of the conditions of this approval; any management plans required under this approval; and whether outcomes and milestones required by these conditions and commitments made in management plans required under this approval have been met or are on track to being met. The compliance report must include any actual or potential contraventions, and must consider the **Department's** *Annual Compliance Report Guidelines*. Documentary evidence providing proof of the date of publication must be provided to the **Department** within 7 days after the compliance report is published. All compliance reports must remain on the website for the period this approval has effect. The person taking the action may cease preparing and publishing compliance reports required by this condition with written agreement of the **Minister** to do so.

9. Potential or actual contraventions of the approval conditions (including contravention with a commitment in a management plan) must be reported in writing / by email to the **Department** within 2 business days of the person taking the action becoming aware of the actual or potential contravention.

10. **Conservation Area**

To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) and habitat for **Black Cockatoos** the person taking the action must establish a Conservation Area of at least 89.1 ha in the area designated as 'Conservation Area' on the map provided at Attachment A prior to the **commencement** of **construction**. The person taking the action must:

(a) Include at least 19.5 ha of the TEC within the Conservation Area;

(b) Prior to **commencement** of **construction**, provide the **Department** with written evidence that the Conservation Area will be protected and managed in perpetuity by a **recognised conservation organisation**;

(c) Within five years of the date of this approval, vest management and ownership of the conservation area with a **recognised conservation organisation**.

12. **Black Cockatoo Habitat**

To protect the habitat for **Black Cockatoos,** the person taking the action:

(a) Must not clear more than 830 Tuart trees (*Eucalyptus gomphocephala*) that are greater than 500 mm diameter at breast height (DBH) from within the project area of the Rockingham Industry Zone, designated as 'SEA Boundary' on the map provided at Attachment A. The person taking the action must ensure that no trees are cleared within the Conservation Area referred to in Condition 10. Within 12 months of the **commencement** of **construction**, the person taking the action must, in consultation with **DPaW**, plant in the revegetation area within the **DPaW** managed land at Rockingham Lakes Regional Park up to 4,980 Tuart seedling trees (*Eucalyptus gomphocephala*) at a ratio of 6 seedling trees for every tree greater than 500 mm DBH removed from the project area. The seedling trees must be planted at a density of 200-250 per hectare in cleared or degraded areas where Tuart density has previously been reduced. In consultation with the **Department** the person taking the action must ensure these seedling trees are protected in perpetuity.

(b) Must, within 12 months of the **commencement** of **construction** commence a Tuart revegetation project as described below:

i. If, after two years from the date of planting trees, a survival rate of at least 80% seedling trees is not achieved, all seedling trees that have not survived must be replaced within 12 months, and maintained to achieve a survival rate of at least 80% for at least a further three years;

ii. The person taking the action must fund and manage the Tuart revegetation project in consultation with **DPaW** until such a time as management responsibility has been formally transferred to a **recognised conservation organisation**; and

iii. The revegetation project must be at least partially undertaken in the Rockingham Lakes Regional Park. If there is insufficient appropriate land in the Rockingham Lakes Regional Park to receive the required revegetation, the person taking the action, in consultation with **DPaW** and the **Department**, must find alternative locations to undertake the revegetation within the Rockingham region.

(c) Must submit a **Black Cockatoo** Habitat Revegetation Plan (BCHRP) for the **Minister's** approval that describes how approval condition 12(a) and 12(b) will be implemented. The plan must be prepared in consultation with the DPaW. The person taking the action must not **commence construction** unless the **Minister** has approved the BCHRP.

The BCHMP must address the following matters:

i. The location of the revegetation areas;

ii. Planting methodology, including soil preparation;

iii. The flora species that will be planted;

iv. A monitoring program (including how survival rates and success criteria will be determined);

v. Construction of a temporary fence around the perimeter of the revegetation areas;

vi. Management of weeds and feral animals in the revegetation area;

vii. How the performance of the plan will be reported to the **Minister**: and

viii. Who will be responsible for implementing all aspects of the plan.

The person taking the action must implement the approved BCHMP.

Attachment A

APPENDIX 4

Notice of Variation to Conditions December 2016 (EPBC 2010/5337)

VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Rockingham Industrial Zone, WA (EPBC 2010/5337)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Western Australian Land Authority ABN: 34 868 192 835
Approved action	The development of 339 ha of land in Rockingham, WA for industrial purposes (the Rockingham Industry Zone) [See EPBC Act referral 2010/5337]

Variation

Variation of conditions of approval	The variation is: Delete condition 10(c) attached to the approval and substitute with condition 10(c) specified below.
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

Name and position	Monica Collins Assistant Secretary Compliance & Enforcement Branch
Signature	Monica.
Date of decision	13 December 2016

Conditions attached to the approval

10. Conservation Area

To protect the threatened ecological community *Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain* (TEC) and habitat for **Black Cockatoos** the person taking the action must establish a Conservation Area of at least 89.1 ha in the area designated as 'Conservation Area' on the map provided at Attachment A prior to the **commencement** of **construction**. The person taking the action must:

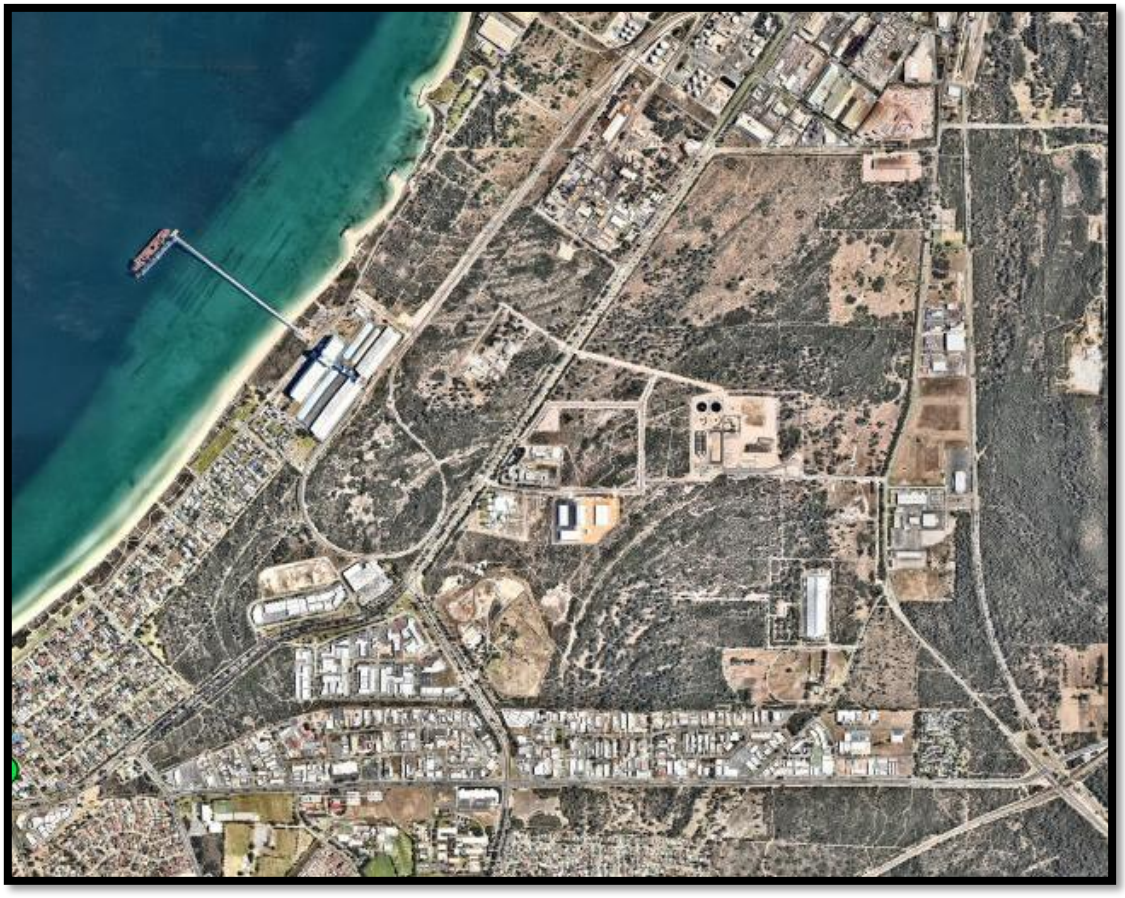
(c) By 30 November 2021, vest management and ownership of the conservation area with a **recognised conservation organisation**.

APPENDIX 5

2014 to 2019 Aerial Photography

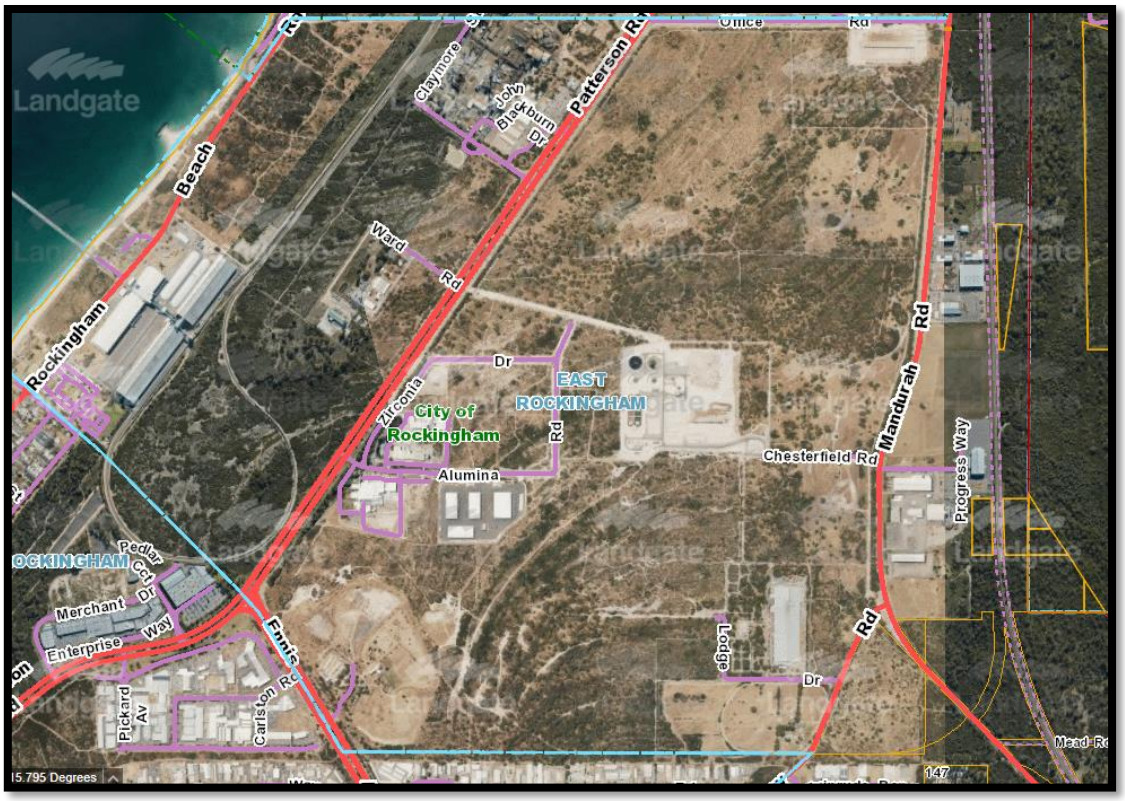
December 2014

November 2015



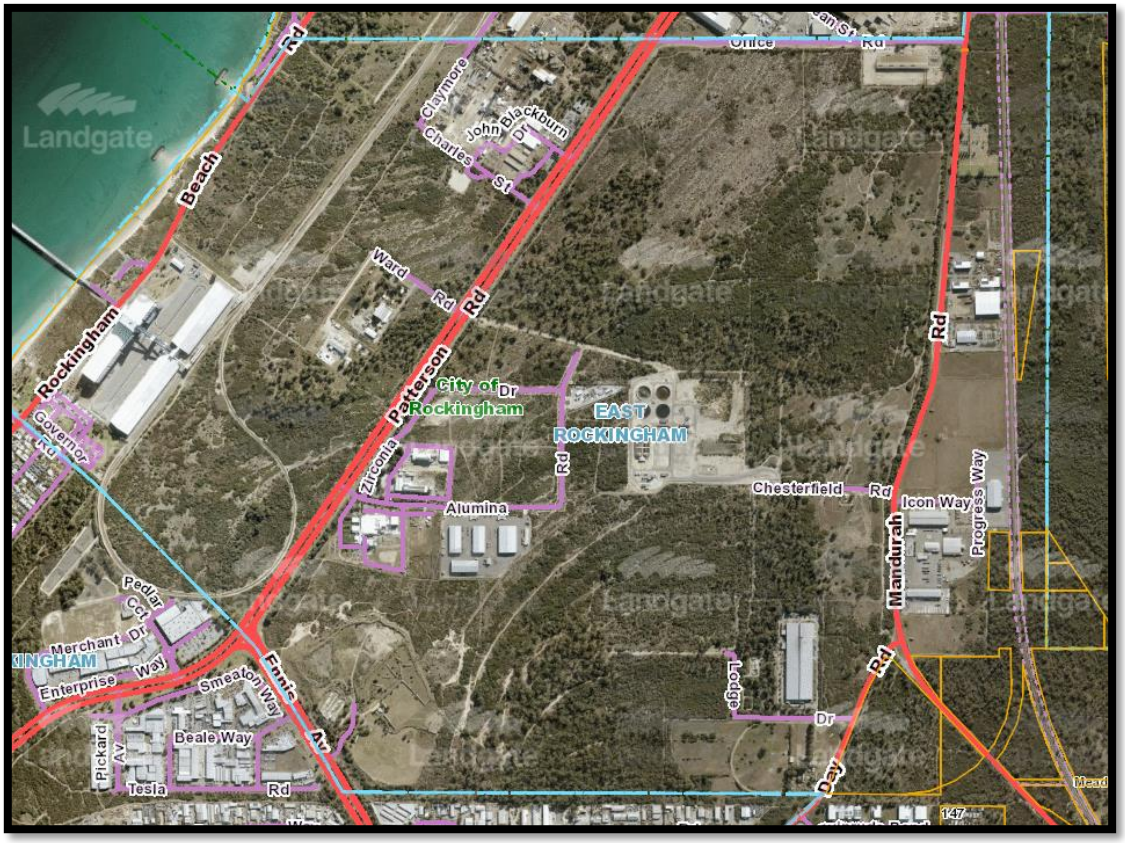
March 2016

June 2017



September 2017

July 2018



April 2019

May 2020

APPENDIX 6

Groundwater Monitoring Report

Development WA

Rockingham Industrial Zone

Groundwater Monitoring Report

2015-2019

April 2020

Report ref. J5943l

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JDA Consultant Hydrologists

DISCLAIMER

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QUALITY ASSURANCE

The JDA quality control system has been in place since 1997 and meets the requirements of AS/NZS ISO 9001:2008. JDA is committed to maintaining and improving the quality management system.

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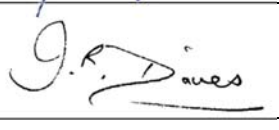
Document Version No.	Issue Date
J5943l	30/4/2020

	Name	Signature	Date
Author	Sri Adiyanti		30/04/2020
Checked by	Mathew Yan		30/04/2020
Approved by	Jim Davies		30/04/2020

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APPENDICES

1. INTRODUCTION

The Rockingham Industrial Zone (RIZ) is located in the City of Rockingham and is approximately 48 km southwest of Perth CBD and 32 km north of Mandurah (Figure 1). The RIZ (approximately 1150 ha) is the last major landholding in the Perth Metropolitan Region which is designed for heavy industrial use. It is well situated with access to deep water port facilities, road, rail and energy resources.

Within the RIZ is the Water Corporation East Rockingham Wastewater Treatment Plant (ERWWTP), which has a 91 ha conservation area located immediately south of it (Figure 2).

A Strategic Environmental Assessment (Coffey Environments, 2009) was prepared for development of the RIZ and was approved by the Minister for the Environment in 2011 and Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (SEWPAC) under the *Environmental Protection and Biodiversity Conservation Act*, 1999. As a condition of approval, a Water Management Strategy (Hyd2o, 2013) was prepared to ensure an integrated total water cycle management approach is applied in the development, aiming to protect and enhance wetland areas and threatened ecological communities (Sedgelands in Holocene dune swales of the Southern Swan Coastal Plain). The WMS included a post-development groundwater monitoring program which is described below.

1.1 Post-Development Monitoring Schedule and Reporting

The RIZ Water Management Strategy (WMS) (Hyd2o, 2013) presents a post-development groundwater monitoring program that outlines the requirement for a long-term monitoring of groundwater levels and quality in the site. It specifies monitoring to be conducted monthly for groundwater levels and quarterly for groundwater quality, following construction for a period of five years.

JDA commenced the post-development monitoring in February 2015 and has now completed the required 5 year monitoring program.

2. MONITORING PROGRAM AND LOCATIONS

2.1 Groundwater

2.1.1 Groundwater Levels

Aim: To ensure the integrity of wetlands, groundwater dependent ecosystems and Cockburn Sound are maintained.

Method: Levels were monitored in 10 groundwater monitoring bores (ERGM bores) and 1 DWER monitoring bore as shown in Figure 2 and detailed in Table 1. Static groundwater levels were measured by JDA field staff using an electrical depth. Bore logs are provided in Appendix A.

Pre-development groundwater levels and quality were historically monitored in a series of 15 shallow monitoring bores (ERGM series) installed on 18 April 2005. All bores consisted of 75mm PVC with end caps and slotted below the water table. A site visit in early 2015 established that eight bores were still in existence from the original series. Two additional bores, i.e. MR1 and ERGM17, were installed in March and July 2015, respectively, by drill rig using a hollow stem auger. These additional bores (MR1 and ERGM17) consist of 50mm PVC with end caps and slotted below the water table. Bore MR1 was destroyed in May 2017 and was reinstated as MR1R in June 2017, with the same construction details as MR1.

Frequency: Levels in ERGM1 to ERGM15 bores were measured quarterly since 20 April 2015, whilst levels in ERGM17 since July 2015 and MR1 since April 2015.

2.1.2 Groundwater Quality

Aim: To assess the performance of the integrated water management strategy, particularly the effect of the non-structural source controls on post-development groundwater quality.

Method: Samples were collected from the 10 groundwater monitoring bores (ERGM bores) by JDA field staff, for submission to a NATA-accredited laboratory for the following parameters analysis:

Nutrient parameters:

- Electrical Conductivity (EC),
- pH,
- Total Phosphorus (TP),
- Total Nitrogen (TN),
- Nitrogen in nitrous oxides (NO_x-N),
- Total Kjeldahl Nitrogen (TKN),
- Total Phosphorus (TP),
- Filterable Reactive Phosphorus (FRP or PO_4-P).

Heavy Metals parameters:

- Arsenic (As),
- Cadmium (Cd),
- Copper (Cu),
- Nickel (Ni),
- Lead (Pb),
- Zinc (Zn).

In addition, EC and pH were also measured on site by JDA staff.

All sampling was conducted in accordance to the guidelines set out by the Australian/New Zealand Standard (AS/NZS) 5667.11: 1998 (R2016) "*Water Quality - Sampling Part 11: Guidance on sampling of groundwater*". Groundwater samples were field-filtered.

All groundwater data collected was stored in JDA ESdat database, with results provided in Appendix B.

Frequency: Sampling in ERGM1 to ERGM15 was completed quarterly since March 2015, ERGM17 since August 2015, and MR1 since May 2015. Field measurement of pH and EC in ERGM bores was also conducted on the same occasion when sampling was completed.

TABLE 1: GROUNDWATER MONITORING SITE DETAILS

Bore ID	GDA 2020 (MGA 50)		Top of Casing Elevation	Natural Surface Elevation (mAHD) [2)]	Total Depth (mbTOC)[2)]
	Easting	Northing			
ERGM1	383827	6430509	4.62	3.92	6.39
ERGM2	385207	6431027	4.58	3.93	6.35
ERGM5	383005	6429298	4.79	4.10	6.41
ERGM7	384343	6428949	3.54	2.90	5.81
ERGM12	383880	6429397	3.79	3.27	6.33
ERGM13	383947	6429361	4.28	3.62	6.40
ERGM14	384038	6429292	4.43	3.74	6.41
ERGM15	384159	6429166	3.67	3.10	6.37
ERGM17	382211	6429333	5.23	4.63	5.90
MR1/MR1R	385565	6428606	4.85	4.26	6.00
T230(O)	384863	6428725	6.73	6.08	35.00

[1)] mAHD: metres Australian Height Datum
[2)] mbTOC: metres below natural surface

2.2 Monitoring Criteria and Contingency Plan

The contingency plan for breaches of the groundwater level and quality monitoring is extracted from Table 8 of the Water Management Strategy (Hyd2o, 2013) and is set out in Table 2. The plans and actions are for the prevention of any adverse impact arising from breaches of the criteria (see Section 3.2.2) , to ensure the integrity of wetlands, groundwater dependent ecosystems and Cockburn Sound are maintained.

TABLE 2: MONITORING CRITERIA AND CONTINGENCY PLAN

Monitoring Type	Criteria for Assessment	Criteria Assessment Frequency	Contingency Action
Groundwater Level	Groundwater levels not to be lower than 0.5mAHD	After each monitoring occasion	1. Assess if an isolated, development area or regional occurrence. 2. Determine if due to the development or other external factors (including groundwater abstraction). 3. Resample if necessary. 4. Perform appropriate contingency action as required (including ERWWTP as a source of groundwater). 5. Record and report in the annual report any breach and action taken. 6. Stormwater drainage system. 7. Perform maintenance as required.
Groundwater Quality	Nutrient and heavy metals concentrations in shallow bores to be similar to or better than pre-development monitoring.	Annual review of water quality targets	1. Identify potential point sources from analysing water quality results from each groundwater bore. 2. Visit potentially contaminating sites to investigate the potential point source. 3. Remove the point source. 4. Consider stormwater education/awareness program for industry. 5. Review operational and maintenance practices. 6. Consider modifications to the stormwater system. 7. Consider initiation of community-based projects.

3. MONITORING DATA AND ANALYSIS

3.1 Rainfall

Rockingham has a Mediterranean climate with warm dry summers and cool wet winters.

Figure 3 shows the monthly and annual rainfall recorded at the Bureau of Meteorology (BoM) Halls Head/Mandurah Park Station (January 1950 to December 2001) and Anketell Station (January 2002 to December 2019). Note that the Halls Head Station ceased operation in October 2017, and Anketell starts in January 2002.

The long-term (1950 to 2019) average annual rainfall is 834 mm. The average has slightly decreased by 3% since 1975 to 811 mm, consistent with the general decline in rainfall in southwest Western Australia (DoW, 2015).

The monthly average pan evaporation (Figure 3) is recorded at the BoM Perth Airport Station, with annual average of 2250 mm.

3.2 Groundwater

3.2.1 Groundwater Levels

Recorded groundwater levels for ERGM and DWER bores are shown on Figure 4, showing both pre- and post-development groundwater levels. All post-development groundwater levels satisfy the assessment criteria (>0.5 mAHD) and the levels are comparable to pre-development levels.

A steady increase in winter and summer groundwater levels in 2016, 2017, and 2018 compared to 2015 levels are consistent with above average annual rainfall received in those years (Figure 3 and the middle panel of Figure 4). In 2019, the groundwater levels decrease due to less than average annual rainfall. This trend is also consistent with levels observed in nearby DWER bore T230(O). This suggests that groundwater levels are predominantly influenced by rainfall, rather than water abstraction or development.

3.2.2 Groundwater Quality

Groundwater quality monitoring results for nutrients and heavy metals are shown in Figures 5 to 12 and Figures 13 to Figures 18, respectively.

To illustrate the central tendency of the data and seasonal variability of each groundwater quality parameter, box plots of statistics (with outliers presented, if any) and time-series plots are provided in Figures 5 to 18. Detailed results are presented in Appendix B.

Water quality monitoring results were compared against pre-development concentrations as outlined in the Water Management Strategy (Hyd2o, 2013) for bores ERGM1, ERGM2, ERGM5 and ERGM7. For the remainder of bores where pre-development data is unavailable, results are compared to the existing range of data from available bores.

ANZECC & ARMCANZ have guideline trigger values for South-western Western Australia for freshwater lowland river ecosystems. Whilst these values are not directly applicable to the Study Area, they are included as guide for comparison as follows:

- ANZECC & ARMCANZ (2000a) Table 3.3.6 and 3.3.7: Guideline trigger values for South-western Western Australia slightly disturbed freshwater lowland river ecosystems (for pH and nutrients parameters). Note that the guideline for EC is not applicable for coastal area.

- ANZECC & ARMCANZ (2000) Table 3.4.1: Guideline trigger values for toxicant applied to typical slightly to moderately disturbed ecosystems for 95% level of protection (for heavy metals).

Results of interest are described below.

Electrical Conductivity (EC), Figure 5 shows:

- Groundwater is generally fresh to brackish with EC of less than 2000 µS/cm, except ERGM7 which is saline with average 5700 µS/cm. Sodium and chloride are the dominant cation and anion due to the site proximity to seawater.
- Post-development EC levels are within the pre-development range in majority of bores, except for ERGM2 and ERGM5 which are only slightly above but still within the brackish classification.
- There is no indication of any trend in EC levels in any bore during the 2015-2019 reporting period

pH, Figure 6 shows:

- Groundwater pH measured in all bores is neutral with pH levels ranging between 7 and 8.
- Post-development pH levels are generally within the pre-development range in all bores.
- There is no indication of any trend in pH levels in any bore during the 2015-2019 reporting period.

Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN), Nitrogen in Nitrogen Oxides (NO_x-N) and Ammonia (NH_3-N), Figures 7 to 10 show:

- Total Nitrogen (TN) accounts for organic and inorganic in all forms: dissolved inorganic (nitrogen in nitrogen oxides NO_x-N, ammonia NH_3-N), dissolved organic nitrogen and particulates. TKN is particulate and dissolved organic-bound nitrogen (which can be result from detritus) and ammonia. As all samples were field-filtered, TKN is essentially dissolved organic-bound and ammonia.
- Post-development TN concentrations shown in Figures 7 to 9 are within the pre-development range for ERGM1, ERMG2 and ERMG7, and exceeded in ERGM5. Concentrations measured in ERGM17 are significantly higher for reasons unknown.
- Figure 7 shows majority of bores have measured concentrations within the ANZECC trigger value for lowland river ecosystem (1.2 mg/L) except for ERGM5, ERGM7 and ERGM17.
- Figure 9 shows bores ERGM5 and ERGM17 contain high concentration of NO_x-N (and higher proportion to TN) compared to other bores, which exceed the ANZECC trigger value of 0.15 mg/L. This could be due to nitrate (NO_3^-) influx from seawater which is naturally high in nitrate. Also noticeable is an increasing trend in ERGM17 of NO_x-N concentration since 2018.
- There is an indication of increasing trend of TN and NO_x-N concentrations in ERGM17 since 2018. There is no indication of any trend in nitrogen levels in the rest of the bores during the 2015-2019 reporting period.

Total Phosphorus (TP) and Filterable Reactive Phosphorus (FRP or PO_4-P), Figures 11 and 12 show:

- Total Phosphorus (TP) accounts for all phosphorus species, including dissolved inorganic phosphorus (FRP), dissolved organic phosphorus, particulate organic and inorganic phosphorus. As the samples were field-filtered, the difference between the measured TP and FRP is the dissolved organic phosphorus.
- Post-development TP concentrations shown in Figure 11 are within the pre-development range, except for ERGM7. Bores ERGM7 and ERGM15 exceed the ANZECC trigger value for low river ecosystem (0.065 mg/L) with bores ERGM12 to ERGM14 similar to the guideline value.

- Comparison between Figures 11 and 12 indicate that inorganic dissolved phosphorus forms the majority of total phosphorus.
- There is no indication of any trend in phosphorus levels in all bores during the 2015-2019 reporting period.

Heavy Metals (Arsenic, Cadmium, Copper, Nickel, Lead and Zinc), Figures 13 to 15 show:

- Figure 13 shows that Arsenic (As) concentrations in ERGM2 increased in 2018 and 2019 and exceeded the ANZECC trigger value for 95% level of protection (0.024 mg/L), but was within pre-development range. The concentrations in other bores are less than the trigger value.
- Figure 14 shows that Copper (Cu) in ERGM5, ERGM7, and ERGM17 in February 2019 exceeded the ANZECC trigger value (0.0014 mg/L), but in the next monitoring events the levels were all less than the trigger value. The concentrations in other bores are less than the trigger value and within pre-development range.
- Figure 15 shows that Zinc (Zn) in ERGM2 and ERGM12 exceeded the trigger value (0.008 mg/L) in February 2019 and November 2016, but in the next monitoring events the levels were all less than the trigger value. The concentrations in other bores are less than the trigger value and within pre-development range.
- Cadmium (Cd) and Lead (Pb), concentrations in all bores are equals to or less than the detection limits (≤0.0001 mg/L and ≤ 0.001 mg/L, respectively), details provided in Appendix B;
- Nickel (Ni) concentrations in all bores are equal to or less than the detection limit (≤0.001 mg/L), except ERGM7 in November 2016 (0.003 mg/L), details provided in Appendix B;

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Monitoring of groundwater levels and quality has been completed (2015 - 2019), in accordance with the Rockingham Industrial Zone Water Management Strategy (Hyd2o, 2013).

JDA Concludes:

- Monitoring of post-development groundwater levels satisfy the assessment criteria of >0.5 mAHD. Groundwater levels are predominantly influenced by rainfall, rather than water abstraction or development.
- Post-development groundwater EC and pH levels are less than or comparable to pre-development level and the ANZECC trigger guideline for lowland river ecosystem.
- Post-development groundwater nutrients in majority of monitoring bores are less than pre-development levels, except TN and NO_x-N concentrations in bore ERGM17 indicating an increasing trend, and TP concentration in bores ERGM7 and ERGM15. These increases were investigated further with cause unknown.
- Post-development groundwater heavy metals are generally less than the detection limits (hence less than the ANZECC trigger values for toxicant at slightly to moderately disturbed ecosystems for 95% level of protection), except for Arsenic in ERGM2 which is similar to pre-development levels.
- Overall the 5 years of monitoring indicates parameters are generally within the pre-development range and no further monitoring is required.

5. REFERENCES

Australian and New Zealand Environment and Conservation Council and Agriculture 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, October 2000.

Australian/New Zealand Standard (AS/NZS) 5667.6 (1998). *Water Quality - Sampling Part 6: Guidance on sampling of rivers and streams.* (AS/NZS 5667.6:1998).

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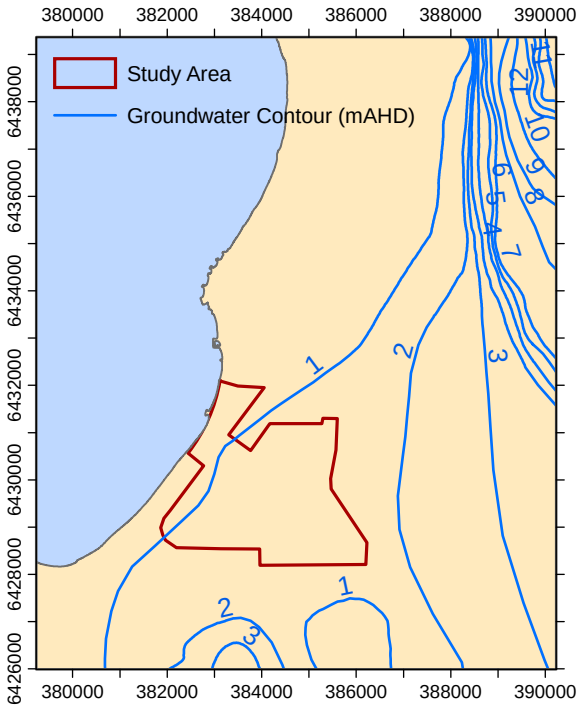
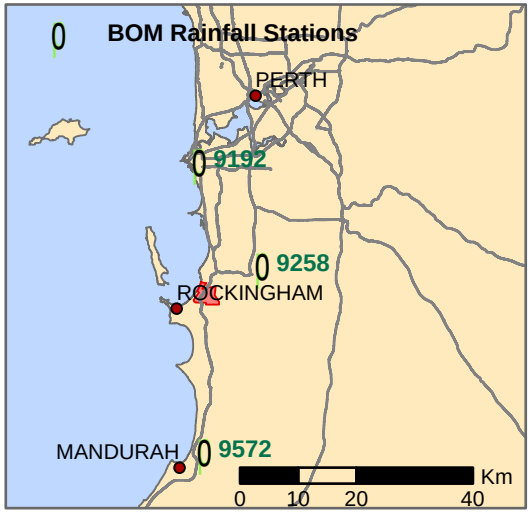
Hyd2o (2013). Rockingham Industry Zone: Water Management Strategy, prepared for Landcorp, December, 2013.

JDA Consultant Hydrologists (2006). *East Rockingham Industrial Park (IP14 Area): Groundwater Hydrology.* JDA Ref. J3477g, dated 2 November 2006, for Landcorp.

Nearmap (2020). Digital imagery.

FIGURES





Data Source: Nearmap (2020) Aerial Photographs 6 Dec 2014 and 17 February 2020.

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Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015 - 2019

Figure 1: Locality Map

Data Source: Nearmap (2020) Aerial Photographs 17 February 2020.

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J5943

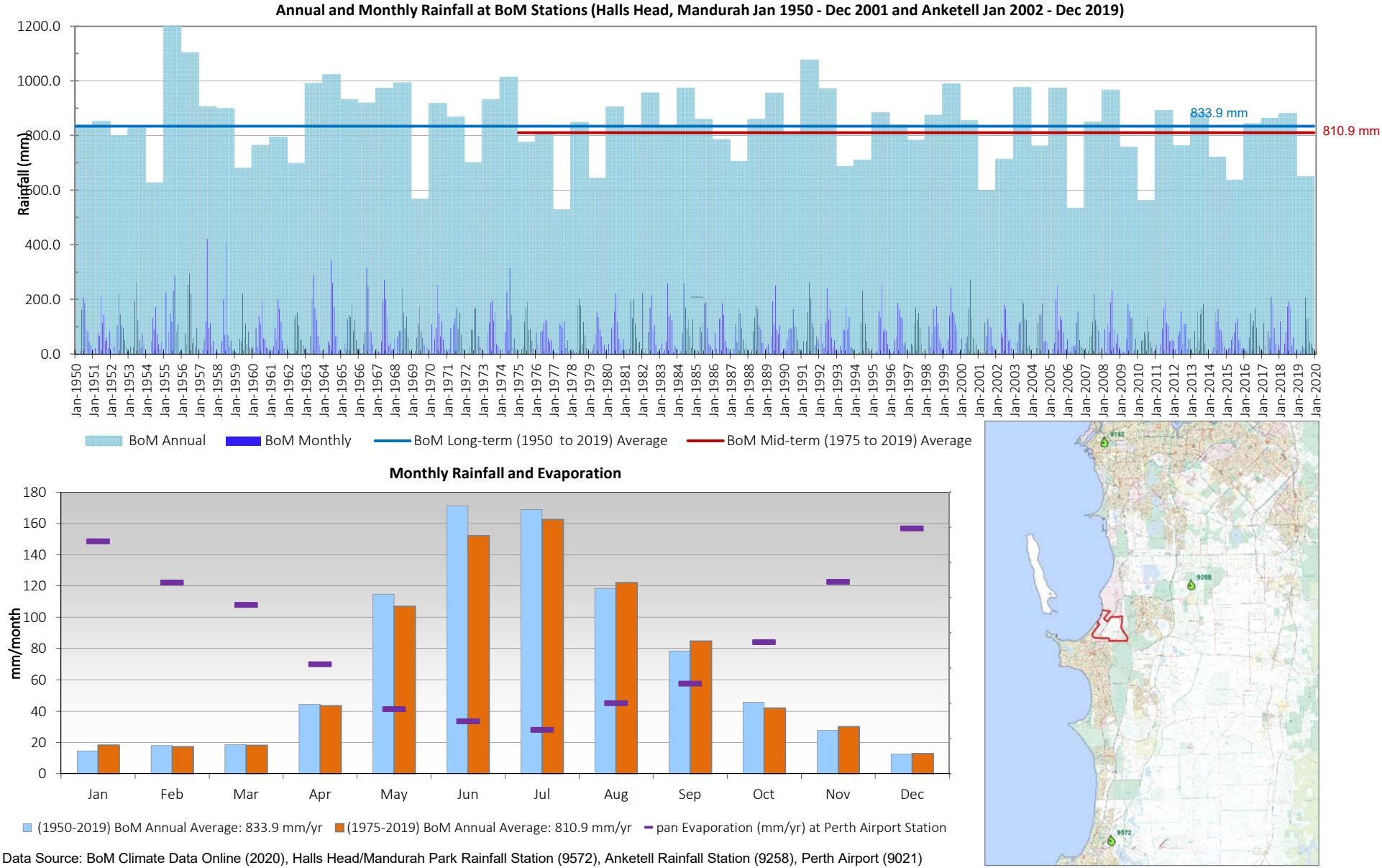
Scale: 1:28,000 @A4

0 200 400 600 800 Meters

Landcorp

Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015 - 2019

Figure 2: Monitoring Bore Locations



Data Source: BoM Climate Data Online (2020), Halls Head/Mandurah Park Rainfall Station (9572), Anketell Rainfall Station (9258), Perth Airport (9021)

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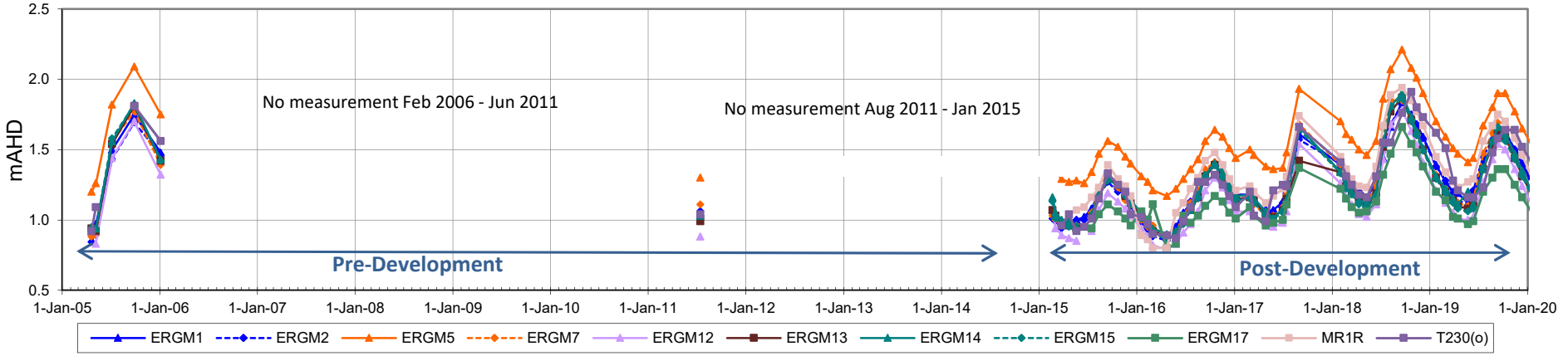
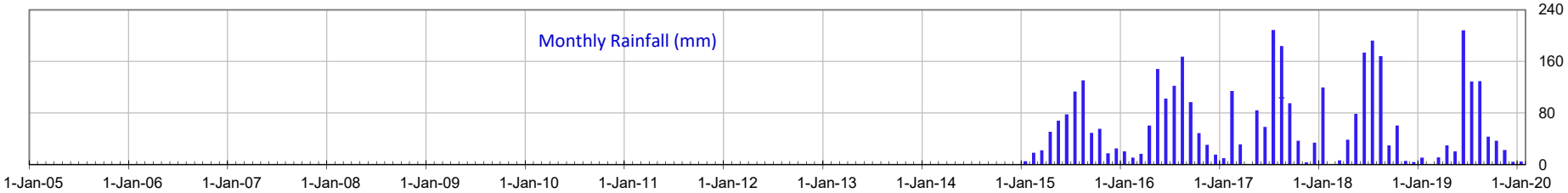
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

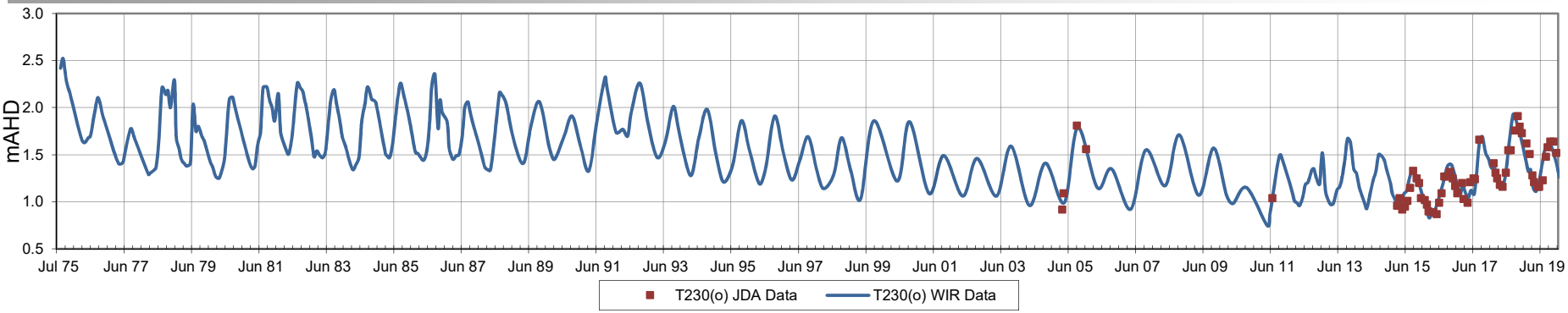
Figure 3: Annual and Monthly Average Rainfall

Rockingham Industrial Zone - Groundwater Levels 2005 - 2019





East Rockingham DoW Bore T230 (O) - Groundwater Levels 1975 - 2019



Data Source: DoW Water Information Reporting http://wir.water.wa.gov.au/ (accessed 20 April 2020)

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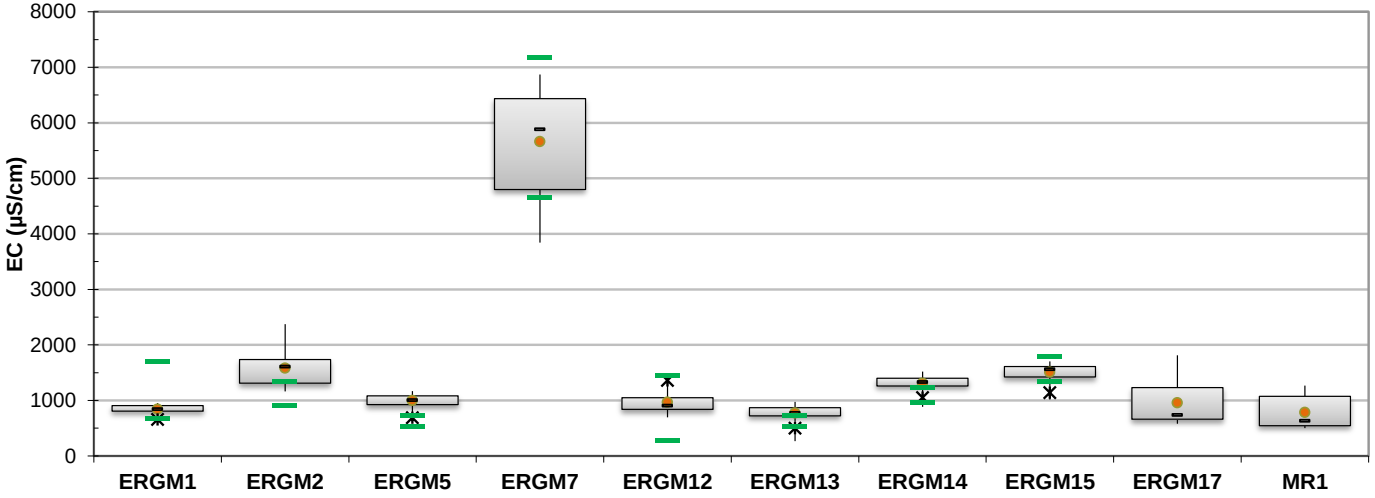
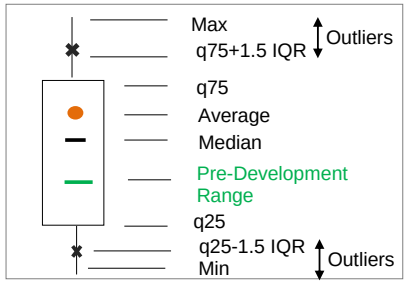
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015 -2019

Figure 4: Groundwater Levels

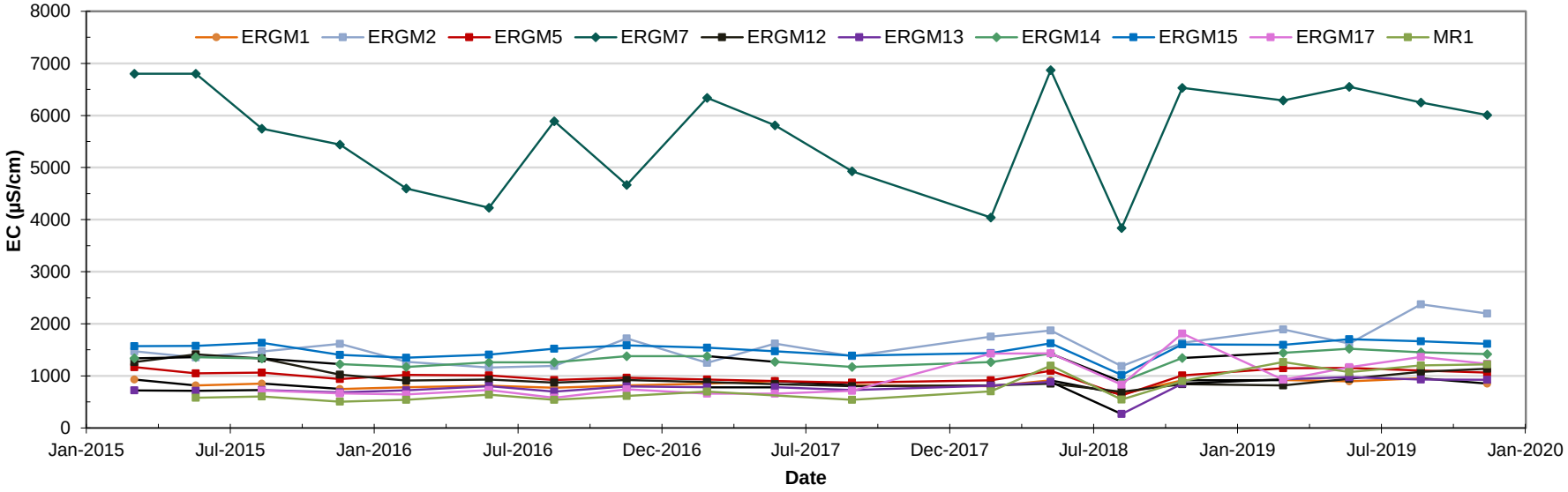
Boxplot of Groundwater Electrical Conductivity (EC) (2015 to 2019)





IQR = Interquartile range =q75-q25

values are average of field and lab EC



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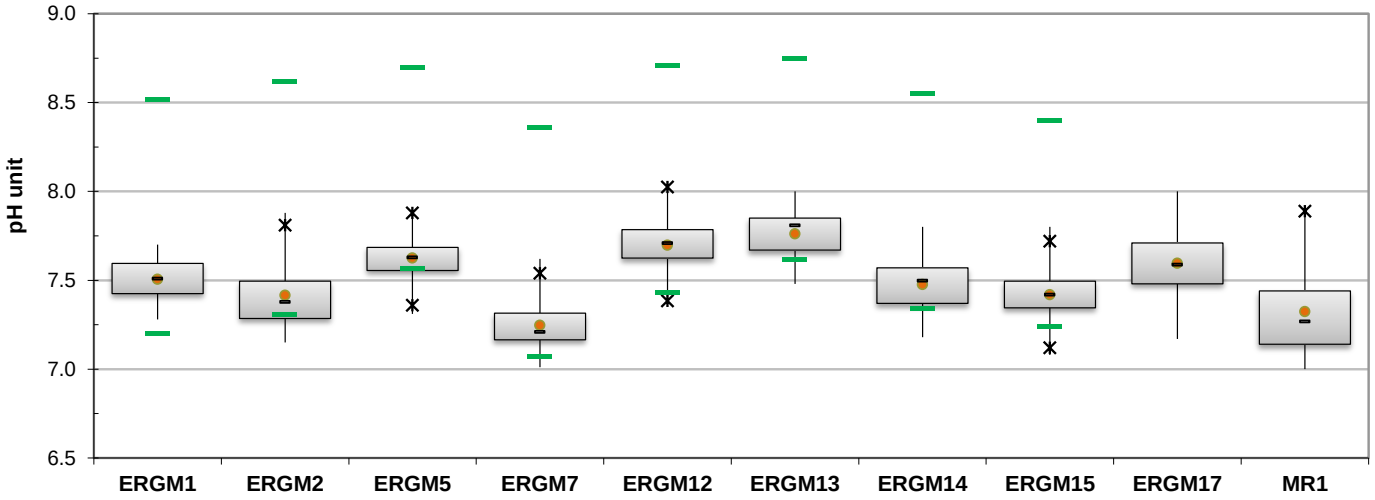
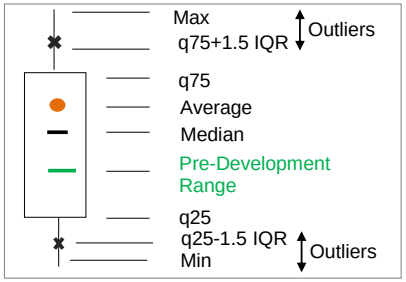
Rockingham Industrial Zone:Post-Development Groundwater Monitoring 2015-2019

Figure 5: Groundwater EC

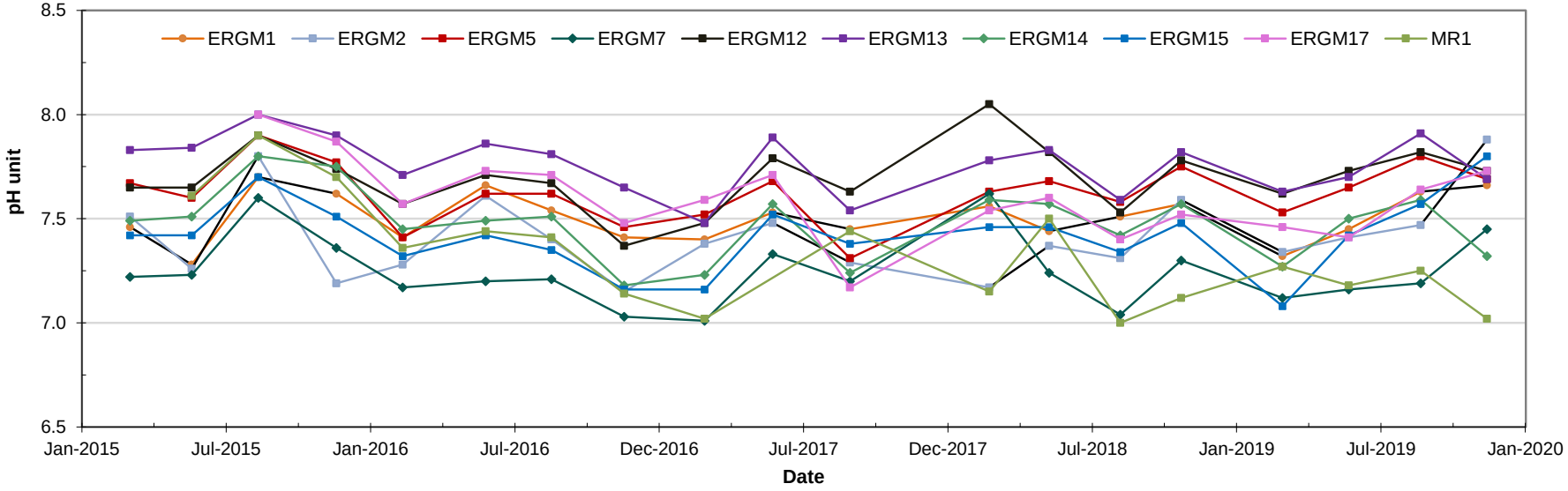
Boxplot of Groundwater pH (2015 to 2019)





IQR = Interquartile range =q75-q25

values are average of field and lab pH



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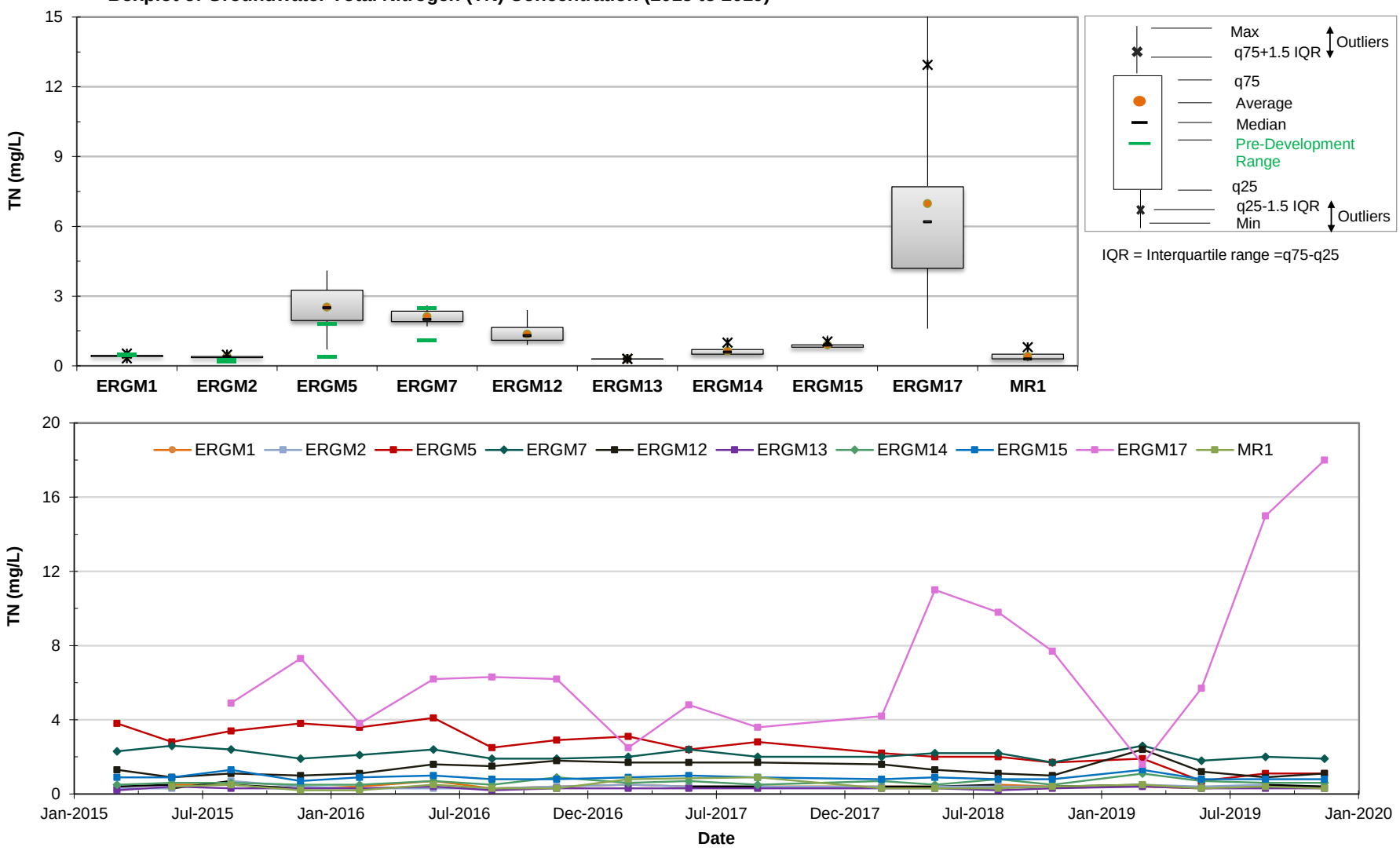
Rockingham Industrial Zone:Post-Development Groundwater Monitoring 2015-2019

Figure 6: Groundwater pH



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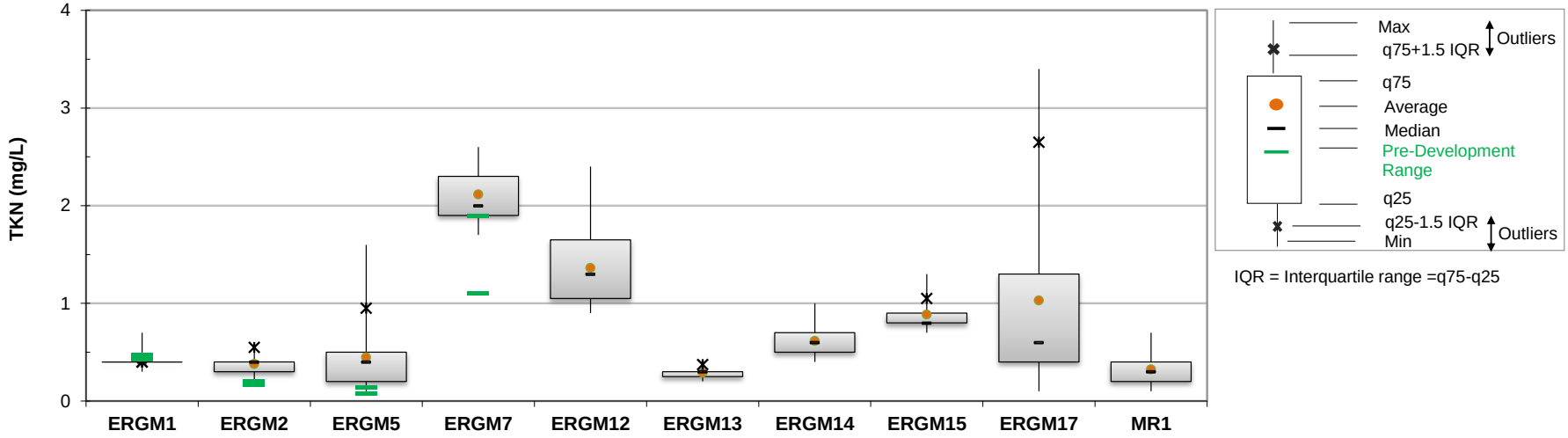
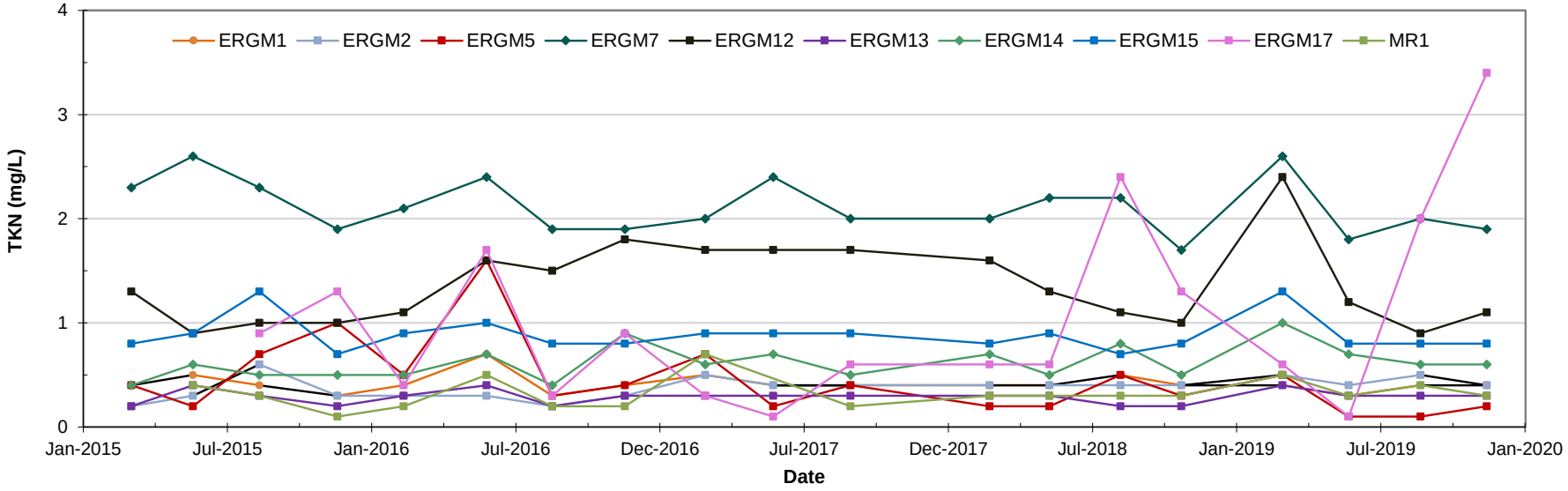
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 7: Groundwater TN Concentration

Boxplot of Groundwater Total Kjeldahl Nitrogen (TKN) Concentration (2015 to 2019)





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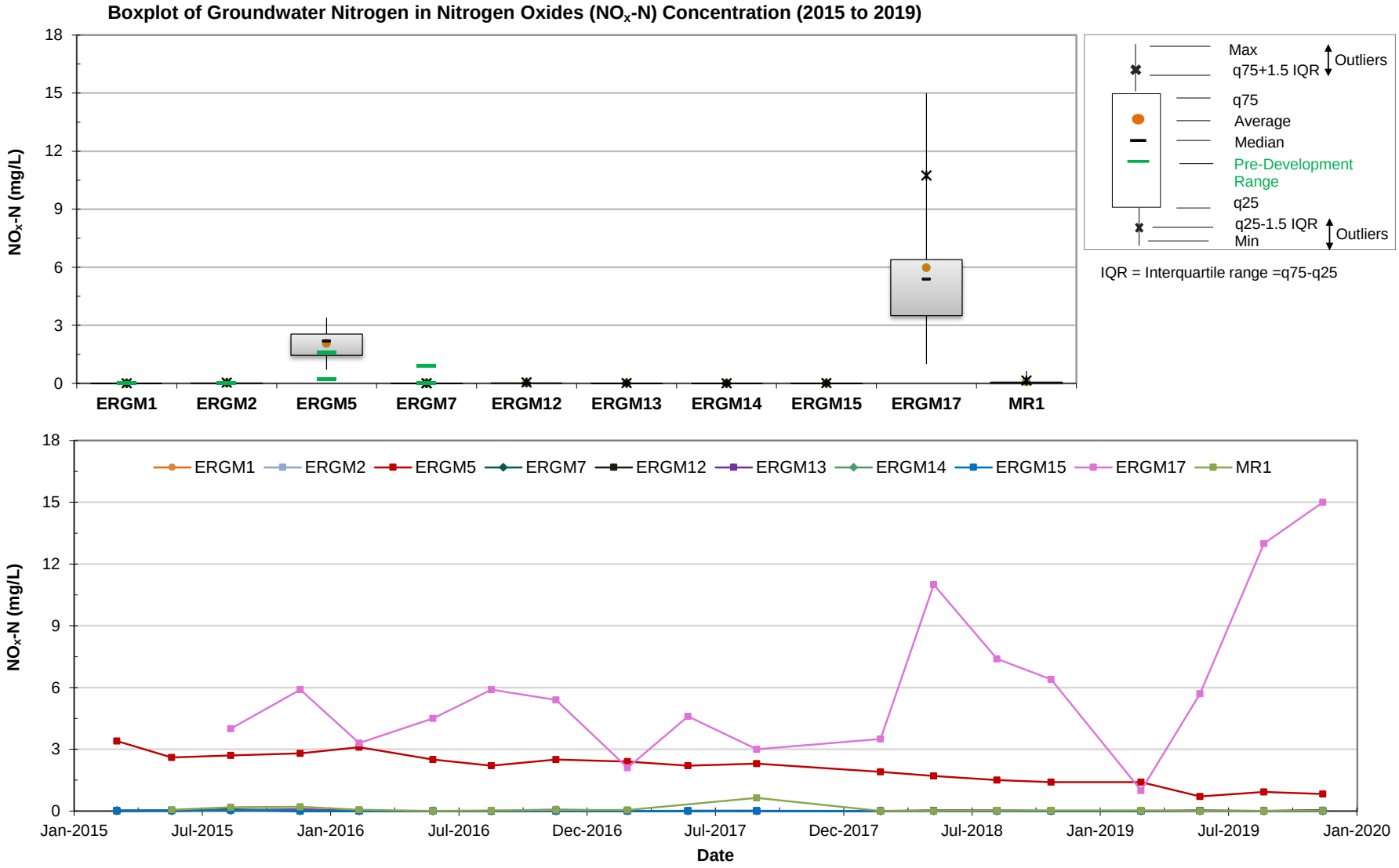
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 8: Groundwater TKN Concentration



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Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 9: Groundwater NO_x-N Concentration

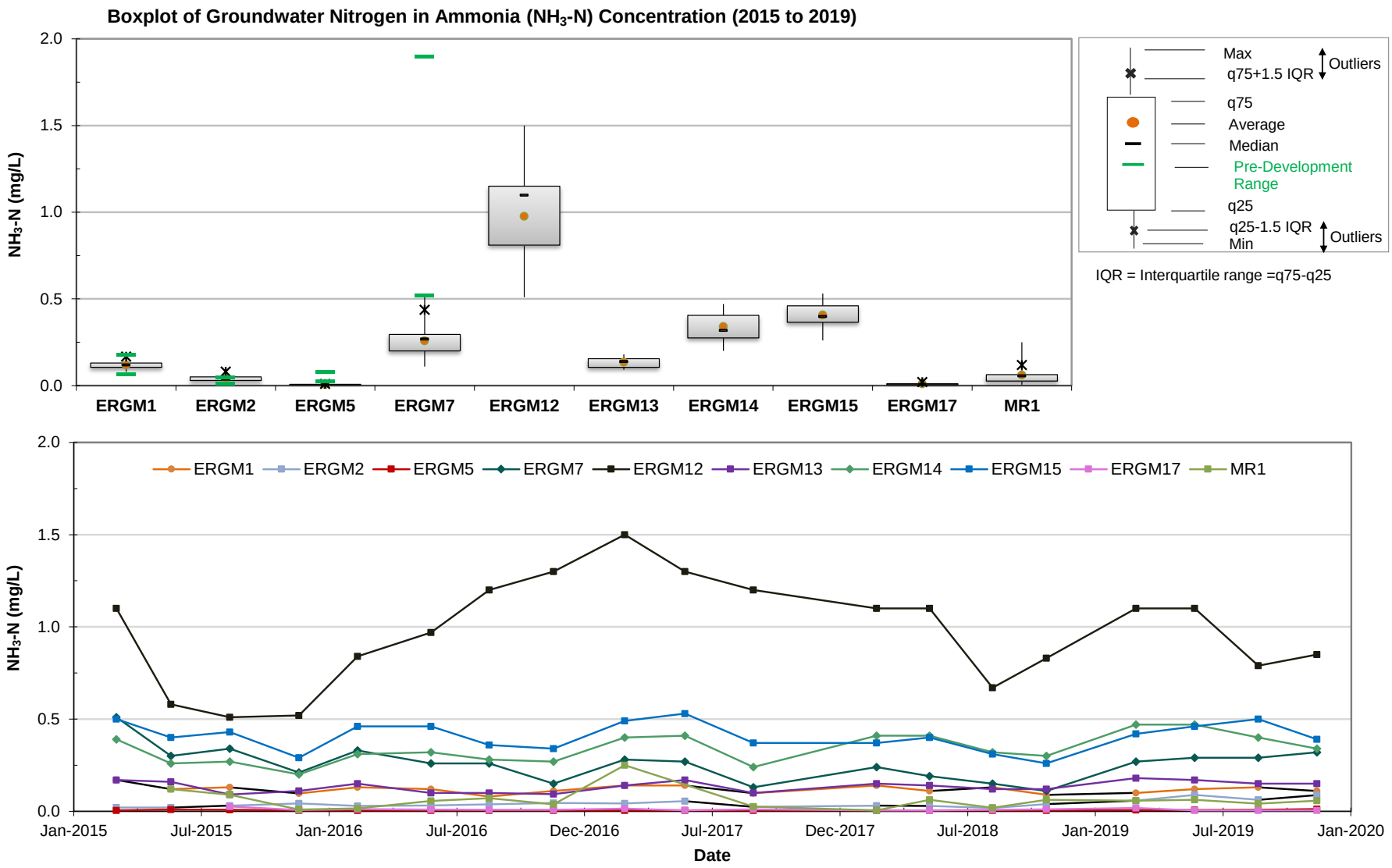

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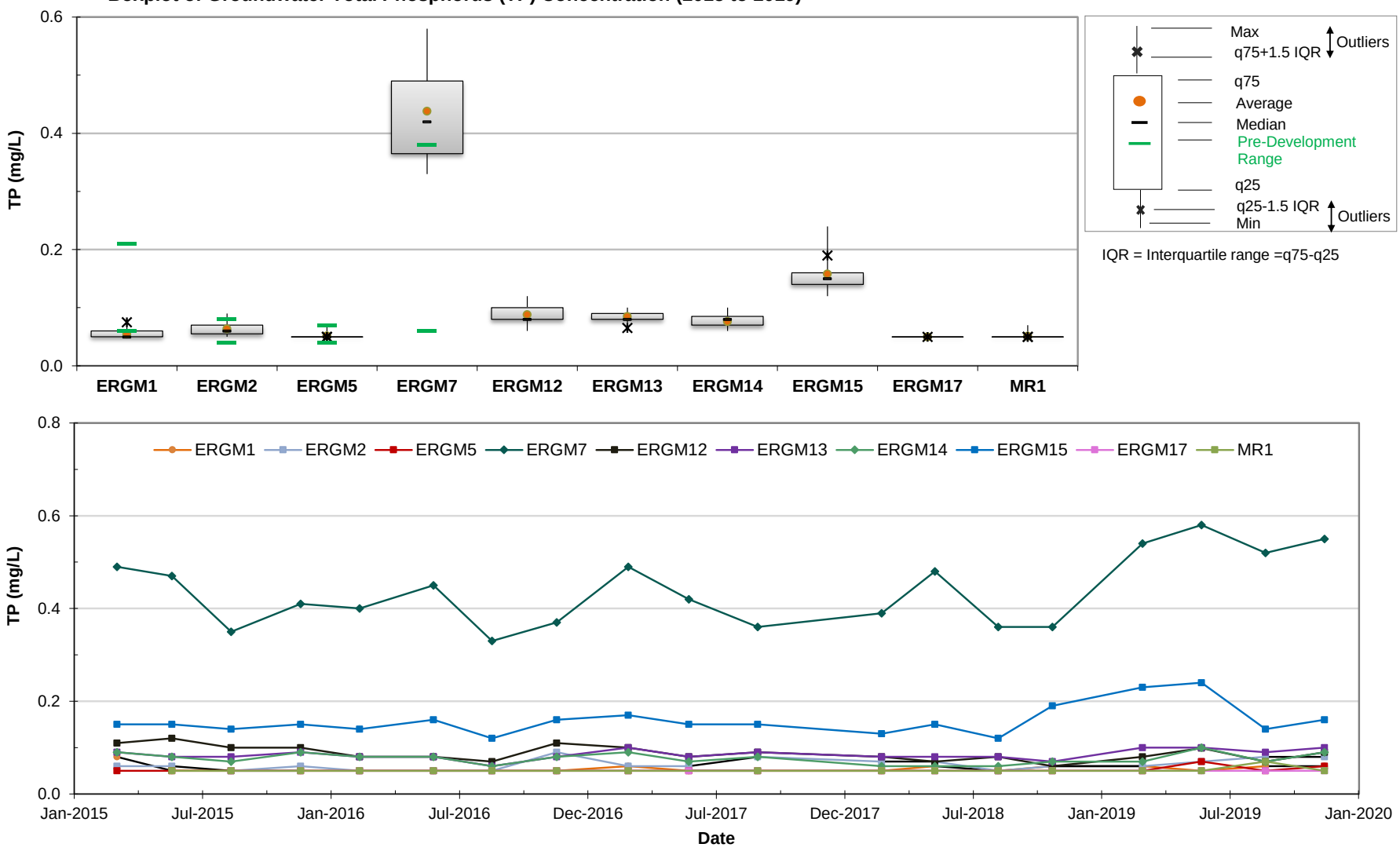
Figure 10: Groundwater NH_3-N Concentration



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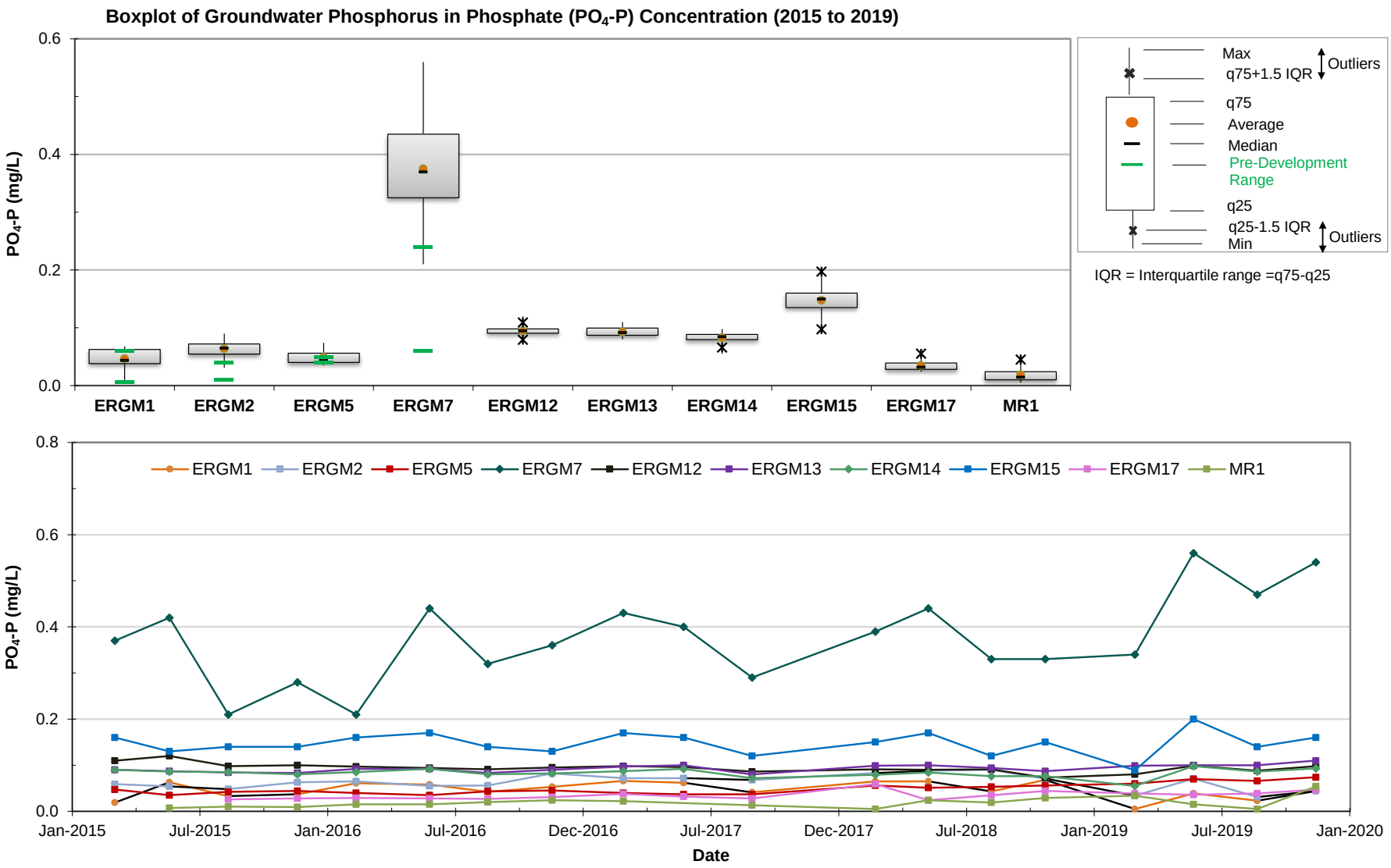
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 11: Groundwater TP Concentration



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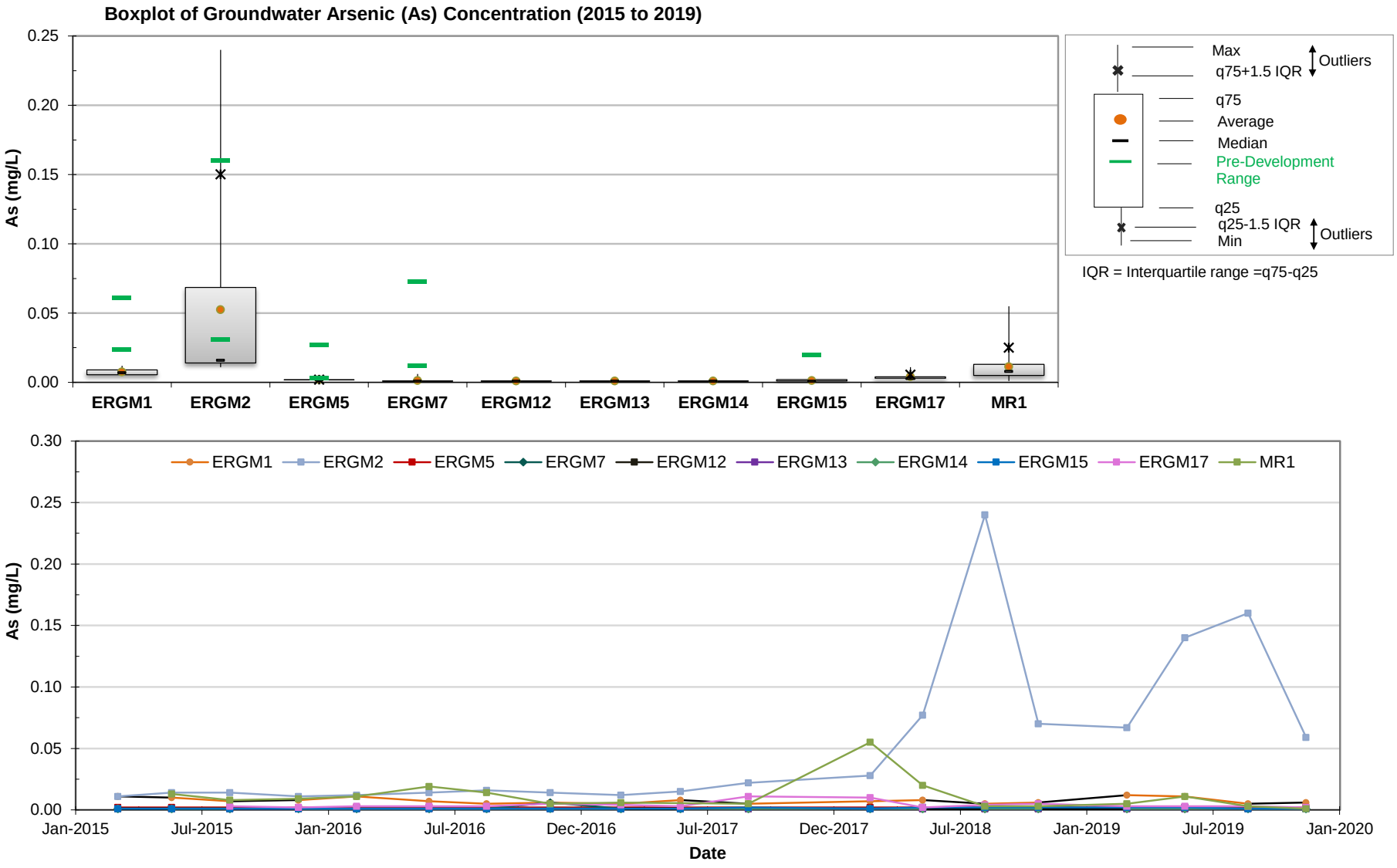
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 12: Groundwater PO_4-P Concentration



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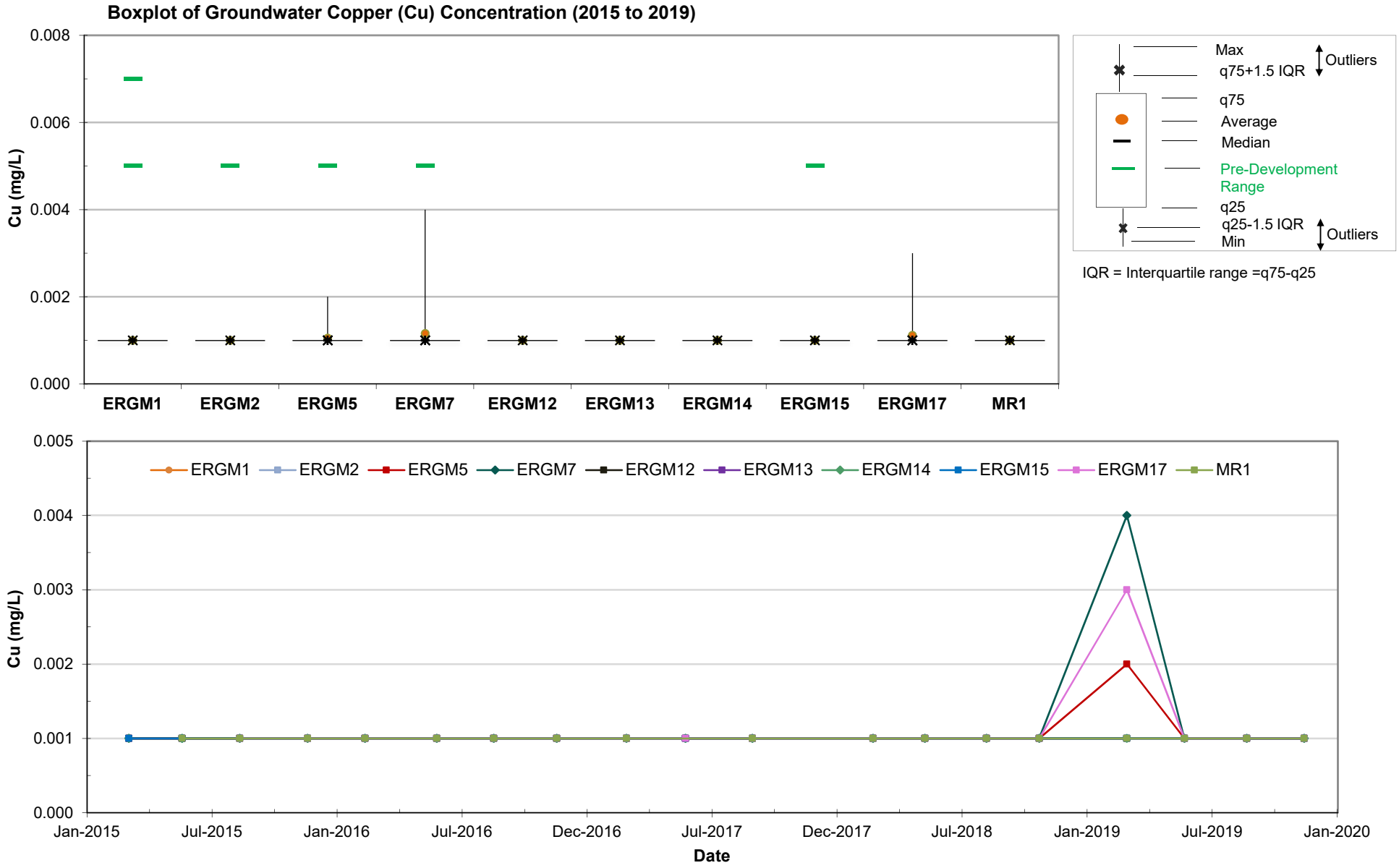
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 13: Groundwater Arsenic (As) Concentration



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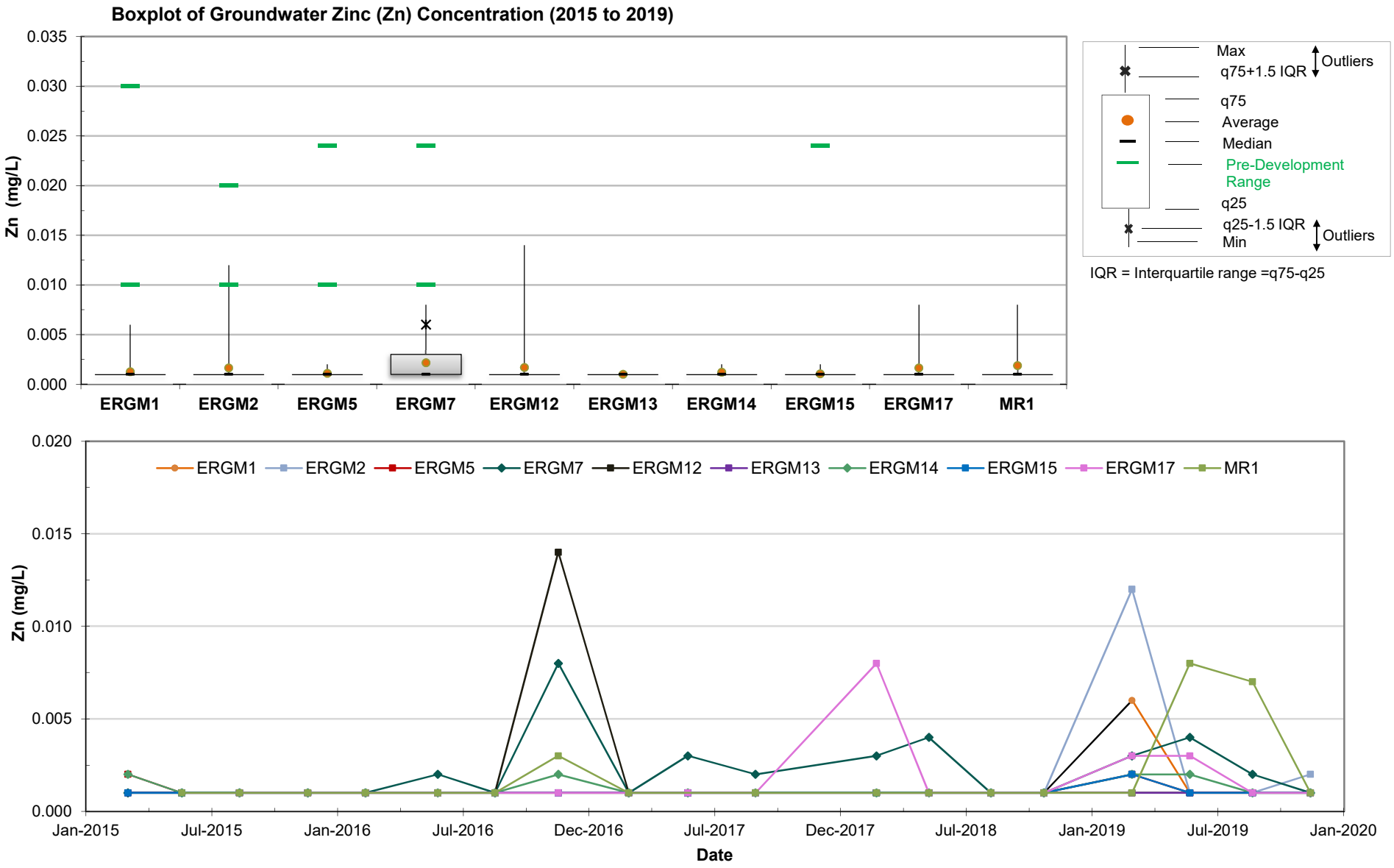
Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 14: Groundwater Copper (Cu) Concentration



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Rockingham Industrial Zone: Post-Development Groundwater Monitoring 2015-2019

Figure 15: Groundwater Zinc (Zn) Concentration

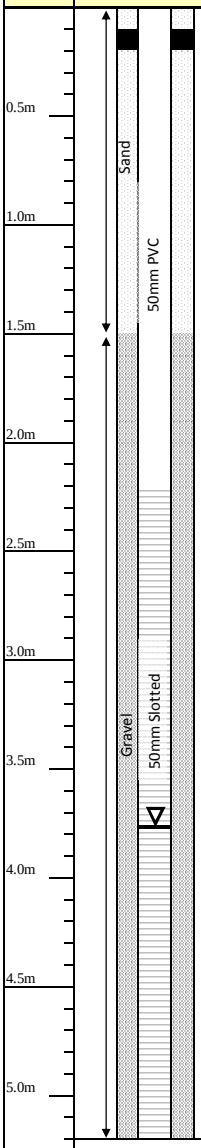
APPENDIX A

JDA Lithological Logs

JDA Consultant Hydrologists
Suite 1, 27 York Street
Subiaco WA 6008
Tel: 9388 2436
Fax: 9381 9279

LITHOLOGICAL LOG

Client:	Landcorp	Job No:	J5943
Project:	Rockingham Industrial Area	Hole commenced:	27/03/2015
Bore location:	385568/6428611	Hole completed:	27/03/2015
Datum:	mAHD	Logged by:	BK
Bore Name:	MR1	Total Depth:	5.20 mbgl
Drill type:	Hollow Auger	R.L. TOC:	4.85 mAHD
Hole diameter:	50mm	Natural Surface:	4.261 mAHD



Depth (m)	BORE CONSTRUCTION	GRAPHICAL LOG	LITHOLOGICAL LOG: LITHOLOGY	COLOUR	GRAIN SIZE	SORTING	GRAIN SHAPE	MOISTURE	OTHER
0 - 1.0	Sand		Sand	Brown	F-M	M	Subr	0	
1.0 - 1.5	Sand / 50mm PVC			Cream					Limestone chunks 1.0 to 3.0m
1.5 - 3.0	50mm PVC								Limestone chunks 1.0 to 3.0m
3.0 - 3.5	50mm PVC								
3.5 - 4.0	Gravel / 50mm Slotted			Brown			Suba	Moist	
4.0 - 5.0	Gravel / 50mm Slotted							Saturated	

Sand
Loamy sand
Sandy Loam
Loam
Sandy Clay Loam
Clay Loam
Sandy Clay
Clay

Grain Size	Sorting	Grain	Moisture
f - fine	p - poorly	a - angular	d - dry
m - medium	m - moderately	suba - subangular	m - moist
c coarse	w - well	subr - subrounded	s - saturated
v.c - very coarse		r - rounded	
g - gravel		wr - well rounded	

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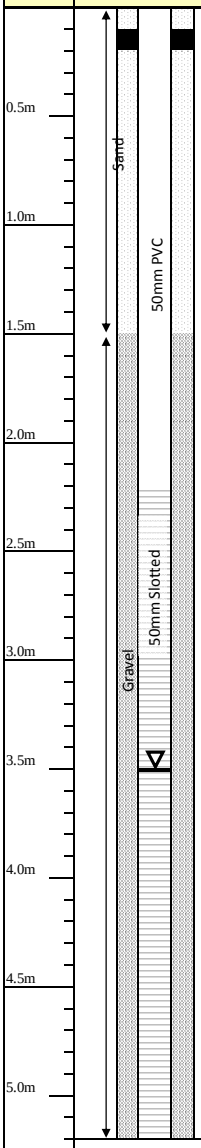
LITHOLOGICAL LOG

Client:	Landcorp	Job No:	J5943
Project:	Rockingham Industrial Area	Hole commenced:	9/07/2015
Bore location:	382207/642333	Hole completed:	9/07/2015
Datum:	mAHD	Logged by:	BK
Bore Name:	ERGM17	Total Depth:	5.25 mbgl
Drill type:	Hollow Auger	R.L. TOC:	5.234 mTO
Hole diameter:	50mm	Natural Surface:	4.634 mAHD



GRAPHICAL LOG	LITHOLOGICAL LOG							
	LITHOLOGY	COLOUR	GRAIN SIZE	SORTING	GRAIN SHAPE	MOISTURE	OTHER
	Sand	Dark Brown	VF	W	Subr	0	
			VF-F	P			
		Cream			Suba		
			F-M			Saturated	
			F-C				

Sand
Loamy sand
Sandy Loam
Loam
Sandy Clay Loam
Clay Loam
Sandy Clay
Clay

Grain Size	Sorting	Grain	Moisture
f - fine	p - poorly	a - angular	d - dry
m - medium	m - moderately	suba - subangular	m - moist
c coarse	w - well	subr - subrounded	s - saturated
v.c - very coarse		r - rounded	
g - gravel		wr - well rounded	

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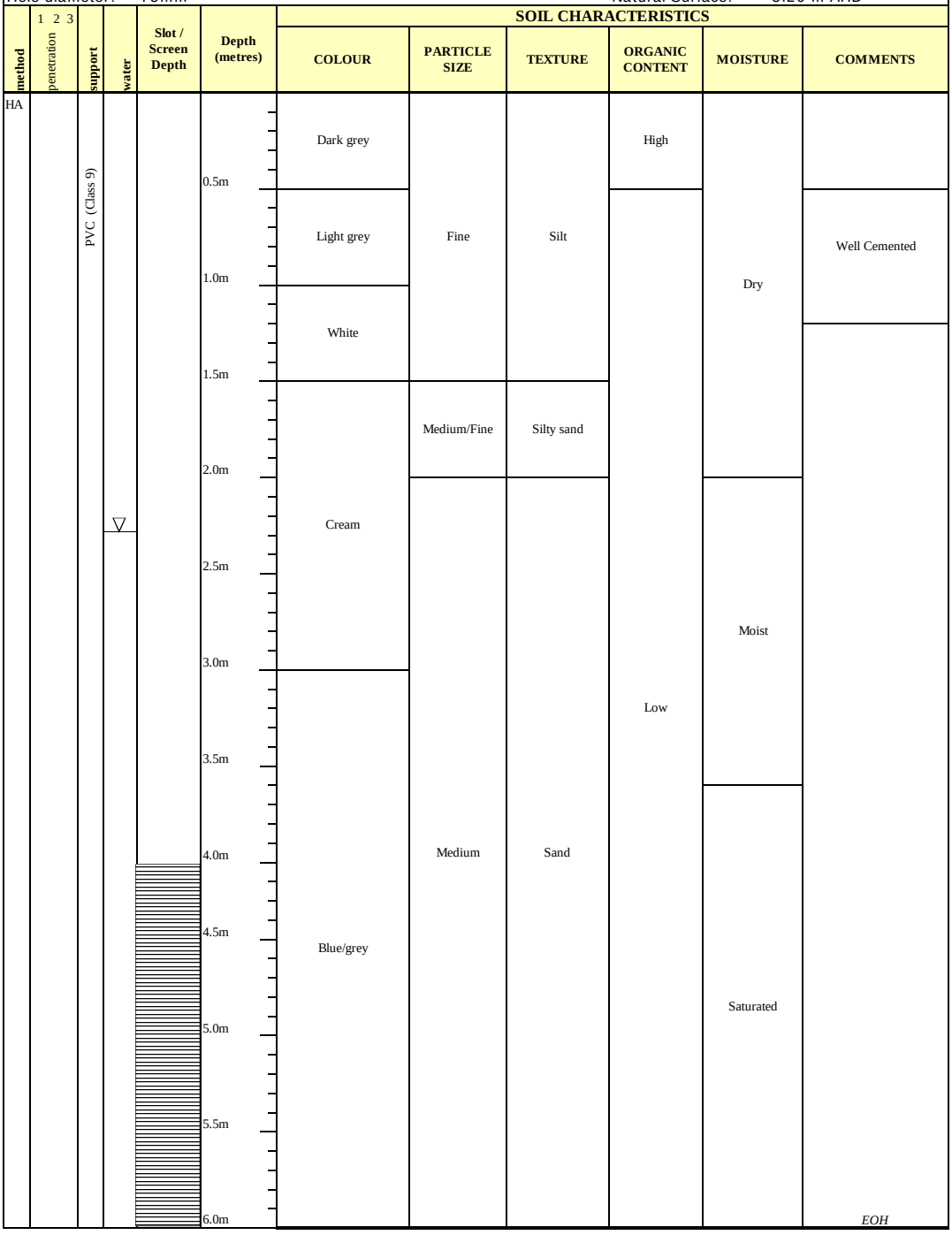
LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	20/04/05
Bore location:	0383876E, 6429393N	Hole completed:	20/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 12	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	3.92 m AHD
Hole diameter:	75mm	Natural Surface:	3.26 m AHD



NOTES ON BORELOG

COLOURS: Solid colours are BLACK, WHITE, BEIGE

Dark :	Brown, Red, Orange, Yellow, Grey, Blue	Tones : solid colour, blemish or mottle
Medium :	Brown, Red, Orange, Yellow, Grey, Blue	
Light :	Brown, Red, Orange, Yellow, Grey, Blue	

PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 2.93 m

Stickup above NS: 0.66 m

WL: 2.30 m below NS

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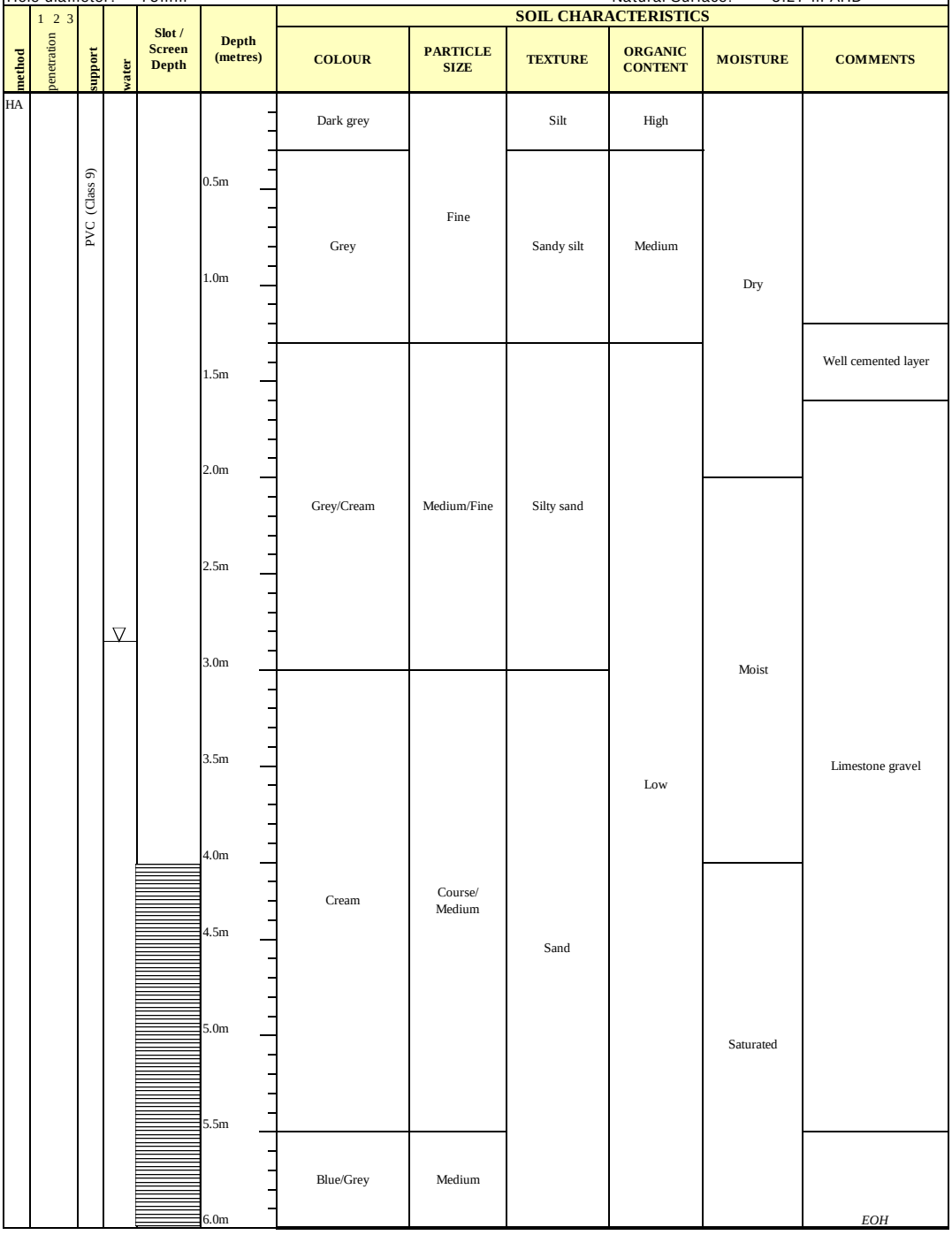
Subiaco WA 6008
Tel: 9388 2436
Fax: 9381 9279

LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	20/04/05
Bore location:	0383873E, 6429392N	Hole completed:	20/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 13	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	3.79 m AHD
Hole diameter:	75mm	Natural Surface:	3.27 m AHD



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ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 3.36 m

Stickup above NS: 0.52 m

WL: 2.84 m below NS

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Subiaco WA 6008
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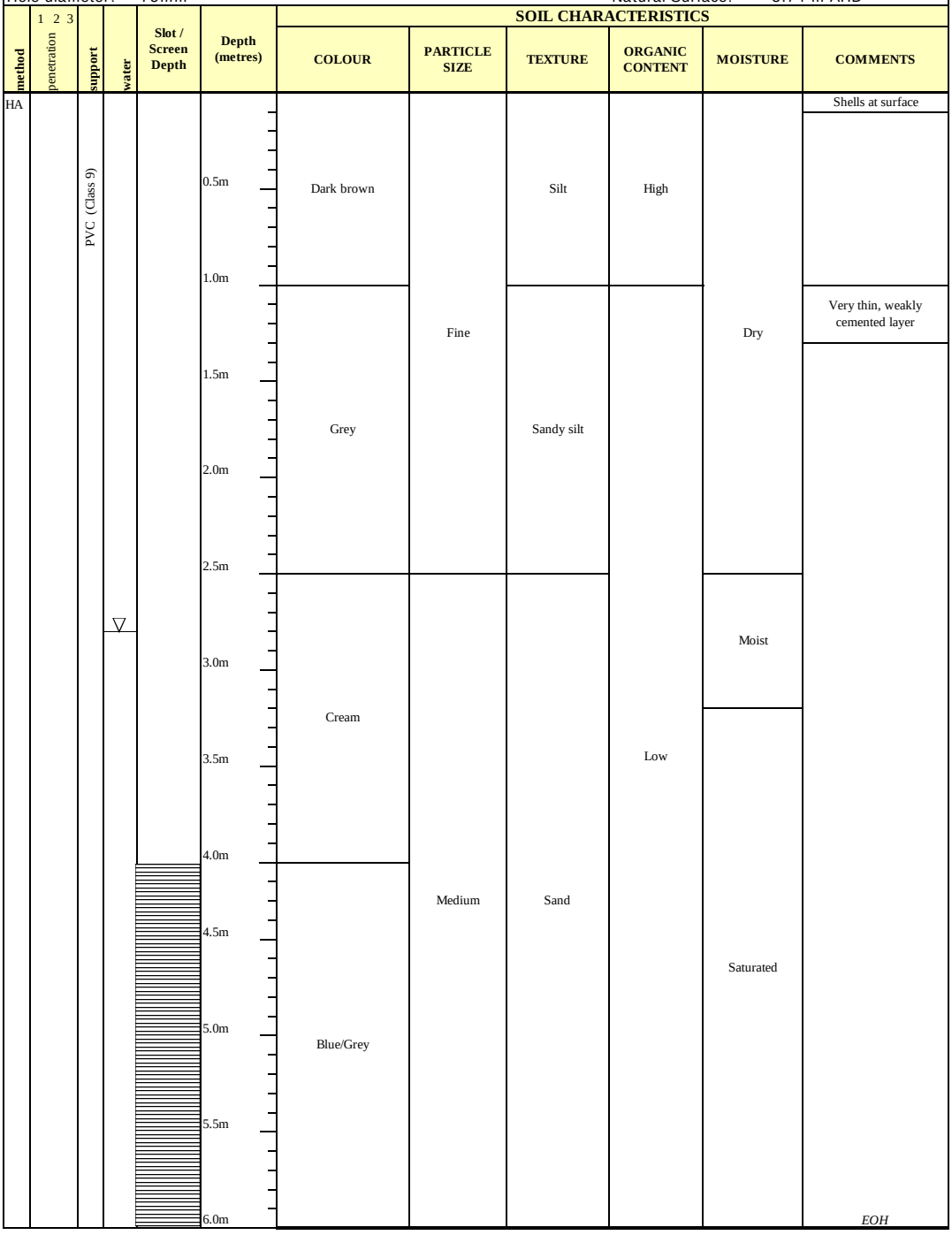
LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	20/04/05
Bore location:	0384035E, 6429290N	Hole completed:	20/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 14	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	4.43 m AHD
Hole diameter:	75mm	Natural Surface:	3.74 m AHD



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TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 3.49 m

Stickup above NS: 0.69 m

WL: 2.80 m below NS

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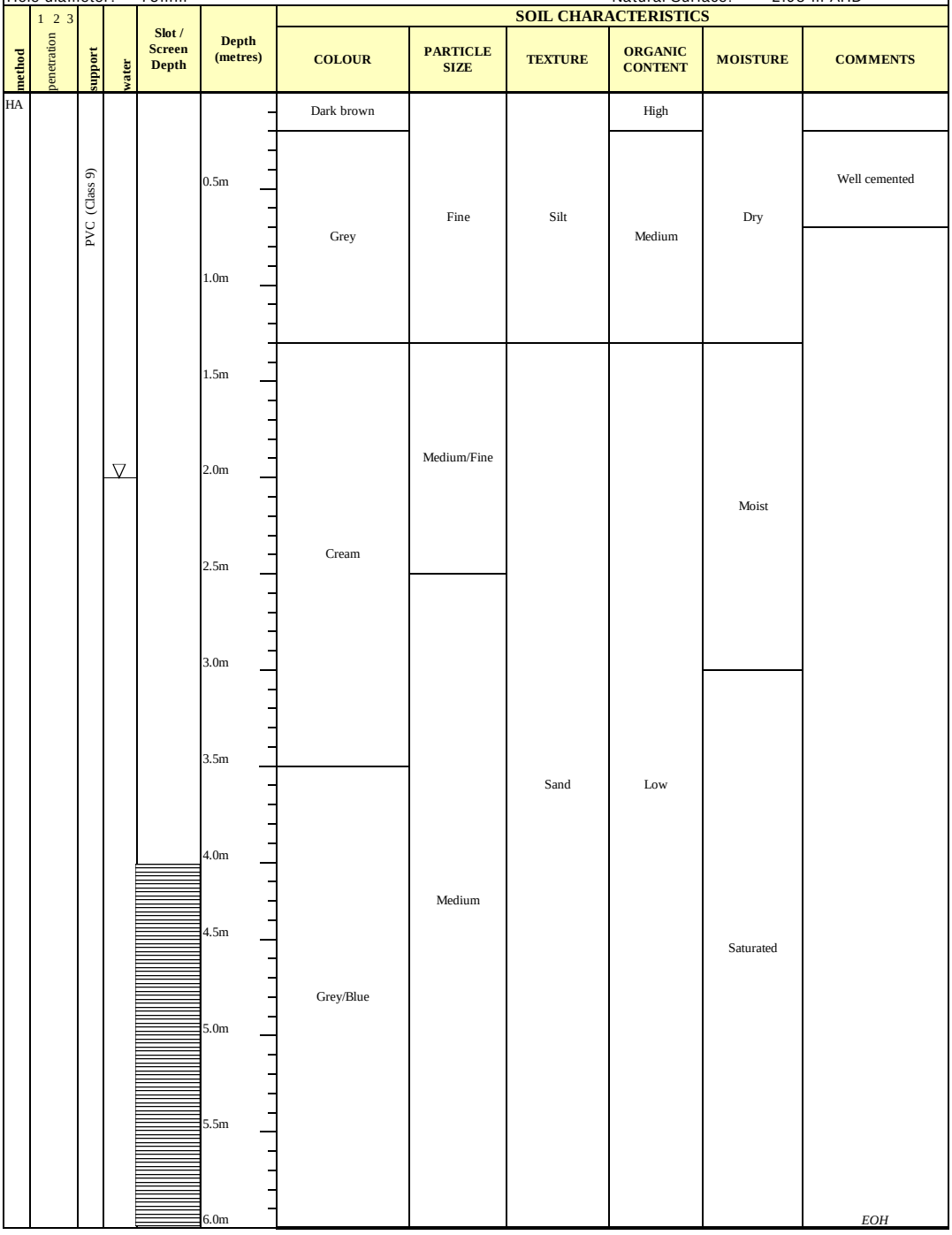
Suite 1, 27 York Street
Subiaco WA 6008
Tel: 9388 2436
Fax: 9381 9279

LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	20/04/05
Bore location:	0384152E, 6429166N	Hole completed:	20/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 15	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	3.67 m AHD
Hole diameter:	75mm	Natural Surface:	2.98 m AHD



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PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

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Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 2.73 m

Stickup above NS: 0.69 m

WL: 2.04 m below NS

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Fax: 9381 9279

LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	19/04/05
Bore location:	0384377E, 6428951N	Hole completed:	19/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 7	Total Depth:	8.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	3.56 m AHD
Hole diameter:	75mm	Natural Surface:	2.90 m AHD

method	1 2 3 penetration	support	water	Slot / Screen Depth	Depth (metres)	SOIL CHARACTERISTICS: COLOUR	PARTICLE SIZE	TEXTURE	ORGANIC CONTENT	MOISTURE	COMMENTS
HA		PVC (Class 9)	▽		0.5m	Light Brown/Cream	Very Fine	Silt			Hard cemented layers
					1.0m	Cream/White	Fine	Sand		Dry	Particle size increasing.
					1.5m	Brown/Cream					
					2.0m	Blue/Grey		Loamy Sand		Moist	
					2.5m	Grey	Fine/Medium	Sand	Low	Saturated	Bore constructed to 5.5 m BNS
					3.0m						
					3.5m						
					4.0m						
					4.5m						
					5.0m						
					5.5m						Extended drilling to locate Tamala Limestone
					6.0m						
					6.5m						
					7.0m						
					7.5m						
					8.0m						Limestone not encountered *EOH*

NOTES ON BORELOG

COLOURS: Solid colours are BLACK, WHITE, BEIGE
Dark : Brown, Red, Orange, Yellow, Grey, Blue — Tones : solid colour, blemish or mottle
Medium : Brown, Red, Orange, Yellow, Grey, Blue
Light : Brown, Red, Orange, Yellow, Grey, Blue

PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 2.65 m

Stickup above NS: 0.66 m

WL: 1.99 m below NS

JDA Consultant Hydrologists
Suite 1, 27 York Street
Subiaco WA 6008
Tel: 9388 2436
Fax: 9381 9279

LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	19/04/05
Bore location:	0383002E, 6429297N	Hole completed:	19/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 5	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	4.79 m AHD
Hole diameter:	75mm	Natural Surface:	4.10 m AHD

method	1 2 3 penetration	support	water	Slot / Screen Depth	Depth (metres)	SOIL CHARACTERISTICS: COLOUR	PARTICLE SIZE	TEXTURE	ORGANIC CONTENT	MOISTURE	COMMENTS
HA		PVC (Class 9)	▽		0.5m	Grey/Dark Brown		Silt	High		Weakly cemented just below surface
					1.0m						Some slightly cemented layers
					1.5m						
					2.0m	Grey	Fine	Silty Sand		Dry	
					2.5m						
					3.0m				Low		
					3.5m						
					4.0m					Moist	
					4.5m	Cream	Medium/Fine	Sand			
					5.0m					Saturated	
					5.5m						
					6.0m						*EOH*

NOTES ON BORELOG

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Light :	Brown, Red, Orange, Yellow, Grey, Blue	

PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 3.53 m

Stickup above NS: 0.69 m

WL: 2.84 m below NS

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LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	18/04/05
Bore location:	0385212E, 6431025N	Hole completed:	18/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 2	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	4.58 m AHD
Hole diameter:	75mm	Natural Surface:	3.93 m AHD

method	1 2 3 penetration	support	water	Slot / Screen Depth	Depth (metres)	SOIL CHARACTERISTICS: COLOUR	PARTICLE SIZE	TEXTURE	ORGANIC CONTENT	MOISTURE	COMMENTS
HA		PVC (Class 9)	▽		0.5m	Grey	Fine	Silt	High	Dry	Partially Cemented
					1.0m						
					1.5m	Creamy White		Sand			
					2.0m	Cream	Medium/Fine	Limestone/ Sand	Low	Moist	
					2.5m						
					3.0m						
					3.5m						
					4.0m		Medium			Saturated	
					4.5m						
					5.0m						
					5.5m						
					6.0m						*EOH*

NOTES ON BORELOG

COLOURS: Solid colours are BLACK, WHITE, BEIGE

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Light :	Brown, Red, Orange, Yellow, Grey, Blue	

PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 3.66 m

Stickup above NS: 0.65 m

WL: 3.01 m below NS

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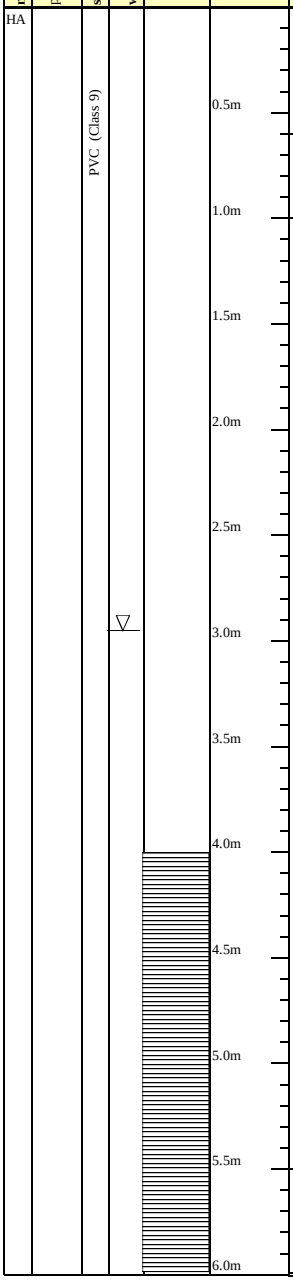
LITHOLOGICAL LOG

Client:	ATA Environmental	Job No:	J3477
Project:	East Rockingham Industrial Park	Hole commenced:	18/04/05
Bore location:	0383826E, 6430506N	Hole completed:	18/04/05
Datum:	MGA94/AHD	Logged by:	SW
Bore Name:	ERGM 1	Total Depth:	6.0 m BNS
Drill type:	Hand Auger	R.L. TOC:	4.62 m AHD
Hole diameter:	75 mm	Natural Surface:	3.92 m AHD



SOIL CHARACTERISTICS					
COLOUR	PARTICLE SIZE	TEXTURE	ORGANIC CONTENT	MOISTURE	COMMENTS
Black	Fine	Silt	High	Dry	
Grey/Brown			Low		
Cream		Sand			
	Medium/Fine	Loamy Sand		Moist	
				Saturated	
Grey		Limestone/ Loamy Sand			*EOH*

NOTES ON BORELOG

COLOURS: Solid colours are BLACK, WHITE, BEIGE
Dark : Brown, Red, Orange, Yellow, Grey, Blue
Medium : Brown, Red, Orange, Yellow, Grey, Blue
Light : Brown, Red, Orange, Yellow, Grey, Blue
Tones : solid colour, blemish or mottle

PARTICLE SIZE : Particles are either FINE, MEDIUM or COARSE

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clay Loam
Clay, Sandy Clay

ORGANIC CONTENT: VOLUME: High, Medium, Low
SIZE: Fine, Medium, Coarse

MOISTURE: Soil Moisture can be either: DRY, SLIGHTLY MOIST, MOIST or SATURATED

STATIC WATER LEVEL

Date: 06/05/05

WL below TOC: 3.65 m

Stickup above NS: 0.69 m

WL: 2.96 m below NS

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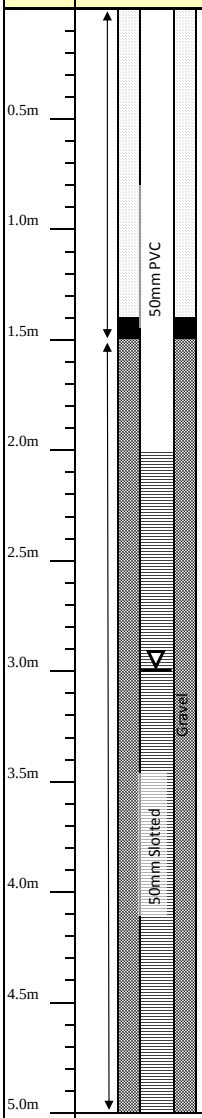
LITHOLOGICAL LOG

Client:	Landcorp	Job No:	J5943
Project:	Rockingham Industrial Area	Hole commenced:	14/16/2017
Bore location:	358864/6428609	Hole completed:	14/16/2017
Datum:	mAHD	Logged by:	AMS
Bore Name:	MR1R	Total Depth:	5 mBGL
Drill type:	Hollow Auger - eDrill	R.L. TOC:	4.85 mAHD
Hole diameter:	50mm	Natural Surface:	4.261 mAHD



Depth (m)	BORE CONSTRUCTION	GRAPHICAL LOG	LITHOLOGICAL LOG: LITHOLOGY	COLOUR	GRAIN SIZE	SORTING	GRAIN SHAPE	MOISTURE	OTHER
0.0			Sand	Brown	F-M	M	Sub r	Dry	
0.5				Brown/Cream					
1.0				Cream					
2.5				White/Cream				Moist	
3.0				Cream				Saturated	
3.5					M-C	M-P	Sub a		Chunks of Limestone
5.0				Grey/Brown					Organic Material

Sand
Loamy sand
Sandy Loam
Loam
Sandy Clay Loam
Clay Loam
Sandy Clay
Clay

Grain Size	Sorting	Grain	Moisture
f - fine	p - poorly	a - angular	d - dry
m - medium	m - moderately	suba - subangular	m - moist
c coarse	w - well	subr - subrounded	s - saturated
v.c - very coarse		r - rounded	
g - gravel		wr - well rounded	

APPENDIX B

Post Development (2015 – 2019)
Groundwater Quality

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1	ERGM1						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Arsenic (Filtered)	mg/L	0.001	0.011	0.01	0.007	0.008	0.011	0.007	0.005	0.006	0.005	0.008	0.005	0.007	0.008	0.005	0.006	0.012	0.011	0.005	0.006	19	0.005	0.012	0.0075	0.007	0.0024
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	<0.001	<0.001	<0.001	19	<0.001	0.006	0.0013	0.001	0.0011
Field																											
EC (field)	µS/cm		930	816	897	750	780	810	770	816	850	900	821	804	913	650	916	918	898	954	852	19	650	954	844	850	76
Temp (Field)	oC		21.8	21.9	15.7	20	24.6	21.6	20.5	20.5	22.2	22.5	21.2	21.9	21.3	20.3	20.4	21.6	21	20.7	20.5	19	15.7	24.6	21	21.2	1.7
pH (Field)	pH Units		7.46	7.28	-	7.62	7.41	7.66	7.54	7.41	7.4	7.53	7.45	7.56	7.44	7.51	7.57	7.32	7.45	7.63	7.66	18	7.28	7.66	7.5	7.485	0.11
Miscellaneous Inorg - water																											
Electrical Conductivity (Non Compensa	µS/cm	1	-	-	810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	810	810		810	
pH (Lab)	pH Units		-	-	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.7	7.7		7.7	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.17	0.12	0.13	0.097	0.13	0.12	0.08	0.11	0.14	0.14	0.098	0.14	0.11	0.13	0.089	0.1	0.12	0.13	0.11	19	0.08	0.17	0.12	0.12	0.022
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.4	0.5	0.4	0.3	0.4	0.7	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.4	19	0.3	0.7	0.42	0.4	0.09
Nitrate (as N) (Filtered)	mg/L	0.005	0.036	0.014	0.042	0.008	0.01	<0.005	<0.005	-	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	0.042	0.01	0.005	0.011
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	0.006	-	<0.005	-	3	<0.005	0.006	0.0053	0.005	0.00058
Total Nitrogen (Filtered)	mg/L	0.1	0.4	0.5	0.5	0.3	0.4	0.7	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.4	19	0.3	0.7	0.42	0.4	0.092
Phosphate (as P) (Filtered)	mg/L	0.005	0.019	0.063	0.033	0.037	0.061	0.058	0.042	0.053	0.066	0.062	0.041	0.065	0.065	0.043	0.068	<0.005	0.039	0.023	0.044	19	<0.005	0.068	0.047	0.044	0.018
Phosphorus (Filtered)	mg/L	0.05	0.08	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.05	<0.05	<0.05	0.06	<0.05	0.06	0.06	<0.05	0.06	0.06	19	<0.05	0.08	0.055	0.05	0.0077

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2	ERGM2						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	0.011	0.014	0.014	0.011	0.012	0.014	0.016	0.014	0.012	0.015	0.022	0.028	0.077	0.24	0.07	0.067	0.14	0.16	0.059	19	0.011	0.24	0.052	0.016	0.063
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	19	<0.001	0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	<0.001	<0.001	0.002	19	<0.001	0.012	0.0016	0.001	0.0025
Field																											
EC (field)	µS/cm		1473	1354	1539	1616	1268	1160	1190	1718	1250	1620	1381	1755	1870	1186	1636	1890	1622	2374	2196	19	1160	2374	1584	1616	337
Temp (Field)	oC		20	20.4	14.8	19.1	22.9	20.3	19.2	20.5	21	20.9	19.9	20.8	20.2	19.6	19.5	20.2	20.1	19.9	19.5	19	14.8	22.9	20	20.1	1.5
pH (Field)	pH Units		7.51	7.26	-	7.19	7.28	7.61	7.4	7.15	7.38	7.48	7.29	7.17	7.37	7.31	7.59	7.34	7.41	7.47	7.88	18	7.15	7.88	7.4	7.375	0.18
Miscellaneous Inorg - water																											
Electrical Conductivity (Non Compensa	µS/cm	1	-	-	1400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1400	1400		1400	
pH (Lab)	pH Units		-	-	7.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.8	7.8		7.8	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.02	0.02	0.031	0.043	0.029	0.032	0.038	0.045	0.043	0.055	0.024	0.031	0.029	0.018	0.039	0.058	0.089	0.062	0.088	19	0.018	0.089	0.042	0.042	0.038	0.021
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.2	0.3	0.6	0.3	0.3	0.3	0.2	0.3	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.4	19	0.2	0.6	0.38	0.4	0.1
Nitrate (as N) (Filtered)	mg/L	0.005	0.022	0.008	0.057	0.026	0.012	<0.005	<0.005	-	<0.005	0.014	0.016	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	0.036	17	<0.005	0.057	0.014	0.005	0.014
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	0.085	-	-	-	-	-	-	-	0.008	-	<0.005	-	3	<0.005	0.085	0.033	0.008	0.045
Total Nitrogen (Filtered)	mg/L	0.1	0.3	0.3	0.7	0.4	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.4	19	0.3	0.7	0.41	0.4	0.097
Phosphate (as P) (Filtered)	mg/L	0.005	0.059	0.054	0.048	0.063	0.065	0.055	0.056	0.082	0.072	0.072	0.068	0.083	0.088	0.09	0.071	0.034	0.071	0.031	0.044	19	0.031	0.09	0.063	0.065	0.017
Phosphorus (Filtered)	mg/L	0.05	0.06	0.06	0.05	0.06	<0.05	<0.05	<0.05	0.09	0.06	0.06	0.08	0.07	0.07	0.05	0.06	0.06	0.07	0.08	0.08	19	<0.05	0.09	0.064	0.06	0.012

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5	ERGM5						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	19	0.002	0.002	0.002	0.002	0
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	19	<0.001	0.002	0.00111	0.001	0.00023
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	19	<0.001	0.002	0.0011	0.001	0.00032
Field																											
EC (field)	µS/cm		1169	1046	1123	941	1020	1010	920	966	930	900	872	916	1100	625	1008	1145	1154	1105	1065	19	625	1169	1001	1010	130
Temp (Field)	oC		20.1	20.5	16.1	18.9	23.3	20.2	19.5	19.4	20.7	21.3	20.3	20.6	20.4	19.3	19.3	20.1	19.9	19.6	19.7	19	16.1	23.3	20	20.1	1.3
pH (Field)	pH Units		7.67	7.6	-	7.77	7.41	7.62	7.62	7.46	7.52	7.68	7.31	7.63	7.68	7.58	7.75	7.53	7.65	7.8	7.69	18	7.31	7.8	7.6	7.625	0.13
Miscellaneous Inorg - water																											
Electrical Conductivity (Non Compensa	µS/cm	1	-	-	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1000	1000		1000	
pH (Lab)	pH Units		-	-	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.9	7.9		7.9	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	0.024	0.02	0.02	0.033	0.02	0.022	0.026	-	0.026	0.022	0.032	0.05	0.038	0.031	0.035	-	0.023	0.015	0.02	17	0.015	0.05	0.027	0.024	0.0087
Ammonia as N (Filtered)	mg/L	0.005	<0.005	0.01	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.007	0.008	0.012	19	<0.005	0.012	0.0062	0.005	0.002
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.4	0.2	0.7	1	0.5	1.6	0.3	0.4	0.7	0.2	0.4	0.2	0.2	0.5	0.3	0.5	<0.1	0.1	0.2	19	<0.1	1.6	0.45	0.4	0.36
Nitrate (as N) (Filtered)	mg/L	0.005	3.4	2.6	2.7	2.8	3.1	2.5	2.2	-	2.4	2.2	2.3	1.9	1.7	1.5	1.4	-	0.71	0.92	0.83	17	0.71	3.4	2.1	2.2	0.79
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	2.5	-	-	-	-	-	-	-	1.4	-	0.93	-	3	0.93	2.5	1.6	1.4	0.81
Total Nitrogen (Filtered)	mg/L	0.1	3.8	2.8	3.4	3.8	3.6	4.1	2.5	2.9	3.1	2.4	2.8	2.2	2	2	1.7	1.9	0.7	1.1	1.1	19	0.7	4.1	2.5	2.5	0.98
Phosphate (as P) (Filtered)	mg/L	0.005	0.047	0.035	0.042	0.044	0.04	0.035	0.043	0.045	0.04	0.037	0.037	0.056	0.051	0.053	0.056	0.06	0.07	0.066	0.074	19	0.035	0.074	0.049	0.045	0.012
Phosphorus (Filtered)	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	0.06	19	<0.05	0.07	0.052	0.05	0.005

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7	ERGM7						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary					
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.006	0.001	<0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	19	<0.001	0.006	0.0013	0.001	0.0011
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	19	<0.001	0.004	0.0012	0.001	0.00069
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	0.003	0.0011	0.001	0.00046
Zinc (Filtered)	mg/L	0.001	0.001	<0.001	<0.001	<0.001	0.002	0.001	0.008	<0.001	0.003	0.002	0.003	0.004	<0.001	0.001	0.003	0.004	0.002	0.001	0.002	19	<0.001	0.008	0.0022	0.001	0.0018
Field																											
EC (field)	µS/cm		6800	6800	6490	5440	4600	4230	5890	4667	6340	5810	4930	4040	6870	3840	6530	6290	6550	6250	6010	19	3840	6870	5704	6010	1009
Temp (Field)	oC		21.1	21.5	16.6	19.5	24.3	21	19.8	19.7	22.6	21.6	20.5	21.7	21.1	17.5	19.6	20.9	20.4	18.8	19.7	19	16.6	24.3	20	20.5	1.7
pH (Field)	pH Units		7.22	7.23	-	7.36	7.17	7.2	7.21	7.03	7.01	7.33	7.2	7.62	7.24	7.04	7.3	7.12	7.16	7.19	7.45	18	7.01	7.62	7.2	7.205	0.15
Miscellaneous Inorg - water																											
Electrical Conductivity	µS/cm	1	-	-	5000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5000	5000		5000	
pH (Lab)	pH Units		-	-	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.6	7.6		7.6	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.51	0.3	0.34	0.21	0.33	0.26	0.26	0.15	0.28	0.27	0.13	0.24	0.19	0.15	0.11	0.27	0.29	0.29	0.32	19	0.11	0.51	0.26	0.27	0.092
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	2.3	2.6	2.3	1.9	2.1	2.4	1.9	1.9	2	2.4	2	2	2.2	2.2	1.7	2.6	1.8	2	1.9	19	1.7	2.6	2.1	2	0.26
Nitrate (as N) (Filtered)	mg/L	0.005	<0.005	0.011	0.034	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	0.01	17	<0.005	0.034	0.0074	0.005	0.0071
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	<0.005	-	<0.005	-	3	<0.005	<0.005	0.005	0.005	0
Total Nitrogen (Filtered)	mg/L	0.1	2.3	2.6	2.4	1.9	2.1	2.4	1.9	1.9	2	2.4	2	2	2.2	2.2	1.7	2.6	1.8	2	1.9	19	1.7	2.6	2.1	2	0.27
Phosphate (as P) (Filtered)	mg/L	0.005	0.37	0.42	0.21	0.28	0.21	0.44	0.32	0.36	0.43	0.4	0.29	0.39	0.44	0.33	0.33	0.34	0.56	0.47	0.54	19	0.21	0.56	0.38	0.37	0.095
Phosphorus (Filtered)	mg/L	0.05	0.49	0.47	0.35	0.41	0.4	0.45	0.33	0.37	0.49	0.42	0.36	0.39	0.48	0.36	0.36	0.54	0.58	0.52	0.55	19	0.33	0.58	0.44	0.42	0.076

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12	ERGM12						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary					
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	19	<0.001	0.014	0.0017	0.001	0.003
Field																											
EC (field)	µS/cm		1265	1413	1370	1022	909	930	870	918	880	840	802	816	850	694	839	818	944	1076	1138	19	694	1413	968	909	199
Temp (Field)	oC		21.2	22.2	15.6	19.3	21.2	21.2	20.3	20.1	22.9	22.5	20.6	21.3	21	18.6	19.8	20.5	19.9	19.9	19.8	19	15.6	22.9	20	20.5	1.6
pH (Field)	pH Units		7.65	7.65	-	7.74	7.57	7.71	7.67	7.37	7.48	7.79	7.63	8.05	7.82	7.53	7.78	7.62	7.73	7.82	7.73	18	7.37	8.05	7.7	7.69	0.15
Miscellaneous Inorg - water																											
Electrical Conductivity	µS/cm	1	-	-	1300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1300	1300		1300	
pH (Lab)	pH Units		-	-	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.9	7.9		7.9	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	1.1	0.58	0.51	0.52	0.84	0.97	1.2	1.3	1.5	1.3	1.2	1.1	1.1	0.67	0.83	1.1	1.1	0.79	0.85	19	0.51	1.5	0.98	1.1	0.28
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	1.3	0.9	1	1	1.1	1.6	1.5	1.8	1.7	1.7	1.7	1.6	1.3	1.1	1	2.4	1.2	0.9	1.1	19	0.9	2.4	1.4	1.3	0.39
Nitrate (as N) (Filtered)	mg/L	0.005	0.007	0.033	0.08	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	0.032	0.026	0.01	-	0.032	0.011	0.02	17	<0.005	0.08	0.017	0.007	0.02
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	0.012	-	0.012	-	3	<0.005	0.012	0.0097	0.012	0.004
Total Nitrogen (Filtered)	mg/L	0.1	1.3	0.9	1.1	1	1.1	1.6	1.5	1.8	1.7	1.7	1.7	1.6	1.3	1.1	1	2.4	1.2	0.9	1.1	19	0.9	2.4	1.4	1.3	0.39
Phosphate (as P) (Filtered)	mg/L	0.005	0.11	0.12	0.098	0.1	0.097	0.094	0.091	0.095	0.098	0.096	0.086	0.091	0.09	0.091	0.073	0.08	0.099	0.088	0.098	19	0.073	0.12	0.094	0.095	0.01
Phosphorus (Filtered)	mg/L	0.05	0.11	0.12	0.1	0.1	0.08	0.08	0.07	0.11	0.1	0.08	0.09	0.08	0.07	0.08	0.06	0.08	0.099	0.07	0.09	19	0.06	0.12	0.088	0.08	0.016

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13	ERGM13						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary					
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Arsenic (Filtered)	mg/L	0.001	<0.001	0.001	0.001	0.001	<0.001	0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	19	<0.001	0.001	0.001	0.001	0
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	0.001	0.001	0.001	0
Field																											
EC (field)	µS/cm		721	713	766	685	723	800	700	799	780	780	729	814	886	267	852	934	976	928	923	19	267	976	778	780	152
Temp (Field)	oC		20.8	23	15.3	19.7	21.3	21.4	20.5	21.2	22.5	22.4	21.5	21.7	21.4	19.7	20.4	21.1	21	20.7	20.6	19	15.3	23	21	21.1	1.6
pH (Field)	pH Units		7.83	7.84	-	7.9	7.71	7.86	7.81	7.65	7.48	7.89	7.54	7.78	7.83	7.59	7.82	7.63	7.7	7.91	7.69	18	7.48	7.91	7.7	7.795	0.13
Miscellaneous Inorg - water																											
Electrical Conductivity	µS/cm	1	-	-	690	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	690	690		690	
pH (Lab)	pH Units		-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	8		8	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.17	0.16	0.091	0.11	0.15	0.1	0.1	0.093	0.14	0.17	0.1	0.15	0.14	0.12	0.12	0.18	0.17	0.15	0.15	19	0.091	0.18	0.13	0.14	0.03
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.2	0.4	0.3	0.2	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.3	0.3	0.3	19	0.2	0.4	0.29	0.3	0.066
Nitrate (as N) (Filtered)	mg/L	0.005	0.025	0.031	0.054	0.09	<0.005	<0.005	<0.005	-	0.007	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	-	0.01	<0.005	0.006	17	<0.005	0.09	0.016	0.005	0.023
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	0.008	-	<0.005	-	3	<0.005	0.008	0.006	0.005	0.0017
Total Nitrogen (Filtered)	mg/L	0.1	0.2	0.4	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.3	0.3	0.3	19	0.2	0.4	0.3	0.3	0.058
Phosphate (as P) (Filtered)	mg/L	0.005	0.09	0.087	0.084	0.083	0.092	0.092	0.083	0.09	0.097	0.1	0.08	0.099	0.1	0.094	0.087	0.099	0.1	0.1	0.11	19	0.08	0.11	0.093	0.092	0.0079
Phosphorus (Filtered)	mg/L	0.05	0.09	0.08	0.08	0.09	0.08	0.08	0.06	0.08	0.1	0.08	0.09	0.08	0.08	0.08	0.07	0.1	0.1	0.09	0.1	19	0.06	0.1	0.085	0.08	0.011

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14	ERGM14						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.001	<0.001	19	<0.001	0.002	0.0012	0.001	0.00042
Field																											
EC (field)	µS/cm		1337	1359	1468	1226	1174	1260	1260	1381	1380	1270	1171	1263	1427	887	1343	1444	1521	1455	1418	19	887	1521	1318	1343	145
Temp (Field)	oC		21.2	21.2	15.1	19.6	22.5	21.3	19.2	19.4	22.9	22.4	19.6	21.7	21.4	20.2	20	21.1	20.9	20.6	20.4	19	15.1	22.9	21	20.9	1.7
pH (Field)	pH Units		7.49	7.51	-	7.75	7.45	7.49	7.51	7.18	7.23	7.57	7.24	7.59	7.57	7.42	7.57	7.27	7.5	7.59	7.32	18	7.18	7.75	7.5	7.495	0.15
Miscellaneous Inorg - water																											
Electrical Conductivity	µS/cm	1	-	-	1200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1200	1200		1200	
pH (Lab)	pH Units		-	-	7.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.8	7.8		7.8	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.39	0.26	0.27	0.2	0.31	0.32	0.28	0.27	0.4	0.41	0.24	0.41	0.41	0.32	0.3	0.47	0.47	0.4	0.34	19	0.2	0.47	0.34	0.32	0.078
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.4	0.6	0.5	0.5	0.5	0.7	0.4	0.9	0.6	0.7	0.5	0.7	0.5	0.8	0.5	1	0.7	0.6	0.6	19	0.4	1	0.62	0.6	0.16
Nitrate (as N) (Filtered)	mg/L	0.005	0.042	0.023	0.052	0.023	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	0.052	0.012	0.005	0.015
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	0.008	-	<0.005	-	3	<0.005	0.008	0.006	0.005	0.0017
Total Nitrogen (Filtered)	mg/L	0.1	0.5	0.6	0.6	0.5	0.5	0.7	0.5	0.9	0.6	0.7	0.5	0.7	0.5	0.8	0.5	1.1	0.7	0.6	0.6	19	0.5	1.1	0.64	0.6	0.16
Phosphate (as P) (Filtered)	mg/L	0.005	0.09	0.086	0.085	0.08	0.085	0.092	0.08	0.082	0.087	0.092	0.072	0.079	0.084	0.076	0.076	0.055	0.098	0.086	0.093	19	0.055	0.098	0.083	0.085	0.0095
Phosphorus (Filtered)	mg/L	0.05	0.09	0.08	0.07	0.09	0.08	0.08	0.06	0.08	0.09	0.07	0.08	0.06	0.06	0.06	0.07	0.07	0.1	0.07	0.09	19	0.06	0.1	0.076	0.08	0.012

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15	ERGM15						
		Sampling Date	3/03/2015	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.002	<0.001	<0.001	19	<0.001	0.002	0.0013	0.001	0.00048
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	19	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	19	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	0.001	19	<0.001	0.002	0.0011	0.001	0.00023
Field																											
EC (field)	µS/cm		1569	1575	1669	1403	1349	1410	1520	1587	1540	1470	1390	1436	1624	1017	1604	1598	1704	1666	1617	19	1017	1704	1513	1569	159
Temp (Field)	oC		20.8	21.4	15.7	20	23.8	21.4	20.2	19.6	23.5	21.7	20.1	21.8	21.1	18.1	19.9	21.2	20.7	20.4	20.1	19	15.7	23.8	21	20.7	1.8
pH (Field)	pH Units		7.42	7.42	-	7.51	7.32	7.42	7.35	7.16	7.16	7.52	7.38	7.46	7.46	7.34	7.48	7.08	7.42	7.57	7.8	18	7.08	7.8	7.4	7.42	0.16
Miscellaneous Inorg - water																											
Electrical Conductivity (Non Compen	µS/cm	1	-	-	1600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1600	1600		1600	
pH (Lab)	pH Units		-	-	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.7	7.7		7.7	
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	17	<0.005	<0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.5	0.4	0.43	0.29	0.46	0.46	0.36	0.34	0.49	0.53	0.37	0.37	0.4	0.31	0.26	0.42	0.46	0.5	0.39	19	0.26	0.53	0.41	0.4	0.076
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.8	0.9	1.3	0.7	0.9	1	0.8	0.8	0.9	0.9	0.9	0.8	0.9	0.7	0.8	1.3	0.8	0.8	0.8	19	0.7	1.3	0.88	0.8	0.16
Nitrate (as N) (Filtered)	mg/L	0.005	0.017	0.018	0.046	0.01	<0.005	<0.005	<0.005	-	<0.005	<0.005	0.012	<0.005	0.006	0.017	<0.005	-	<0.005	<0.005	0.006	17	<0.005	0.046	0.01	0.005	0.01
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	0.008	-	<0.005	-	3	<0.005	0.008	0.006	0.005	0.0017
Total Nitrogen (Filtered)	mg/L	0.1	0.9	0.9	1.3	0.7	0.9	1	0.8	0.8	0.9	1	0.9	0.8	0.9	0.8	0.8	1.3	0.8	0.8	0.8	19	0.7	1.3	0.9	0.9	0.16
Phosphate (as P) (Filtered)	mg/L	0.005	0.16	0.13	0.14	0.14	0.16	0.17	0.14	0.13	0.17	0.16	0.12	0.15	0.17	0.12	0.15	0.089	0.2	0.14	0.16	19	0.089	0.2	0.15	0.15	0.024
Phosphorus (Filtered)	mg/L	0.05	0.15	0.15	0.14	0.15	0.14	0.16	0.12	0.16	0.17	0.15	0.15	0.13	0.15	0.12	0.19	0.23	0.24	0.14	0.16	19	0.12	0.24	0.16	0.15	0.032

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943								
		Location	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17	ERGM17								
		Sampling Date	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	24/05/2017	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary							
ChemName	Unit	PQL																				Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation
Dissolved Metals in Water																											
Arsenic (Filtered)	mg/L	0.001	0.003	0.002	0.003	0.003	0.003	0.005	0.004	0.003	0.011	0.01	0.002	0.004	0.005	0.003	0.003	0.003	0.002	17	0.002	0.011	0.0041	0.003	0.0026		
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	17	<0.0001	<0.0001	0.0001	0.0001	0		
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.003	<0.001	<0.001	<0.001	<0.001	17	<0.001	0.003	0.0011	0.001	0.00049		
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	17	<0.001	<0.001	0.001	0.001	0		
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	17	<0.001	0.001	0.001	0.001	0		
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	0.003	0.003	<0.001	<0.001	17	<0.001	0.008	0.0016	0.001	0.0018		
Field																											
EC (field)	µS/cm		753	662	644	730	580	742	660	660	715	1428	1435	832	1814	927	1165	1364	1231	17	580	1814	961	753	370		
Temp (Field)	oC		15.9	18.7	23.9	21.6	20.7	21.1	22.7	22.7	21.6	23	22.1	20.3	20.7	21.7	21.4	20.9	21.1	17	15.9	23.9	21	21.4	1.8		
pH (Field)	pH Units		-	7.87	7.57	7.73	7.71	7.48	7.59	7.71	7.17	7.54	7.6	7.4	7.52	7.46	7.41	7.64	7.73	16	7.17	7.87	7.6	7.58	0.17		
Miscellaneous Inorg - water																											
Electrical Conductivity	µS/cm	1	680	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	680	680		680			
pH (Lab)	pH Units		8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	8		8			
Nutrients in Water																											
Nitrite as N (Filtered)	mg/L	0.005	0.039	0.034	0.06	0.08	0.056	-	0.082	0.14	0.037	0.021	0.013	0.017	0.051	-	0.034	0.006	<0.005	15	<0.005	0.14	0.045	0.037	0.036		
Ammonia as N (Filtered)	mg/L	0.005	0.026	0.007	0.012	0.009	0.008	0.008	0.014	0.006	0.011	<0.005	<0.005	0.008	0.011	0.018	<0.005	<0.005	<0.005	17	<0.005	0.026	0.0096	0.008	0.0056		
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.9	1.3	0.4	1.7	0.3	0.9	0.3	<0.1	0.6	0.6	0.6	2.4	1.3	0.6	<0.1	2	3.4	17	<0.1	3.4	1	0.6	0.9		
Nitrate (as N) (Filtered)	mg/L	0.005	4	5.9	3.3	4.5	5.9	-	2.1	4.6	3	3.5	11	7.4	6.4	-	5.7	13	15	15	2.1	15	6.4	5.7	3.8		
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	5.4	-	-	-	-	-	-	-	1	-	13	-	3	1	13	6.5	5.4	6.1		
Total Nitrogen (Filtered)	mg/L	0.1	4.9	7.3	3.8	6.2	6.3	6.2	2.5	4.8	3.6	4.2	11	9.8	7.7	1.6	5.7	15	18	17	1.6	18	7	6.2	4.3		
Phosphate (as P) (Filtered)	mg/L	0.005	0.026	0.028	0.029	0.028	0.027	0.031	0.038	0.032	0.028	0.059	0.024	0.035	0.044	0.039	0.036	0.039	0.047	17	0.024	0.059	0.035	0.032	0.0091		
Phosphorus (Filtered)	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	17	<0.05	<0.05	0.05	0.05	0		

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943						
		Location	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1	MR1						
		Sampling Date	20/05/2015	12/08/2015	19/11/2015	11/02/2016	26/05/2016	17/08/2016	17/11/2016	27/02/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary					
ChemName	Unit	PQL																	Number of Results	Minimum Concentrati	Maximum Concentratio	Average Concentratio	Median Concentratio	Standard Deviation
Dissolved Metals in Water																								
Arsenic (Filtered)	mg/L	0.001	0.013	0.008	0.009	0.011	0.019	0.014	0.005	0.006	0.055	0.02	0.003	0.003	0.005	0.011	0.003	0.001	16	0.001	0.055	0.012	0.0085	0.013
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	16	<0.0001	<0.0001	0.0001	0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	16	<0.001	<0.001	0.001	0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	16	<0.001	<0.001	0.001	0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	16	<0.001	<0.001	0.001	0.001	0
Zinc (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.008	0.007	<0.001	16	<0.001	0.008	0.0019	0.001	0.0022
Field																								
EC (field)	µS/cm		580	663	504	542	640	540	613	700	-	-	-	-	-	-	-	-	8	504	700	598	596.5	68
Temp (Field)	oC		22.1	17	19.6	24.4	21.9	19	23.4	22.8	-	-	-	-	-	-	-	-	8	17	24.4	21	22	2.5
pH (Field)	pH Units		7.61	-	7.7	7.36	7.44	7.41	7.14	7.02	-	-	-	-	-	-	-	-	7	7.02	7.7	7.4	7.41	0.24
Miscellaneous Inorg - water																								
Electrical Conductivity	µS/cm	1	-	550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	550	550		550	
pH (Lab)	pH Units		-	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.9	7.9		7.9	
Nutrients in Water																								
Nitrite as N (Filtered)	mg/L	0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	14	<0.005	0.005	0.005	0.005	0
Ammonia as N (Filtered)	mg/L	0.005	0.12	0.09	0.009	0.016	0.056	0.071	0.038	0.25	<0.005	0.062	0.019	0.062	0.058	0.063	0.041	0.057	16	<0.005	0.25	0.064	0.0575	0.058
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.4	0.3	<0.1	0.2	0.5	0.2	0.2	0.7	0.3	0.3	0.3	0.3	0.5	0.3	0.4	0.3	16	<0.1	0.7	0.33	0.3	0.14
Nitrate (as N) (Filtered)	mg/L	0.005	0.065	0.19	0.21	0.066	0.005	0.028	-	0.052	<0.005	0.006	0.027	0.034	-	<0.005	0.009	0.019	14	<0.005	0.21	0.052	0.0275	0.067
Nitrogen (Total Oxidised) (Filtered)	mg/L	0.005	-	-	-	-	-	-	0.056	-	-	-	-	-	0.03	-	0.009	-	3	0.009	0.056	0.032	0.03	0.024
Total Nitrogen (Filtered)	mg/L	0.1	0.4	0.5	0.2	0.2	0.5	0.3	0.3	0.8	0.3	0.3	0.3	0.4	0.5	0.3	0.4	0.3	16	0.2	0.8	0.38	0.3	0.15
Phosphate (as P) (Filtered)	mg/L	0.005	0.007	0.01	0.009	0.015	0.015	0.02	0.024	0.022	<0.005	0.024	0.019	0.029	0.034	0.015	<0.005	0.054	16	<0.005	0.054	0.019	0.017	0.013
Phosphorus (Filtered)	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.05	16	<0.05	0.07	0.051	0.05	0.005

		Project ID	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943	J5943							
		Location	MR1r	MR1r	MR1r	MR1r	MR1r	MR1r	MR1r	MR1r	MR1r							
		Sampling Date	30/08/2017	22/02/2018	9/05/2018	7/08/2018	23/10/2018	28/02/2019	23/05/2019	22/08/2019	14/11/2019	Statistical Summary						
ChemName	Unit	PQL										Number of Results	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Standard Deviation	
Dissolved Metals in Water																		
Arsenic (Filtered)	mg/L	0.001	0.005	-	-	-	-	-	-	-	-	1	0.005	0.005		0.005		
Cadmium (Filtered)	mg/L	0.0001	<0.0001	-	-	-	-	-	-	-	-	1	<0.0001	<0.0001		0.0001		
Copper (Filtered)	mg/L	0.001	<0.001	-	-	-	-	-	-	-	-	1	<0.001	<0.001		0.001		
Lead (Filtered)	mg/L	0.001	<0.001	-	-	-	-	-	-	-	-	1	<0.001	<0.001		0.001		
Nickel (Filtered)	mg/L	0.001	<0.001	-	-	-	-	-	-	-	-	1	<0.001	<0.001		0.001		
Zinc (Filtered)	mg/L	0.001	<0.001	-	-	-	-	-	-	-	-	1	<0.001	<0.001		0.001		
Field																		
EC (field)	µS/cm		543	701	1196	545	899	1266	1074	1203	1221	9	543	1266	961	1074	297	
Temp (Field)	oC		19.9	22.3	22	19.6	19.5	21.8	21.5	19.9	20.1	9	19.5	22.3	21	20.1	1.1	
pH (Field)	pH Units		7.44	7.15	7.5	7	7.12	7.27	7.18	7.25	7.02	9	7	7.5	7.2	7.18	0.17	
Nutrients in Water																		
Nitrite as N (Filtered)	mg/L	0.005	0.037	-	-	-	-	-	-	-	-	1	0.037	0.037		0.037		
Ammonia as N (Filtered)	mg/L	0.005	0.026	-	-	-	-	-	-	-	-	1	0.026	0.026		0.026		
Kjeldahl Nitrogen Total (Filtered)	mg/L	0.1	0.2	-	-	-	-	-	-	-	-	1	0.2	0.2		0.2		
Nitrate (as N) (Filtered)	mg/L	0.005	0.64	-	-	-	-	-	-	-	-	1	0.64	0.64		0.64		
Total Nitrogen (Filtered)	mg/L	0.1	0.9	-	-	-	-	-	-	-	-	1	0.9	0.9		0.9		
Phosphate (as P) (Filtered)	mg/L	0.005	0.013	-	-	-	-	-	-	-	-	1	0.013	0.013		0.013		

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