Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191

Compliance Assessment Report

2022 - 2023

Main Roads WA

Revision 0

30-Aug-23

SWGA-00-134-00-REP-0011

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Client		Main Roads WA				
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C	27-Jul-23	SWGA Review	A.G. & D.P.	E.R.		A.H.
D	31-Jul-23	Main Roads Review	A.G. & D.P.	E.R.		A.H.
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Current revision		**0**				

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1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the construction and operation of the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

1.2 Purpose and scope

This Compliance Assessment Report (CAR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with conditions set out in Ministerial Statement 1191 (MS 1191).

Condition 12-6 of MS 1191 requires an annual compliance assessment report to be submitted to the Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER).

MS 1191: Condition 12-6

The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.

This CAR has been produced in accordance with condition M12.6 and has been endorsed by the Commissioner for Main Roads' delegate (Appendix A).

This CAR incorporates a 12-month audit period from 31 May 2022 to 30 May 2023. This is the first CAR to be submitted under Ministerial Statement 1191.

1.3 Proposal overview

The Proposal includes the construction and operation of 10.5 kilometres of the BORR Southern Section, located about 200 km south of Perth. The 200 hectare development envelope occurs mainly within the Shire of Capel (including the localities of Gelorup, North Boyanup and Statham) and a small component within the City of Bunbury. The location and physical extent of the Proposal are summarised in Table 1 and Figure 1.

Table 1. Location and authorised extent of physical and operational elements.

Element	Location	Authorised Extent
Freeway standard dual carriageway, grade separated interchanges and vehicle bridges, regional distributor roads, local road modifications, drainage structures, and other infrastructure, including but not limited to, noise walls, screen walls, fauna-crossings and land-bridges, possum rope-bridges, pedestrian underpass/overpass, principle shared path, lighting, fencing, signage, and safety barriers.	Located within the Development Envelope as shown in Figure 1.	Clearing and disturbance of no more than 71.5 ha of native vegetation within the 200 ha Development Envelope.

1.4 Proponent details

The proponent for the Proposal is Main Roads Western Australia (Main Roads).

Main Roads awarded a contract to South West Gateway Alliance (SWGA) to design and construct the Bunbury Outer Ring Road.

COLLEGE GROVE

DALYELLUP

GELORUP

STRATHAM

HENTY PLAINS

Bussell Highway

Western Highway

SLIP

LEGEND

- Proposal Area
- Retention Vegetation Area
- Clearing Exclusion Areas
- Major Road

HARVEY
BUNBURY
CAPEL
BUSSELTON

Paper Size ISO A3

0 250 500 750 1,000

Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

Australian Government
BUILDING OUR FUTURE

mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Proposal Area

FIGURE 1

2 Summary of Proposal's Implementation Status

2.1 Clearing during the reporting period

Construction of the Proposal (BORR Southern Section) commenced on 1 August 2022.

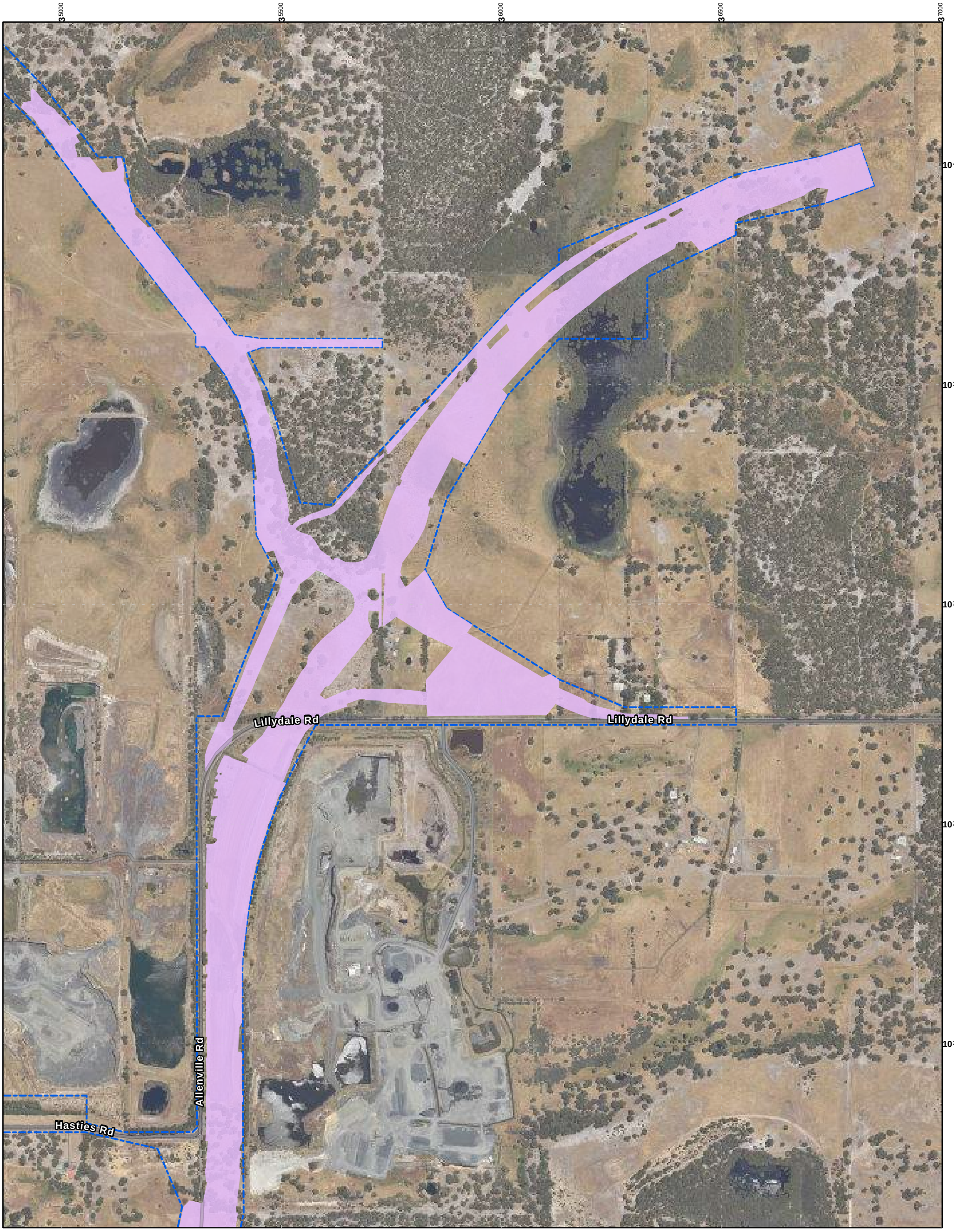
Clearing of 29.72 hectares (ha) of native vegetation has occurred during the reporting period (Table 2; Figure 2a).

Clearing of key environmental aspects as identified in MS 1191 are all within the associated specified limits.

Table 2. Clearing metrics during the reporting period.

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during this reporting period (and total cleared)
Native vegetation	71.5 ha (within a 200 ha development envelope)	29.72 ha
Conservation Category Wetlands	0.2 ha	0 ha
Resource Enhancement Wetlands	1.4 ha	0.52 ha
Vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands)	23.4 ha	11.49 ha
Vegetation representative of the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands)	4.4 ha	2.06 ha
Vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC	4.5 ha	2.15 ha
Western Ringtail Possum habitat	60.9 ha	24.39 ha
Brush-tailed Phascogale habitat	39.2 ha	18.09 ha
Black-stripe Minnow habitat (potential)	5.5 ha	2.16 ha
Black Cockatoo habitat	60.9 ha	24.39 ha
	no more than 1088 trees with a diameter at breast height of > 500 mm	397 trees
	no more than 11 trees with suitable nest hollows	3

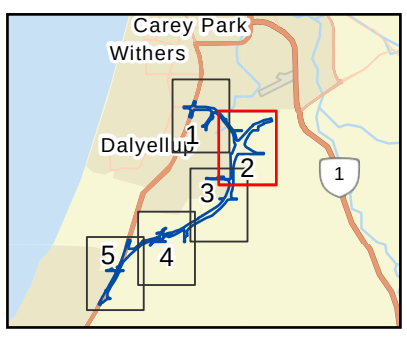

3500
4000
4500
5000
10 5500
10 5000
10 4500
10 4000
10 3500
10 3000
College Grove
Pembroke St
Somerville Dr
Peppermint Blvd
Merton Ave
Bussell Hwy
10
Centenary Rd
Neslite Rd
Starlite Bnd
Rutile Ln
Ferndale Ave
Jacinth Rd
Logan Ln
Crystal Bnd
Bombay Ter
Reeves Appr
Paragon Loop
Norton Prom
Sleaford Dr
Maynard Pde
Jules Rd
Duffield Pl
Berti Ct
English Vw
Loretta Ave
Legend
Ground Disturbance and Clearing Extents (up to 31 May 2023)
Proposal Approval Boundary
Carey Park
Withers
Dalyellup
1
2
3
4
5
South West Gateway Alliance
Delivering the Bunbury Outer Ring Road
Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS Landgate Imagery Jan 2023
A3 scale: 1:8,000
0
200
400
Metres
Date:2/08/2023 Author: justine.belcher Ref:17_02_002_F1_Ground Disturbance and Clearing Extents v2
Coordinate System: GDA 1994 Perth Coastal Grid 1994
Bunbury Outer Ring Road
Figure 2. Ground Disturbance and Clearing Extents Map 1 of 5



Legend

Ground Disturbance and Clearing Extents (up to 31 May 2023)

Proposal Approval Boundary



South West Gateway Alliance
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A3 scale: 1:8,000

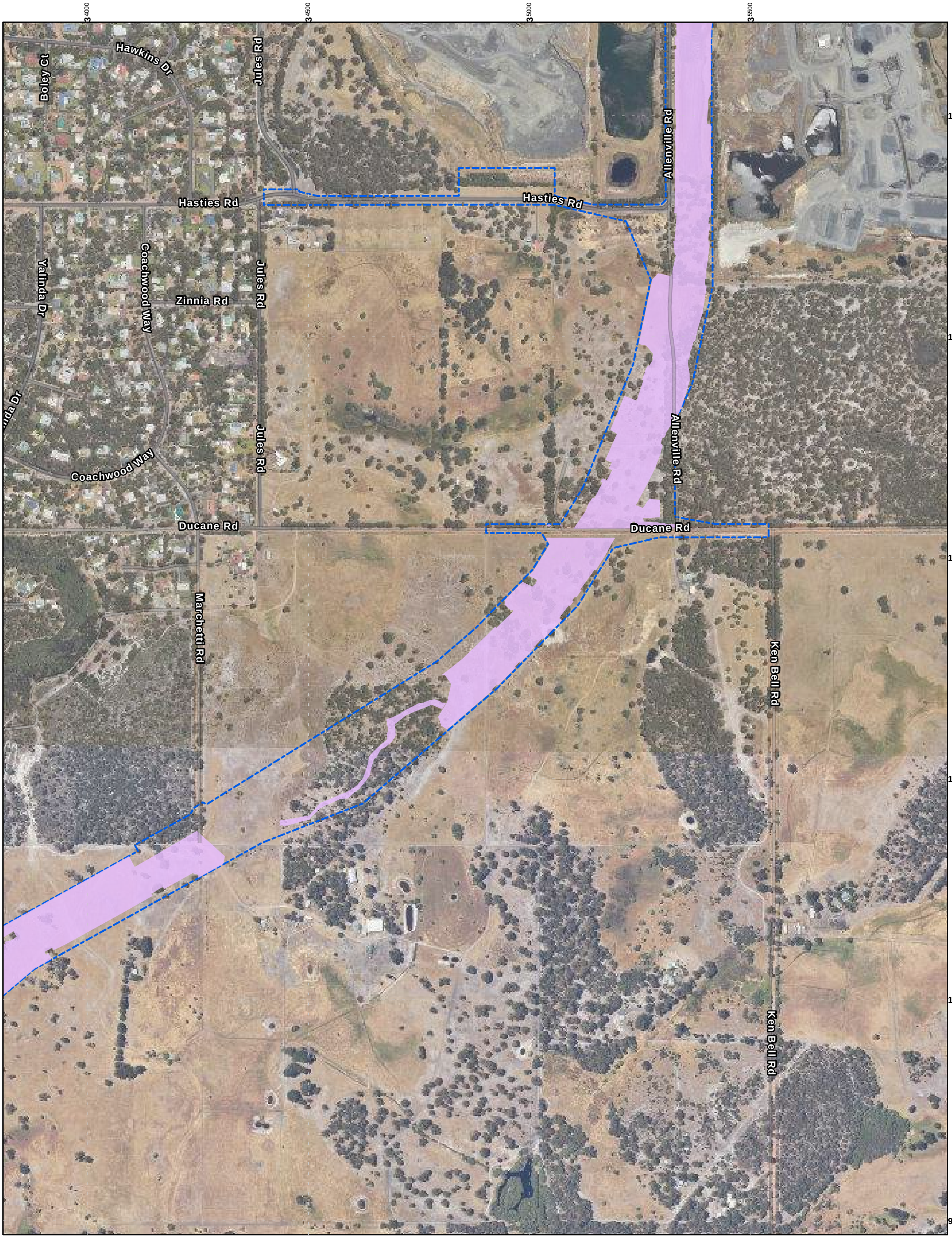
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_002_F1_Ground Disturbance and Clearing Extents v2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 2. Ground Disturbance and Clearing Extents Map 2 of 5



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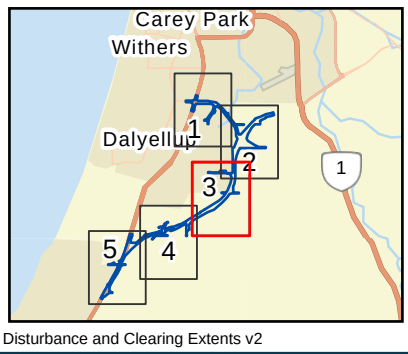
Ground Disturbance and Clearing Extents (up to 31 May 2023)

Proposal Approval Boundary



South West Gateway Alliance
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A3 scale: 1:8,000

0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_002_F1_Ground Disturbance and Clearing Extents v2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

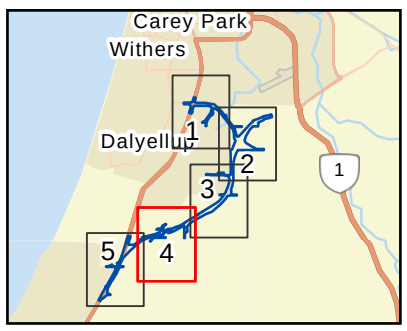
Bunbury Outer Ring Road

Figure 2. Ground Disturbance and Clearing Extents Map 3 of 5

Legend

Ground Disturbance and Clearing Extents (up to 31 May 2023)

Proposal Approval Boundary



South West Gateway Alliance
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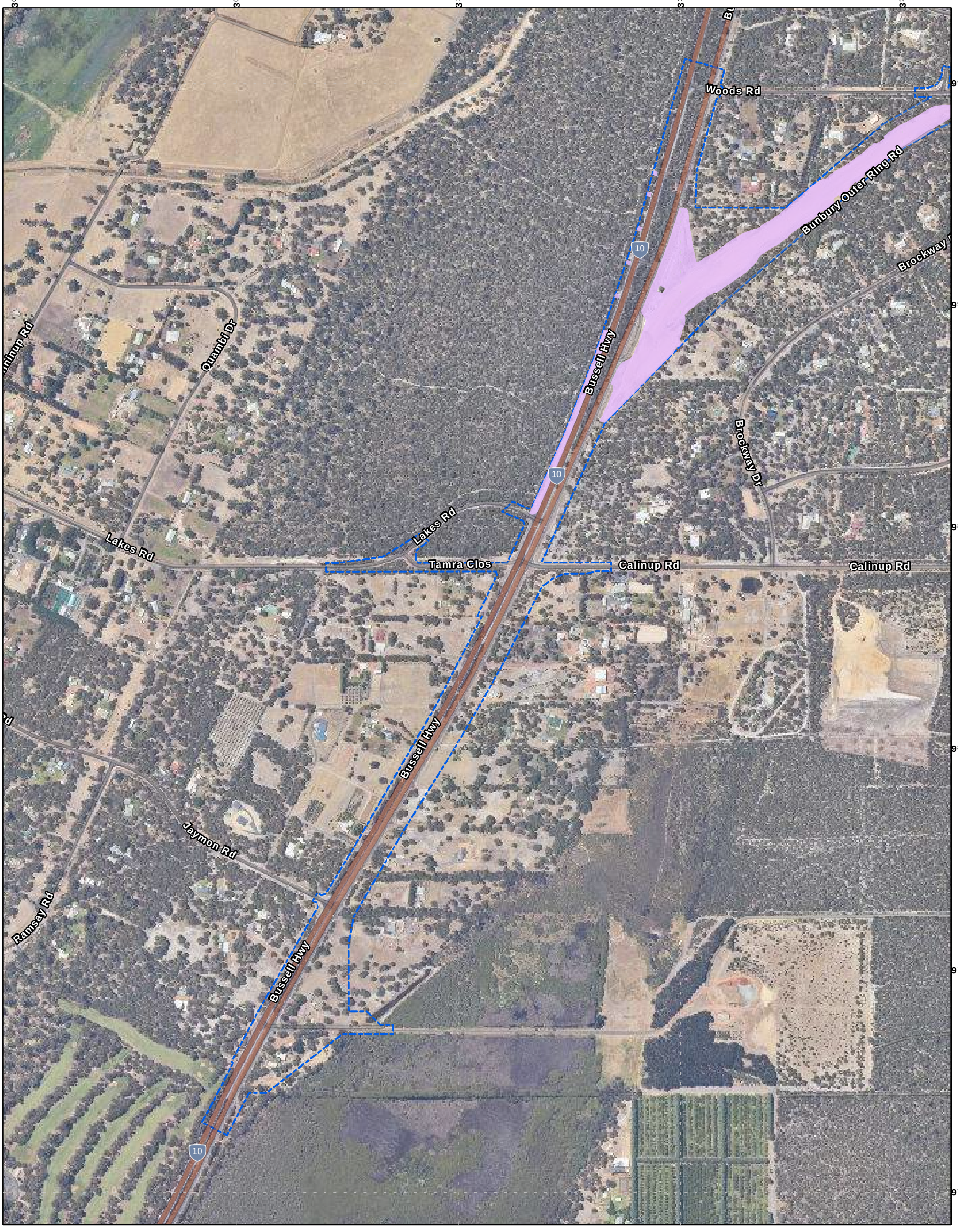
Bunbury Outer Ring Road

Figure 2. Ground Disturbance and Clearing Extents Map 4 of 5



Legend

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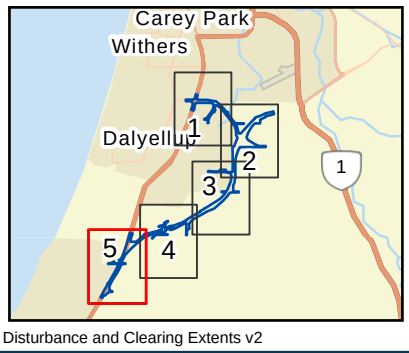
Proposal Approval Boundary



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

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Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 2. Ground Disturbance and Clearing Extents Map 5 of 5

2.2 Clearing staging during the reporting period

Clearing was conducted across 15 separate clearing stages during the reporting period (Table 3; Figure 2b).

Table 3. Clearing staging during the reporting period.

Clearing staging during the reporting period				
Clearing stage	**Category**	**Patch**	**Commencement**	**Completion**
Bussell - Yalinda	1	8	02/08/2022	26/08/2022
Allenville	3	-	21/11/2022	25/11/2022
Centenary (west)	2	-	08/12/2022	12/12/2022
Centenary (east)	2	-	23/01/2023	23/01/2023
Section 31	3	-	24/01/2023	31/01/2023
Marchetti - Jilley	3	-	16/02/2023	21/02/2023
Ducane (south)	3	-	22/02/2023	28/02/2023
Hasties - Ducane	2/3	-	28/02/2023	16/03/2023
Lilydale Rd (north)	3	-	20/03/2023	28/03/2023
Section 31 (fence line)	3	-	28/03/2023	29/03/2023
Ducane (north)	1	5	03/04/2023	17/04/2023
Yalinda - Jilley (access track)	1	7	20/04/2023	04/05/2023
Banksia Hill (access track)	1	6	27/04/2023	28/04/2023
Lilydale - Centenary	1	4	04/05/2023	29/05/2023
Centenary - Lilydale	1/2/3	1,2,3	10/05/2023	14/07/2023

3 Compliance Reporting

3.1 Background

This Compliance Assessment Report (CAR) has been prepared in accordance with the Office of the Environmental Protection Authority (OEPA) *Post Assessment Guideline No. 3 – Post Assessment Guideline for Preparing a Compliance Assessment Report (PAG 3)* (OEPA, 2012b) to address conditions 12-3 and 12-6 of MS 1191, which state:

MS 1191: Condition 12-3

After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 12-2 the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 12-1.

MS 1191: Condition 12-6

The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.

Condition 12-1 of MS 1191 referenced above states:

MS 1191: Condition 12-1

The proponent shall prepare, and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 12-6, or prior to implementation of the proposal, whichever is sooner.

3.2 Objective

This CAR has been developed to align with the structure indicated in the approved Compliance Assessment Plan (CAP; SWGA 2022), which was prepared in accordance with the requirements of condition 12-2 and the Office of the Environmental Protection Authority (OEPA) *Post Assessment Guideline for Preparing a Compliance Assessment Plan, Post Assessment Guideline No. 2* (OEPA, 2012a).

The proposed table of contents from the CAP is presented in Table 4. The table includes reference to sections in the CAR that correspond to the required content.

This CAR includes:

- Statement of compliance prepared in accordance with the OEPA *Post Assessment Form for a Statement of Compliance and endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf* (Appendix A).
- Ministerial Statement audit table in accordance with Appendix 1 of the CAP (Appendix B).
- Subsidiary management plan audit tables (Appendix C, D)
- Evidence (related to potential non-compliances/non-conformances only (Appendix E).
- Summary table of evidence (Appendix F).
- Relevant survey reports and/or monitoring and management plans prepared to demonstrate compliance (Appendix G-J).

Table 4. Table of contents for Compliance Assessment Reporting as outlined in the CAP.

Heading	Description	Section
Introduction	Brief about the Proposal, including: • Proposal background • Proposal approvals • Proponent details	Section 1
Summary of proposal's implementation status	Summary of the current implementation status of the Proposal, specifically milestones/achievements within the audit period.	Section 2
Statement of compliance	Statement of whether the proponent has complied with the conditions, prepared in accordance with the OEPA *Post Assessment Form* for a Statement of Compliance and endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf.	Appendix A
Details of declared compliance status	Endorsed by Main Roads Managing Director or a person delegated to sign on the Managing Director's behalf.	Appendix A
Non-compliances and corrective actions, if any	Identify all non-compliances and corrective actions.	Appendix A, E
MS 1191 audit table	Ministerial Statement audit table in accordance with Appendix 1 of the CAP.	Appendix B
MS 1191 CFMP audit table	Construction Fauna Management Plan audit table	Appendix C
MS 1191 HFMP audit table	Habitat Fragmentation Management Plan audit table.	Appendix D
Summary table of supporting evidence demonstrating compliance	Supporting/ verifying information/ documentation	Appendix F
Detailed reporting for monitoring and management plans.	Relevant management plans, reports and/or monitoring prepared to ensure and demonstrate compliance.	Appendices G-J

3.3 Reporting Period

This CAR addresses a compliance period of 31 May 2022 to 30 May 2023 and will be submitted to the CEO of the DWER by 31 August 2023. Subsequent CARs will address the compliance period from 31 May to 30 May with each report submitted to the CEO of the DWER by the annual date of 31 August following the conclusion of the compliance period.

4 Compliance Assessment

4.1 Assessment approach

The audit to determine the status and evidence of compliance was completed by SWGA, external specialist consultants and Main Roads.

The Proposal has been subject to routine external inspections and audits during the reporting period to review compliance against MS 1191, including:

- Independent daily site inspection / audits during clearing within clearing category 1 areas (Preston Consulting).
- Regulatory site inspections to review compliance during the reporting period by Department of Water and Environmental Regulation (DWER) and Department of Biodiversity, Conservation and Attractions (DBCA).

4.2 Criteria

Criteria were based on the MS 1191 conditions of approval. The audit table in Appendix B presents all the approval conditions and the performance of the Proposal to these conditions for the reporting period. The audit table contains each condition separated into audit elements for auditing purposes (i.e., the audit criteria) and includes the following headings:

- Audit Code: Ministerial Statement reference number.
- Subject: The environmental subject/issue.
- Requirement: Wording of the relevant implementation condition, procedure, or commitment.
- How: The way the proponent intends to achieve the requirement.
- Evidence: Information or data collected to verify compliance, i.e., report/letter/site inspection requirements.
- Phase: Proposal phase.
- Timeframe: Specific timing and/or location.
- Status: Notes about the fulfilment of compliance.
- Further Information: Additional details and supporting information to verify compliance status.

The ‘Status’ field of the audit tables in Appendix B, Appendix C and Appendix D describes the implementation of the action and compliance with the condition, procedure or commitment. Although the CEO of DWER makes the final determination of compliance, it is necessary to update this field each audit period, as the Proposal progresses. DWER has prepared updated guidance related to the preparation of compliance audits, including generic expressions that are used to identify the status of each item as defined in Appendix B.

4.3 Compliance with conditions

A Statement of Compliance in relation to the conditions of MS 1191 for the period addressed in the CAR has been included in Appendix A.

Compliance with the conditions of MS 1191 for the Proposal has been assessed and reported using the Audit Table in Appendix B.

4.4 Subsidiary plans

Conditions of MS1191 require the implementation of a number of subsidiary plans (Table 5), referenced in the Audit Table (Appendix B).

Table 5. Subsidiary plans to be implemented in accordance with MS1191 conditions.

Condition	Plan Implementation
3.5	Phytophthora Dieback Management Plan
5.2	Construction Fauna Management Plan (CFMP)
6.3	Habitat Fauna Management Plan (HFMP)
7.2	Traffic Noise Management Plan
8.3	Amenity Management Plan
9.4	Offset Management Plan
12.1	Compliance Assessment Plan (CAP)

Compliance with the requirement to implement specific Environmental Management Plans required in accordance with Conditions 5 and 6 of MS 1191 has been assessed and reported using the Audit Tables in Appendices C and D.

4.5 Retention of Compliance Statements

All Compliance Assessment Reports will be retained by Main Roads in accordance with relevant record keeping legislation including the:

- *State Records Act, 2000.*
- *Evidence Act, 1906.*
- *Electronic Transactions Act, 2011.*
- *Freedom of Information Act, 1992.*

Main Roads will retain CARs (including all associated compliance assessments) and evidence used to verify compliance for the life of the proposal and then for a minimum of seven years after the end of the life of the proposal. Main Roads will continue to implement the proposal until the CEO has determined all conditions of MS1191 have been satisfactorily met.

CARs will be retained on Main Roads' Electronic Document and Records Management System that Main Roads is required to maintain and operate in accordance with its obligations under the *State Records Act, 2000.*

4.6 Public Availability of Compliance Reports

In line with Condition 13-1 and the *Post Assessment Guideline 4: Making Information Publicly Available* (OEPA 2012d), compliance assessment reports will be made publicly available by publishing them on the Main Roads Western Australia website. This will occur within 14 days of the report being submitted to the CEO.

5 References

Minister for Environment. 2022. Ministerial Statement 1191 – Bunbury Outer Ring Road Southern Section, May 2022 https://www.epa.wa.gov.au/sites/default/files/1MINSTAT/Statement%201191_0.pdf

OEPA. 2012a. Post Assessment Guideline for Preparing a Compliance Assessment Plan, Post Assessment Guideline No. 2. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012b. Post Assessment Guideline for Preparing an Audit Table, Post Assessment Guideline No. 1. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012c. Post Assessment Guideline for Preparing a Compliance Assessment Report, Post Assessment Guideline No. 3. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012d. Post Assessment Guideline for Making Information Publicly Available, Post Assessment Guideline No. 4. August. Office of the Environmental Protection Authority. Perth, Western Australia.

SWGA, 2022. Compliance Assessment Plan, South West Gateway Alliance, Perth Western Australia.

6 Figures

Figure 2b. Clearing stages during the reporting period.

Centenary (west)

Centenary (east)

Centenary Road

Patch 1

Patch 2

Patch 3

Patch 1, 2 & 3

Section 31

Section 31 (fence

BUSSELL HWY

Patch 4

Lillydale Rd North

Patch 4

Lillydale Road

Allenville Rd

INDEX

MAP 1

MAP 2

Hasties Road

Hasties - Ducane

Patch 5 - Ducane (north)

Patch 5

Ducane Road

Ducane (south)

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Clearing areas Aug 2022 - May 2023

Clearing Categories

Cat 1

Cat 2

Cat 3

N

0 500

metres

Figure 2b.
Clearing stages during the reporting period.

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1765 | Date: 24 Aug 2023 | Revised: | Projection: MGA Z50 (GDA2020) | Scale: 1:12,000 @ A3

INDEX

MAP 1

MAP 2

Ducane Road

Ducane (south)

Patch 5

Patch 6

Marchetti Road

Marchetti - Jilley

Banksia Hill (access track)

Eucalypt Drive

BUSSELL HWY

Jilley - Yalinda (access track)

Yalinda Drive

Marchetti - Jilley

Bussell - Yalinda

Patch 7

Woods Road

Patch 8a

Jilley Road

Patch 8b

Bussell - Yalinda

Bussell - Yalinda

Cornup Road

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Clearing areas Aug 2022 - May 2023

Clearing Categories

Cat 1

Cat 2

Cat 3

N

0 500

meters

Figure 2b. Clearing stages during the reporting period.

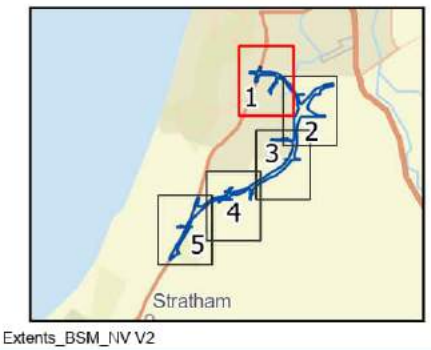
Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1765 | Date: 22 Aug 2023 | Revised: | Projection: MGA Z50 (GDA2020) | Scale: 1:12,000 @ A3

Figure 3. Ground disturbance and clearing extents during the reporting period in relation to native vegetation and potential Black-stripe minnow habitat.

Legend

- Potential Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



South West Gateway Alliance
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A3 scale: 1:8,000

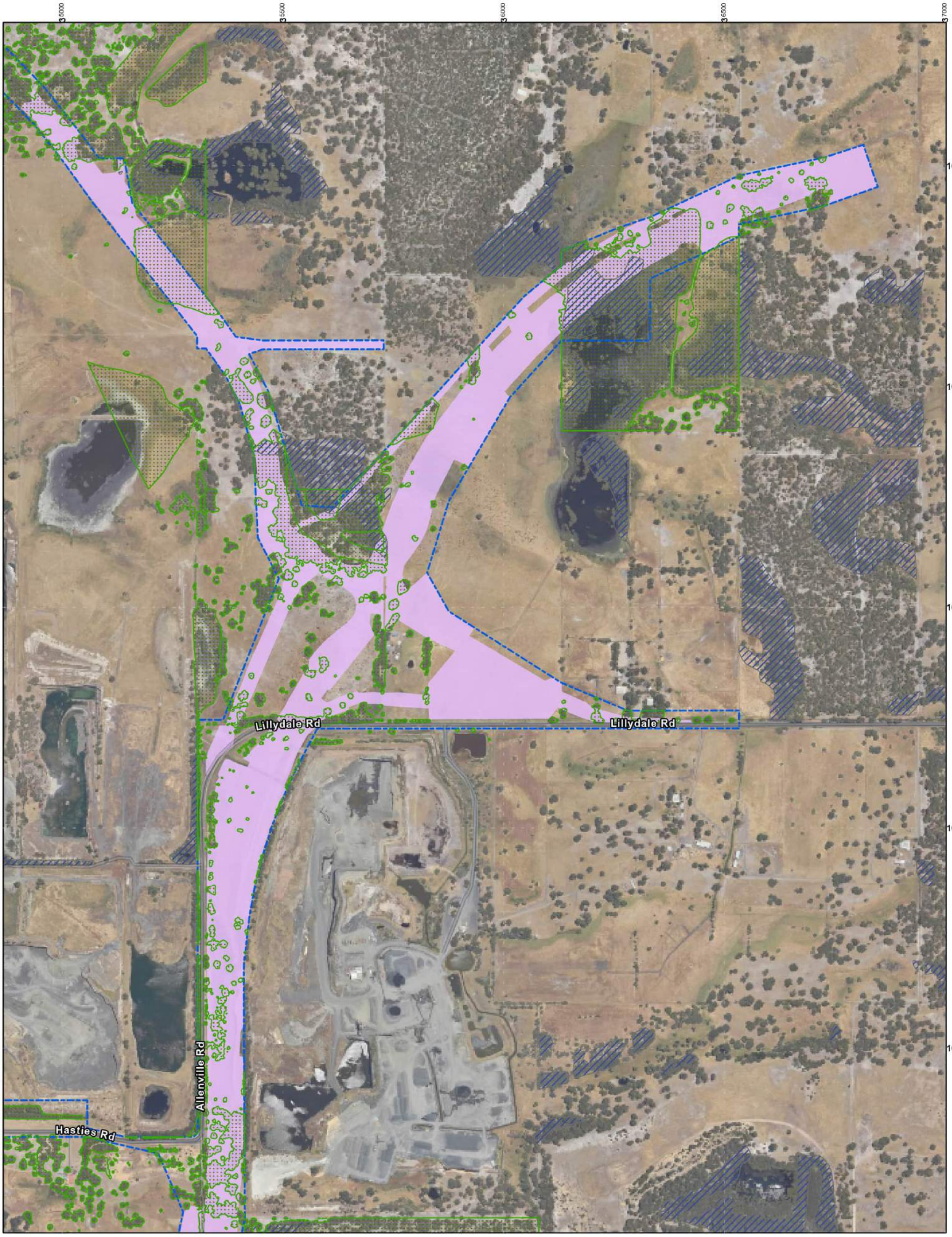
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 3. Ground disturbance and clearing extents in relation to Black Stripe Minnow and Natural Vegetation. Map 1 of 5



Legend

- Potential Black-stripe minnow habitat
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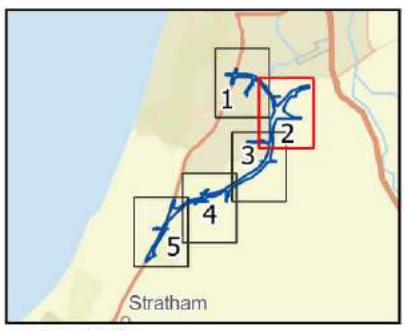

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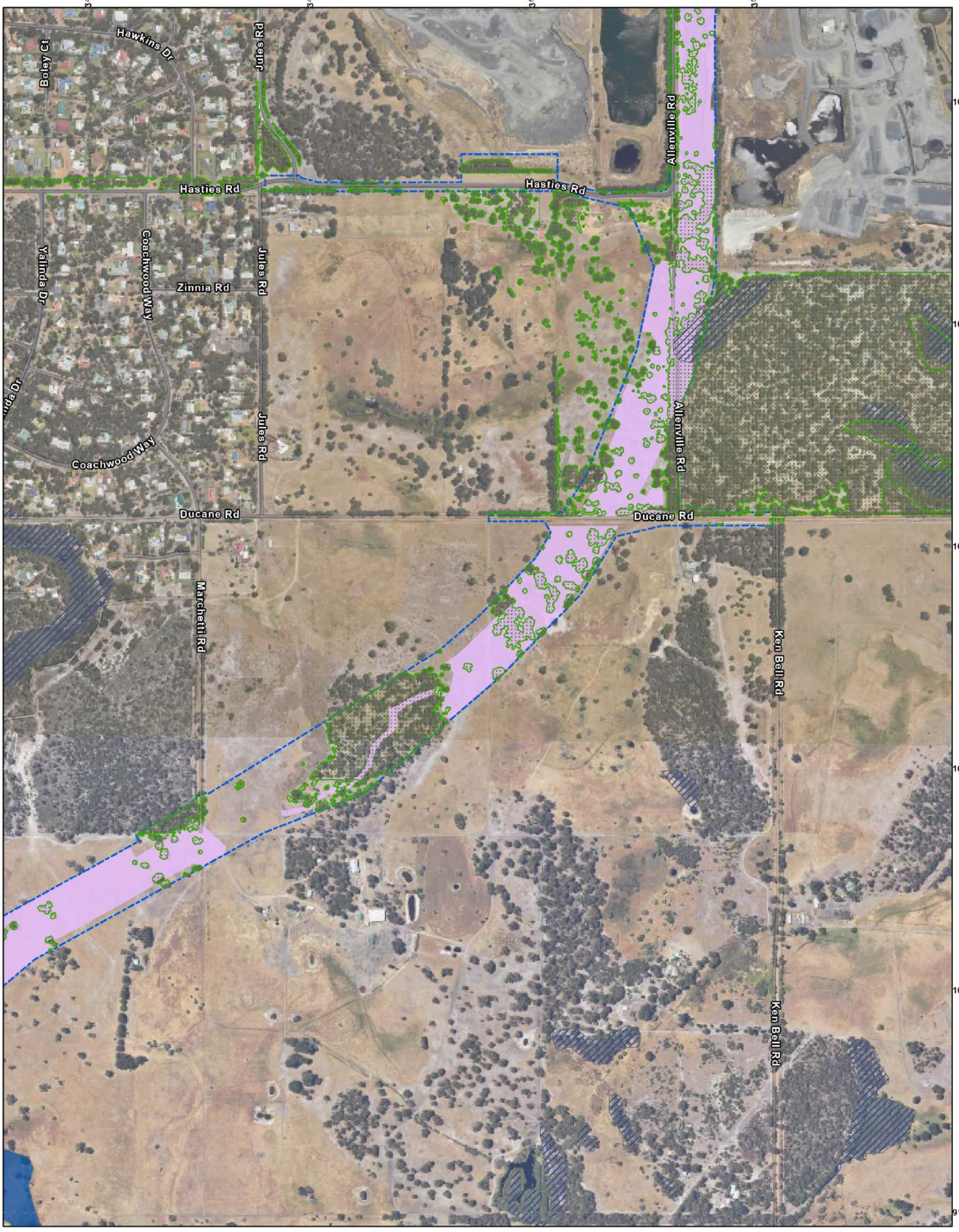
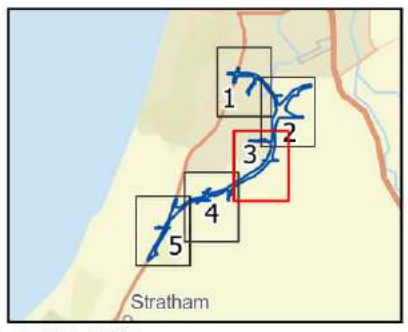
Bunbury Outer Ring Road

Figure 3. Ground disturbance and clearing extents in relation to Black Stripe Minnow and Natural Vegetation. Map 2 of 5



Legend

- Potential Black-stripe minnow habitat
- Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

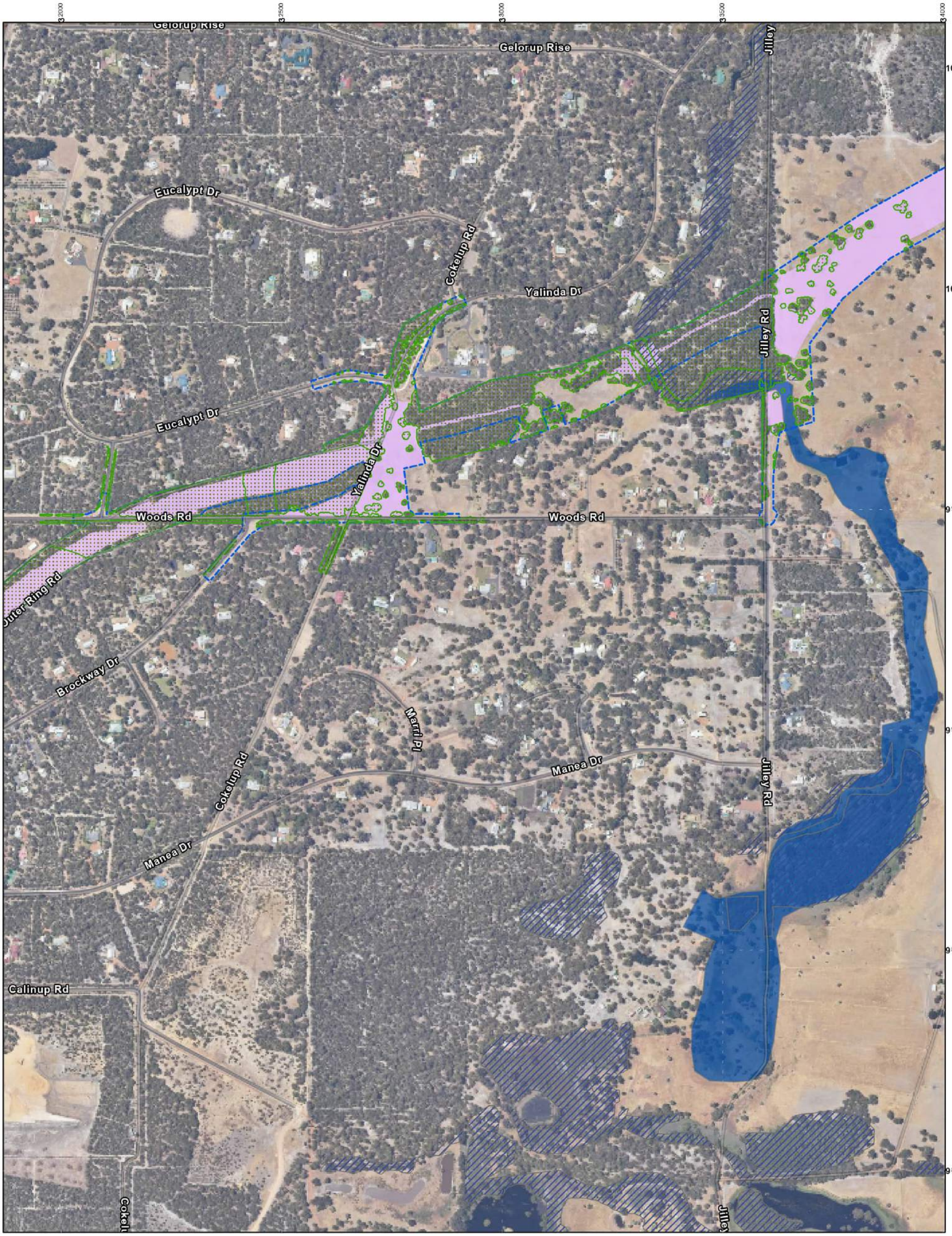
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 3. Ground disturbance and clearing extents in relation to Black Stripe Minnow and Natural Vegetation. Map 3 of 5

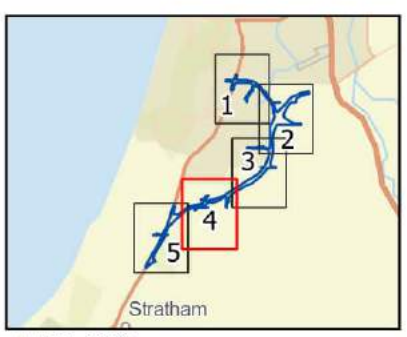


Legend

- Potential Black-stripe minnow habitat
- Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary

A3 scale: 1:8,000

0 200 400 Metres



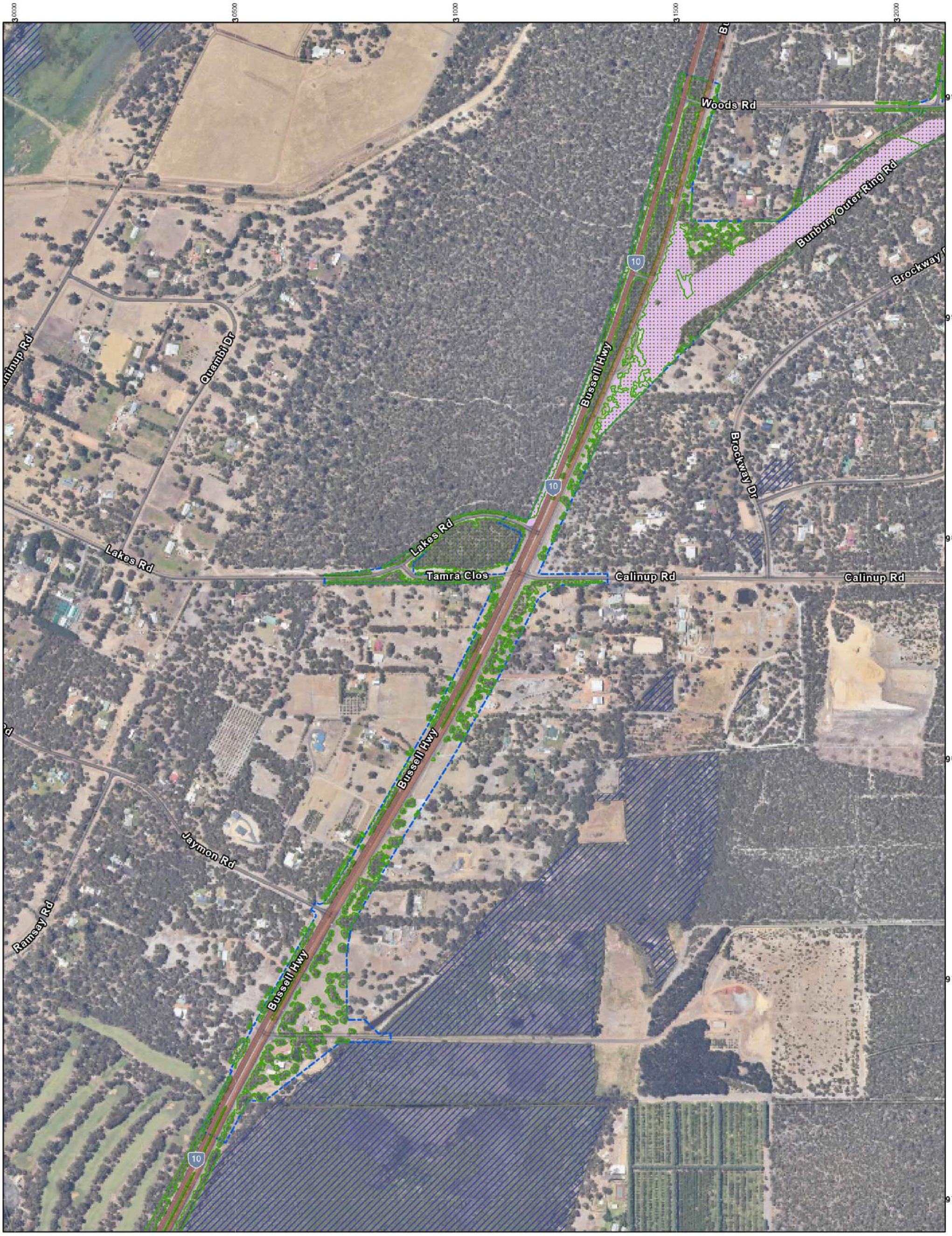
South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

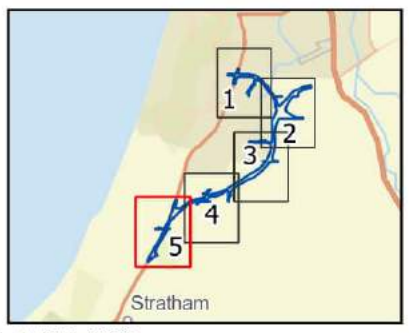
Bunbury Outer Ring Road

Figure 3. Ground disturbance and clearing extents in relation to Black Stripe Minnow and Natural Vegetation. Map 4 of 5



Legend

- Potential Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

0 200 400 Metres

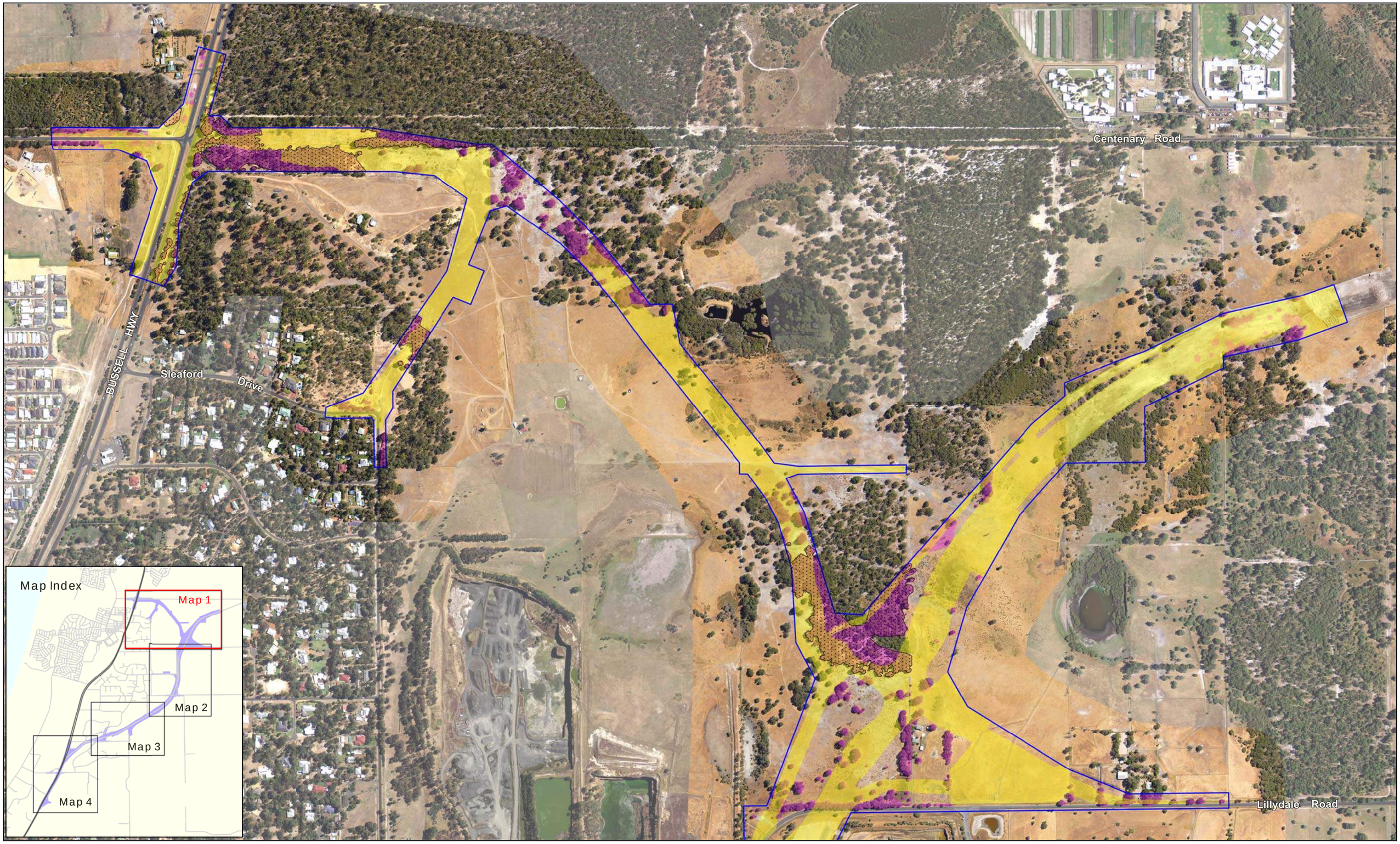
Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 3. Ground disturbance and clearing extents in relation to Black Stripe Minnow and Natural Vegetation. Map 5 of 5

Figure 4a. Ground disturbance and clearing extents during the reporting period in relation to Western ringtail possum habitat and South-western brush-tailed phascogale habitat.



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023
- Western Ringtail Possum habitat
- Brush-tailed Phscogale habitat

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Western Ringtial Possum habitat

Brush-tailed Phascogale habitat

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,500 @ A3

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Western Ringtail Possum habitat

Brush-tailed Phascogale habitat

N

0 400

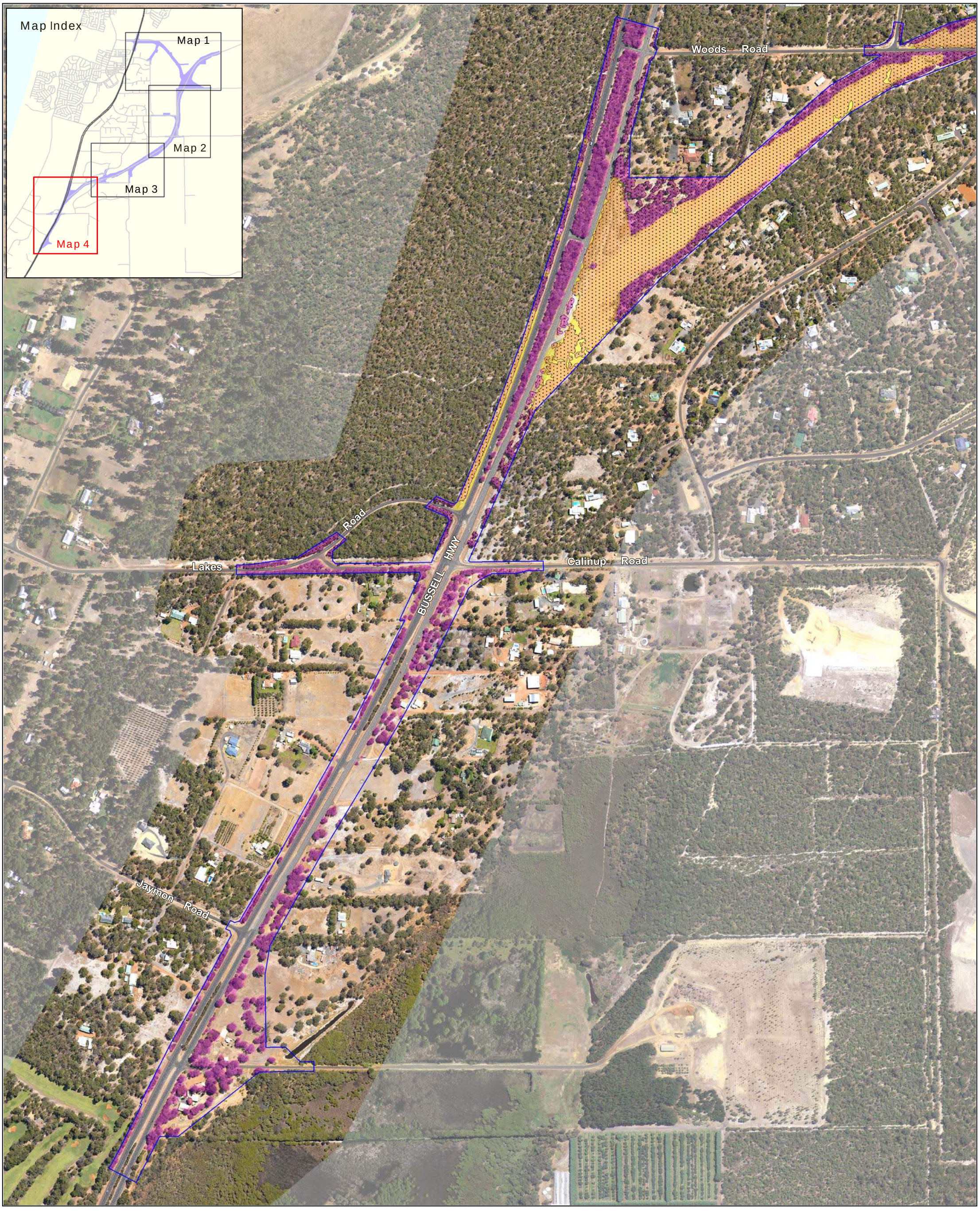
metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023)
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

metres

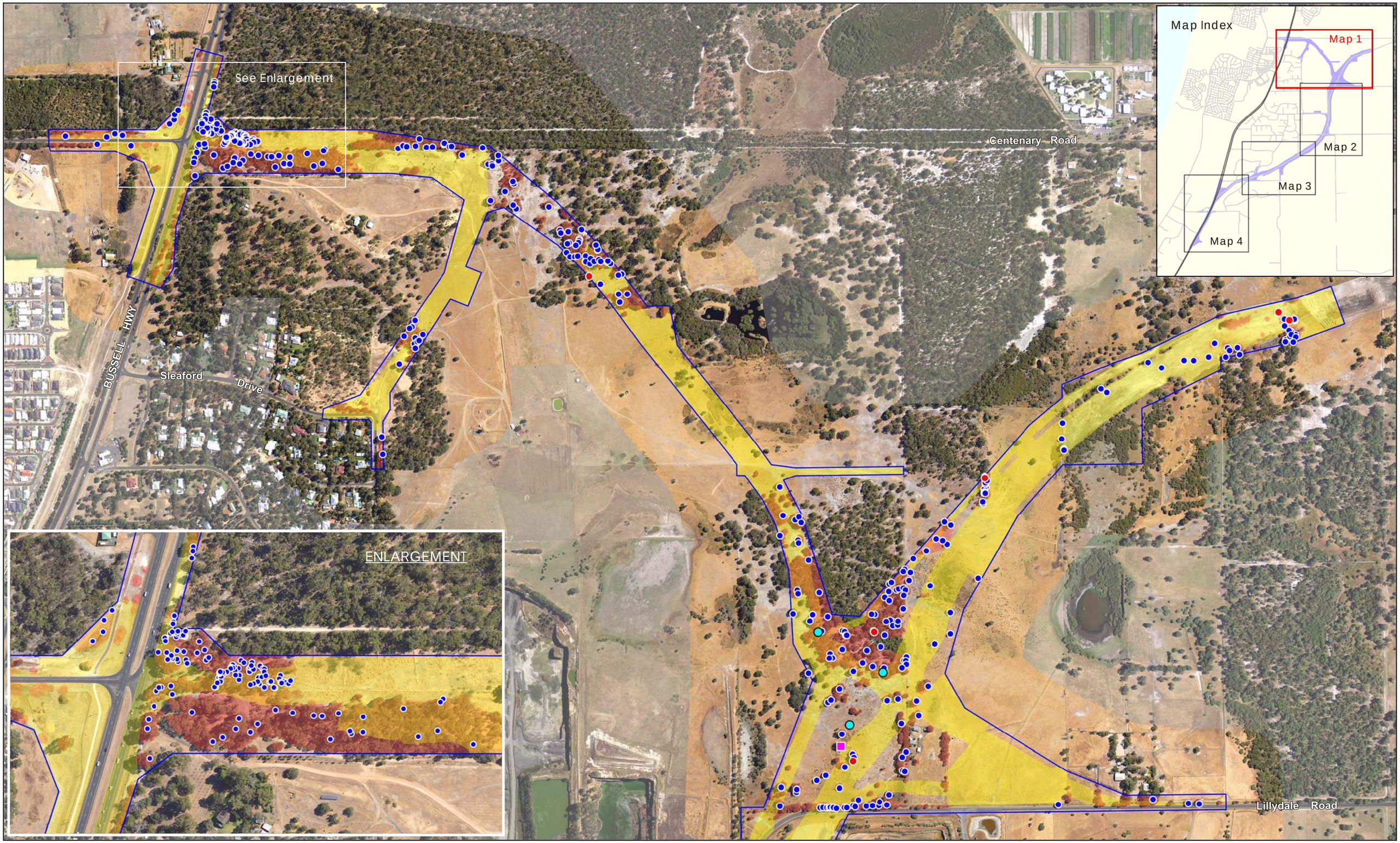
BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 8 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,000 @ A3

Figure 4b. Ground disturbance and clearing extents during the reporting period in relation to Black cockatoo habitat and habitat trees.



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2023

- Potentially suitable
- Unlikely suitable
- Not suitable
- Tree suitable DBH - no hollows

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Black cockatoo habitat

0 400

metres

N

BC Tree Habitat Hollow Assessment 2023

Potentially suitable

Unlikely suitable

Not suitable

Tree suitable DBH - no hollows

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 2

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1765 | Date: 4 Aug 2023 | Revised: | Projection: MGA Z50 (GDA2020) | Scale: 1:7,500 @ A3

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

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Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS 1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2023

Potentially suitable

Unlikely suitable

Not suitable

Tree suitable DBH - no hollows

N

0 400

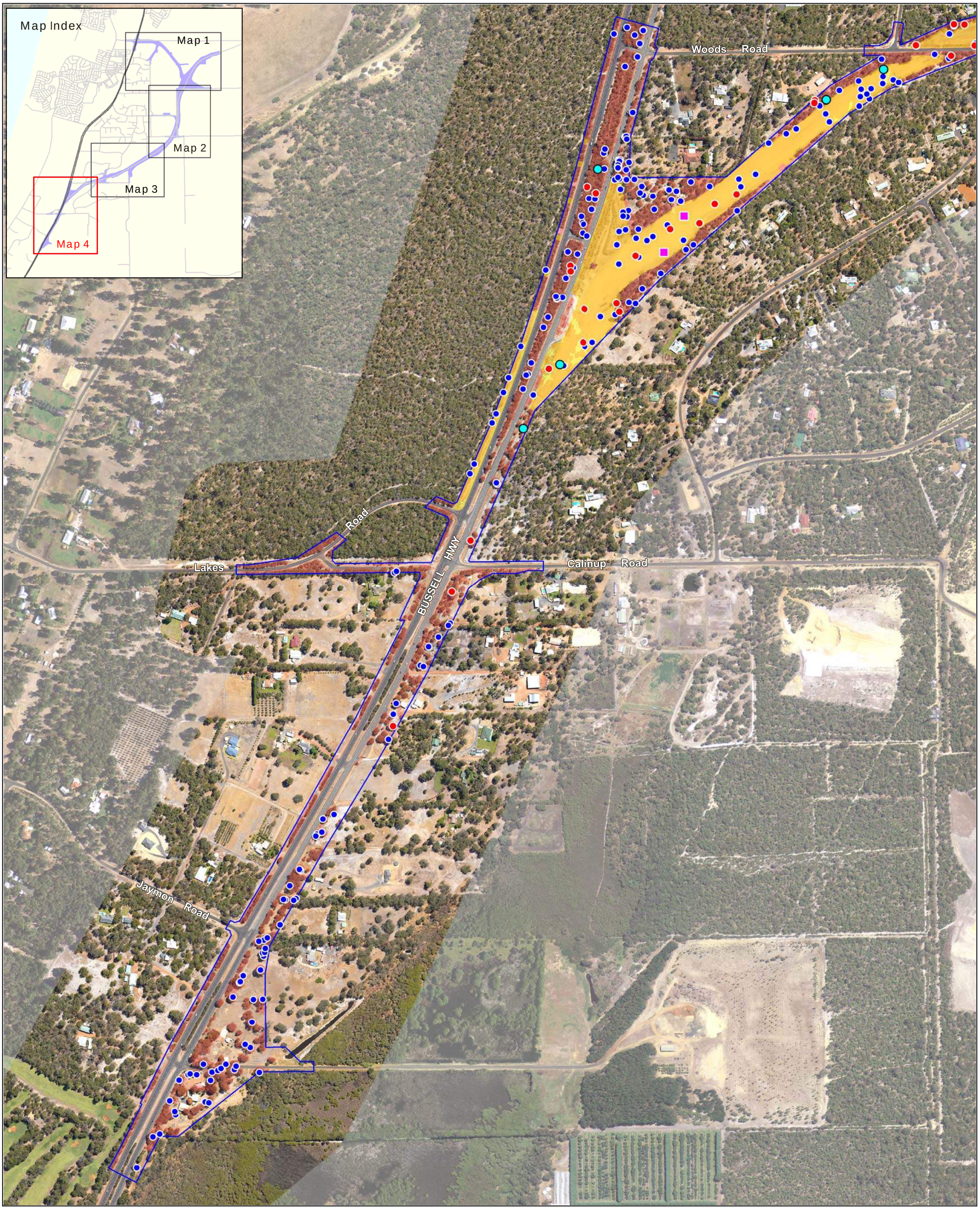
metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023)
- Black cockatoo habitat

0 300

metres

N

BC Tree Habitat Hollow Assessment 2023

- Potentially suitable
- Unlikely suitable
- Not suitable
- Trees suitable DBH - no hollows

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 8 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,000 @ A3

Figure 5. Ground disturbance and clearing extents during the reporting period in relation to Threatened and Priority Ecological Communities and inland waters (wetlands).

Legend

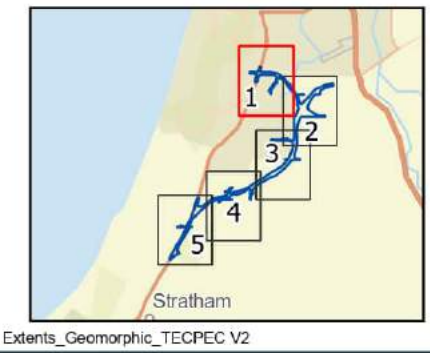
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



A3 scale: 1:8,000

0 200 400 Metres

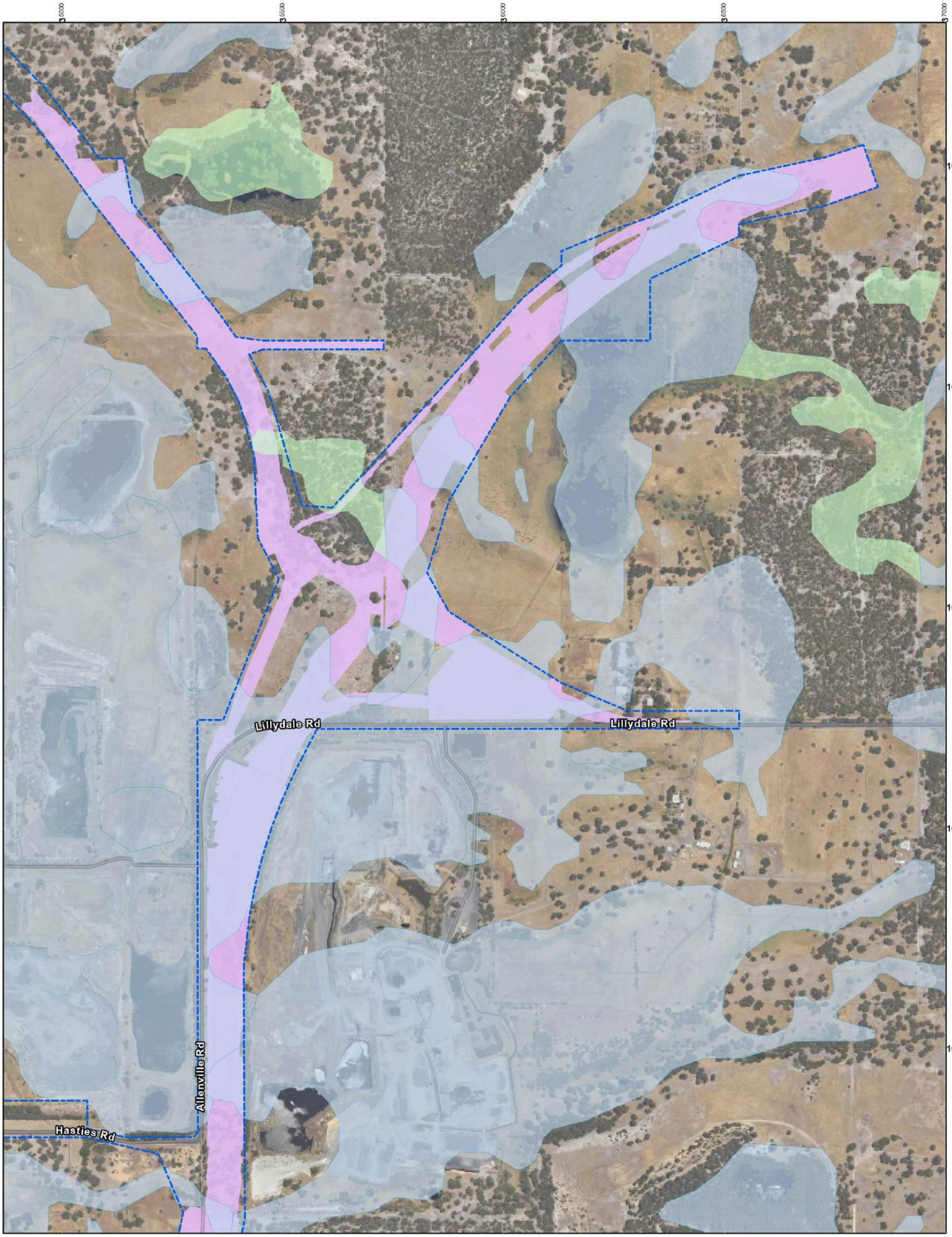
Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 1 of 5

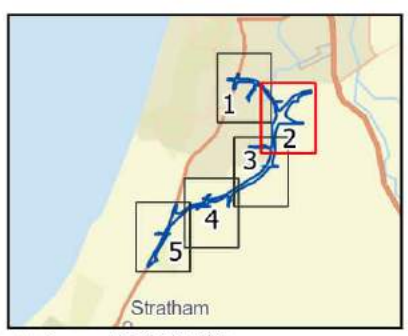


Legend

- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



South West Gateway Alliance
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A3 scale: 1:8,000

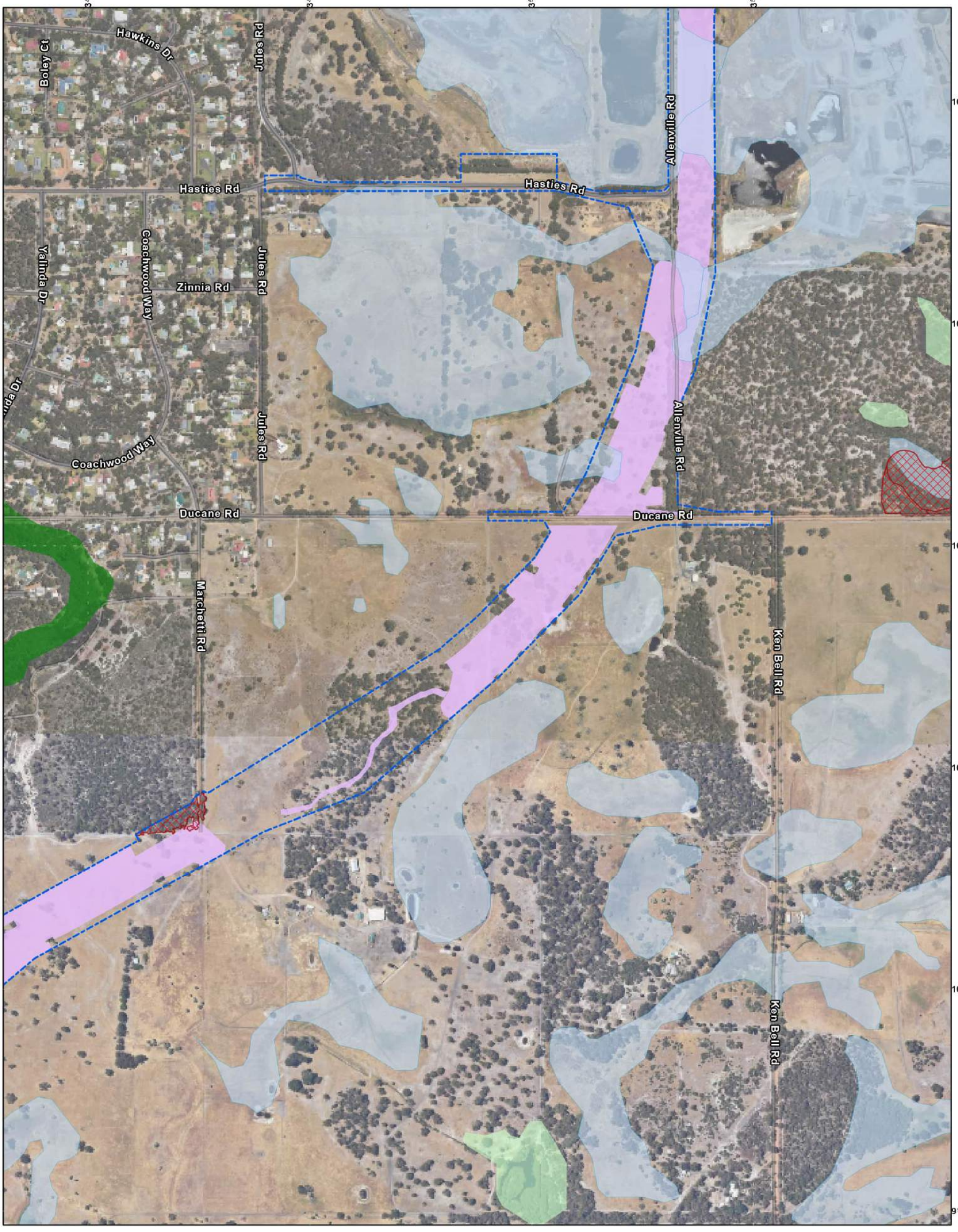
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 2 of 5



Legend

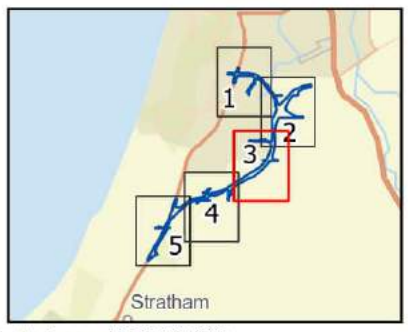
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

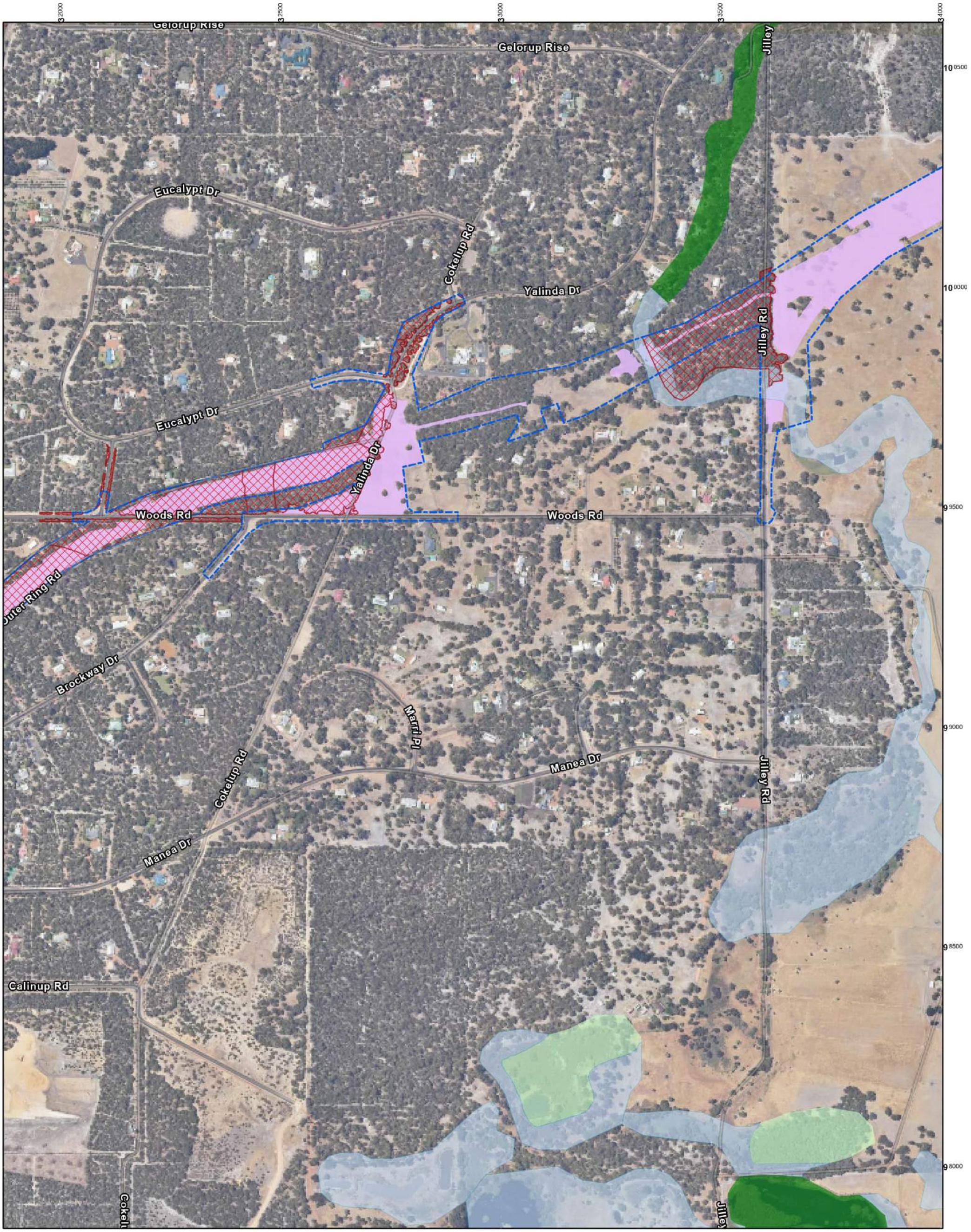
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 3 of 5



Legend

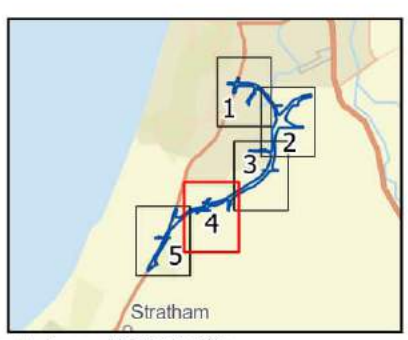
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

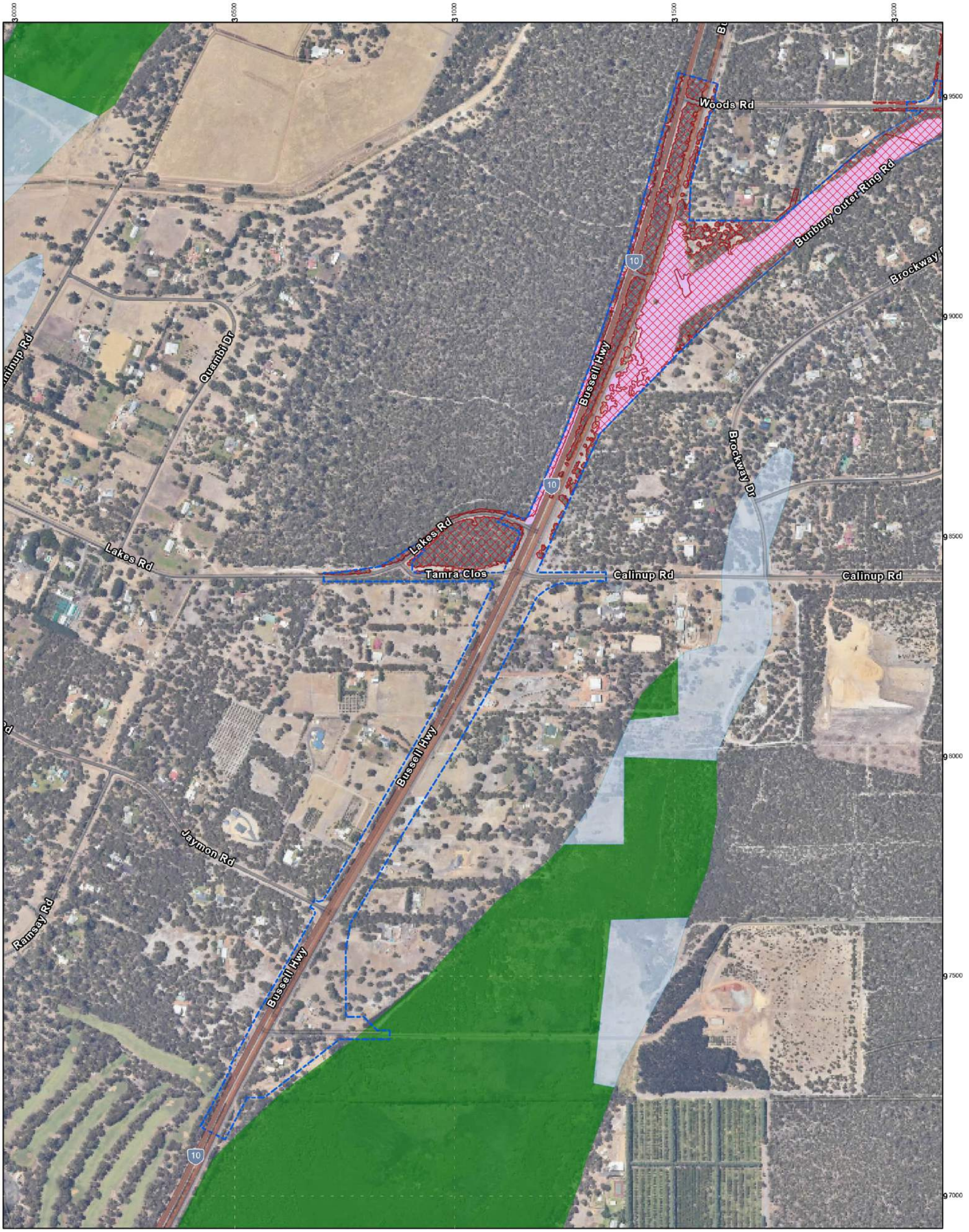
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 4 of 5



Legend

- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

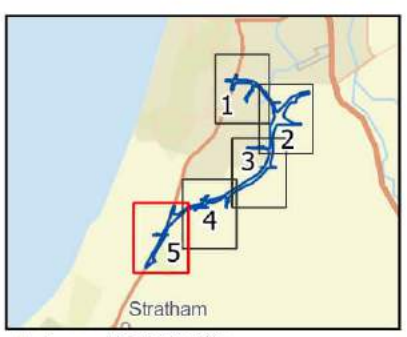
- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use wetlands

A3 scale: 1:8,000

0 200 400 Metres



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 5 of 5

7 Appendices

Appendix	Title
Appendix A	MS 1191 Statement of Compliance
Appendix B	MS 1191 Audit Table
Appendix C	MS 1191 Construction Fauna Management Plan Audit Table
Appendix D	MS 1191 Habitat Fragmentation Management Plan Audit Table
Appendix E	Evidence (related to potential non-compliance/non-conformance only)
Appendix F	Summary table of evidence
Appendix G	M2-4 Environmental Performance Report – Inland waters
Appendix H	M3-4 Environmental Performance Report – Flora and vegetation (PEC)
Appendix I	M4.4-4.6 Report – Black Cockatoo Artificial Nest Hollows
Appendix J	M5-3 Environmental Performance Report – Construction Fauna Management Plan

Appendix A

Statement of Compliance

Statement of Compliance

1 Proposal and Proponent Details

Proposal Title	*Bunbury Outer Ring Road (Southern Section)*
Statement Number	*1191*
Proponent Name	*Main Roads Western Australia*
Proponent's Australian Company Number (where relevant)	50 860 676 021

2 Statement of Compliance Details

Reporting Period	*31/05/22* to *30/05/23*

Implementation phase(s) during reporting period (please tick ✓ relevant phase(s))							
Pre-construction	✓	Construction	✓	Operation		Decommissioning	

Audit Table for Statement addressed in this Statement of Compliance is provided at Attachment:	B
An audit table for the Statement addressed in this Statement of Compliance must be provided with this Statement of Compliance. The audit table must be prepared and maintained in accordance with the Office of the Environmental Protection Authority's (OEPA) *Post Assessment Guideline for Preparing an Audit Table*, as amended from time to time. The 'Status Column' of the audit table must accurately describe the compliance status of each implementation condition and/or procedure for the reporting period of this Statement of Compliance. The terms that may be used by the proponent in the 'Status Column' of the audit table are limited to the Compliance Status Terms listed and defined in The CAP.	

Were all implementation conditions and/or procedures of the Statement complied with within the reporting period? (please tick ✓ the appropriate box)			
No (please proceed to Section 3)		Yes (please proceed to Section 4)	✓

Each page (including Attachment 2) must be initialed by the person who signs Section 4 of this Statement of Compliance. INITIALS: MS

3 Details of Non-compliance(s) and/or Potential Non-compliance(s)

The information required Section 3 must be provided for each non-compliance or potential non-compliance identified during the reporting period covered by this Statement of Compliance.

Non-compliance/potential non-compliance

Which implementation condition or procedure was non-compliant or potentially non-compliant?
Was the implementation condition or procedure non-compliant or potentially non-compliant?
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?

Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☐ Yes ☐ Reported to OEPA verbally Date _____ ☐ Reported to OEPA in writing Date _____	☐ No

What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)
What was the cause(s) of the non-compliance or potential non-compliance?
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above inform action may be provided as an attachment to this Statement of Compliance)

Proponent Declaration

I, Martine Scheltema *(Main Roads, Manager Environment)* declare that I am authorised on behalf of the Commissioner of Main Roads Western Australia (being the person responsible for the proposal) to submit this form and that the information contained in this form is true and not misleading.

Signature: Martine Scheltema Date: 31.08.23

Please note that:

- it is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give or cause to be given information that to his knowledge is false or misleading in a material particular; and
- the Chief Executive Officer of the DWER has powers under section 47(2) of the Environmental Protection Act 1986 to require reports and information about implementation of the proposal to which the statement relates and compliance with the implementation conditions.

4 Submission of Statement of Compliance

One hard copy and one electronic copy (preferably PDF on CD or thumb drive) of the Statement of Compliance are required to be submitted to the Chief Executive Officer, DWER, marked to the attention of Manager, Compliance (Ministerial Statements).

Please note, the DWER has adopted a procedure of providing written acknowledgment of receipt of all Statements of Compliance submitted by the proponent, however, the DWER does not approve Statements of Compliance.

5 Contact Information

Queries regarding Statements of Compliance, or other issues of compliance relevant to a Statement may be directed to Compliance (Ministerial Statements), DWER:

Manager, Compliance (Ministerial Statements)

Department of Water and Environmental Regulation

Postal Address: Locked Bag 33
Cloisters Square
PERTH WA 6850

Phone: (08) 6364 7000

Email: compliance@dwer.wa.gov.au

6 Post Assessment Guidelines and Forms

Post assessment documents can be found at www.epa.wa.gov.au

Each page (including Attachment 2) must be initialed by the person who signs Section 4 of this Statement of Compliance. INITIALS: MS

ATTACHMENT 1

Table 1 Compliance Status Terms

Compliance Status Terms	Abbrev	Definition	Notes
Compliant	C	Implementation of the proposal has been carried out in accordance with the requirements of the audit element.	This term applies to audit elements with: • ongoing requirements that have been met during the reporting period; and • requirements with a finite period of application that have been met during the reporting period, but whose status has not yet been classified as 'completed'.
Completed	CLD	A requirement with a finite period of application has been satisfactorily completed.	This term may only be used where: • audit elements have a finite period of application (e.g. construction activities, development of a document); • the action has been satisfactorily completed; and • the Office of the Environmental Protection Authority (OEPA) has provided written acceptance of 'completed' status for the audit element.
Not required at this stage	NR	The requirements of the audit element were not triggered during the reporting period.	This should be consistent with the 'Phase' column of the audit table.
Potentially Non-compliant	PNC	Possible or likely failure to meet the requirements of the audit element.	This term may apply where during the reporting period the proponent has identified a potential non-compliance and has not yet finalized its investigations to determine whether non-compliance has occurred.
Non-compliant	NC	Implementation of the proposal has not been carried out in accordance with the requirements of the audit element.	This term applies where the requirements of the audit element are not "complete" have not been met during the reporting period.

Compliance Status Terms	Abbrev	Definition	Notes
In Process	IP	Where an audit element requires a management or monitoring plan be submitted to the OEPA or another government agency for approval, that submission has been made and no further information or changes have been requested by the OEPA or the other government agency and assessment by the OEPA or other government agency for approval is still pending.	**The term 'In Process' may not be used for any purpose other than that stated in the Definition Column.** The term 'In Process' may not be used to describe the compliance status of an implementation condition and/or procedure that requires implementation throughout the life of the project (e.g. implementation of a management plan).

Appendix B

MS 1191 Audit Table

MS 1191 Audit Table

Note:

- Phases that apply in this table = Pre-Construction, Construction, Operation, Decommissioning, Overall (several phases).
- This audit table is a summary and timetable of conditions and commitments applying to this Proposal. Refer to the Minister's Statement for full detail/precise wording of individual elements.
- Code prefixes: M = Minister's condition, P = Proponent's commitment.
- Acronyms list: CEO = Chief Executive Officer of OEPA; DEC = Department of Environment Regulation; DPAW = Department of Parks and Wildlife; DIA = Department of Indigenous Affairs; DMP = Department of Mining and Petroleum; DWER = Department of Water and Environmental Regulation; EPA = Environmental Protection Authority; DoH = Department of Health; DoW = Department of Water, Minister for Env = Minister for the Environment; OEPA = Office of the Environmental Protection Authority.
- Compliance Status: C = Compliant, CLD = Completed, NA = Not Audited, NC = Non – compliant, NR = Not Required at this stage. Please note the terms VR = Verification Required and IP = In Process are only for OEPA use.

Audit Table for Ministerial Statement 1191

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M1.1	Limitations and extent of proposal	When implementing the proposal, the proponent shall ensure the proposal does not exceed the following extents: Clearing and disturbance of no more than 71.5 ha of native vegetation within a 200 ha development envelope.	Implement Proposal in accordance with limitations and extents.	Annual Compliance Assessment Report (CAR)	Overall	Ongoing	C	Clearing and disturbance of 29.72 ha of native vegetation has occurred during the reporting period and does not exceed the 71.5 ha permitted. Refer to Table 3 and Figure 2 of this CAR.
1191:M2.1	Inland Waters	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 0.2 ha of Conservation Category Wetlands; and (b) 1.4 ha of Resource Enhancement Wetlands.	Implement Conditions M2-2 and M2-3. Implement Proposal and clearing in accordance with limitations and extents of Condition M2-1(1).	Annual CAR	Overall	Ongoing	C	Clearing and disturbance has not occurred within areas classified as Conservation Category Wetlands during the reporting period. Clearing and disturbance of 0.52 ha of Resource Enhancement Wetlands has occurred during the reporting period and does not exceed the 1.4 ha permitted. Refer to Table 3 and Figure 5 of this CAR.
		(2) no project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions: (a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931); (b) Conservation Category Wetland (UFI-14478); (c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and; (d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).					C	There have been no project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions: (a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931); (b) Conservation Category Wetland (UFI-14478); (c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and; (d) Black-stripe minnow (*Galaxiella nigrostriata*) habitats Refer to Appendix G: M2.4 Environmental Performance Report – Inland Waters.
1191:M2.2	Inland Waters	Prior to ground-disturbing activities, the proponent shall undertake monitoring of the hydrological regimes of the values listed in condition 2-1(2) and submit a report to the CEO about the preconstruction baseline conditions and predicted post-development hydrological regime.	Prepare Hydrological Regime Report.	Baseline Hydrological Regime Report	Pre-construction	Prior to ground-disturbing activities	CLD	The Baseline Hydrological Regime Report was submitted to DWER on the 18 July 2022, prior to ground-disturbing activities.
1191:M2.3	Inland Waters	The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.	Monitoring of hydrological regimes and water quality.	Annual Hydrological Regime Report Annual CAR	Overall	During construction, and until the CEO is satisfied that the proponent has demonstrated the outcomes in Condition M2-1(2) have been met	C	Monitoring of hydrological regimes and water quality has been conducted during the reporting period. Refer to Appendix G: M2.4 Environmental Performance Report – Inland Waters.
1191:M2.4	Inland Waters	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:	Prepare an annual Environmental Performance Report (EPR) in relation to Inland Waters.	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Appendix G: M2.4 Environmental Performance Report – Inland Waters.

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Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(1) outline the monitoring that was undertaken during the implementation of the proposal; (2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved; (3) report whether that the outcomes in condition 2-1(2) were achieved; and (4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).						
1191:M2.5	Inland Waters	The proponent shall not construct bridge footings, drainage structures and abutments within the area depicted in Figure 5.	The Proposal shall be designed and constructed in accordance with Condition M2-5.	Annual CAR	Overall	Ongoing	C	A Section 45C(5) Amendment to Condition 2.5 was requested on 7 November 2022 and approved on 15 February 2023. No construction of bridge footings, drainage structures and abutments has occurred within the area depicted in Figure 5.
1191:M3.1	Flora and Vegetation	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 23.4 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (*Banksia Woodlands*); (b) 4.4 ha of vegetation representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and (c) 4.5 ha of vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.	Implement Proposal and clearing in accordance with limitations and extents of Condition M3-1(1). Implement Conditions M3-2 and M3-3 with regard to Baseline and Annual PEC Reports. Implement Condition M3-5.	Annual CAR Baseline and Annual PEC Reports Design, survey, and GIS files	Overall	Until the CEO is satisfied that the proponent has demonstrated the outcomes in Condition M3-1(2) have been met	C	During the reporting period, clearing and disturbance has included: (a) 11.49 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (*Banksia Woodlands*); (b) 2.06 ha of vegetation representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and (c) 2.15 ha of vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC. Refer to Table 2 and Figure 5 of this CAR.
		(2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands, and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1).					C	There have been no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands, and Tuart-Peppermint Woodlands. Refer to Appendix H, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
1191:M3.2	Flora and Vegetation	Prior to ground-disturbing activities, the proponent shall undertake monitoring of the values listed in condition 3-1(2) and submit a report about the preconstruction baseline conditions to the CEO.	Prepare and submit Baseline PEC / TEC Report.	Baseline PEC / TEC Report	Pre-construction	Prior to ground-disturbing activities	CLD	The Baseline PEC / TEC Report was submitted to DWER on the 18 July 2022, prior to ground-disturbing activities.
1191:M3.3	Flora and Vegetation	The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.	Annual PEC / TEC Report.	Annual PEC Report Annual CAR	Overall	Until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met	C	Refer to Appendix H, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
1191:M3.4	Flora and Vegetation	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall: (1) outline the monitoring that was undertaken during the implementation of the proposal; (2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved; (3) report whether that the outcomes in conditions 3-1(1) and 3-1(2) were achieved; and	Prepare an annual Environmental Performance Report (EPR) in relation to Flora and Vegetation.	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Appendix H, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in conditions 3-1(1) and 3-1(2).						
1191:M3.5	Flora and Vegetation	The proponent shall undertake the following actions within the development envelope during construction and for five (5) years post-construction: (1) implement hygiene protocols consistent with the Management of *Phytophthora cinnamomi* for Biodiversity Conservation in Australia, Part 2 National Best Practice Guidelines as amended or replaced from time to time; and (2) undertake weed control and management to prevent the introduction or spread of environmental weeds.	Implement Dieback Management Plan. Implement weed control and management.	Dieback Management Plan Annual CAR	Overall	During construction and for 5 years post-construction	C	Refer to SWGA Phytophthora Dieback Management Plan (SWGA-30-134-20-PLN-0001-0). Refer to SWGA Topsoil and Mulch Management Plan (SWGA-30-134-20-PLN-0002-0). Refer to SWGA Construction Environmental Management Plan (SWGA-00-134-20-MPL-0002-0).
1191:M4.1	Terrestrial Fauna (Construction)	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 60.9 ha of habitat for western ringtail possum; (b) 60.9 ha of black cockatoo foraging and breeding habitat; (c) 1088 black cockatoo potential nesting trees, and 11 trees with suitable hollows; (d) 39.2 ha of habitat for south-western brush-tailed phascogale; and (e) 5.5 ha of habitat for black-stripe minnow.	Implement Proposal and clearing in accordance with limitations and extents of Condition M4-1(1).	Annual CAR Design, survey, and GIS files	Overall	During implementation of the proposal	C	During the reporting period, clearing and disturbance has included: (a) 24.39 ha of habitat for western ringtail possum; (b) 24.39 ha of black cockatoo foraging and breeding habitat; (c) 397 black cockatoo potential nesting trees, and 3 trees with potentially suitable hollows; (d) 18.09 ha of habitat for south-western brush-tailed phascogale; and (e) 2.16 ha of potential habitat for black-stripe minnow. Refer to Table 2 and Figures 4a and 4b of this CAR.
1191:M4.2	Terrestrial Fauna (Construction)	Prior to ground-disturbing activities the proponent shall undertake the following actions: (1) within seven (7) days prior to clearing, using a qualified and licensed terrestrial fauna spotter with experience in surveying for black cockatoos, inspect all potential nesting trees hollows within the development envelope to determine if any hollows are being used for nesting by black cockatoos; (2) if any hollows are in use by black cockatoos, the proponent shall not disturb or clear the nesting tree, or vegetation within a ten (10) metre radius of the nesting tree, until after the cockatoos have naturally completed nesting (young have fledged and dispersed) and an appropriately qualified terrestrial fauna spotter has verified that the hollow(s) are no longer being used by black cockatoos; and	Undertake Black cockatoo surveys in accordance with Condition M4-2(1) within 7 days prior to clearing. Implement pre-clearing protocols of Conditions M4-2(1) and M4-2(2).	Survey Report Annual CAR	Pre-construction & Construction	Prior to ground-disturbing activities for each stage of clearing	C	Pre-clearing survey reports in relation to Black cockatoos have been prepared for each clearing stage (refer to CAR, Table 3 for clearing stages).
		(3) within seven (7) days prior to clearing (or if staged, prior to each stage) implement pre-clearance protocols to minimise impacts to terrestrial fauna.					C	Refer to Appendix C: Construction Fauna Management Plan (CFMP) Audit Table including in relation to 'sensitive clearing protocols'.
1191:M4.3	Terrestrial Fauna (Construction)	During the construction of the proposal the proponent shall: (1) ensure the presence of appropriately qualified fauna spotters during clearing activities;	Engage appropriately qualified fauna spotters during clearing activities. Implement Condition M4-3(2) and M4-3(3).	Annual CAR	Construction	During the construction of the proposal	C	At least one appropriately qualified fauna spotter(s) (depending on habitat category) was present during clearing activities. Refer to M0 Independent Daily Inspection Reports. Fauna spotter accreditation: Regulation 28: Fauna Taking (Relocation) Licence. Licence Number: FR28000318-4. Section 40: Authorisation to Take or Disturb Threatened Species. Authorisation Number: TFA 2223-0034. Authorisation Number: TFA 2223-0005 (TFA 2223-0005c). Authorisation Number: TFA 2020-0013-3 (TFA 2020-0013f).

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Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(2) not clear or cause any project attributable indirect impacts to the clearing exclusion areas as defined in Figure 1; and					C	Refer to Appendix H, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
		(3) ensure foraging species for black cockatoos are not planted within ten (10) metres of the road.					NR	There has been no revegetation to date within the Proposal area.
1191:M4.4	Terrestrial Fauna (Construction)	The proponent must install one artificial black cockatoo nesting hollow for each suitable hollow that cannot be avoided in the 11 trees with suitable hollows identified in condition 4-1(1)(c).	Install artificial black cockatoo nesting hollows.	Annual CAR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing.	C	Three artificial nesting hollows were installed in accordance with Condition M4.4. Refer to Appendix I, M4.4-4.6 Report: Installation of Four Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, July 2023).
1191:M4.5	Terrestrial Fauna (Construction)	Each artificial black cockatoo nesting hollow required by condition 4-4 must be installed prior to commencement of the next black cockatoo breeding season following clearing.	Install artificial black cockatoo nesting hollows required under Condition M4-4 prior to commencement of the next black cockatoo breeding season following clearing.	Annual CAR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing.	C	Refer to Appendix I, M4.4-4.6 Report: Installation of Four Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, July 2023).
1191:M4.6	Terrestrial Fauna (Construction)	The artificial black cockatoo nest hollow(s) required by condition 4-4 of must: (1) be installed at the locations identified by DBCA within property locations as set out and described in Table 1 of condition 9-2. (2) be designed and placed in accordance with the specifications details in How to design and place artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline; and (3) be monitored and maintained in accordance with the specifications detailed in How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline, for a period of at least ten (10) years.	Design and install artificial black cockatoo nesting hollow required under Condition M4-4 in consultation with DBCA and according the DBCA guidelines. Monitor artificial nesting hollows for a period of 10 years.	Correspondence from DBCA Annual CAR & EPR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing and monitored and maintained for at least 10 years	C	Refer to Appendix I, M4.4-4.6 Report: Installation of Four Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, July 2023). This report details the installation locations, designs, and monitoring program.
1191:M4.7	Terrestrial Fauna (Construction)	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, for a period of at least ten (10) years, that shall: (1) outline the monitoring and maintenance that was undertaken in accordance with the specifications detailed in How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline; and (2) outline the results of the monitoring and maintenance undertaken.	Prepare an annual Environmental Performance Report (EPR) in relation to Condition M4-7.	EPR as part of Annual CAR	Overall	Annually for at least 10 years	NR	Not required at this stage. Three artificial nesting hollows were installed in Ducane Reserve in June 2023. Refer to Appendix I, M4.4-4.6 Report: Installation of Four Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, July 2023).
1191:M5.1	Construction Fauna Management Plan	The proponent shall implement the proposal to achieve the following environmental objective: (1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.	Implement Construction Fauna Management (CFM) Plan	Annual CAR CFM Plan	Construction	During construction	C	The CFMP has been implemented to reduce the risk of project attributable adverse impacts to conservation significant terrestrial fauna. Refer to Appendix C: Construction Fauna Management Plan Audit Table, for management actions and outcomes.
1191:M5.2	Construction Fauna Management Plan	The proponent shall prepare a Construction Fauna Management Plan and submit to the CEO prior to ground-disturbing activities.	Prepare CFM Plan.	CFM Plan Annual CAR	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for Construction Fauna Management Plan received from DWER on 22 July 2022 (DWER Ref: DWERVT10554). A copy of the CFMP is available on the Main Roads website.
		This Plan shall: (1) specify the passive relocation management actions to be implemented prior to and during clearing;					C	Refer to Section 2.1 of the CFMP.

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Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;					C	Refer to Table 1-5 of the CFMP.
		(3) specify monitoring that: (a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan; (b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the *Biodiversity Conservation Act 2016*; (c) evaluates the suitability, adequacy, and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3; (d) evaluates impacts to residential western ringtail possum individuals at receival sites; and (e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).					C	Refer to Table 2-1 and Section 2.3 in the CFMP.
		(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;					C	Refer to Figures 7 – 9 in the CFMP.
		(5) specify management actions; management targets; monitoring locations, methodologies, indicators, and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and					C	Refer to Tables 2-1, 2-2, and 2-3 of the CFMP for management actions, management targets and monitoring locations.
		(6) be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the *Biodiversity Conservation Act 2016*.					C	Refer to Section 4 of the CFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M5.3	Construction Fauna Management Plan	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall: (1) outline the monitoring that was undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2; (2) outline the results of the monitoring undertaken to report whether that the environmental objective specified in condition 5-1(1) was achieved; (3) report whether that the objective in condition 5-1(1) was achieved; and (4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1).	Prepare an annual Environmental Performance Report (EPR) in relation to Construction Fauna Management (Condition M5-3).	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Appendix J, M5.3 Environmental Performance Report - CFMP.
1191:M5.4	Construction Fauna Management Plan	The proponent shall not commence ground-disturbing activities until the CEO has confirmed in writing that the Construction Fauna Management Plan satisfies the requirements of condition 5-2.	Prepare and submit CFM Plan. Approval of CFM Plan by CEO.	Correspondence from CEO Annual CAR	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for CFMP (Rev1A; July 2022) received from DWER on 22 July 2022 (DWER Ref: DWERVT10554).
1191:M5.5	Construction Fauna Management Plan	The proponent shall implement the latest revision of the Construction Fauna Management Plan approved by the CEO.	Implement latest version of CFM Plan. Undertake baseline fauna survey for WRP and BPh within 30 days prior to clearing. Record and report priority fauna encountered during clearing. Monitoring including radio-telemetry surveys.	Annual CAR CFM Plan Pre-clearing fauna survey reports Priority fauna records and reports Monitoring surveys Correspondence with CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved	C	Refer to Appendix C, Construction Fauna Management Plan (CFMP) Audit Table. Refer to Appendix J, M5.3 Environmental Performance Report - CFMP.
1191:M5.6	Construction Fauna Management Plan	The proponent: (1) may review and submit proposed amendments to the Construction Fauna Management Plan; or (2) shall review and submit proposed amendments to the Construction Fauna Management Plan when directed by the CEO.	CFM Plan reviewed as required.	CFM Plan	Overall	As required or when directed by the CEO	NR	
1191:M5.7	Construction Fauna Management Plan	The proponent shall continue to implement the Construction Fauna Management Plan as approved by the CEO in writing, until the CEO has confirmed by written notice that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved.	Implement CFM Plan.	CFM Plan Annual CAR Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved	C	Refer to Appendix C, Construction Fauna Management Plan (CFMP) Audit Table.
1191:M6.1	Habitat Fragmentation Management Plan	The proponent shall ensure the implementation of the proposal achieves the following environmental objectives: (1) minimise the impacts of habitat fragmentation that are attributable to the proposal on western ringtail possum; and (2) minimise the impacts from predation that are exacerbated by the proposal on western ringtail possum.	Implement Habitat Fragmentation Management (HFM) Plan in accordance with Condition M6-3.	Annual CAR HFM Plan	Overall	Ongoing	C	Refer to Appendix D Habitat Fragmentation Management Plan (HFMP) Audit Table.
1191:M6.2	Habitat Fragmentation Management Plan	The proponent shall ensure the implementation of the proposal achieves the following environmental outcome: (1) abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within a maximum of fifteen (15) years from the commencement of construction.	Implement HFM Plan.	Annual CAR HFM Plan	Overall	Within a maximum of 15 years from the commencement of construction	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table. Refer to Appendix J, M5.3 Environmental Performance Report - CFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M6.3	Habitat Fragmentation Management Plan	The proponent shall prepare a Habitat Fragmentation Management Plan and submit to the CEO prior to ground-disturbing activities.	Prepare and submit HFM Plan, including consultation with DBCA.	HFM Plan Consultation with DBCA	Pre-construction	Prior to ground-disturbing activities	CLD	Habitat Fragmentation Management Plan (HFMP) submitted to CEO on 22 July 2022. A copy of the HFMP is available on the Main Roads website.
		This Plan shall: (1) when implemented, substantiate, and ensure that conditions 6-1 and 6-2 are being met;					C	The approved HFMP has been developed to achieve the objectives of Conditions 6.1 and 6.2 and the ongoing monitoring will demonstrate these objectives have been met. Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table Refer to Appendix J, M5.3 Environmental Performance Report – CFMP.
		Fauna crossings, land-bridges and fragmentation (2) specify the locations, dimensions and designs of fauna crossings to reconnect terrestrial fauna habitats, including tree-canopy connections to fauna crossings for western ringtail possum (and brush-tailed phascogale);					C	Refer to Section 2.3 of the HFMP.
		(3) specify the locations and designs of a minimum of two (2) fauna land bridges, which are to be: (a) a minimum width of five (5) metres at the Yalinda Drive traffic bridge; and (b) between five (5) and ten (10) metres at the dedicated fauna land bridge east of Yalinda Drive (to be determined in consultation with DBCA);					C	Refer to Section 2.3.2 of the HFMP.
		(4) specify the revegetation and maintenance requirements of the fauna land bridges to maximise utilisation by western ringtail possums and ensure revegetation is self-sustaining or otherwise managed to ensure its ongoing survival;					C	Refer to Section 2.3.2.2 and 2.3.2.3 of the HFMP.
		(5) specify monitoring methodologies to evaluate the effectiveness and utilisation of fauna crossings and fauna land bridges by western ringtail possum against the objectives in condition 6-1 which must include, but not be limited to, monitoring of DNA scat analysis and camera-monitoring;					C	Refer to Section 2.3.3 of the HFMP.
		(6) specify monitoring methodologies to evaluate the project attributable effects of fragmentation on the demographics and genetics of the local western ringtail possum population and the effectiveness of minimisation measures to demonstrate whether the objective in condition 6-1(1) and outcome in condition 6-2 will be met; Predator control;					C	Refer to Section 2.3.3 of the HFMP.
		(7) specify actions to undertake targeted predator control to reduce predation impacts to conservation significant fauna, to be implemented: (a) one (1) month prior to clearing; (b) during construction of the proposal; and (c) at entrances/exits to fauna crossings and fauna land bridges for a minimum of five (5) years post-construction, subject to the five (5) yearly review required by condition 6-3(12); Abundance and persistence of western ringtail possum;					C	Refer to Section 2.4 of the HFMP.
		(8) specify monitoring methodologies to evaluate the abundance and persistence of the western ringtail possum at the receival sites to demonstrate whether the outcome in condition 6-2 will be met; Protection and enhancement of adjacent habitat;					C	Refer to Table 2.4 of the HFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(9) demonstrate how the habitat within the clearing exclusion areas (excluding the 'Grey Giant' Heritage Place No. 26059 site) and vegetation retention areas (defined in Figure 4) in Gelorup will be maximised for benefits to western ringtail possums and, where relevant, include provisions to establish revegetation of degraded areas;					C	Refer to Section 2.6.1 of the HFMP.
		(10) include provisions to monitor revegetation required by condition 6-3(9), and undertake maintenance and remedial measures as required to demonstrate it is self-sustaining and habitat is maximised for benefits to western ringtail possums;					C	Refer to Sections 2.6.1 and 2.6.2 of the HFMP.
		(11) outline the long-term management and protection mechanism of the clearing exclusion areas and the vegetation retention areas as defined in Figure 4; General plan provisions;					C	Refer to Section 2.6.2 of HFMP.
		(12) be implemented for a minimum of fifteen (15) years post-construction, or otherwise agreed to by the CEO and on advice of DBCA following review of effectiveness every five (5) years;					NR	Review not yet required, refer to Section 3.3 for details on the HFMP review schedule.
		(13) specify management actions; management targets; monitoring locations, methodologies, indicators, and timing; and contingency actions and investigations in the event of a failure to meet a management target to demonstrate that the objectives in condition 6-1 and outcome in condition 6-2 will be met; and					C	Refer to Table 2-1, 2-2, and 2-3 of the HFMP.
		(14) be prepared in consultation with DBCA and in accordance with any requirements of a lawful authority obtained under the *Biodiversity Conservation Act 2016*.					C	Refer to Section 4 of the HFMP.
1191:M6.4	Habitat Fragmentation Management Plan	The proponent shall include a report of a peer review carried out by an independent person or independent persons with suitable technical experience to review the Draft Habitat Fragmentation Management Plan, required under condition 6-3, to report on the adequacy of that content to achieving the objectives and outcome specified in conditions 6-1 and 6-2.	Engage an independent person to undertake peer review. Submit peer review of HFM Plan to CEO.	Peer review of HFM Plan Correspondence with CEO	Pre-construction	Prior to ground-disturbing activities	CLD	A Peer Review of the HFMP was completed on 8 June 2022, prior to ground disturbance. Refer to Appendix C of the HFMP for the Peer Review Report.
1191:M6.5	Habitat Fragmentation Management Plan	The proponent shall submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, following the review of effectiveness every five (5) years, required by condition 6-3(12), that shall: (1) outline the monitoring that was undertaken during the implementation of the Habitat Fragmentation Management Plan required in condition 6-3; (2) outline the results of the monitoring undertaken to report whether that the environmental objectives and outcome specified in conditions 6-1 and 6-2 was achieved; (3) report whether that the objectives and outcome specified in conditions 6-1 and 6-2 was achieved; and (4) outline any management actions undertaken during the implementation of the Habitat Fragmentation Management Plan required in condition 6-3 to meet the objectives and outcome specified in conditions 6-1 and 6-2.	Prepare an Environmental Performance Report (EPR) in relation to the HFM Plan.	EPR as part of Annual CAR	Overall	Every 5 years	NR	EPR in relation to the HFMP due in 2027.
1191:M6.6	Habitat Fragmentation Management Plan	The proponent shall include a report of a peer review carried out by an independent person or independent persons with suitable technical experience to review the Environmental Performance Reports, required under condition 6-5, with the report and to report on the adequacy of that content to	Peer review of EPR required under Condition M6-5.	Peer review and report	Overall	Every 5 years	NR	Peer Review of EPR in relation to the HFMP due in 2027.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		achieving the objectives and outcome specified in conditions 6-1 and 6-2.						
1191:M6.7	Habitat Fragmentation Management Plan	The proponent shall not commence ground-disturbing activities until the CEO has confirmed in writing that the Habitat Fragmentation Management Plan satisfies the requirements of condition 6-3.	Prior to ground-disturbing activities, confirmation from CEO that HFM Plan satisfies Condition M6-3.	HFM Plan Correspondence from CEO	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for HFMP (Rev1A; July 2022) received from DWER on 22 July 2022 (DWER Ref: DWERVT10552).
1191:M6.8	Habitat Fragmentation Management Plan	The proponent shall implement the latest revision of the Habitat Fragmentation Management Plan approved by the CEO.	Implement latest version of HFM Plan.	HFM Plan Annual CAR	Overall	When HFM Plan has been updated	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table.
1191:M6.9	Habitat Fragmentation Management Plan	The proponent: (1) may review and submit proposed amendments to the Habitat Fragmentation Management Plan; or (2) shall review and submit proposed amendments to Habitat Fragmentation Management Plan when directed by the CEO.	Review HFM Plan as required.	HFM Plan Correspondence from CEO	Overall	As required or when directed by the CEO	NR	
1191:M6.10	Habitat Fragmentation Management Plan	The proponent shall continue to implement the Habitat Fragmentation Management Plan as approved by the CEO in writing, until the CEO has confirmed by written notice that the proponent has demonstrated that the environmental objectives and outcomes detailed in conditions 6-1 and 6-2 of the Habitat Fragmentation Management Plan have been achieved.	Implement HFM Plan.	Annual CAR HFM Plan Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives and outcomes in conditions 6-1 and 6-2 of the Habitat Fragmentation Management Plan have been achieved	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table.
1191:M7.1	Social Surroundings (Noise)	The proponent shall implement the proposal to meet the following environmental objective: (1) minimise operational noise impacts on existing noise sensitive receptors, as far as practicable.	Implement Conditions M7-2 to M7-7	Annual CAR TNM Plan	Overall	Ongoing	NR	
1191:M7.2	Social Surroundings (Noise)	At least six (6) months prior to the operation of the proposal and in order to meet the requirements of condition 7-1, the proponent shall prepare a Traffic Noise Management Plan to include: (1) outdoor noise management targets; (2) indoor noise management targets to apply to noise sensitive receptors where the construction of noise walls is not feasible or practicable; (3) the noise management actions to ensure the noise management targets are met during the operation of the proposal; (4) where noise walls will be constructed, the location, height, and timing of construction of the walls; (5) where acoustic treatment of houses will be implemented, the standard of treatments, timing, and evidence of consultation with affected stakeholders; (6) road design measures to minimise noise emissions where relevant and appropriate, including low noise road surfaces and selection of appropriate bridge expansion joints; (7) post-construction noise monitoring to demonstrate that noise management actions meet the relevant outdoor noise management targets; and (8) contingency actions in the event relevant noise management targets are not met.	Prepare Traffic Noise Management (TNM) Plan.	Annual CAR TNM Plan	Construction	At least 6 months prior to the operation of the proposal	NR	Construction is not complete and will not be completed within 6 months.
1191:M7.3	Social Surroundings (Noise)	The Traffic Noise Management Plan shall be approved by notice in writing from the CEO prior to the commencement of operation.	Submission of TNM Plan.	Correspondence confirming approval of TNM Plan Annual CAR TNM Plan	Construction	Prior to the commencement of operation	NR	

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M7.4	Social Surroundings (Noise)	The proponent: (1) may review and revise the Traffic Noise Management Plan; or (2) shall review and revise the Traffic Noise Management Plan when directed by the CEO by notice in writing.	TNM Plan will be reviewed annually and revised if required or as directed by the CEO.	Annual CAR TNM Plan	Overall	As required or when directed by the CEO	NR	
1191:M7.5	Social Surroundings (Noise)	The proponent shall implement the approved Traffic Noise Management Plan, or the most recent version, which the CEO has confirmed by notice in writing satisfies the requirements of condition 7-2.	Implement TNM Plan.	Annual CAR TNM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objective in condition 7-1 is being and will continue to be met	NR	
1191:M7.6	Social Surroundings (Noise)	The proponent shall continue to implement the Traffic Noise Management Plan, or any subsequently approved revisions until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objective in condition 7-1 is being and will continue to be met.	Implement Traffic Noise Management Plan.	Annual CAR TNM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objective in condition 7-1 is being and will continue to be met	NR	
1191:M7.7	Social Surroundings (Noise)	In the event of failure to implement management actions detailed in the approved Traffic Noise Management Plan, the proponent shall meet the requirements of condition 12-6 (Compliance Reporting) and shall immediately implement management actions to meet the requirements of condition 7-1.	Traffic Noise Corrective Actions Report. Revised Traffic Noise Management Plan.	Annual CAR Traffic Noise Corrective Actions Report	Overall	Immediately implement management actions	NR	
1191:M8.1	Social Surroundings (Amenity Management Plan)	The proponent shall demonstrate that the proposal is designed and constructed in order to meet the following environmental objective: (1) minimise the impacts to social connectivity and visual amenity.	Implement Amenity Management (AM) Plan in accordance with Condition M8-	AM Plan	Overall	Ongoing	NR	
1191:M8.2	Social Surroundings (Amenity Management Plan)	The proponent shall demonstrate that the proposal is implemented to meet the following environmental outcome: (1) ensure no project attributable direct or indirect impacts to significant trees.	Implement Amenity Management (AM) Plan in accordance with Condition M8- Conduct surveys and monitoring of significant tree	Annual CAR AM Plan Significant Tree Survey Reports	Overall	Ongoing	C	No significant trees have been impacted. Refer to Appendix H, M3-4 Environmental Performance Report – Flora and Vegetation (PEC)
1191:M8.3	Social Surroundings (Amenity Management Plan)	The proponent shall prepare an Amenity Management Plan and submit to the CEO within twelve (12) months of the issue of the statement. The Plan shall include, but not be limited to: (1) outcomes of consultation undertaken with the local community and relevant stakeholders regarding: (a) the specifications and locations of amenity infrastructure such as screen-walls, noise-walls, vegetative screening, landscaping, revegetation, pedestrian overpasses/underpasses, walking trails, foot/cycle paths, and any other relevant infrastructure; (2) a map of the amenity infrastructure to be constructed/installed; (3) the roles and responsibilities for on-going maintenance of the amenity infrastructure; and (4) information to demonstrate how the objective in condition 8-1 and outcome in condition 8-2 will be achieved by the Amenity Management Plan.	Prepare AM Plan.	AM Plan Annual CAR	Overall	By 31 May 2023	CLD	The Bunbury Outer Ring Road (Southern Section) Amenity Management Plan (Main Roads WA Reference: D23#500728) was submitted to the CEO on 30 May 2023.
1191:M8.4	Social Surroundings (Amenity Management Plan)	After submitting the Amenity Management Plan and receiving approval by notice in writing from the CEO the proponent shall implement the Amenity Management Plan.	Implement AM Plan.	Annual CAR Correspondence with CEO	Overall	After receiving approval by the CEO	NR	

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M8.5	Social Surroundings (Amenity Management Plan)	Following construction, the proponent shall prepare and submit a report to demonstrate that the requirements of the Amenity Management Plan have been implemented and the objective of condition 8-1 and outcome of condition 8-2 has been achieved.	Prepare and submit a report on AM Plan implementation.	Report (Condition M8-5) Correspondence with CEO	Operation	Following construction	NR	
1191:M9.1	Offsets	The proponent shall implement offset measures to counterbalance the significant residual impacts to the following environmental values: (1) 60.9 ha of habitat for western ringtail possum; (2) 60.9 ha of black cockatoo foraging and breeding habitat; (3) 39.2 ha of habitat for south-western brush-tailed phascogale; (4) 23.4 ha of Banksia Woodlands of the Swan Coastal Plain PEC (Banksia Woodlands); (5) 4.4 ha of Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and (6) 4.5 ha of Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.	Implement Conditions M9-2 to M9-14.	Annual CAR	Overall	Ongoing	NR	The Offset Management Plan (Rev C, Nov 2022) was submitted to DWER for approval on 23 Dec 2022.
1191:M9.2	Offsets	To meet the requirement of condition 9-1 the proponent shall undertake offset measures to the extents and at the locations as set out and described in Table 1.	Implement offset measures in accordance with Table 1 and the BORR Southern Section Offset Management (OM) Plan.	Annual CAR	Overall	Ongoing	NR	
1191:M9.3	Offsets	Within twelve months of the commencement of ground-disturbing activities, the proponent shall revise the existing Bunbury Outer Ring Road (BORR) Southern Section Offset Management Plan to the requirements of the CEO, and to meet the following objectives: (1) counterbalance the significant residual impacts listed in condition 9-1; (2) improve connectivity of western ringtail possum habitats; (3) ensure a net-gain in western ringtail possum populations in secure conservation tenure within fifteen (15) years from the commencement of construction; and (4) demonstrate a strategic conservation benefit for the western ringtail possum species.	Revise OM Plan and submit to CEO.	OM Plan Annual CAR	Overall	Within twelve months of the commencement of ground-disturbing activities	C	The Offset Management Plan (Rev C, Nov 2022) was submitted to DWER for approval on 23 Dec 2022.
1191:M9.4	Offsets	The BORR Southern Section Offset Management Plan shall: (1) demonstrate that the objectives in condition 9-3 will be met; (2) describe how the offset measures will be implemented consistent with condition 9-2; (3) be prepared in consultation with DBCA, the Shire of Capel and the Shire of Dardanup; (4) consistent with condition 9-2, spatially identify the areas (Proposed Offset Conservation Areas) of: (a) acquired lands offset areas to receive on-ground management and/or revegetation offset measures; (b) DBCA lands to receive on-ground management and revegetation offset measures. (5) demonstrate how the environmental values within the Proposed Offset Conservation Areas will be maintained and improved in order to counterbalance the significant residual impact to the environmental values in condition 9-1 through application of the principles of the WA Environmental Offsets Policy and completion of the WA Offsets Template, as	Prepare OM Plan.	OM Plan Annual CAR	Overall	Within twelve months of the commencement of ground-disturbing activities	NR	The Offset Management Plan (Rev C, Nov 2022) was submitted to DWER for approval on 23 Dec 2022, however, has not yet been approved.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		described in the WA Environmental Offsets Guidelines, and the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy Assessment Guide, or any subsequent revisions of these documents; (6) for the land acquisition offsets identified in condition 9-2: (a) demonstrate that the Proposed Offset Conservation Areas contain the minimum extents of the environmental values identified in condition 9-2; (b) identify how the Proposed Offset Conservation Areas will be protected, being either the sites are ceded to the Crown for the purpose of management for conservation, or the sites are managed under other suitable mechanism for the purpose of conservation as agreed by the CEO by notice in writing; (c) specify the quantum of works associated with establishing the Proposed Offset Conservation Areas, including a contribution for maintaining the offset for at least twenty (20) years after completion of purchase or approval of the offset management plan where relevant; and (d) identify the relevant management body for the on-going management of the Proposed Offset Conservation Areas, including its role, and the role of the proponent, and confirmation in writing that the relevant management body accepts responsibility for its role. (7) For revegetation and/or on-ground management offsets identified in condition 9-2: (a) state the completion criteria for revegetation and/or on-ground management for each offset site, which will demonstrate attainment of the 'future quality with offset' score in Schedule 3. For revegetation offsets relating to western ringtail possum environmental values, this shall include, but not be limited to: (i) western ringtail possum target densities; (ii) completion criteria to measure (at a minimum) ringtail possum abundance/distribution, habitat structure and vegetation condition; and (iii) adaptive management to inform successful habitat revegetation for western ringtail possum. (b) demonstrate the consistency of the targets with the objectives of any relevant guidance, including but not limited to, recovery plans or area management plans; (c) detail the on-ground management actions, with associated timeframes for implementation and completion, to achieve the targets identified in condition 9-4(7)(a); and (d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions identified under conditions 9-4(7)(a) and 9-4(7)(c). (8) for the predator control program within the Ludlow Tuart State Forest/Tuart Forest National Park (consistent with the proponent's Offset Strategy Revision 3 August 2021):						

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(a) state the targets to be achieved by the predator control program which will result in a tangible improvement to the environmental values being offset; (b) demonstrate the consistency of the targets with the objectives of any relevant guidance, including but not limited to, recovery plans or area management plans; (c) detail the on-ground management actions, with associated timeframes for implementation and completion to achieve the targets identified in condition 9-4(8)(a), and how the implementation of the predator control program will facilitate the achievement of the objectives in conditions 9-3(3) and 9-3(4); and (d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions, including but not limited to, a review of the program's effectiveness to demonstrate that the objective of conditions 9-3(3) and 9-3(4) will be met. (9) (9) for the establishment of a Wildlife Carer's Peppermint Orchard: (a) identify the location of the Wildlife Carer's Peppermint Orchard and state the completion criteria for this offset measure in accordance with DBCA requirements; and (b) detail the monitoring, reporting and evaluation mechanisms to demonstrate the completion criteria identified under condition 9-4(9)(a) will be met.						
1191:M9.5	Offsets	The proponent: (1) may review and revise the BORR Southern Section Offset Management Plan; or (2) shall review and revise the BORR Southern Section Offset Management Plan as and when directed by the CEO by a notice in writing.	OM Plan will be reviewed annually and revised if required or as directed by the CEO.	Revised OM Plan Annual CAR	Overall	As required or when directed by the CEO	NR	
1191:M9.6	Offsets	The CEO shall confirm in writing that the BORR Southern Section Offset Management Plan satisfies the requirements of conditions 9-3 and 9-4[1].	Develop and submit OM Plan.	Correspondence from CEO	Pre-construction	Within twelve months of the commencement of ground-disturbing activities	NR	Response from DWER regarding Offset Management Plan approval is pending following submission on 23 December 2022.
1191:M9.7	Offsets	The proponent shall implement the latest revision of the BORR Southern Section Offset Management Plan approved by the CEO.	Implement latest version of OM Plan.	Annual CAR OM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met.	NR	
1191:M9.8	Offsets	The proponent shall continue to implement the BORR Southern Section Offset Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objectives in condition 9-3 are being met.	Implement OM Plan.	Annual CAR Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met	NR	
1191:M9.9	Offsets	When a notification to the CEO occurs in accordance with condition 12-5, the proponent shall provide a report to the CEO within sixty (60) days if the actions, objectives, or targets in the BORR Southern Section Offset Management Plan are unable to be met, and provide details and timing of	Prepare and submit a report to CEO.	Report (Condition M9-9) Correspondence from CEO	Overall	Within 60 days if the actions, objectives, or targets in the BORR Southern Section Offset	NR	

[1] This condition has been amended as part of the s45C signed 22 June 2022.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		contingency actions to be undertaken, to the satisfaction of the CEO.				Management Plan are unable to be met		
1191:M9.10	Offsets	The proponent shall report to the CEO on the outcomes of the contingency actions as required by condition 9-9 within sixty (60) days of completion.	Prepare and submit a report to CEO.	Report (Condition M9-10)	Overall	Within 60 days of completion of the contingency actions	NR	
1191:M9.11	Offsets	The proponent shall continue to implement contingency actions as required by condition 9-9 until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objectives in condition 9-3 are being met.	Implement contingency actions required under Condition M9-9.	Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met	NR	
1191:M9.12	Offsets	If, after receiving the Environmental Performance Report required by condition 6-5 the CEO determines that the proposal has not met the environmental outcome in condition 6-2 and has resulted in an additional significant residual impact to western ringtail possum, and after notifying the proponent in writing, the proponent must undertake an additional offset to counterbalance the significant residual impact from the additional impact to western ringtail possum in habitats adjoining the development envelope.	Implement additional offsets and revise OM Plan.	Correspondence with CEO OM Plan Annual CAR	Overall	Upon the request of the CEO	NR	
1191:M9.13	Offsets	Within twelve (12) months of receiving notice in writing from the CEO that an additional offset is required under condition 9-12, the proponent shall update the BORR Southern Section Offset Management Plan required by condition 9- 3 to include additional offsets to counterbalance the significant residual impacts to western ringtail possums.	Update OM Plan to include additional offsets requirements and submit to CEO.	Updated OM Plan Annual CAR Correspondence from CEO	Overall	Within 12 months of receiving notice from the CEO that an additional offset is required under condition 9-12	NR	
1191:M9.14	Offsets	The proponent shall implement the latest version of the BORR Southern Section Offset Management Plan, which the CEO has confirmed in writing satisfies the requirements of condition 9-4.	Implement latest version of OM Plan.	OM Plan Annual CAR Correspondence from CEO	Overall	As required when OM Plan is updated	NR	
1191:M10.1	Contact Details	The proponent shall notify the CEO of any change of its name, physical address, or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.	Submit written notification to the CEO of changes to contact details.	Written notification to CEO	Overall	Within 28 days of a change of name, physical address, or postal address.	NR	No changes occurred within this reporting period.
1191:M11.1	Time Limit for Proposal Implementation	The proponent shall not commence implementation of the proposal after five (5) years from the date of this Statement, and any commencement, prior to this date, must be substantial.	Implement the proposal and Condition M11-2.	Written notification to CEO	Overall	By 31 May 2027	CLD	This CAR is also considered to be written confirmation that the proponent has substantially commenced construction.
1191:M11.2	Time Limit for Proposal Implementation	Any commencement of implementation of the proposal, on or before five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.	Submit written notification to the CEO.	Written notification to CEO	Overall	By 31 May 2027	CLD	This CAR is also considered to be written confirmation that the proponent has substantially commenced construction.
1191:M12.1	Compliance Reporting	The proponent shall prepare and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 12-6, or prior to implementation of the proposal, whichever is sooner.	Prepare a Compliance Assessment Plan and submit to the CEO for approval.	Compliance Assessment Plan (CAP) CEO approval of CAP	Overall	By 28 February 2023 or prior to implementation	CLD	The Compliance Assessment Plan (CAP) was submitted to the CEO on 20 July 2022. A copy of the CAP is available on the Main Roads website.
1191:M12.2	Compliance Reporting	The Compliance Assessment Plan shall indicate: (1) the frequency of compliance reporting; (2) the approach and timing of compliance assessments; (3) the retention of compliance assessments; (4) the method of reporting of potential non-compliances and corrective actions taken;	Prepare and submit to the CEO a CAP addressing all requirements.	CAP CEO approval of CAP	Overall	By 28 February 2023 or prior to implementation	CLD	Refer to the CAP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(5) the table of contents of Compliance Assessment Reports; and (6) public availability of Compliance Assessment Reports.						
1191:M12.3	Compliance Reporting	After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 12-2 the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 12-1.	Undertake compliance assessments in accordance with the approved CAP.	Annual CAR	Overall	Ongoing	C	The CAP was approved by the CEO on 21 July 2022. SWGA Ref: SWGA-00-134-20-MPL-0004 DWER Ref: WERVT10374
1191:M12.4	Compliance Reporting	The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 12-1 and shall make those reports available when requested by the CEO.	Prepare and retain annual compliance assessment reports in accordance with the approved CAP. Make CARs available to CEO on request.	Annual CAR	Overall	Ongoing	C	This CAR. Annual compliance assessment reports developed in accordance with the CAP will be available on the Main Roads website.
1191:M12.5	Compliance Reporting	The proponent shall advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.	Written correspondence to CEO within 7 days of any potential non-compliance.	Annual CAR Correspondence to CEO advising of potential non-compliances.	Overall	Within 7 days of that non-compliance being known	C	No non-compliances have been known to have occurred during the reporting period.
1191:M12.6	Compliance Reporting	The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall: (1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf; (2) include a statement as to whether the proponent has complied with the conditions; (3) identify all potential non-compliances and describe corrective and preventative actions taken; (4) be made publicly available in accordance with the approved Compliance Assessment Plan; and (5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.	Submit Annual CAR.	Annual CAR Transmittal documentation of CAR.	Overall	By 31 August 2023 and annually thereafter	C	This is the first Compliance Assessment Report for MS1191.
1191:M13.1	Public Availability of Data	Subject to condition 13-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal, the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)), management plans and reports relevant to the assessment of this proposal and implementation of this Statement.	Publish on Main Roads Western Australia website or provide reports as directed by the CEO.	Transmittal documentation of request for data Website link	Overall	Ongoing	C	This CAR will be published on the Main Roads Western Australia website within 14 days of the report being submitted to the CEO. Other approved management plans and/or reports are available on the Main Roads website.
1191:M13.2	Public Availability of Data	If any data referred to in condition 13-1 contains particulars of: (1) a secret formula or process; or (2) confidential commercially sensitive information; the proponent may submit a request for approval from the CEO to not make these data publicly available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publicly available.	Provide the CEO with an explanation and reasons why data should not be made publicly available.	Correspondence with CEO, request for confidentially, if applicable	Overall	Ongoing	NA	

Appendix C

MS 1191 Construction Fauna Management Plan Audit Table

Audit Table for *Construction Fauna Management Plan* (CFMP) - Requirements to be implemented in accordance with Condition 5 of Ministerial Statement 1191.

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
WRP and BTP Management Actions and Performance Targets **Pre construction** Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Prior to clearing, the final road design shall be assessed against the proposed clearing area to ensure the required clearing area is no more than the approved area.	Avoid direct impacts to WRP and BTP individuals Minimise indirect impacts on adjacent receival habitat Preclude use of refuge sites within the Development Envelope prior to construction Reduce predator population within the Development Envelope and adjacent habitat	The road design is within the specified clearing limits for the Proposal. Refer this CAR, Table 2 and Figures 2-5.	Compliant
		• At least six (6) weeks prior to clearing, install artificial dreys, artificial watering points and protective natural structures (such as felled trees) in receival sites outside the development envelope, exclusion areas and other areas where appropriate (refer to Section 1.4.1.1.3). • At least six (6) weeks prior to clearing, install arboreal ropes where practical to provide connections from habitat inside the development envelope to receival sites outside the development envelope to minimise the need for WRP to go to ground (refer to Section 1.4.1.1.3).		In consultation with WRP expert Barbara Jones, and Biota Environmental Sciences, SWGA have installed: • artificial dreys and watering points a minimum of six weeks prior the commencement of Category 1 clearing stages during the reporting period. • arboreal ropes where appropriate to provide connections from habitat inside the development envelope to receival sites outside the development envelope. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) survey for WRP and BTP shall be undertaken to confirm presence / absence and number individuals within the development envelope and at receival sites (refer to Section 2.3.2).		Fauna surveys for WRP and BTP have been conducted within the 30 day period prior to clearing activities commencing within clearing stages during the reporting period. Refer to M5-5 Terrestrial Fauna Surveys Refer to Appendix J: M5.3 Environmental Performance Report - CFMP.	Compliant
		• Deploy soft-jaw traps within the Development Envelope during the 30-day period prior to the clearing based on field observations (refer to Section 1.4.1.1.2).		Experienced specialists consultants have been engaged to undertake predator control within and adjoining the Development Envelope. This includes the deployment of soft-jaw traps during the 30-day period prior to clearing. Refer to M6-8 Predator Control Progressive Report.	Compliant
		• Vacant dreys suitable for WRP or BTP shall be removed, and hollows blocked prior to clearing were deemed appropriate and safe.		All clearing of native vegetation has involved specialist fauna consultants with specific experience in relation to WRP / BTP. A component of their daily activities on site is inspection of hollows and the removal of vacant dreys prior to clearing. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Prior to clearing, control of WONS, declared plants and aggressive environmental weeds recognised as threats to WRP habitat will be undertaken within the Development Envelope.		SWGA have engaged suitably qualified contractors to undertake weed control throughout the Proposal area. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• All WRP and BTP habitat that is to be retained within the Development Envelope shall be delineated prior to site works to ensure it is conserved.		All WRP and BTP habitat that is to be retained is pegged and flagged accordingly to ensure it is conserved. SWGA has a detailed ground disturbance and clearing protocol outlined in the *SWGA Construction Environmental Management Plan* and reflected in the *SWGA Ground Disturbance and Clearing Permit.* Refer to M0 SWGA Construction Environmental Management Plan. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing of vegetation shall be confined to daylight hours. • Movement / disturbance of recently cleared vegetation (within 24 hours and prior to downsize / chipping) shall be confined to daylight hours.		SWGA commence clearing one hour after sunrise and complete clearing one hour before sunset as per the Geoscience Australia astronomical definitions. All movement / disturbance of cleared vegetation is checked by fauna spotters and confined to daylight hours (as per the requirements above). Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Cleared vegetation shall be chipped immediately (i.e., not stockpiled) or transported at least 100 m from WRP and BTP habitat before further processing.		The clearing process implemented across the Proposal includes the down-sizing and mulching (chipping) of cleared vegetation on the same day that it is cleared. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• All buildings requiring demolition for the Proposal shall be inspected for WRP and BTP twice a day for two days prior to demolition works. • Where WRP or BTP are observed, or suspected, to be in any building to be demolished attempts shall be made to capture the animal prior to the demolition works commencing. • A licensed fauna-spotter shall be on-site at all times during the demolition of buildings suspected or observed to house WRP or BTP. • Machinery operators shall maintain radio communication with their spotter. • Any pest animal baits used in buildings to be demolished shall be in bait stations and disposed of prior to demolition.		All demolition activities have included the pre-demolition inspections and risk assessment, conducted by specialist fauna consultants. No WRP or BTP have been recorded prior to or during demolition activities. All pest animal baiting has involved the use of appropriate bait stations. Refer to M0 Independent Daily Inspection Reports.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
During clearing Section 2.1 Table 2.1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	**Sensitive Clearing Protocols** • Patches of WRP habitat to be cleared will be delineated prior to clearing.	Avoid direct impacts to WRP and BTP. Minimise indirect impacts on adjacent receival habitat. Avoid indirect impacts to WRP in adjacent habitat. Restore and maintain connectivity between known WRP and BTP habitat areas. Reduce predator population within the Development Envelope and adjacent habitat.	SWGA has a detailed ground disturbance and clearing protocol outlined in the *SWGA Construction Environmental Management Plan* and reflected in the *SWGA Ground Disturbance and Clearing Permit.* This includes demarcation of clearing and exclusion areas prior to clearing utilising licenced surveyors. Prior to clearing, the clearing areas are subject to walk-through inspections involving representatives from all major relevant disciplines (environment, engineering, construction, survey, machine operators, fauna spotters, Aboriginal heritage monitors, independent quality certifiers, client). Refer to M0 SWGA Construction Environmental Management Plan. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing timeframes for Category 1, 2 and 3 Habitat Clearing Categories (Table 1-5) shall be followed.		All clearing works are completed within the clearing timeframes defined in the CFMP. Category 1 clearing is undertaken between the period of March 1st and August 30th. During the reporting period, the category 1 clearing dates are listed below. 2022: August 2nd - August 26th 2023: April 3rd – May 31st (end of reporting period).	Compliant
		• Spotlighting of potential WRP and BTP habitat shall be undertaken by a suitably experienced person for two nights within the seven (7) days prior to clearing. Trees containing WRP will be tagged and checked during pre-clearing fauna searches.		Suitably experienced persons have been engaged to undertake the pre-clearing, clearing and post clearing assessments. All engaged consultants are recognised zoologists or ecologists with prior experience in assessment and management of WRP / BTP during construction activities. Lead personnel have over 20 years' experience in this regard. All clearing of native vegetation including potential WRP and BTP habitat has included pre-clearing nocturnal surveys for 2 nights within 7 days prior to clearing utilising specialised fauna consultants with specific experience in relation to WRP / BTP surveys. Trees with the potential to contain WRP / BTP are tagged and checked during pre-clearing fauna searches. Refer to M5-5 Terrestrial Fauna Surveys. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Pre-clearing fauna searches shall be conducted immediately prior to (i.e., on the day of) and during clearing operations and will include hollows, dreys, ground debris, dense ground-level vegetation, fallen timber and logs.		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. Pre-clearing fauna searches have been conducted immediately prior to and during clearing operations. Vacant dreys / vacant tree hollows suitable for WPR or BTP, have been removed prior to clearing where appropriate. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing shall be conducted congruent with the habitat clearing categories as detailed in Table 1-5 and shown in Figure 2. • Habitat clearing is to be staged, commencing from existing cleared edges / roads, and progressing towards habitat that will be retained to direct WRP and BTP towards these areas as per the proposed clearing staging (Figure 2).		Clearing has been congruent with the habitat clearing categories and staging. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Where western ringtail possums (WRP) are observed during clearing operations, the tree containing the animal shall be left for up to two consecutive nights to allow for the animal to vacate or move into an artificial drey (installed within or near trees known to contain possums prior to clearing), while clearing continues in adjacent vegetation. If the tree continues to be occupied after two consecutive nights, the animal will be safely coerced / relocated to a safe area outside of the clearing footprint by the authorised fauna spotter(s). Where possums have been identified as likely to occur (i.e., observed hollow), trees shall be 'bumped gently" with a machine prior to felling. The machinery operator and fauna spotter(s) will wait and observe the tree for a period of time to allow fauna to move off on its own accord into the surrounding vegetation. If the animal remains in the tree, the tree shall be felled slowly and controlled onto vegetation, as directed by the fauna spotter(s). The 'soft felling' of habitat trees will provide a 'cushion' for the vegetation being felled, minimising the risk of injury to the animal and allow any WRP the opportunity to safely vacate.		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. When observed during clearing operations, trees containing WRP or BTP have been left for up to two consecutive nights at the discretion of specialist fauna spotters. Trees observed to support WRP after two consecutive nights have been treated in accordance with the sensitive clearing protocols, and on advice by specialised fauna spotters with specific experience in relation to management of WRP. Refer also to M0 Independent Daily Inspection Reports.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
		• Artificial dreys may be installed within or near trees known to contain WRP prior to clearing, as WRP appear to preferentially move into artificial dreys. Entrances of inhabited dreys will be safely blocked, and both the drey and WRP will be securely relocated into nearby receival site habitat, as has been successfully implemented in other local clearing projects (Dr. Mike Bamford, pers. comm.). Alternatively, where practical, the hollow may be cut from the tree with the WRP in situ, and relocated to nearby receival habitat, as has been successfully implemented in other local clearing projects (Dr. Mike Bamford, pers. comm.). • In situations where connections to adjacent receiving habitat have been reduced by ongoing clearing or potentially cause stress or take of the animal, a licensed fauna spotter may coerce / move the animal to a safe area outside of the clearing footprint. Where practical, WRP will be encouraged to move along the branches of one tree to the next, into receival site habitat. Experience shows that WRP will also step onto a net and allow themselves to be carried on the net to trees in receival habitat (Dr. Mike Bamford, pers. comm.).		All clearing of native vegetation has involved monitoring by specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. Hollows containing WRP or BTP have been safely removed from relevant trees and relocated to adjacent receival habitat if appropriate for the circumstances. Fauna spotters present on site during clearing have coerced or relocated WRPs, where practicable, to adjacent habitat outside the clearing boundary where appropriate (in accordance with authorisations issues under the *Biodiversity Conservation Act 2016*). Refer also to M0 Independent Daily Inspection Reports.	Compliant
		• Felled trees with hollows shall be checked immediately for fauna after felling (by fauna spotter) and prior to further processing. If it is not possible to fully inspect the hollow, the tree will be left on the ground overnight to allow time for any undetected fauna to vacate. • Vacant dreys within felled trees will be destroyed immediately to prevent animals re-entering them.		All clearing of native vegetation has involved monitoring by specialised fauna consultants with specific experience in relation to WRP/BTP being present on site during the clearing activities. A component of their daily activities on site is an inspection of trees and vegetation immediately on felling to inspect for fauna. Where it was not possible to fully inspect the trees, hollows, or vegetation, these were left as a minimum overnight to allow time for any undetected fauna to vacate. Vacant dreys within felled trees are immediately dismantled to prevent animals re-entering them. Refer also to M0 Independent Daily Inspection Reports.	Compliant
		• A post-clearing survey shall be undertaken (by fauna spotter) immediately following each day's clearing operations and the following morning to identify the presence of any injured animals.		All clearing of native vegetation has involved specialised fauna spotters with specific experience in relation to WRP/BTP being present on site during the clearing activities. A component of their daily activities on site is a post-clearing inspection to review cleared areas, and to identify any potential injured animals. Refer also to M0 Independent Daily Inspection Reports.	Compliant
		Terrestrial Fauna Handling • Fauna handling shall only be conducted by licensed fauna spotters.		SWGA have engaged highly experienced and licensed biologists to undertake the pre-clearing, clearing and post clearing assessments. All engaged sub-consultants are recognised zoologists or ecologists with prior experience in assessment and management of WRP during construction activities (SW Environmental personnel each have around 20 years' experience in this regard). Refer also to CAR Audit Table M4-3(1) Fauna spotter accreditation	Compliant
		• Any WRP and BTP showing signs of injury or illness shall be caught, bagged, and taken to an experienced wildlife veterinarian. • If an injured WRP or BTP has not already been captured, then the appointed fauna-spotter must attempt to capture the animal for the purposes of veterinary assessment and treatment. • All treatment of injured fauna shall be undertaken by a veterinarian.		SWGA has access to a number of experienced wildlife veterinarians and wildlife carers should they be required.	Compliant
		• Where clearing operations abut existing roads, in addition to standard traffic management measures, visual message boards shall be installed to warn drivers of the potential for fauna to cross the road during clearing operations.		Vehicle Message Boards have been installed where clearing works abut existing roads to notify drivers of the potential for fauna to cross the road, for clearing works abutting roads. Refer also to M0 Independent Daily Inspection Reports.	Compliant
During construction Section 2.1 Table 2.1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Road construction activities (i.e., activities undertaken after clearing has been completed) adjacent to WRP habitat will only be undertaken during daylight hours where practicable.	Avoid direct impacts to WRP and BTP. Minimise indirect impacts on adjacent receival habitat. Avoid indirect impacts to WRP in adjacent habitat. Restore and maintain connectivity between known WRP and BTP habitat areas.	Normal construction hours are 7am – 5pm, Monday to Friday (excluding Public Holidays). Out of hours work is restricted and regulated. It should be noted that clearing works commence at least one hour after sunrise and are completed at least one hour before sunset as per the Geoscience Australia astronomical definitions.	Compliant
		• Post-clearing, possum exclusion fencing (temporary and permanent) shall be installed adjacent at known habitat areas to exclude WRP and BTP moving onto the road (Figure 6). The fencing will be 1.5 m high and be constructed to prevent possums being able to climb over or dig under it. Possum exclusion fencing shall take account of and complement noise and screen walls in excluding fauna from moving onto the road.		The Proposal design reports and drawings include the requirements for installation of fauna fencing in accordance with CFMP, with installation ongoing within the Proposal area.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
		• Deploy soft-jaw traps bi-monthly within the Development Envelope during construction based on the outcomes of site assessments.	Reduce predator population within the Development Envelope and adjacent habitat.	Experienced specialists consultants have been engaged to undertake predator control within and adjoining the Development Envelope. Refer to M6-8 Predator Control Progressive Report.	Compliant

		Loss of ecological connectivity
		• Construct two fauna bridges at Yalinda Drive and 350 meters to the east, at least 5 meters in width.
		• Install permanent possum rope bridges / underpasses at key location(s) to enable fauna including WRP to move between retained habitat areas, see Figure 6.
		• Install tree-canopy connections to all crossing structures.
		• The size and design of all movement devices will be based on MRWA Design of Fauna Underpasses (MRWA, 2010), topography at the site, expert advice (Barbara Jones, pers. comm.), information from relevant studies and reports (QDMR, 2000; Harper, M., Mccarthy, M. & van der Ree, R., 2008) and in line with the concept designs
		• Underpass dimensions will be based on the fauna recorded or expected to occur in the vicinity.
		• The final underpass designs will incorporate the following features known to encourage use by fauna and reduce the risk of predation:
		  • Connection to nearby habitat via overhead rope hawsers and poles (minimum 2.5 m high) (Plate 1);
		  • Objects for fauna to shelter on, under or in (furniture) will be locally sourced and will include sand, mulch, logs, and rocks;
		  • Revegetation using fast growing species at underpass entrances to provide cover for animals approaching, entering, and leaving the underpasses;
		  • Natural flooring such as sand or gravel;
		  • Possum fencing to direct fauna towards the underpass entrance;
		  • Dual-use underpasses will have a concrete substrate and will not contain furniture (furniture would be washed away by drainage flows); and
		• The Proposal Area boundary will be fenced according to the detailed design to restrict pedestrian and vehicular access to retained WRP habitat.
				The Proposal is in the construction phase. Fauna crossing structures have not been constructed during the reporting period, but will be constructed as per the Proposal design reports and drawings.	Not required at this stage

Post construction		• Deploy soft-jaw traps bi-annually at fauna crossing structure access and egress points (once in each of the spring and autumn seasons) for five years post-construction based on the outcomes of site assessments.	Minimise predation at crossing structures.	Not required at this stage.	Not required at this stage
SMART Performance Standards for WRP and BTP Section 2.1.2. Table 2-2	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• No WRP injuries or mortalities as a consequence of construction activity. • No WRP or BTP injuries or mortalities as a consequence of construction activity.	Avoid direct impacts to WRP and BTP individuals. Preclude use of refuge sites within the Development Envelope prior to construction.	Despite the CFMP being implemented according to the management actions, an event occurred during construction activities on 22 August 2022 that resulted in the injury and subsequent mortality of a WRP. DWER and DCCEEW were notified on the same day of the incident and DBCA were consulted with in relation to the incident and subsequent investigation. Clearing operations were ceased immediately and only recommenced following consultation with DBCA. A number of corrective actions have been implemented since the event to mitigate recurrence, including the ongoing use of pole cameras to inspect deep hollows, requirement of fauna spotters to hold Working at Heights Permits (to allow better in situ inspection of elevated hollows) and the use of an articulating grab attachment on excavators to soft fell trees. Subsequent to the additional management measures being applied, no further construction related WRP mortalities have been recorded.	Compliant
		• Not more than 60.9 ha of WRP and 39.2 ha of BTP habitat cleared.	Minimise indirect impacts on adjacent receival habitat Reduce clearing of WRP and BTP habitat to the extent practicable in final design.	Refer this CAR (Table 2 and Figure 4) for clearing or WRP and BTP habitat during the reporting period. 24.39 ha of WRP habitat was cleared during the reporting period. This is less than the 60.9 ha permitted. 18.09 ha of BTP habitat was cleared during the reporting period. This is less than the 39.2 ha permitted.	Compliant
Post construction	• Western Ringtail Possum (WRP,	• WRP abundance trends at monitored receival sites commensurate with (i.e., not greater than 5 % different to) those at reference sites.	Minimise indirect impacts on WRP in adjacent receival habitat.	Not required at this stage.	Not required at this stage

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
Section 2.1.2. Table 2-2	*Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Quality / condition of WRP and BTP monitored receival sites adjacent to the Development Envelope is maintained at baseline or any change is commensurate with (i.e., not greater than 5% different to) that at reference site habitat. • WONS, Declared weeds and / or environmental weeds recognised as threats to WRP within the Development Envelope are below baseline survey levels.	Maintain condition rating in adjacent WRP and BTP receival habitat.	Not required at this stage.	Not required at this stage
		• Installation of engineered movement structures as per specification.	Restore and maintain connectivity between known WRP and BTP habitat areas.	Not required at this stage.	Not required at this stage
		• Monitor and implement predator management at crossings to ensure observation do not increase by 25%.	Minimise predation at crossing structures.	Not required at this stage.	Not required at this stage
WRP Monitoring Program Section 2.3.7. Table 2-3	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Injury or death of WRP recorded by Fauna spotters (with lawful authority) and reported to Manager Environment within 24 hours of incident occurring. • Main Roads to consult with DBCA of the WRP injury or mortality occurring.	Avoid direct impacts to WRP individuals.	An incident occurred on 22 August 2022 during construction activities that resulted in the injury and subsequent mortality of a WRP. DWER and DCCEEW were notified on the same day of the incident, and DBCA were consulted with in relation to the incident and subsequent investigation.	Compliant
		• Relocation of WRP recorded by Fauna spotters (with lawful authority) and reported to DBCA / DWER within thirty (30) days after clearing (for each clearing stage).		Records of whether threatened or priority fauna (WRP / BTP) are encountered during clearing, are reported to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage), including the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the *Biodiversity Conservation Act 2016*. Refer to M5-5 Fauna records during clearing.	Compliant
		• Area of WRP habitat cleared reported to Manager Environment monthly.	Reduce clearing of WRP habitat to the extent practicable in final design Minimise indirect impacts on adjacent receival habitat.	Area of WRP habitat cleared is reported to the Manager Environment daily during Category 1 clearing and reported monthly. This CAR details the total WRP habitat cleared during the reporting period (Table 2, Figure 4a).	Compliant

		• Report annually as part of Environmental Performance Report against performance measures and contribution of measures to achievement of the environmental objectives. The EPR or response summary will include:
		  • Bi-monthly surveys - WRP presence / absence, abundance, and distribution (within DE and at receival habitat and reference sites) monitored by a continuation and expansion of the bi-monthly strip sampling surveys that have been conducted within the Development Envelope, receival sites and reference sites since October 2019.
		  • WRP monitoring - telemetry study (including GPS collars), and mark-resight study.
		  • Habitat monitoring – WRP habitat (within the Development Envelope and at receival sites) monitored via assessment of 3D aerial imagery.
			Restore and maintain connectivity between known WRP habitat areas.
			Minimise indirect impacts on WRP in adjacent receival habitat.
			Maintain condition rating in adjacent WRP receival site habitat.
				This CAR.
				Refer to Appendix J: M5.3 Environmental Performance Report - CFMP.
					Compliant

Site Induction Training Program Section 2.4.3. Table 2-5		• Awareness of Main Roads Environmental Policy. • Identification of the environmental values in the Development Envelope. • Identification of key environmental risks associated with the Proposal, and the identification of management requirements to control such risks. • Roles and responsibilities of all personnel in the protection and management of the environment, including identification of key personnel that have specific roles or responsibilities. • Awareness of importance of compliance with the environmental requirements (including penalties for non-conformance with the environmental requirements). • Pegging of the area of works, and other pegging types (for example, trees to be retained). • Clearing of native vegetation and management of topsoil. • Hygiene procedures for Phytophthora Dieback management and weed management. • Appropriate disposal of wastes. • Environmental incidents, including the requirements for management and reporting. • The environmental benefits of improved personal performance.	Site induction training program.	All personnel on the Project are required to complete an online and face to face induction. The induction addresses the details listed. Refer to M0 SWGA Construction Environmental Management Plan.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
Environmental Audit Schedule **Pre construction** Section 3.1. Table 3-1		• Review of construction procedures to ensure CFMP management / monitoring actions are incorporated within works procedures.	Prior to construction.	A pre-commencement audit was completed in July 2022 (Preston Consulting), prior to the commencement of construction works associated with the Proposal.	Compliant
Environmental Audit Schedule **Construction** Section 3.1. Table 3-1		• Inspections by site environmental personnel during the clearing of Habitat Category 1 areas. • Inspections by site environmental personnel to identify compliance with CFMP. • Independent audit for assessment of compliance with CFMP.	Daily. Periodic (generally weekly). Once during construction.	Independent auditors are on site daily during clearing within Category 1 areas, including specific review of compliance against the CFMP. The reports from daily inspections are generally provided to DWER on a daily basis. Refer to M0 Independent Daily Inspection Reports. SWGA environmental personnel are on site daily during clearing of Category 1 areas. Daily inspections include identifying compliance with the CFMP. Between Jun-Aug 2023, an independent audit was completed on the implementation of the CFMP. No non-compliances were recorded.	Compliant
Environmental Audit Schedule **Post construction** Section 3.1. Table 3-1		• Independent audit for assessment of compliance with CFMP.	Once during 3 year post construction period.	Not required at this stage.	Not required at this stage
CFMP Review Schedule **Construction**		• CFMP will be reviewed and updated, as necessary with adaptive management measures following completion of year 1 clearing.	Prior to recommencing of Category 1 Habitat in 2023.	The completion of one year of clearing was not reached during the reporting period, however, the CFMP was reviewed prior to commencement of the Category 1 clearing phase for 2023. No updates were required.	Compliant
CFMP Review Schedule **Construction and Post Construction**		• Review of CFMP management and monitoring actions. • Review of opportunities for an improvement in environmental performance. • Revise CFMP (if appropriate) and seek DWER approval of revised CFMP.	Once every three years post construction for nine (9) years.	Not required at this stage.	Not required at this stage

Appendix D

MS 1191 Habitat Fragmentation Management Plan Audit Table

Audit Table for *Habitat Fragmentation Management Plan* (HFMP) - Requirements to be implemented in accordance with Condition 6 of Ministerial Statement 1191.

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
WRP Management Actions and Performance Targets **Prior to construction** Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Undertake pre-construction baseline 3D aerial surveys of habitat condition in Development Envelope, receival sites and reference sites to assess if pre-construction condition rating in adjacent WRP receival habitat is maintained post construction.	• Maintain pre-construction condition rating in adjacent WRP receival habitat (Section 2.6) through pre and post construction condition monitoring.	Aerial surveys of habitat condition within and adjacent to the Proposal area were completed in July 2022 (prior to construction) and February 2023. Refer to Appendix J: M5.3 Environmental Performance Report - CFMP.	Compliant
During construction Section 2.1 Table 2-1		• Construct two fauna bridges at Yalinda Drive and 350 meters to the east, both at least 5 meters in width.	• No significant reduction in adjacent receival habitat condition (CFMP and Section 2.6) due to indirect impacts associated with the Proposal detected through pre and post construction condition monitoring. • Restore connectivity between known WRP habitat areas (Section 2.3), through installing crossing structures and subsequent utilisation monitoring. • Ensure revegetation is planted to the design criteria specified in Section 2.3.2.1 and 2.3.2.2.	This is incorporated in the Proposal design, however, not yet constructed.	Not required at this stage
		• Install permanent possum rope bridges / underpasses at key location(s) (section 2.3) to enable WRP to move between retained habitat areas (Figure 3). Install tree-canopy connections to all crossing structures. The size and design of all movement devices will be based on MRWA Design of Fauna Underpasses (MRWA, 2010), topography at the site, expert advice (Barbara Jones, pers. comm.), information from relevant studies and reports (QDMR, 2000; Harper, M., Mccarthy, M. & van der Ree, R., 2008) and in line with the concept designs (Figure 5). Underpass dimensions will be based on the WRP fauna recorded or expected to occur in the vicinity (Figure 5 HFMP).		This is incorporated in the Proposal design, however, not yet constructed.	Not required at this stage

		• The final underpass designs will incorporate the following features known to encourage use by WRP and reduce the risk of WRP predation:
		  • Connection to nearby habitat via overhead rope hawsers and poles (minimum 2.5 m high)
		  • Objects for WRP to shelter on, under or in (furniture) will be locally sourced and will include sand, mulch, logs, and rocks
		  • Revegetation using fast growing species at underpass access and egress points to provide cover for WRP approaching, entering, and leaving the underpasses
		  • Natural flooring such as sand or gravel
		  • Possum fencing to direct fauna towards the underpass entrance
		  • Dual-use underpasses will have a concrete substrate and will not contain furniture (furniture would be washed away by drainage flows).
				This is incorporated in the Proposal design, however, not yet constructed.	Not required at this stage

		• Install possum fence adjacent to known habitat areas to limit WRP access to the Development Envelope, see Figure 3 (HFMP). • The possum fence will be 1.5 m high and constructed to prevent WRP being able to climb over or dig under it, see Figure 4 (HFMP).		The Proposal design reports and drawings include the requirements for installation of fauna fencing in accordance with the HFMP.	Compliant

		• Undertake targeted revegetation:
		  • at fauna crossing structure access and egress points (adjacent to the Development Envelope) to make utilisation of the structures attractive and effective for WRP
		  • on fauna land bridge decks
		  • in degraded portions of vegetation retention areas and clearing exclusion areas.
				No revegetation has been undertaken during the reporting period.
				Fauna crossing structures and land bridges are not yet constructed.
				Revegetation of fauna crossing structure access and egress points, and fauna bridges will occur following their construction.
					Not required at this stage

		• Deploy soft-jaw traps, or other appropriate approach or technique, within the Development Envelope during construction (refer to Section 2.4.2)	• Reduce predator population within the Development Envelope and adjacent habitat compared to baseline survey results	Specialist consultants have been engaged to undertake predator control within and adjoining the Proposal area. Soft-jaw traps are the primary approach to predator (fox) control. Implementation of the feral and invasive animal management occurs prior to, during, and post-clearing. Refer to M6-8 Predator Control Progressive Report.	Compliant
Post construction Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Install design features at WRP crossing structure locations (adjacent to the Development Envelope) to ensure access to water is maintained and to encourage utilisation of the structures. • Ongoing 3D aerial surveys of habitat condition in Development Envelope, receival sites and reference sites.	• Maintain connectivity between known WRP habitat areas (Section 2.3) through installing crossing structures and demonstrating WRP usage though structure utilisation monitoring.	The Proposal is in the construction phase. This management action will be implemented post-construction. Aerial surveys of habitat condition within and adjacent to the Proposal area have been completed in July 2022 (prior to construction) and February 2023 and are ongoing. Refer also to Appendix J, M5.3 Environmental Performance Report - CFMP.	Not required at this stage

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
		• Supplement revegetation at fauna crossing structure access and egress points (adjacent to the Development Envelope) where required to achieve completion criteria (Table 2-7).	• Revegetation to meet completion criteria specified in Table 2-7.	The Proposal is in the construction phase. This management action will be implemented post-construction. Fauna crossing structures are not yet constructed. No revegetation at fauna structures has been completed during the reporting period.	Not required at this stage
		• Deploy soft-jaw traps, or other appropriate approach or technique, bi-annually at fauna crossing structure access and egress points (once in each of the spring and autumn seasons) for the period of EPBC Act/EP Act approvals or as otherwise agreed by the Minister/CEO (refer to Section 2.4.2).	• Reduce predator population within the Development Envelope and adjacent habitat.	The Proposal is in the construction phase. Fauna crossing structures are not yet constructed. This management action relates to the post-construction phase.	Not required at this stage
		• Motion sensor IR cameras will be installed on fauna crossing structures to assist with determining crossing structure efficacy.	Cameras will be deployed for a minimum of four weeks annually for a minimum of fifteen (15) years postconstruction.	The Proposal is in the construction phase. Fauna crossing structures are not yet constructed. Motion sensor IR cameras will be implemented post-construction.	Not required at this stage
SMART Performance Standards for WRP Management Objectives Section 2.1.3 Table 2-3		• No reduction in receival site vegetation condition against pre-construction habitat survey results (Section 2.3.3.2), or any trends in condition change are consistent with changes to reference site habitat condition over the same period.	• Maintain or improve condition rating in adjacent WRP receival habitat.	Refer to Appendix J: M5.3 Environmental Performance Report - CFMP. Refer to Appendix H: M3-4 Environmental Performance Report – Flora and Vegetation.	Compliant
		• WRP abundance and persistence trends at receival sites returns to pre-disturbance levels within 15 years from commencement of the action.	• Minimise or avoid indirect impacts on WRP in adjacent receival habitat.	Specialist consultants have undertaken bi-monthly WRP surveys within and areas adjacent to the Proposal area since 2019 to identify trends in WRP abundance within and adjoining the Proposal area and at reference sites. Refer to Appendix J: M5-3 Environmental Performance Report – CFMP.	Compliant
		• Restore and maintain connectivity between known WRP habitat areas.	• Structures utilised within 5 years of construction	Connectivity will be maintained and restored through the installation of fauna bridges, crossings, and underpasses. The Proposal is in the construction phase. This management action will be implemented post-construction.	Not required at this stage
		• As detailed in Table 2-7 for the fauna land bridges and forecourt areas and fauna crossing structure access and egress points and Table 2-10 for vegetation retention and clearing exclusion areas.	Ensure revegetation meets design criteria. • Ensure revegetation achieves success criteria.	The Proposal is in the construction phase. No revegetation has yet occurred. This management action will be implemented upon the commencement of revegetation.	Not required at this stage
SMART Performance Standards for HFMP Outcomes Section 2.1.3 Table 2-4	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• WRP abundance at monitored receival sites return to pre-disturbance levels.	• Abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within fifteen (15) years from the commencement of construction.	Longer-term management requirement. Refer to Appendix J, M5-3 Environmental Performance Report - CFMP.	Not required at this stage
Land-bridge Revegetation Monitoring Section 2.3.2.3. Table 2-7	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Installation of logs and timber (furniture), minimum 2 per ha, to provide cover for ground fauna. • Weed cover within revegetation area less than 20 % by area. • No weed occurrence is to extend more than 50 % of the bridge deck width. • Bare ground cover within revegetation area no more than 10 % by area. • Plant density equivalent to at least 20 stems per 25 m2. • Native vegetation cover 80 % by area across all strata. • Evidence of juvenile native plant recruitment. • Native vegetation cover 80 % by area across all strata and • Evidence of juvenile native plant recruitment. • A minimum of 50 % of the range of species planted present.	Presence of fauna furniture. Weed cover by area based on quadrats. Bare ground cover by area based on quadrats. Plant density. Native vegetation cover by area based on quadrats. Natural recruitment of native species. Presence/absence of pests. Diversity of species present.	The Proposal is in the construction phase. Fauna crossing structures are not yet constructed. No revegetation at fauna structures has been completed during the reporting period.	Not required at this stage
WRP Habitat Fragmentation Monitoring Section 2.3.3. Table 2-8	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Habitat monitoring – WRP habitat (within the Development Envelope and at receival sites) monitored via assessment of 3D aerial imagery.	Maintain condition rating in adjacent WRP receival site habitat.	Refer to Appendix J: M5-3 Environmental Performance Report – CFMP. Refer to Appendix H, M3.4 Environmental Performance Report – Flora and Vegetation.	Compliant

		• WRP monitoring –
		  • Telemetry study (including GPS collars), and
		  • Mark-resight study.
			Minimise indirect impacts on WRP in adjacent receival habitat.	Refer to Appendix J: M5-3 Environmental Performance Report – CFMP.	Compliant

		• Genetic relatedness study – genetic analyses of the population and relational dynamics (degree of relatedness) of WRP within the Development Envelope and receival sites.	Abundance and persistence of the western ringtail possum in the receival sites returns to	Refer to Appendix J, M5-3 Environmental Performance Report – CFMP.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Status
		• Bi-monthly surveys - WRP presence / absence, abundance, and distribution (within DE and at receival habitat and reference sites) monitored by a continuation and expansion of the bi-monthly strip sampling surveys that have been conducted within the Development Envelope, receival sites and reference sites since October 2019.	pre-disturbance levels within fifteen (15) years from the commencement of construction.	Refer to Appendix J, M5-3 Environmental Performance Report – CFMP.	Compliant
		• Conduct visual assessment of constructed / in construction WRP movement structures to confirm these are as per detailed design and provision of as constructed plans. • Possum fencing intact and effective. Conduct inspections of fencing for damage and effective function. • WRP recorded or filmed using rope bridge or underpass. • WRP presence / absence (at structures).	Restore and maintain connectivity between known WRP habitat areas.	The Proposal is still in the construction phase. Fauna crossing structures are not yet constructed. These management action will be implemented post-construction.	Not required at this stage
		• Revegetation to design specification. • Revegetation success, see Section 2.6.3.	Ensure revegetation meets design criteria. Ensure revegetation achieves success criteria.	The Proposal is still in the construction phase. No revegetation has yet occurred. This management action will be implemented upon the commencement of revegetation.	Not required at this stage
WRP Predator Control Monitoring Aspects Section 2.4.3 Table 2-9	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Predator control efficacy, based on feral predator presence within the Development Envelope and receival sites. • Predator control implementation schedule and field records	Reduce predator population within the DE and adjacent habitat. Minimise predation at crossing structures.	Experienced specialist consultants have been engaged to undertake predator control within and adjoining the Development Envelope. Refer to M6-8 Predator Control Progressive Report.	Compliant
Reporting Requirements Section 2.7.1 Table 2-11	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Implementation of HFMP.	Annually (as part of annual compliance reporting).	The HFMP has been implemented during the reporting period. Refer to this CAR.	Compliant
		• Non-compliance with HFMP or Environmental incident.	Report - As soon as reasonably practicable but not more than seven business days after becoming aware of the incident or non-compliance (DWER).	No non compliances with the HFMP have been recorded during the reporting period. An incident occurred on 22 August 2022 during construction activities that resulted in the injury and subsequent mortality of a WRP. DWER and DCCEEW were notified on the same day of the incident.	Compliant
HFMP Review Construction and Post construction Section 3.3 Table 3-2	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Review of HFMP management and monitoring actions. • Review of opportunities for an improvement in environmental performance	Annually (Once during construction)	The HFMP is subject to ongoing review (with the most recent undertaken in February 2023). No updates have been required to date.	Compliant
		• Revise HFMP (if appropriate) and seek approval of EPA for revised HFMP	Once every three years post construction for at least nine (9) years*.	Not required at this stage.	Not required at this stage
HFMP Review Post construction Section 3.3 Table 3-2		• Peer review of EPR	Every five years post construction for 15 years	Not required at this stage.	Not required at this stage

Appendix E

Evidence (related to potential non-compliance/non-conformance only)

Not required.

Appendix F
Evidence Summary Table

Appendix F. Evidence Summary Table.

Cond.	Evidence Reference	Description
M1-1	Ground disturbance and clearing (Figures and shapefiles)	Figures and shapefiles in relation to ground disturbance and clearing during the reporting period (31 May 2022 to 31 May 2023) for specified environmental aspects / values.
M2-1 (2)	M2-2 Baseline Hydrological Regime Report M2-4 Environmental Performance Report	MS1191 M2-2 Baseline Hydrological Regime Report. MS1191 M2-4 Environmental Performance Report.
M2-2	M2-2 Baseline Hydrological Regime Report	MS1191 M2-2 Baseline Hydrological Regime Report.
M2-3, 2-4	M2-4 Environmental Performance Report	MS1191 M2-4 Environmental Performance Report.
M2-5	Attachment 2 to Statement 1191	MS1191 S45C(5) amendment to Condition 2-5.
M3-1 (2)	M3-2 Baseline PEC / TEC Report M3-4 Environmental Performance Report	MS1191 M3-2 Baseline PEC / TEC Report. MS1191 M3-4 Environmental Performance Report.
M3-2	M3-2 Baseline PEC / TEC Report	MS1191 M3-2 Baseline PEC / TEC Report.
M3-3, 3-4	M3-4 Environmental Performance Report	MS1191 M3-4 Environmental Performance Report
M3-5(1)	M3-5 Phytophthora Dieback Management Plan	MS1191 M3-5 Phytophthora Dieback Management Plan
M3-5(2)	M3-5 Weed Control and Management	MS1191 M3-5 Weed Control and Management
M4-2	M4-2 Black cockatoo pre-clearing surveys	MS1191 M4-2 Black cockatoo pre-clearing survey reports
M4-3(1)	M4-3 Fauna spotters	MS1191 M4-3 Fauna spotter accreditation
M4-3(2)	M3-4 Environmental Performance Report M5-3 Environmental Performance Report	MS1191 M3-4 Environmental Performance Report MS1191 M5-3 Environmental Performance Report
M4-4 - 4-6	M4-7 M4-4-4-6 Report – Black cockatoo	MS1191 M4-4-4-6 Report – Black cockatoo ANH
M5-2	M5-2 Construction Fauna Management Plan	MS1191 M5-2 Construction Fauna Management Plan
M5-3	M5-3 Environmental Performance Report	MS1191 M5-3 Environmental Performance Report
M5-4	M5-4 Construction Fauna Management Plan - Approval	MS1191 M5-2 Construction Fauna Management Plan – Approval
M5-5	M5-5 Terrestrial fauna surveys	MS1191 M5-2 Baseline pre-clearing terrestrial fauna surveys
M5-5	M5-5 Fauna records during clearing	MS1191 M5-2 Fauna records during clearing
M6-3	M6-3 Habitat Fragmentation Management Plan	MS1191 M6-3 Habitat Fragmentation Management Plan
M6-7	M6-7 Habitat Fragmentation Management Plan - Approval	MS1191 M6-7 Habitat Fragmentation Management Plan - Approval
M6-8	M6-8 Predator Control Progressive Report	MS1191 M6-8 Predator Control Progressive Reports
M8-3	M8-3 Amenity Management Plan	MS1191 M8-3 Amenity Management Plan
M9-3	M9-3 Offset Management Plan	MS1191 M9-3 Offset Management Plan
M12-1	M12-1 Compliance Assessment Plan	MS1191 M12-1 Compliance Assessment Plan
M12-3	M12-1 Compliance Assessment Plan	MS1191 M12-1 Compliance Assessment Plan - Approval
M0 Multiple	M0 SWGA CEMP	SWGA Construction Environmental Management Plan
M0 Multiple	M0 Independent Daily Inspection Reports	Independent Daily Audit - Inspection Reports (Preston)

Appendix G

M2.4 Environmental Performance Report – Inland Waters

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M2-4

Environmental Performance Report

Inland Waters (2022 - 2023)

Main Roads WA

Revision 0

28-Aug-23

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Document control						
Report title		Ministerial Statement 1191 | M2-4 Environmental Performance Report – Inland Waters				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	19-July-23	SWGA Review	A.G.	E.R.		A.H.
B	27-Jul-23	SWGA Review	A.G.	E.R.		A.H.
C	31-Jul-23	Main Roads Review	A.G.	E.R.		A.H.
0	28-Aug-23	Issued	E.R.	Main Roads		M.S.
Current revision		**0**				

Contents

Figures

Tables

1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted that in relation to Inland Waters, there was the potential for direct and indirect impacts to hydrological regimes and water quality in adjacent Conservation Category Wetlands (CCWs), Resource Enhancement Wetlands (REWs), the Five Mile Brook and black stripe minnow habitats.

To address these impacts, under Condition 2 of MS1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there be no project-attributable impacts to the hydrological regime and water quality of CCW and REW wetlands, Five Mile Brook or black-stripe minnow habitat.

Ministerial Statement 1191, therefore, includes the following conditions in relation to Inland Waters:

Condition 2-1(2)

> *No project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:*
>
> *(a) Five Mile Brook (incorporating MU Wetland UFI-1163 and CC Category Wetland UFI-931),*
>
> *(b) CC Category Wetland (UFI-14478),*
>
> *(c) RE Wetlands (UFI-1117 and UFI-15493), and*
>
> *(d) black-stripe minnow (Galaxiella nigrostriata) habitats defined and mapped in the proponent's Action Management Plan CC Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).*

Condition 2-2

> *Prior to ground-disturbing activities, the proponent shall undertake monitoring of the hydrological regimes of the values listed in condition 2-1(2) and submit a report to the CEO about the preconstruction baseline conditions and predicted post-development hydrological regime.*

Condition 2-3

> *The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.*

2 Environmental Performance Report

2.1 Purpose and scope

This Environmental Performance Report (EPR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with Condition 2-4 set out in MS 1191.

Condition 2-4 of MS 1191 requires an annual Environmental Performance Report (EPR) to be submitted to the Chief Executive Officer (CEO) of the EPA as part of the Compliance Assessment Report (CAR).

> **MS 1191: Condition 2-4**
>
> *The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:*
>
> > *(1) outline the monitoring that was undertaken during the implementation of the proposal;*
> >
> > *(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved;*
> >
> > *(3) report whether that the outcomes in condition 2-1(2) were achieved; and*
> >
> > *(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).*

This EPR has been prepared to address Conditions 2-1(2), 2-3 and 2-4 of MS 1191 during the reporting period.

This EPR incorporates a 12-month audit period from 31 May 2022 to 31 May 2023. This is the first EPR associated with Condition 2-4 to be submitted under MS 1191.

Two reports have been prepared reviewing hydrological regime and water quality:

- Annual Groundwater Report (prepared by AECOM - Attachment 1).
- Annual Aquatic Fauna and Surface Water Report (prepared by SLR Consulting - Attachment 2).

2.2 Clearing metrics in relation to Inland Waters during the reporting period

Construction of the Proposal commenced on 1 August 2022.

Clearing and disturbance of Inland Waters during the reporting period is summarised in Table 1 and Figure 1.

Table 1. Ground disturbance and clearing in relation to Inland Waters during the reporting period (May 2022 –23).

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during this reporting period (and total cleared)
Conservation Category Wetlands	0.2 ha	0 ha
Resource Enhancement Wetlands	1.4 ha	0.52 ha
Black-stripe minnow habitat (potential)	5.5ha	2.16 ha

2.3 Key References and Reports

A number of key references and reports have informed the preparation of this report:

Appeals Convenor (2022). Appeals Convenor's Report to the Minister for Environment: Appeals objecting to Report and Recommendations of EPA Report 1714 – Bunbury Outer Ring Road Southern Section. Appeal 045/21, April 2022. Office of the Appeals Convenor, Perth, Western Australia.

Bunbury Outer Ring Road Integrated Planning Study BORR IPT (2019). Wetland Study (BORR-02-RP-EN-007, Jan 2019).

Bunbury Outer Ring Road Integrated Planning Study BORR IPT (2020). Groundwater and Surface Water Quality Monitoring 2019-20 (BORR-00-RP-EN-005 Rev 1, August 2020).

Environmental Protection Authority (2021). Bunbury Outer Ring Road Southern Section, Commissioner for Main Roads Western Australia. Report 1714, October 2021. Environmental Protection Authority, Perth, Western Australia.

South West Gateway Alliance (2021). Bunbury Outer Ring Road Determination of Design Groundwater Levels (SWGA-00-270-00-REP-0001, September 2021).

Southwest Gateway Alliance (2022). Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report. (SWGA-00-134-00-REP-0006, July 2022).

WRM (2021) Bunbury Outer Ring Road Southern Section: Targeted Conservation Significant Aquatic Fauna Monitoring 2021. Unpublished report by Wetland Research and Management to SWGA. December 2021.

Figure 1. Ground disturbance and clearing extents during the reporting period in relation to inland waters (wetlands).

Legend

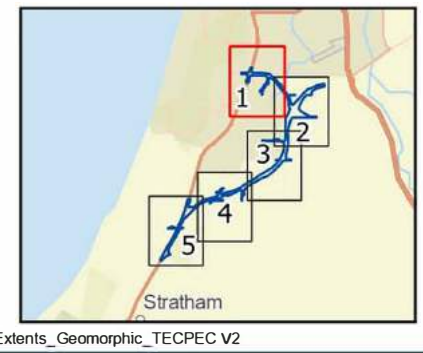
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



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Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

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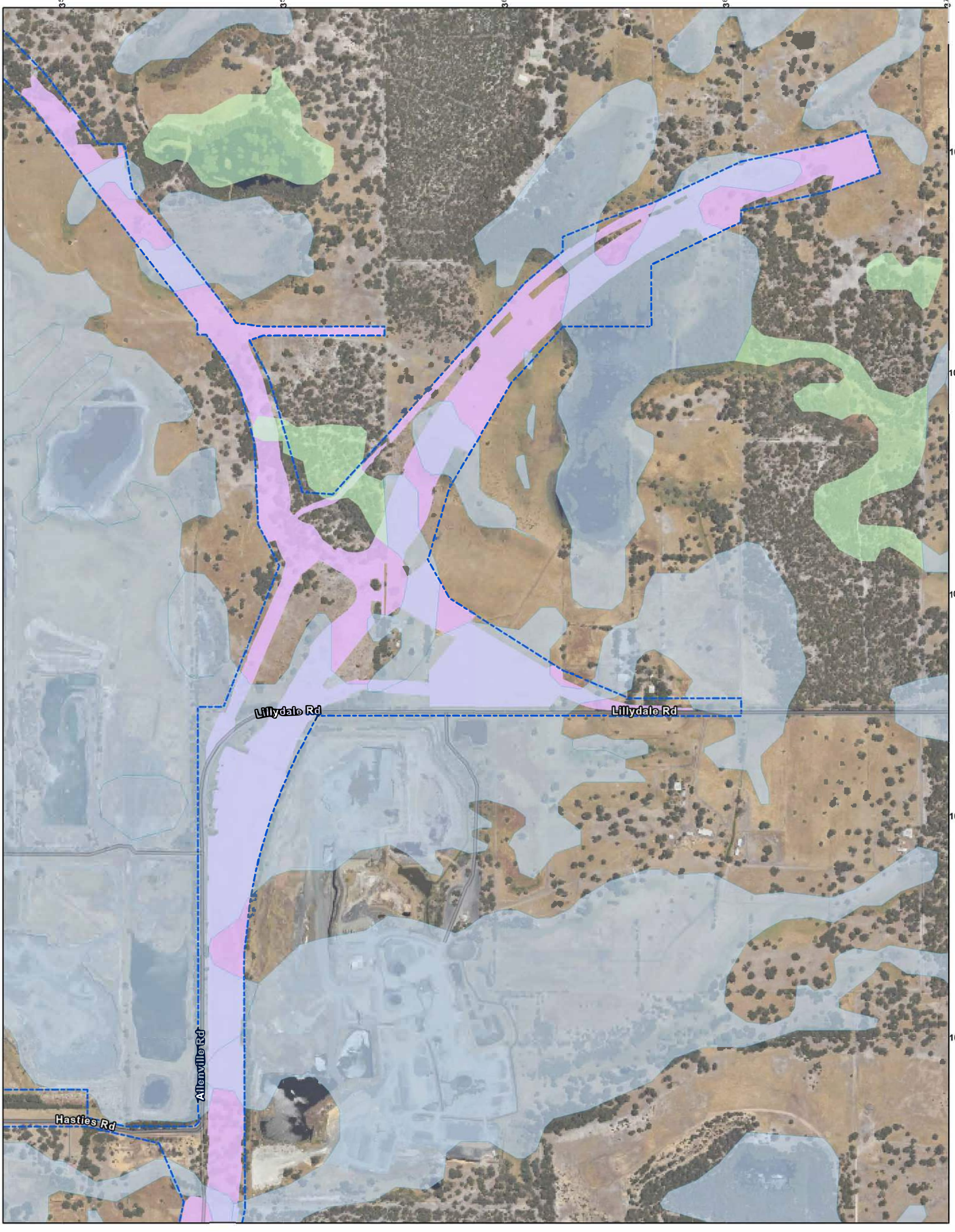
Bunbury Outer Ring Road

Figure 1. Ground disturbance and clearing extents in relation to Geomorphic Wetlands. Map 1 of 5

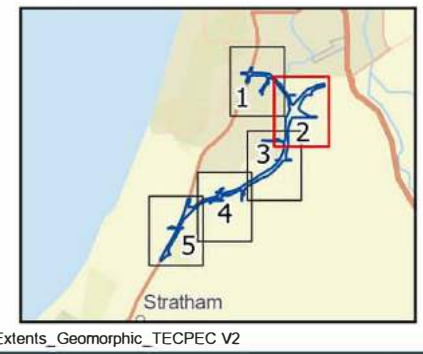


Legend

- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



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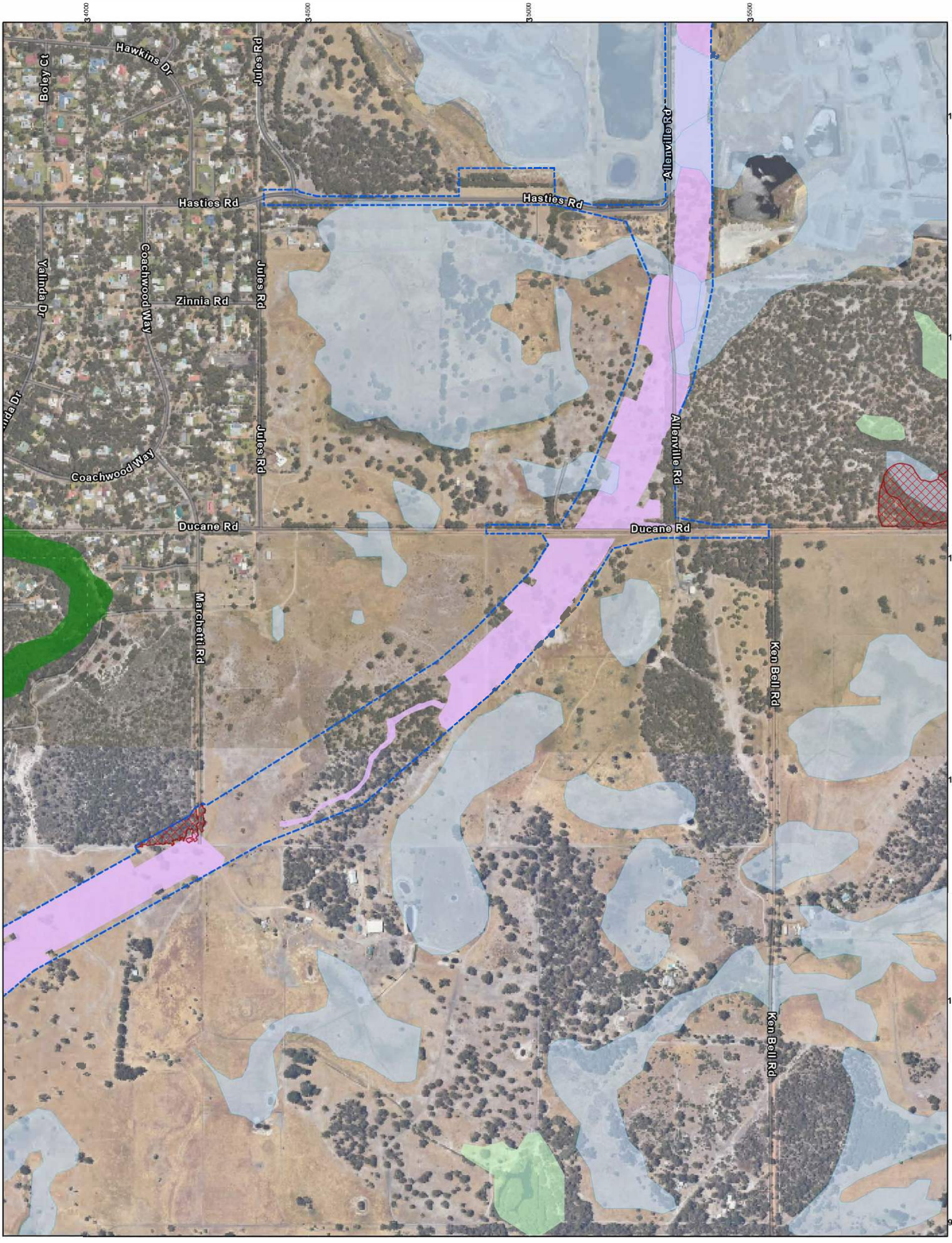
Date:2/08/2023 Author: justine belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 1. Ground disturbance and clearing extents in relation Geomorphic Wetlands. **Map 2 of 5**



Legend

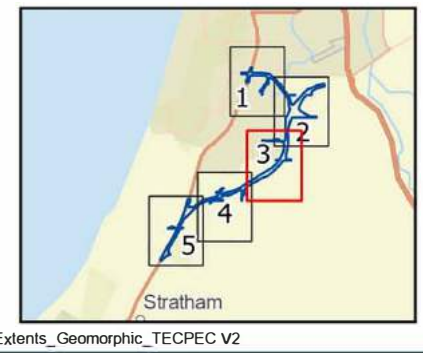
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



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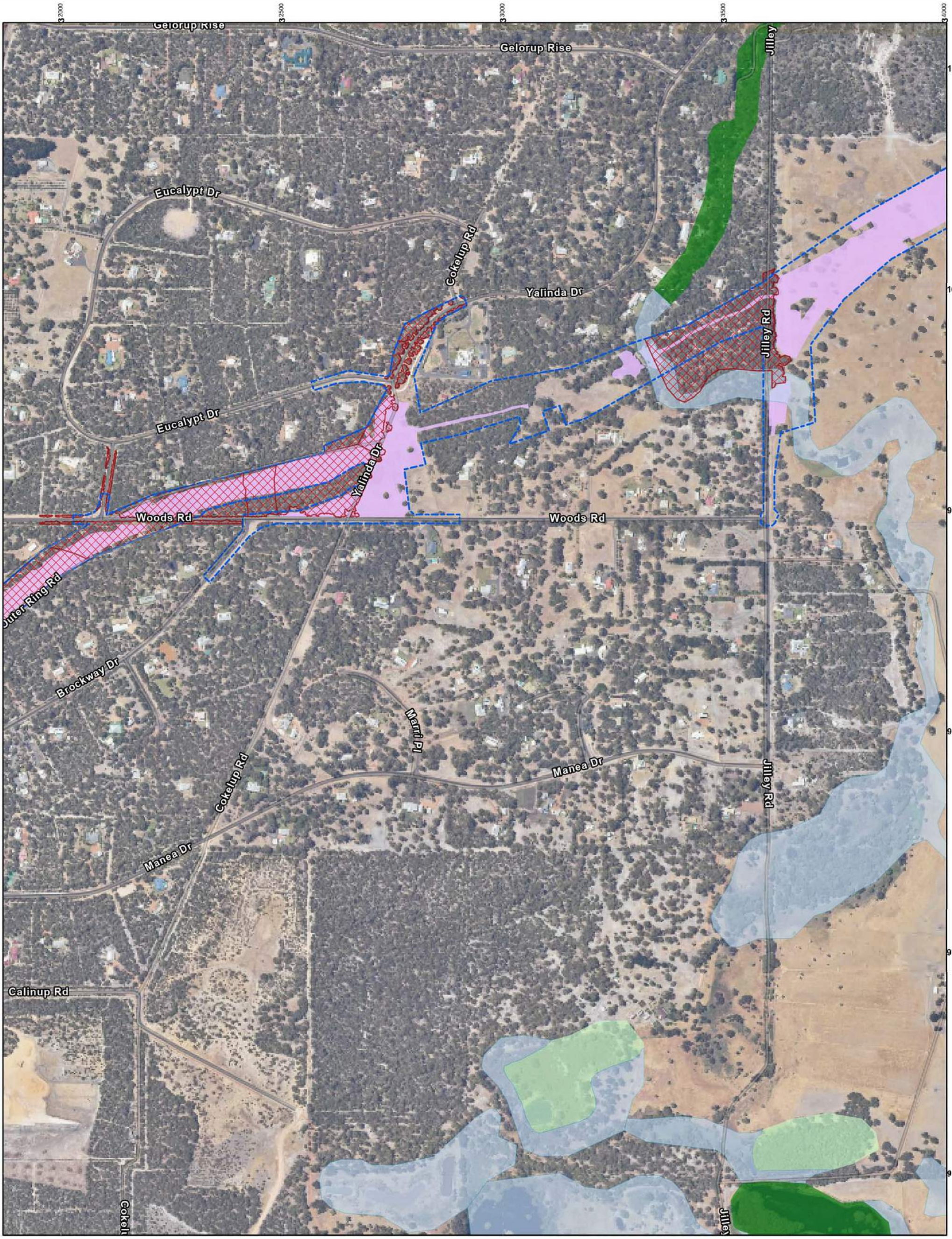
Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 1. Ground disturbance and clearing extents in relation Geomorphic Wetlands. Map 3 of 5



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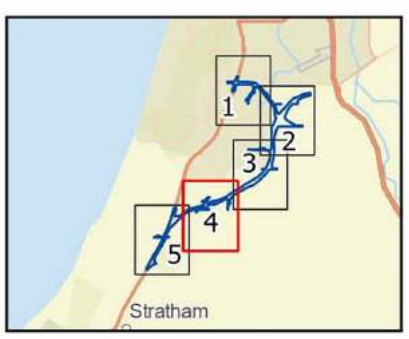
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



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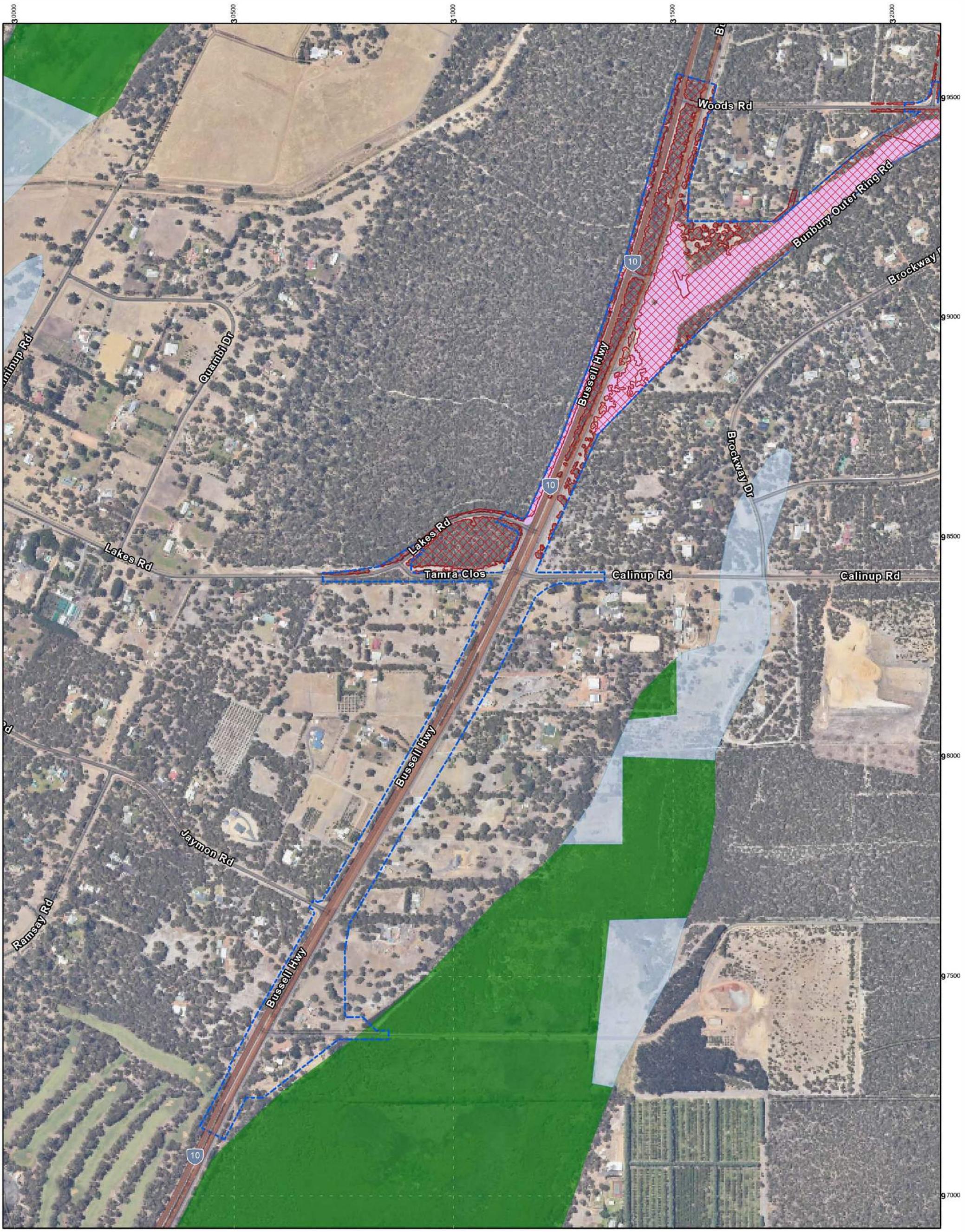
Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 1. Ground disturbance and clearing extents in relation to Geomorphic Wetlands.



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- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use wetlands

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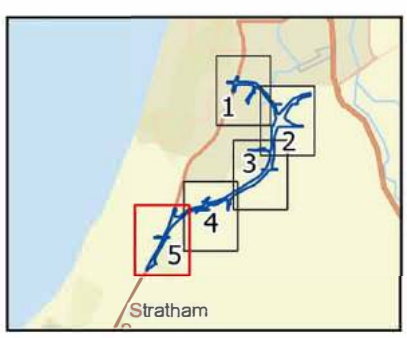

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Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

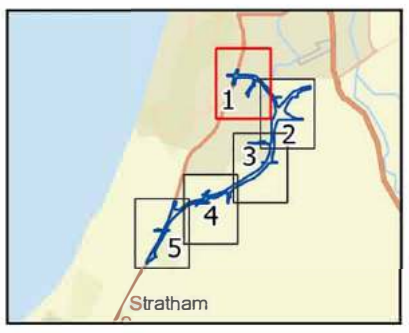
Bunbury Outer Ring Road

Figure 1. Ground disturbance and clearing extents in relation to Geomorphic Wetlands.

Figure 2. Ground disturbance and clearing extents during the reporting period in relation to potential Black-stripe minnow habitat.

Legend

- Potential Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



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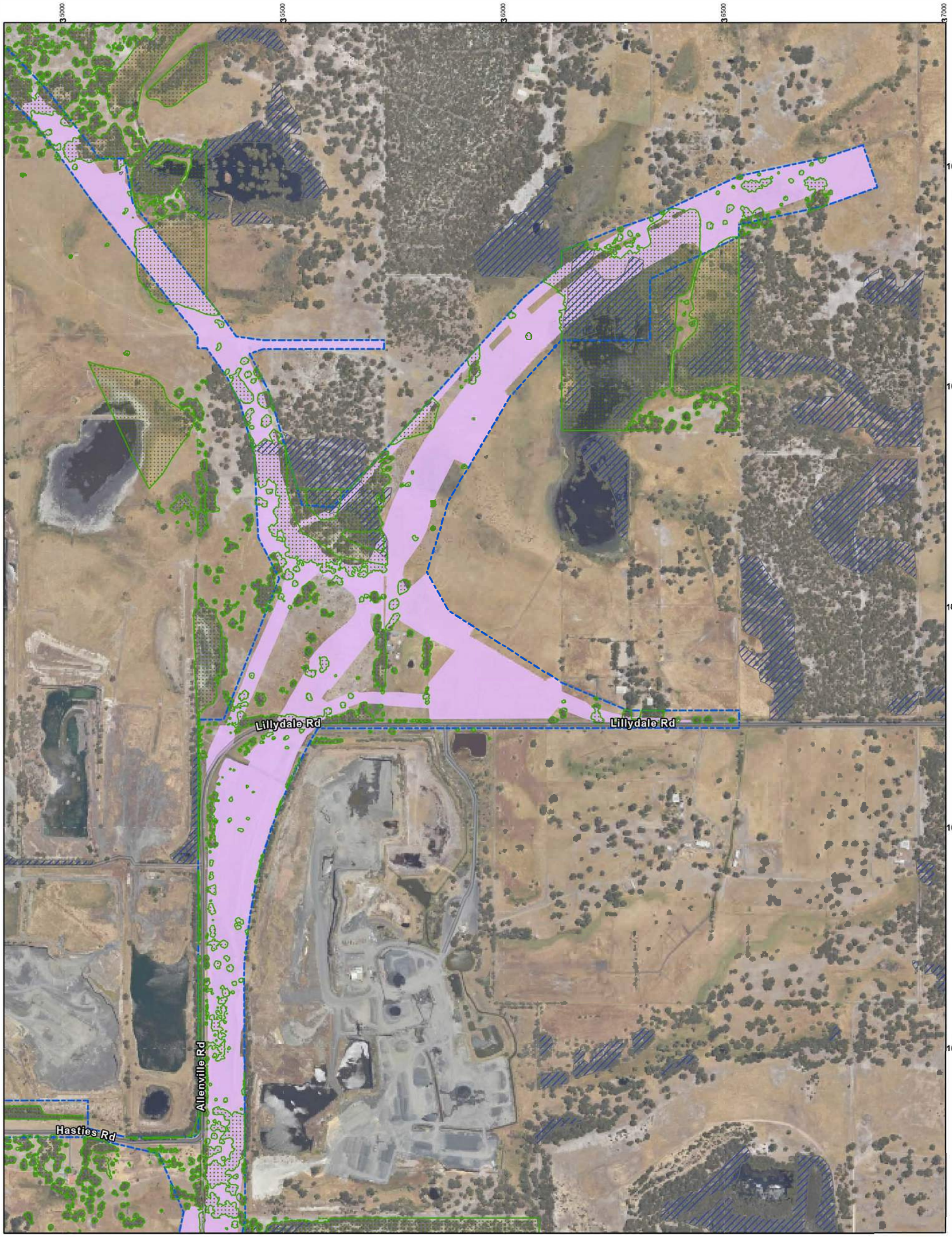
Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

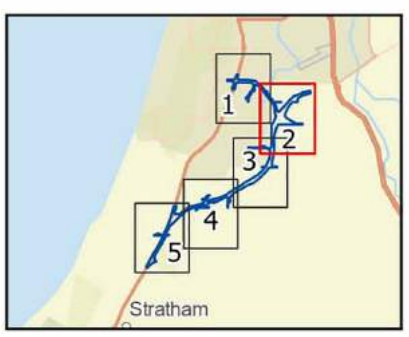
Bunbury Outer Ring Road

Figure 2. Ground disturbance and clearing extents in relation to potential Black Stripe Minnow habitat. Map 1 of 5



Legend

- Potential Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

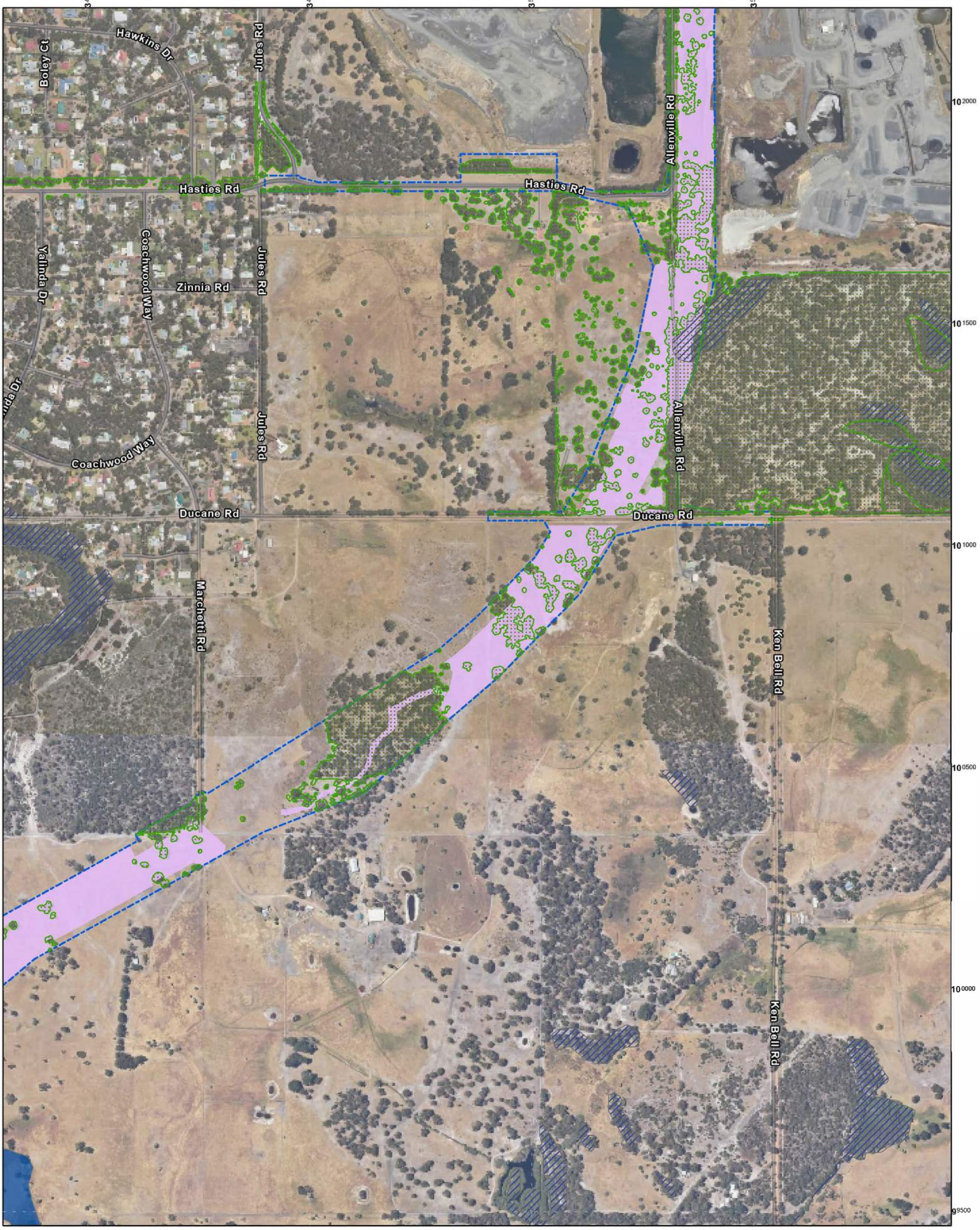
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

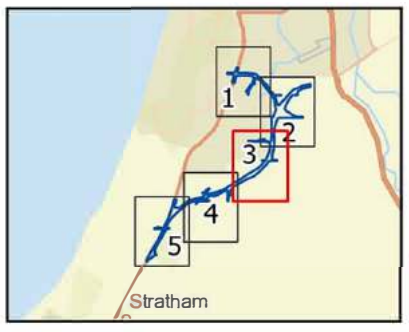
Bunbury Outer Ring Road

Figure 2. Ground disturbance and clearing extents in relation to potential Black Stripe Minnow habitat. **Map 2 of 5**



Legend

- Potential Black-stripe minnow habitat
- Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

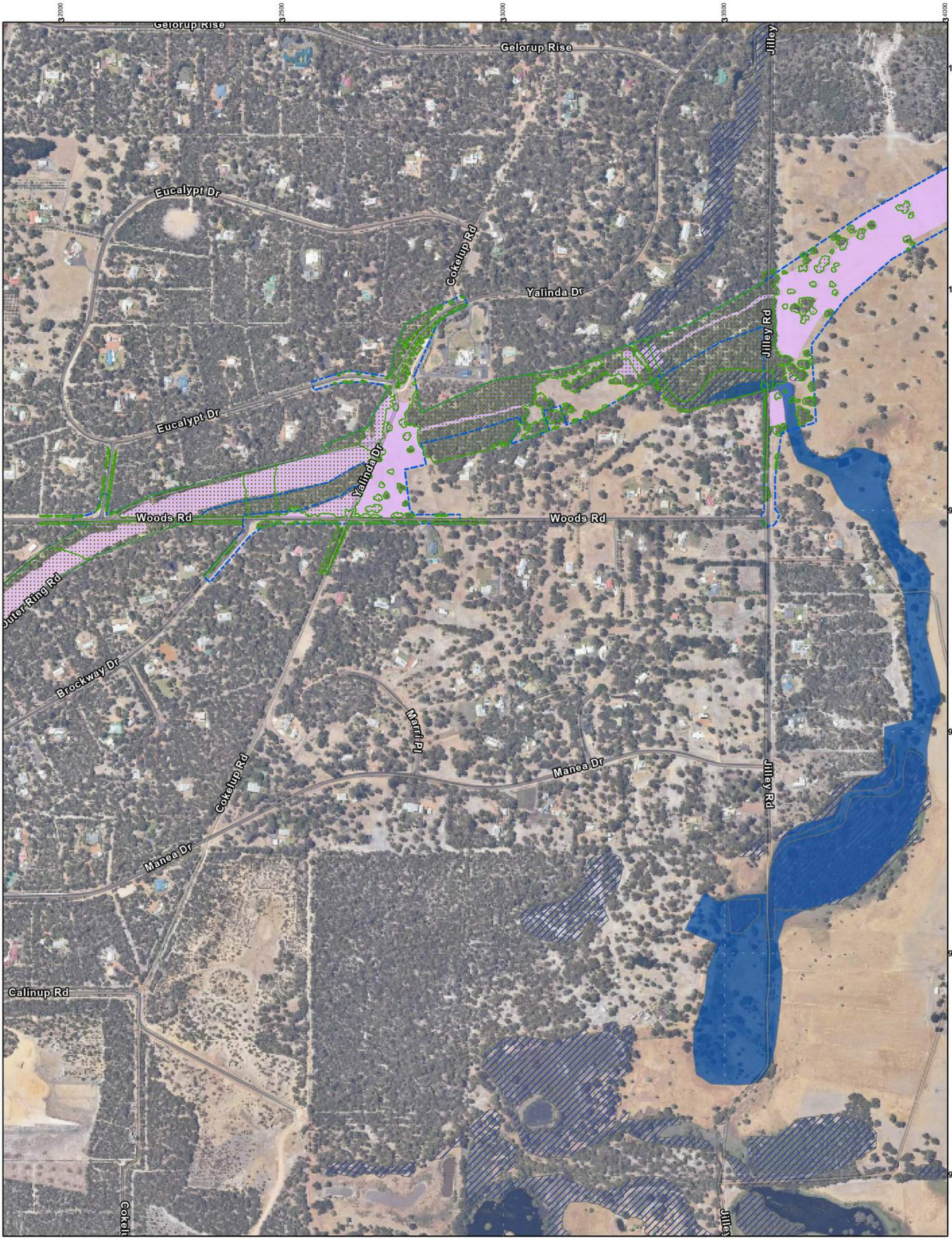
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

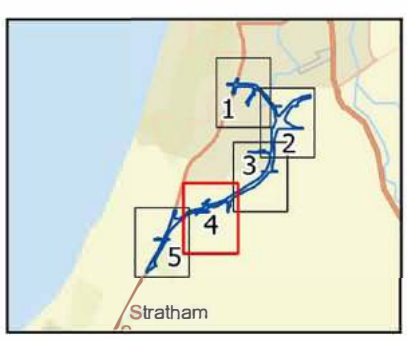
Bunbury Outer Ring Road

Figure 2. Ground disturbance and clearing extents in relation to potential Black Stripe Minnow habitat. **Map 3 of 5**



Legend

- Potential Black-stripe minnow habitat
- Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



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A3 scale: 1:8,000

0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

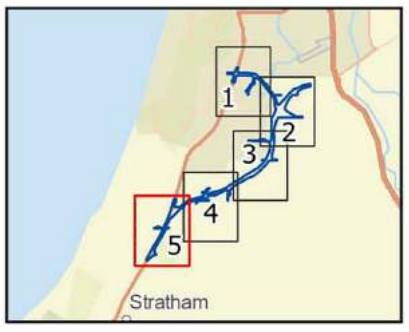
Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 2. Ground disturbance and clearing extents in relation to potential Black Stripe Minnow habitat. **Map 4 of 5**

Legend

- Potential Black-stripe minnow habitat
- Native vegetation
- Ground Disturbance and Clearing Extents (up to 31 May 2023)
- Proposal Approval Boundary



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0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_003_Clearing Extents_BSM_NV V2

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Bunbury Outer Ring Road

Figure 2. Ground disturbance and clearing extents in relation to potential Black Stripe Minnow habitat. Map 5 of 5

South West Gateway Alliance

Report

Annual Groundwater Report (AECOM and SWGA, 2023)

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191

Annual Groundwater Report

2022 - 2023

Main Roads WA

Revision 0

28-Aug-23

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Document control						
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Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
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B	25-Jul-23	SWGA Review	AG	ER		AH
C	31-Jul-23	Main Roads Review	AG	ER		AH
0	28-Aug-23	Issued	ER	Main Roads		MS
Current revision		**0**				

Contents

Figures

Tables

1 Executive Summary

This report relates to Conditions 2-1 through 2-4 of Ministerial Statement 1191 for the Bunbury Outer Ring Road (Southern Section) associated with an annual review of the hydrological regime and water quality when compared to preconstruction baseline conditions of:

- Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland (UFI-931).
- Conservation Category Wetland (UFI-14478).
- Resource Enhancement Wetlands (UFI-1117 and UFI-15493).
- Black-stripe minnow *(Galaxiella nigrostriata)* habitat.

Targeted groundwater and surface water levels and quality have been monitored since 2019, prior to construction commencement, and continued through 2023.

This report summarises the groundwater monitoring data for the reporting period (May 2022 to May 2023) in relation to baseline data. With the commencement of staged construction activities in August 2022, key findings from May 2022 to May 2023 monitoring assessment include:

- Shallow water table levels continue to respond rainfall recharge events.
- Groundwater levels linked to all TEC/PEC and REW areas reported trends within or slightly lower than the historic regime, consistent with trends in regional groundwater levels.
- The average variability of groundwater levels in 2022-2023 can be attributed to seasonal rainfall events.
- Outside the local influences of the Gelorup quarry facility (BORR_MW11 and MR_MW05), groundwater salinity remained fresh to slightly brackish with concentrations reporting between 98 to 1,360 µS/cm Electrical Conductivity (EC).
- No Hydrocarbons were detected in groundwater during the 2022-2023 period.

Based on the review, groundwater monitoring remains within historical ranges with minor changes compared with baseline data as presented in the *Bunbury Outer Ring Road, North, Central and Southern Section's Groundwater and Surface Water Monitoring Report 2019-2020* (BORR IPT, 2020) and *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022).

As such, Main Roads WA was compliant with Conditions 2-1(2), 2-3 and 2-4 of MS 1191 during the reporting period.

2 Introduction

2.1 Project Background

Main Roads Western Australia (Main Roads) is currently constructing the Bunbury Outer Ring Road (BORR) Southern Section (Figure 1A and Figure 1B). The Project area is located approximately 170 km south of Perth and occurs within the City of Bunbury and Shire of Capel. Construction of the Proposal commenced in August 2022 and is proposed to continue until 2025.

2.2 Purpose and Scope

The Commissioner of Main Roads was granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Project is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

This monitoring review summarises the groundwater monitoring data for the reporting period from May 2022 to May 2023 in the context of local baseline conditions. Locations of groundwater monitoring bores in relation to specific environmental values are indicated in Figure 1A and Figure 1B.

The objective of this report is to assess the impact (if any) on the hydrological regime and water quality of the identified environmental values, as a result of construction related activities associated with the Proposal. To achieve this, ongoing groundwater level and quality monitoring data is compared with baseline data as presented in *Bunbury Outer Ring Road, North, Central and Southern Section's Groundwater and Surface Water Monitoring Report 2019-2020* (BORR IPT, 2020) and *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022).

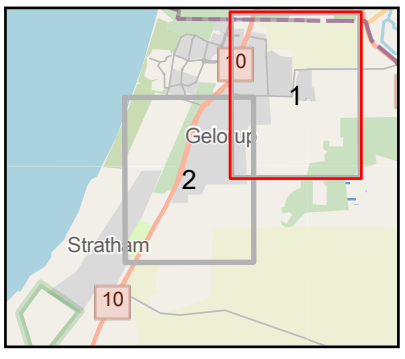
Parade Rd
15493
BORR_MW46
Centenary Rd
Atkins Rd
Neslite Rd
Starlite Bend
Ferndale Av
Sleaford Dr
Crystal Bend
Bussell Hwy
Maynard Pde
BORR_MW12
Norton Prom
Duffield Pl
1117
Tiffany Ct
Loretta Av
Gelorup Quarry
BORR_PB13
Lillydale Rd
Olearia Ct
Jules Rd
Frances Rd
Hawkins Dr
Allenville Rd
BORR_MW11
Hasties Rd
Hampstead St
Zinnia Rd
BORR_MR_MW05
Brookview Av
Coachwood Way
BORR_MW10
Ducane Rd
Yalinda Dr
Marchetti Rd
931
BORR_MW09
BORR_PB11
BORR_MB11s
BORR_MB11d
1163
BORR_MW08a
Woods Rd
Jilley Rd
Ken Bell Rd
Hair Pl

Author: justine.belcher L:\LegacyProjects\606X\60644386\900_CAD_GIS\920_GIS\02_MXDs\25_STH_Groundwater_Monitoring_Review\25_STH_Groundwater_Monitoring_Review.aprx

Legend

Groundwater Boreholes
- Monitoring Bores
- Production Bore

Geomorphic Wetlands
Potential Black Stripe Habitat
Black-Stripe Minnow Wetland Habitat
TECPEC South
Ministerial Boundary 1191 (STH SWGA)
Rivers DoW



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:17,000

0 450 900 Metres

Date: 19/07/2023 25_01_GW_Monitoring_v1

Coordinate System: GDA 1994 Perth Coastal Grid 1994PCG94

BORR Annual Groundwater Review to 31 May '23

Groundwater Monitoring Locations: Page 1

Harewoods Rd
Heathridge Rd
Brookview Av
Crowd Rd
Hampstead St
Ducane Rd
Watkins Rd
Yalinda Dr
931
Gelorup Rise
Eucalypt Dr
BORR_PB11
BORR_MB11s
BORR_MB11d
BORR_MW08a
BORR_MW07
Woods Rd
Brockway Dr
Marri Pl
BORR_PB14
BORR_MB14s
BORR_MB14d
BORR_BH27.1
Manea Dr
Quambi Dr
Bussell Hwy
1163
Minninup Rd
Lakes Rd
BORR_MW06
Calinup Rd
Jaymon Rd
Dugite Rd
Jilley Rd
BORR_MW05
Ramsay Rd
14478
BORR_MW04

Author: justine.belcher\L:\Legacy\Projects\606X\60644386\900_CAD_GIS\920_GIS\02_MXDs\25_STH_Groundwater_Monitoring_Review\25_STH_Groundwater_Monitoring_Review.aprx

Legend

Groundwater Boreholes
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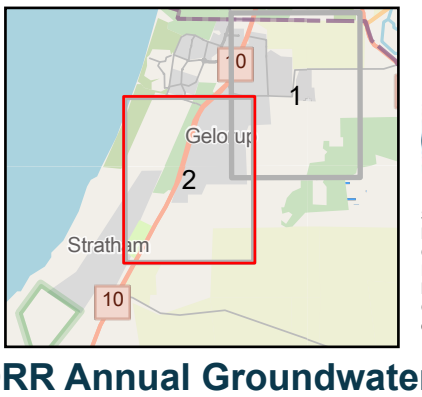

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:17,000

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Date: 19/07/2023 25_01_GW_Monitoring_v1

Coordinate System: GDA 1994 Perth Coastal Grid 1994PCG94

BORR Annual Groundwater Review to 31 May '23

Groundwater Monitoring Locations: Page 2

3 Site Characteristics

3.1 Climate

The Project area falls within the Swan Coastal Plain, which is typically described as having a warm Mediterranean climate, dominated by a hot, dry summer and a mild, wet winter. Table 1 presents Bunbury (ID 009965) monthly rainfall data in context with the project (BOM, 2023).

In context to the assessment of environmental change, rainfall predominantly occurs during winter months. Historical average (1995 to 2022) annual rainfall recorded at the Bunbury meteorological station is about 630 mm/yr. During baseline monitoring (2018-2021), rainfall was recorded below the historical average. Since construction commenced, rainfall has been recorded above both the historical and more recent averages (Table 2).

Table 1 Bunbury Monthly Rainfall Data (BOM Station 009965)

Month	1995-2022	Reporting Period					2018 to 2023 Average
		2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	
	Historical Average	Baseline			Construction Commenced		
	(mm)						
Jun	135.7	178	182	152.2	101	110.4	144.7
Jul	145.5	165.2	94.6	129	199.8	226.2	163.0
Aug	118.2	146.2	91.8	65.6	108.2	132.8	108.9
Sep	79.7	29.2	30	88.2	95.2	70.2	62.6
Oct	36.4	37.6	53.2		123.4	30.6	61.2
Nov	21.4	3	15.4		12.6	18	12.3
Dec	15.8	5.8	0.2	5	10.6	0	4.3
Jan	10.4		1.2	0.2	0	0.6	0.5
Feb	8.4		12.4	54.6	2.8	0.0	17.5
Mar	19.7	21.2	35.2	36.4	8.6	15.8	23.4
Apr	41.1	16.2	23.6	74	61.6	112.4	57.6
May	97.2	34.8	114.4	147.8	111	37.0	89.0
Total	**632.3**	**602.4**	**539.6**	**605.2**	**723.8**	**717.0**	**655.9**

3.2 Topography

Topography ranges from 5 – 39 m Australian Height Datum (AHD) with the more elevated areas associated with the Spearwood sands and Bassendean sands and the least elevated areas associated with drainage lines (5 – 10 m AHD) (GoWA, 2021).

3.3 Groundwater

The Proposal area occurs within the Bunbury Groundwater Area, which is proclaimed under the Rights in Water and Irrigation Act 1914 (RIWI Act), and therefore has numerous licenced and unlicenced private and commercial bores.

In context to the Proposal, the primary groundwater units underlying the Proposal Area are:

- The Superficial Aquifer: a thin (5 –40 m below ground level (bgl)) to absent, predominantly unconfined layer and is recharged by direct infiltration of rainfall. This forms a key aquifer for local private groundwater abstraction.
- The Leederville Aquifer: a confined formation ranging from 15 –300 m bgl, which is recharged by downward seepage from the overlying Superficial aquifer and direct infiltration in outcrop areas. This forms an aquifer for local private and commercial abstraction.

- The Yarragadee Aquifer: a confined formation (within the Proposal area) underlying the Leederville aquifer and ranging from 600 m to 1,200 m thick. The Yarragadee aquifer recharges by direct infiltration of rainfall where unconfined, and elsewhere through limited seepage from the overlying Leederville aquifer (Department of Water, 2009). This forms a key aquifer for local private and project related abstraction (PB11 and PB14).

A total of nineteen (19) groundwater wells were installed in the Southern Section in 2018 for the targeted groundwater and Acid Sulfate Soil (ASS) investigations (BORR IPT, 2020). Water level data was initially monitored using both telemetered and non-telemetered loggers.

Groundwater typically flows in a westerly direction towards the Indian Ocean (BORR IPT, 2020). Depth to groundwater in the Proposal area is generally driven by topography with the lower-lying areas reporting groundwater is shallow, with seasonal variability of up to 2 m and ranges between groundwater close to or at the surface to between 5 and 17 m bgl (BORR IPT, 2020). In more elevated areas linked to the costal ridgeline, depth to groundwater can be over 18 m deep.

Groundwater salinity in the Superficial Aquifer is generally fresh to marginally brackish (<500 to <2,000 mg/L Total Dissolved Solids). There is, however, likely to be some localised variation as a result of poor drainage and subsequent shallow water tables leading to evapoconcentration of salts during the summer months.

The underlying Leederville and Yarragadee Aquifers are generally fresh, particularly so for the upper sandier parts. Deeper in the aquifer, salinities can increase somewhat, reported to be up to the region of 800 mg/L (Commander, 1984).

3.4 Surface Water

3.4.1 Watercourses

Five Mile Brook is the most northern waterway in the Geographe Catchment, and the key waterway within the Proposal area. The catchment supports a thriving agricultural industry dominated by beef grazing. Rural lifestyle lots and urban residential areas associated with the southern extension of Dalyellup Estate are key land uses in the lower catchment.

Five Mile Brook flows only in the winter months, discharging to Geographe Bay at Minninup Beach. The waterway is modified into an artificial drain for several kilometres before reaching the Bay. In the summer months the mouth of the creek closes over due to lack of flow. When the flow intensifies in the winter months the drain fills, breaks the sandbar, and water flows into Geographe Bay. Since 2000, the mean annual flow for Five Mile Brook is 5GL/yr of a total of 203GL/yr for the waterways of the Geographe catchment (DWER, 2023).

Five Mile Brook has poor water quality, likely resulting from a combination of poor soils which do not retain nutrients and intensive land uses within the catchment (DWER, 2023). The nutrient loads in Five Mile Brook are driven by intensive agricultural land-uses, with a high proportion of beef grazing in the catchment. Due to the seasonal nature of this waterway, there is limited data on which to assess water quality. Limited data shows phosphorus and nitrogen concentrations to be above water quality targets (DWER, 2023).

3.4.2 Wetlands

3.4.2.1 Wetlands of International Significance

No Ramsar wetlands (Ramsar Sites (DBCA-010)) are located within 10 km of the Proposal area. The Ramsar listed Peel-Yalgorup System is located approximately 20 km to the north of the Proposal area and the Vasse-Wonnerup System is located approximately 19 km to the south-west of the Proposal alignment (GoWA, 2020).

3.4.2.2 Geomorphic Wetlands

Wetlands on the Swan Coastal Plain have been classified using a geomorphic-hydrologic approach to wetland classification (Hill, Semeniuk, Semeniuk, & del Marco, 1996; Semeniuk & Semeniuk, 1995). Wetlands have also been evaluated and assigned an appropriate management category which provides guidance on the nature of wetland management and protection that the wetland should be afforded. These include Conservation Category Wetlands (CCW), Multiple Use Wetlands (MUW) and Resource Enhancement Wetlands (REW).

The identified wetland areas within the southern sections of the Proposal include:

- *MUW UFI-1163 – a multiple use wetland (sumpland basin) forming semi-permanent pools within Five Mile Brook south of the proposed alignment.*
- *CCW UFI-931 – a conservation category wetland (sumpland basin) forming semi-permanent pools within Five Mile Brook north of the proposed alignment.*
- *CCW UFI-14478 - a conservation category wetland (sumpland basin) forming a low-lying basin south of the alignment on Bussell Highway.*
- *REW UFI-1117 - a resource enhanced sumpland basin formed in a low-lying basin near Lilydale Road and partially within the alignment.*
- *REW UFI-15493 - a resource enhanced dampland formed in a low-lying basin west of the alignment near Bussell Highway.*

3.4.1 Black-stripe Minnow Habitat

The black-stripe minnow is endemic to south-western Australia and is now rare throughout its distribution. Black-stripe minnow have been confirmed within the Five Mile Brook, located within the Proposal areas (WRM 2021). Figure 1A and Figure 1B presents the potential black-stripe minnow habitats.

Typical habitat conditions include tannin-stained water bodies with large areas of intact riparian vegetation. Importantly, given the high mobility of the species, it is possible that colonisation/recolonisation would occur after a large rainfall event if the wetlands become connected.

3.5 Construction Related Activities

Construction activities with the potential to impact to include hydrological regimes and water quality include:

- Vegetation clearing resulting in erosion and changes in sediment load.
- Excavations in low-lying areas and Five Mile Brook.
- Addition of fill material modifying drainage and surface water ponding areas.
- Lowering of the water table due to temporary dewatering requirements.
- Lowering of the water table due to groundwater abstraction for water supply.

4 Monitoring Program

Monitoring commitments to assess the potential impacts of the Proposal are summarised below in Table 2. Monitoring locations are presented on Figure 1A and Figure 1B and align with *Galaxiella nigrostriata* habitat monitoring sites. In addition, Project related water supply bores (PB11, PB13 and PB14) have been included to provide context to environmental receptors. Details of monitoring bore construction are presented in Appendix A.

Table 2 Monitoring Requirements

Monitoring Location[1]	Locality	Environmental Value[2]		Monitoring Requirements	Comments
GROUNDWATER					
BH27.1 (9 m)*	West of Five Mile Brook	Black-stripe minnow (Galaxiella nigrostriata) habitat	-	Monthly Water level data logging – telemetry and manual Quarterly • Field parameters: pH, temperature, conductivity, redox, total oxygen - Laboratory analysis: - pH - EC - Alkalinity - Acidity - Nutrients: Total Alkalinity, Total Nitrogen, Total Phosphorus - Metals: Arsenic, Cadmium, Copper, Iron, Lead, Nickel, and Zinc	*Decommissioned during reporting period*
BORR_MW46 (6 m)			RE Wetland UFI-15493		
BORR_MW04 (13 m)	South of Five Mile Brook		CC Wetland UFI-14478		
BORR_MW05 (8 m)			CC Wetland UFI-14478		
BORR_MW06 (8 m)			-		
BORR_MW07 (10.50 m)			-		*Limited saturated thickness to collect water sample*
BORR_MW08a (6.0 m)			MU Wetland UFI-1163 (Five Mile Brook)		*Blocked with tree roots – cleared in July 2023*
MR MW05 (5 m)*			-		*Decommissioned during reporting period*
BORR_MW09 (5.5 m)	Preston River to Five Mile Brook		CC Wetland UFI-931		
BORR_MW10 (4 m)			CC Wetland UFI-931		
BORR_MW11 (4.0 m)			-		
BORR_MW12 (4.5 m)*			RE Wetland UFI-1117		*Historically no landholder access*
SURFACE WATER					
Surface Water 10 (SW10)	Five Mile Brook	Black-stripe minnow (Galaxiella nigrostriata) habitat	MU Wetland UFI-1163 Five Mile Brook)	Quarterly • Field parameters: pH, temperature, electrical conductivity (EC), redox, total oxygen, turbidity • Laboratory analysis: - pH - EC - Alkalinity - Acidity - Nutrients: Total Alkalinity, Total Nitrogen, Total Phosphorus - Metals: Arsenic, Cadmium, Copper, Iron, Lead, Nickel, and Zinc	*Dry during reporting period*

[1] Bore ID and Depth (m bgl)
[2] MU – Multiple Use; CC – Conservation Category; RE - Resource Enhanced

Groundwater and surface water levels from monitoring sites have been used to compare against pre-construction baseline and trends in reference monitoring wells as presented in the *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022).

4.1 Applied Guidelines

Water quality for physio-chemical parameters and nutrients have been compared against ANZECC/ARMCANZ (2000) freshwater guideline values for the protection of slightly/moderately disturbed wetland ecosystems in the southwest of Western Australia as these are the most recent locally specific guidelines. Results have also been compared to historical data from the pre-development monitoring program (BORR IPT 2020, SWGA 2022).

5 Methodology

Fieldwork was undertaken as described in Table 3.

Table 3 Field work methodology and demonstration of compliance

Activity/Item	Details
Groundwater Bore -Gauging	All monitoring bores were gauged using an interface probe to determine the depth to groundwater prior to the commencement of sampling. Groundwater gauging recorded information is presented in Appendix B
Groundwater Bore - Sampling Method	All bores were sampled using low-flow technique (peristaltic pump). Ex-situ measurements of water quality parameters were taken on site using a multi-parameter instrument (YSI Pro DSS) fitted with a flow-through-cell. The parameters included pH, dissolved oxygen (DO), redox potential, temperature, and electrical conductivity (EC). Field parameters are presented in Appendix E
Surface Water - Sampling Method	The YSI Pro DSS was used to take in-situ measurements of water quality parameters, including the parameters taken at groundwater bores and water turbidity. Where water level permitted, the measurements were profiled at different depths. Field parameters are presented in Appendix E
Sample Analysis	Primary samples were analysed by ALS, a NATA accredited laboratory, using standard methods. Laboratory QA/QC measures included duplicate and rinsate samples. Duplicate samples were taken at one groundwater bore and one surface water location each round, and rinsates were taken at a frequency of one per day of sampling.
Field Documentation	All field records were logged on standardised field forms and included the date and time, location, field personnel, quality assurance / quality control (QA/QC) sample information and details of the sampling observations, provided in Appendix E.
Sample Preparation, Preservation and Transportation	Samples were placed in laboratory-supplied bottles containing appropriate preservatives. Samples for dissolved metals were not field filtered. Samples were labelled in accordance with the monitoring location, field personnel and date, placed in eskies chilled with ice and forwarded to the laboratory under standard chain of custody (COC) procedures. Copies of the laboratory documentation are presented in Appendix D.
Decontamination Procedure	Decontamination of all non-disposable equipment was completed between sample locations. Disposable equipment such as bladders and gloves were replaced between each location.

6 Monitoring Results

6.1 Groundwater Levels

As per Table 2, a total of 12 groundwater monitoring bore locations form the groundwater level monitoring program for the Proposal. With construction activities commencing in late 2022, monitoring bores MR_MW05 and BH27.1 have been decommissioned. In addition, limited monitoring has been completed in BORR_MW12 as access is limited due to landowner restrictions, and was restricted until July 2023 in bore BORR_MW8a due to consistent tree root blockage (which has now been cleared).

The groundwater levels and water quality in bores were monitored over a 12-month period May 2022 to May 2023 as per Table 2.

Groundwater levels from current and historical monitoring are presented as hydrographs in Appendix B. Where available, each plot presents data logger derived and manual groundwater levels in context with Bunbury monthly rainfall, bore screened interval and design groundwater levels (predicted historical maximum). To provide some context to pre-construction, hydrographs are presented from August 2018 through to May 2023.

Importantly, in context with local changes to the groundwater environment, the past two years have reported above average rainfall (Table 1) compared to baseline conditions (2018 to 2021). To highlight groundwater related observations, the Proposal area has been divided into four discrete topographic zones incorporating:

- Eastern Topographic Flats – lower elevations linked to Palusplain and shallow sediments overlaying Bunbury Basalt: *Areas of potential black-stripe minnow habitat*
- Five Mile Brook area: *Areas of known black-stripe minnow habitat*
- Residential Ridgeline – elevated residential areas linked to the coastal dunes and limestone ridgeline
- West of ridgeline – western flank of the ridgeline and towards the ocean: *Areas of potential black-stripe minnow habitat*

With this in mind, shallow groundwater level observations for the 2022-2023 reporting period includes:

Eastern Agricultural Flats: CC Wetland UFI-931 and RE Wetland UFI-1117 – outside influence of the Gelorup quarry (BORR_MW9, BORR_MW10 and MR_MW05)

- Depth to groundwater ranged between 1.59 m bgl (winter high) and 3.25 m bgl (summer low) and driven by local drainage features and linked to depth to underlying Bunbury Basalt.
- Groundwater elevation ranges between 15.56 mAHD and 16.99 m AHD with groundwater flow gradients generally towards the west.
- A slightly higher seasonal variability of 1.66 m when compared with a baseline of up to 1.43m.
- Topographic sinks prone to inundation during winter rainfall and becoming seasonally connected to main drainage lines.

Quarry influence (BORR_MW11)

- A seasonal low groundwater level of 3.74 m bgl with level rising to 0.64 m bgl following winter rainfall and similar to pre-construction baseline conditions (2018-2022) including a summer low of 3.98 m bgl rising to a winter high of 0.58m bgl.
- The local groundwater level reported a seasonal variability range of 3.1 m compared to baseline conditions of 3.4m and likely linked to fluctuations in the adjacent quarry pit lake.

Five Mile Brook: MU Wetland UFI-1163 (BORR_MW08a)

- A depth to groundwater ranging between 1.78 m bgl forming the winter high and a summer low of 3.86 m bgl, similar to the pre-construction baseline of between 1.84 m bgl and 2.24 m bgl.
- A similar seasonal variation of 2.08 m compared with baseline of 2.40 m and likely a direct correlation with annual rainfall and subsequent runoff.
- Observed local surface water inundation following winter rain and drainage towards Five Mile Brook.

Residential Ridgeline (BORR_MW07)

- The topographic high ridgeline with underlying limestone and well drained sand stratigraphy and therefore not forming suitable habitat for the black-stripe minnow.
- This area forms a widespread residential area with private landowners reliant on groundwater use and therefore likely impacting on groundwater levels and quality throughout the year peaking during the summer dry season.
- Represented by BORR_MW07, a deeper groundwater level was observed ranging between 10.09 m bgl (winter) and 10.46 m bgl (summer). This compares with the baseline monitoring conditions of between 9.89 m bgl and 10.29 m bgl.
- Due to the lower direct rainfall recharge impacts, a muted seasonal variation in groundwater levels of between 0.37m (2022-2023 reporting period) and 0.41 m (baseline) was reported.

West of Ridgeline: RE Wetland UFI-15493 and CC Wetland UFI-14478 (BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46, BH27.1)

- Depth to groundwater ranging between 5.03 m bgl (winter high) and 5.73 m bgl (summer low) compared to baseline conditions of between 4.77 m bgl (winter) and 5.46 m bgl (summer) with seasonal high levels driven by local drainage features.
- Groundwater elevation ranges between 12.11 mAHD and 17.8 m AHD with groundwater flow gradients generally towards the west.
- A seasonal variability of up to 0.37 m compared with a baseline of up to 0.69m.

Groundwater levels measured during the 2022-2023 reporting period continue within historical pre-construction baseline ranges.

6.2 Water Quality

As per Table 2, a total of 12 groundwater monitoring bore locations form the groundwater water quality monitoring program for the Proposal. A number of qualifications in relation to the monitoring program include:

- Monitoring bores MR_MW05 and BH27.1 have been decommissioned.
- BORR_MW07 has had restricted sampling due to the bore depth having limited saturated thickness and therefore limiting sample collection using the peristaltic sampling pump.
- Limited monitoring has been completed in bores BORR_MW8a due to consistent tree root blockage. This bore was cleared in July 2022 and again in July 2023.
- BORR_MW12 has historically had limited access due to landowner restrictions.
- Both BORR_MW11 and MR_MW05 report elevated groundwater concentrations as a result of the adjacent quarry pit lakes and therefore have been noted but removed from the Project related change assessment.

Water quality was monitored over the period May 2022 to May 2023. Water quality dates from current and historical monitoring are presented as temporal plots in Appendix B. Where available, each plot presents analyte concentrations in context with Bunbury monthly rainfall. To provide some context to pre-construction, temporal plots are presented from August 2018 through to May 2023. The Proposal area is located in an area that has been extensively cleared and fertilised for grazing.

To assess the water quality characteristics and potential change as a result of project construction related activities on the black-stripe minnow habitat, it is important to highlight and assess in context with local landuse changes. It has been reported that waterways in the Leschenault Catchment, in which the Proposal Area is situated, regularly exceed ANZECC and ARMCANZ guidelines with results of a similar order of magnitude to the results stated here (DoW, 2012). As a consequence, provided recorded values remain within historical ranges, exceedances of these guidelines are not considered a cause for concern.

6.2.1 Groundwater Quality

Where available, groundwater samples were collected quarterly in August and November 2022, and February and May 2023. Table 4 presents groundwater quality summary results including pre-construction baseline in context with

the current 2023-2023 reporting period. Groundwater quality data is presented as tables along with exceedances in Appendix C.

Table 4 Groundwater Quality – Laboratory Summary Results

Parameter	ANZECC and AARMCANZ (2000) Freshwater Guidelines	Maximum during 2022/23	2022/23 Exceedances	Pre-construction maximum	Pre-construction Exceedances
Copper	0.0014	0.008	BORR_MW04, BORR_MW05, MW09, BORR_MW11	0.052	BORR_MW04, BORR_MW05, MW06, BORR_MW08a, BORR_MW09, BORR_MW10, BORR_MW11, BORR_MW46, MR_MW05
Nickel	0.011	0.015	BORR_MW11	0.041	BORR_MW11
Zinc	0.008	0.062	BORR_MW05	0.404	BORR_MW05
Total Nitrogen	1.5	9.2	BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW09, BORR_MW11, BORR_MW46	6.3	MR_MW05, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW09, BORR_MW11
Total Phosphorus	0.06	0.99	MR_MW05, BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW10, BORR_MW11, BORR_MW46	1.22	MR_MW05, BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW10, BORR_MW11, BORR_MW46

6.2.1.1 Physicochemical Parameters

The historic groundwater salinity (measured as electrical conductivity (EC)) varies from 168 to 1,230 µS/cm with an average of 560 µS/cm, indicating a typically fresh to slightly brackish water type. Monitoring results for the reporting period followed a similar trend with a range of 98 to 1,360 µS/cm with an average of 493 µS/cm (Appendix C).

BORR_MW46 reported acidic pH levels between January and June 2021 with levels of pH 3.2. These low pH levels may have been attributed to the lower-than-average rainfall (539 mm) for this period resulting in lower summer groundwater levels and potential acid sulphate conditions forming.

Excluding the BORR_MW46 pH monitoring results, a historic neutral pH range of between 6.1 and 7.6 is reported. The 2022/23 period reported a similar range with pH levels ranging between 6.3 to 7.6 (Appendix C).

Historic bicarbonate alkalinity ranged from <1 mg/L at BORR_MW46 to 1,230 mg/L at BORR_MW05 (Appendix C). Outside BORR_MW46 (located with Bassendean Sand), the high alkalinity is consistent with the soils based on local limestone and carbonate sands beneath the coastal ridgeline. Both carbonate and hydroxide alkalinity are below laboratory reporting limits for both preconstruction and during construction (Appendix C)

In context to the above, bores BORR_MW11 and MR_MW05 have reported salinity concentrations up to 16,400 µS/cm and 25,200 µS/cm respectively during the reporting period and consistent with baseline conditions.

6.2.1.2 Total Metals

There were no exceedances of guidelines recorded during 2022/23 reporting period for any tested metals with the exception of Copper, Nickel, and Zinc (Table 4). Given the area is extensively shallow sand overlying Bunbury Basalt, slightly elevated levels of Copper, Nickel and Zinc are likely occurring through natural rock weathering processes (AIG, 2000).

Exceedances were recorded in BORR_MW04, BORR_MW05, BORR_MW09 and BORR_MW11 (Appendix C). These observations were exhibited during pre-construction baseline sampling and therefore indicate no change in water quality as a result of the Project.

6.2.1.3 Nutrients

Concentrations of phosphorus (0.0 to 0.99 mg/L) were elevated above the guidelines (0.06 mg/L) for the reporting period however were within the historic limits (up to 1.22 mg/L) (Appendix C). The peak in concentration levels can likely be attributed to the typically high rainfall levels that are recorded annually in June-August that results in first flush and inundation of widespread low-lying fertilised agricultural land.

A change in peak Total Nitrogen concentrations between a baseline of 4.5 mg/L and the recent reporting period of 9.2 mg/L reported during the highly variably winter high rainfall period (Appendix C).

6.2.1.4 Organic Chemicals

Petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylenes, organophosphorus and organochlorine pesticides, and glyphosate were not detected either pre-construction or during the 2022-2023 reporting period.

6.2.1.5 Groundwater Quality Summary

In context with the identified topographic zones, the following observations are apparent:

Eastern Agricultural Flats – outside influence of the Gelorup quarry (BORR_MW9, BORR_MW10)

- Fresh groundwater with a salinity (measured as EC) of between 98 and 496 µS/cm compared with baseline conditions of between 168 and 623 µS/cm.
- Neutral to slightly acidic pH levels between 6.4 and 7.6 compared with the baseline of between 6.2 and 6.8.
- A similar alkalinity range for both baseline and the current reporting period of between 9 and 17 mg/L.

Quarry influence (BORR_MW11, MR_MW05)

- Both BORR_MW11 and MR_MW05 report elevated groundwater concentrations as a result of the adjacent quarry pit lakes.
- Fresh groundwater with a salinity (measured as EC) of between 1,700 and 25,200 µS/cm compared with baseline conditions of between 1,940 and 24,600 µS/cm.
- No change in neutral pH levels of between 6.2 and 7.2 compared with the baseline of between 6.2 and 7.9.
- A similar Bicarbonate Alkalinity range for both baseline and the current reporting period of between 55 and 1,860 mg/L.
- Due to influence in readings from the quarry, this bore was removed from the Project related change assessment

Five Mile Brook (BORR_MW08a)

- A similar fresh groundwater salinity (measured as EC) of between 659 and 692 µS/cm compared with baseline conditions of between 498 and 607 µS/cm.
- A similar neutral pH levels of between 6.7 and 6.75 compared with the baseline of between 6.1 and 6.8.
- A similar alkalinity range for both baseline and the current reporting period of between 9 and 17 mg/L.
- Phosphorus concentration ranging between 0.59 and 0.76 mg/L for the current reporting period compared to baseline of between 0.58 and 1.22 mg/L.

West of Ridgeline (BORR_MW46, BH27.1)

- Fresh groundwater with a salinity (measured as EC) of between 306 and 362 µS/cm compared with baseline of between 216 and 652 µS/cm.
- Neutral pH levels between 6.9 and 7.0 compared with the neutral to acidic baseline of between 3.2 and 6.8 with levels driven by rainfall and seasonal groundwater level fluctuations.
- A bicarbonate alkalinity concentration range for the current reporting period of between 61 mg/L and 71 mg/L compared to baseline

7 Quality Assurance/Quality Control

Field QA/QC was within acceptable levels with all differences between the primary and duplicate within acceptable limits, with the exception of phosphorus. This is considered acceptable as both primary and duplicate results are close to laboratory limit of reporting (LOR) and are low in concentrations (Appendix C).

Lab QA/QC was acceptable with all parameters within acceptable ranges except for:

- 10 Aug 2022 - analysis of pH outside holding times. The laboratory pH results were similar to the field pH results.
- 23 Nov 2022 - Analysis of pH outside holding times and lower frequency of control samples for TRH than prior sampling event. The laboratory pH results were similar to the field pH results for November 2022. No TRH was detected in November, so this is considered acceptable.
- 08 Feb 2023- matrix spike for copper not determined due to high background levels and low frequency of total metals control samples. This is considered acceptable as copper results are similar to other events and all other total metals parameters, including relative percentage difference for field duplicates are acceptable. Analysis of pH outside holding times and lower frequency of control samples for TRH than prior sampling events. The laboratory pH results were similar to the field pH results. No TRH was detected in June, so this is considered acceptable.
- 24 May 2023– analysis of pH outside holding times and lower frequency of control samples for TRH than prior sampling events. The laboratory pH results were similar to the field pH results. No TRH was detected in November, so this is considered acceptable.

In summary, the laboratory data is considered fit for the purpose of assessing water quality trends in the Proposal Area and surrounds.

8 Monitoring Compliance

This monitoring review assesses the compliance with Conditions 2-1(2), Condition 2-3, and Condition 2-4 of MS1191 and outlined in Section 2.2 and summarises the groundwater monitoring data for the 12-month reporting period from May 2022 to May 2023 in context with local baseline conditions. Monitoring compliance has been shaded and coded in accordance with Table 5.

Table 5 Summary of Monitoring Compliance Abbreviations

Abbreviation	Compliance Status	Comments
C	Compliant	More than 80% completed
PNC	Potentially non-compliant	60 to 80% completed
NC	Non-compliant	Less than 60% completed
D	Monitoring Bore Decommissioned/ Destroyed	

Compliance of the scheduled monitoring for 2022-2023 reporting period is summarised in Table 6.

Table 6 Compliance of Monitoring in the Proposal area 2022-2023

Bore ID	2022-2023 Monitoring Bore Data Compliance								
	Monthly Static Water Level	Quarterly Field TDS	Quarterly Field EC	Quarterly Field pH	Quarterly Laboratory Analysis				Notes
					Aug	Nov	Feb	May	
BH27.1	C	C	C	C	C	C	C	D	Well decommissioned by construction
BORR_MW04	C	C	C	C	C	C	C	C	
BORR_MW05	C	C	C	C	C	C	C	C	Dry (Feb, May)
BORR_MW06	C	C	C	C	C	C	C	C	
BORR_MW07	C	C	C	C	C	C	C	C	Well too deep to sample
BORR_MW08a	C	C	C	C	C	C	C	C	Well blocked
BORR_MW09	C	C	C	C	C	C	C	C	
BORR_MW10	C	C	C	C	C	C	C	C	Dry (Feb)
BORR_MW11	C	C	C	C	C	C	C	C	Dry (Feb, May)
BORR_MW12	C	C	C	C	C	C	C	C	Well inaccessible (private property)
BORR_MW46	C	C	C	C	C	C	C	C	Dry (Feb, May)
MR_MW05	C	C	C	C	C	C	D	D	Well decommissioned by construction

9 Conclusions

Associated with Condition 2-1(2), Condition 2-2 and Condition 2-4, of MS1191 for the BORR Southern Section, an annual review to assess the hydrological regime and water quality when compared to pre-construction baseline conditions for:

- *Five Mile Brook (incorporating MU Wetland UFI-1163 and CC Wetland (UFI-931).*
- *CC Wetland (UFI-14478).*
- *RE Wetlands (UFI-1117 and UFI-15493).*
- *Black-stripe minnow (*Galaxiella nigrostriata*) habitats that are within or adjoins the development envelope.*

To achieve this, ongoing groundwater level and water quality monitoring data is compared with baseline data as presented in *Bunbury Outer Ring Road, North, Central and Southern Section's Groundwater and Surface Water Monitoring 2019-2020* (BORR IPT, 2020) and *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022). This monitoring review assesses compliance with the conditions above and summarises the groundwater monitoring data for the reporting period from May 2022 to May 2023 in context with local baseline conditions.

Targeted groundwater and surface water levels and quality have been monitored since 2019, prior to construction commencement and continued through 2023. In context to construction related activities, key findings from the reporting period May 2022 to May 2023 monitoring assessment include:

- Shallow water table levels continue to respond rainfall recharge events.
- Groundwater levels linked to all TEC/PEC and REW areas reported trends within or slightly lower than the historic regime, consistent with trends in regional groundwater levels.
- The average seasonal variability of groundwater levels in 2022-2023 can be attributed to seasonal rainfall events.
- Outside the local influences of the Gelorup quarry facility (BORR_MW11 and MR_MW05), groundwater salinity remained fresh to slightly brackish with concentrations reporting between 98 to 1,360 µS/cm Electrical Conductivity (EC).
- No Hydrocarbons were detected in groundwater during the 2022-2023 period.

Groundwater monitoring was completed in accordance with the outlined monitoring program.

Based on the review, groundwater monitoring remains within historical ranges and no changes compared with baseline data as presented in *Bunbury Outer Ring Road, North, Central and Southern Section's Groundwater and Surface Water Monitoring 2019-2020* (BORR IPT, 2020) and *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022) are attributed to the Project.

As such, Main Roads was compliant with Conditions 2-1(2), 2-3 and 2-4 of MS1191 during the reporting period.

10 References

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Australian Government 2019, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* available from: https://www.waterquality.gov.au/anz-guidelines.

Australian Government Initiative (AIG). 2000. Nickel in freshwater and marine water. Retrieved from Australian Government Initiative: Nickel in freshwater and marine water (waterquality.gov.au).

Australian Government Initiative (AIG). 2000. Zinc in freshwater and marine water. Retrieved from Australian Government Initiative: Zinc in freshwater (waterquality.gov.au)

Bunbury Outer Ring Road Integrated Planning Study (BORR IPT) 2020 *Groundwater and Surface Water Quality Monitoring 2019-20.* Bureau of Meteorology (BOM). 2021.

Climate Statistics for Australian Locations - Bunbury. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/climate/averages/tables/cw_009965.shtml.

DWER, 2023. Geographe Waterways. https://rgw.dwer.wa.gov.au/geographe-waterways/five-mile-brook/

Government of Western Australia (GoWA). 2020. data.wa.gov.au. Retrieved from https://data.wa.gov.au/.

Department of Water 2012, *Leschenault Estuary Water Quality Improvement Plan*, Department of Water, Western Australia.

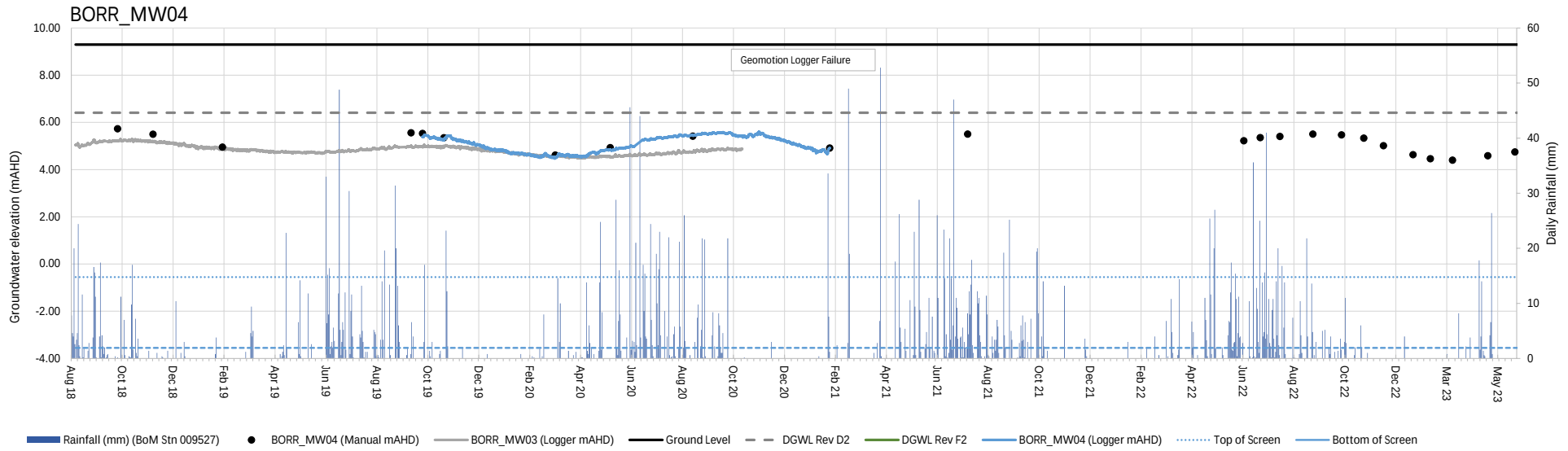
Southwest Gateway Alliance (SWGA) 2021, *Bunbury Outer Ring Road, Southern Section Hydrological Regime Report,* unpublished report to Environmental Protection Authority, August 2021.

Appendix A
Bore Summary Details

App A - Monitoring Bore Construction Details

Bore_ID	River Locality	Location				Ground level (m AHD)	Top of Collar (m AHD)	Depth Drilled	Casing Details	Screened Interval		Seasonal Low GWL (m bgl)	Seasonal Low GWL (m AHD)	DGWL (m AHD)
		Easting (PCG94)	Northing (PCG94)	Easting (MGA94, Z50)	Northing (MGA94, Z50)					From (m bgl)	To (m bgl)			
BORR_MW04	South of Five Mile Brook	30,098	96,440	370,118	6,297,058	9.30	9.45	13	Nominal 50mm ID uPVC class 9 Casing	10	13	4.68	4.62	
BORR_MW05	South of Five Mile Brook	30,660	97,684	370,681	6,298,315	12.20	12.24	8		5	8	6	6.2	7.2
BORR_MW06	South of Five Mile Brook	31,097	98,436	371,109	6,299,072	11.60	11.62	8		5	8	5.76	5.84	6.92
BORR_MW07	South of Five Mile Brook	32,079	99,497	372,079	6,300,144	15.60	15.62	10.5		7.5	10.5	10.12	5.48	6.25
BORR_MW08a	South of Five Mile Brook	33,592	99,726	373,589	6,300,390	15.97	15.95	6		3	6	3.33	12.64	14.53
BORR_MW09	Preston Rv to Five Mile Brook	34,250	100,342	374,240	6,301,013	16.40	16.45	5.5		2.5	5.5	4.91	11.49	14.62
BORR_MW10	Preston Rv to Five Mile Brook	34,870	101,074	374,851	6,301,752	19.30	19.35	4.4		0.5	4.4	2.27	17.03	18.97
BORR_MW11	Preston Rv to Five Mile Brook	35,310	101,916	375,282	6,302,599	20.80	20.80	4.4		0.5	4.4	3.89	16.91	20.8
BORR_MW12	Preston Rv to Five Mile Brook	35,899	103,498	375,853	6,304,187	19.60	19.63	4.5		1.5	4.5	3.46	16.14	18.96
BORR_MW46	Five Mile Brook - West	33,939	104,427	373,883	6,305,094	7.10	7.03	6		3	6	4.74	2.36	4.07
BORR_S_MW10	South of Five Mile Brook	34,558	99,490	374,558	6,300,165	17.87	17.87	4		1	4	1.41	16.46	
MR_MW05	South of Five Mile Brook	35,337	101,506	375,313	6,302,189	20.54	20.63							19.64
BH27.1	Five Mile Brook - West	31,413	98,949	371,426	6,299,584	12.30	12.30	9		6	9			6.74

Appendix B
Groundwater Level Data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Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW04 (Manual mAHD)
BORR_MW03 (Logger mAHD)
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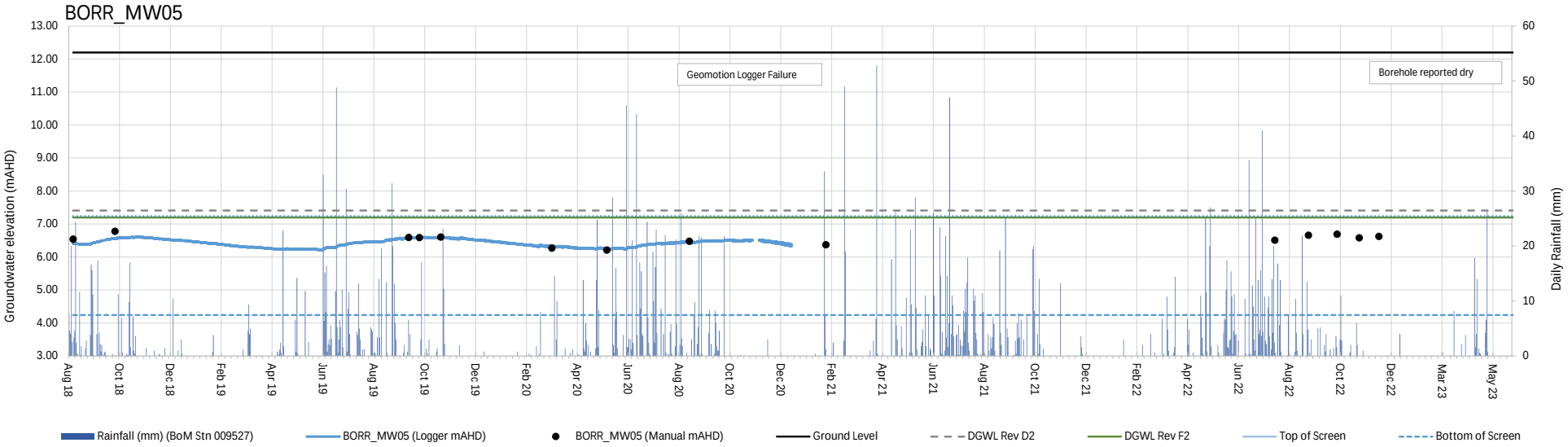
DGWL Rev D2
DGWL Rev F2
BORR_MW04 (Logger mAHD)
Top of Screen
Bottom of Screen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Rainfall (mm) (BoM Stn 009527)
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DGWL Rev F2
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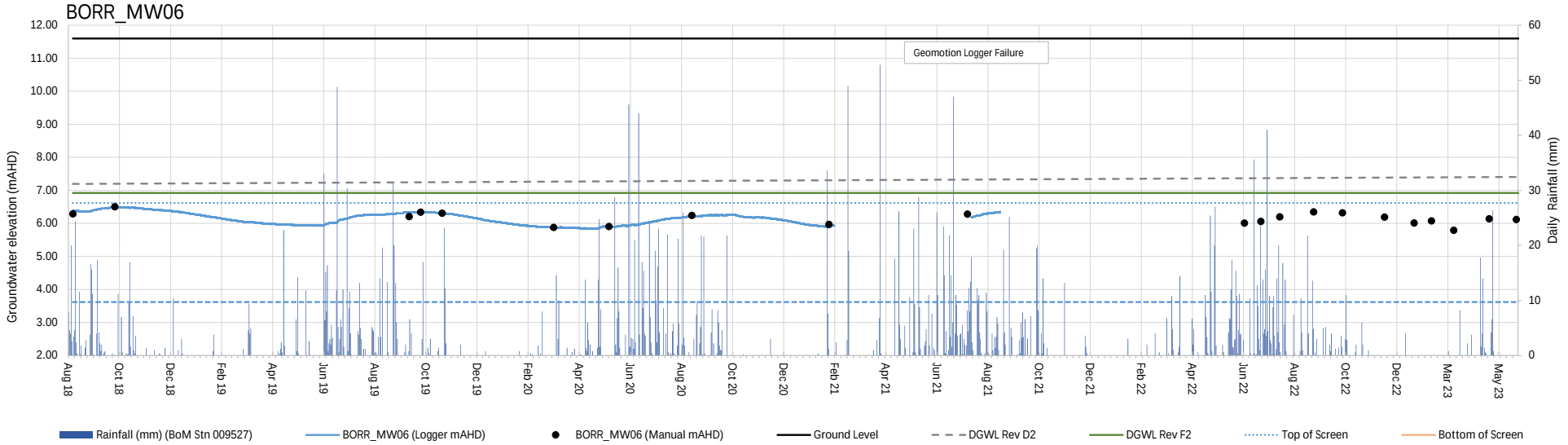
Bottom of Screen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Rainfall (mm) (BoM Stn 009527)
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DGWL Rev F2
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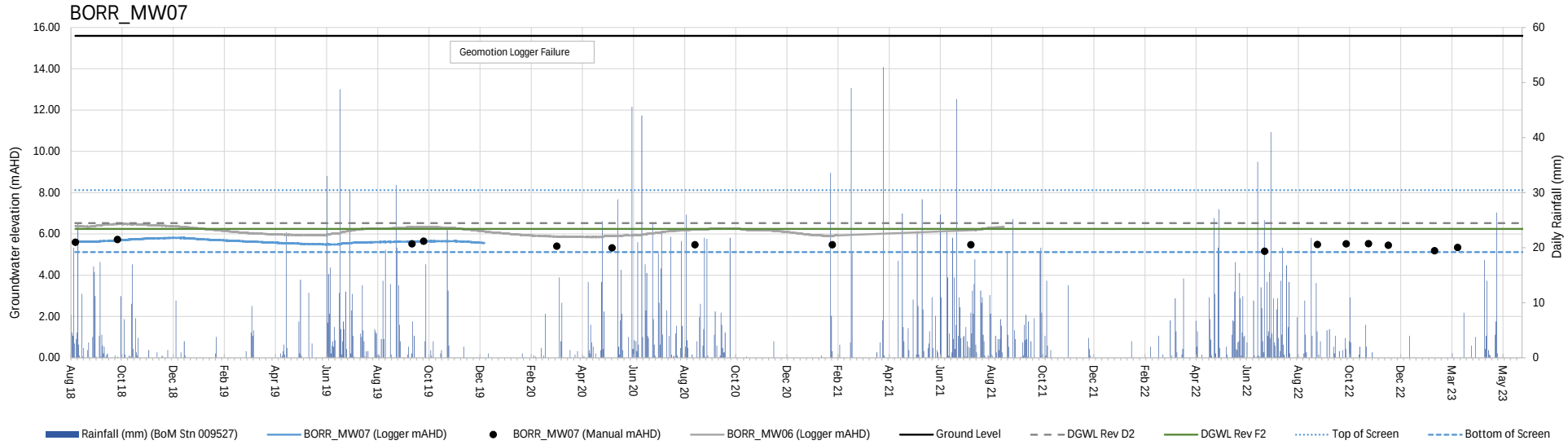
Bottom of Screen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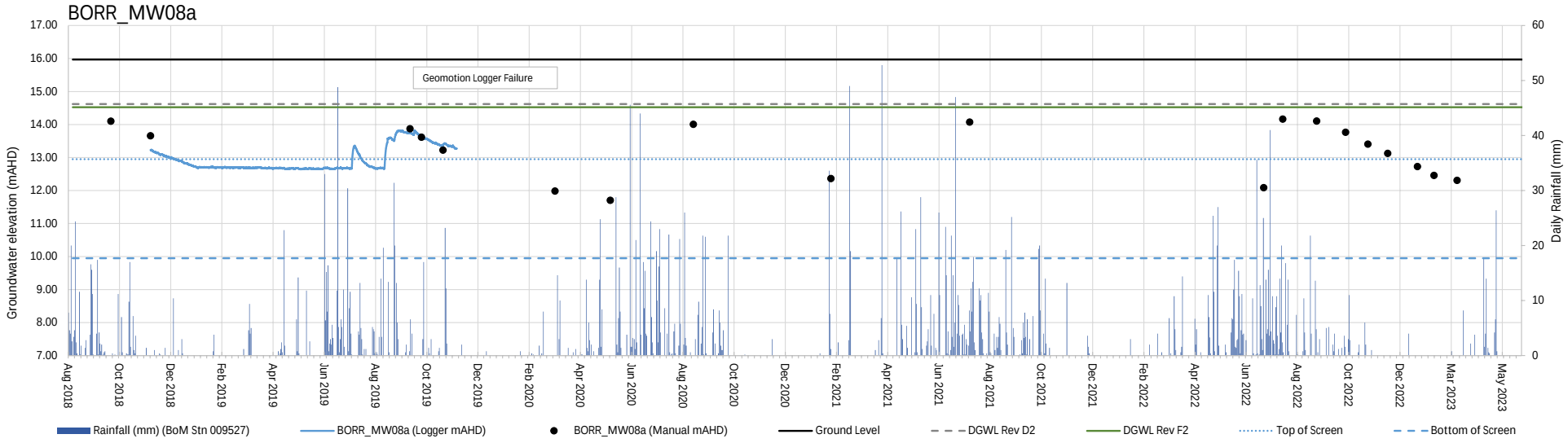
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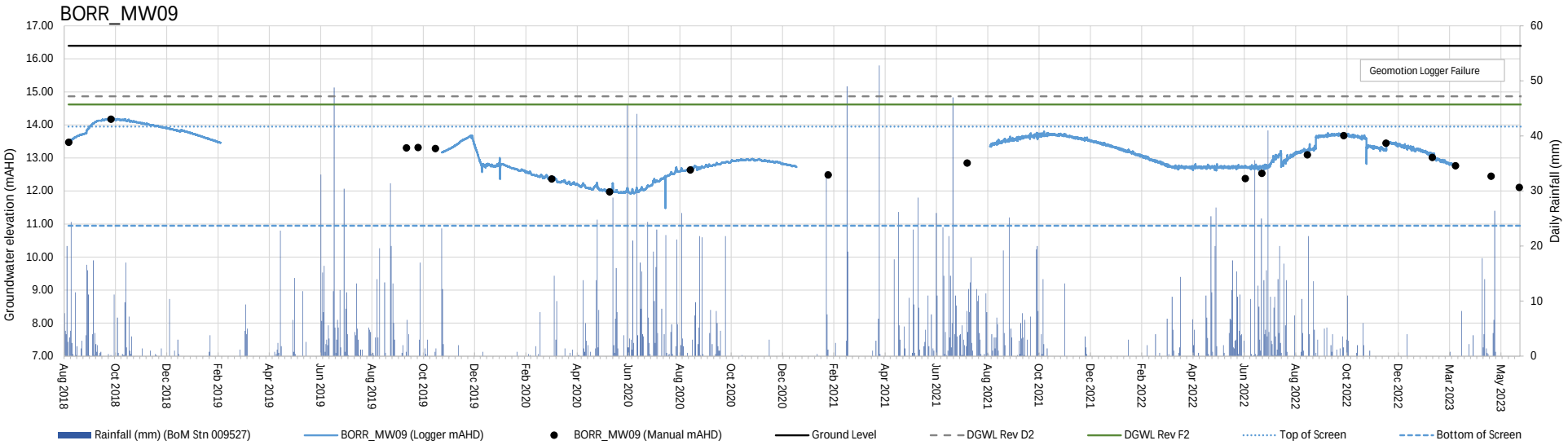
Bottom of Screen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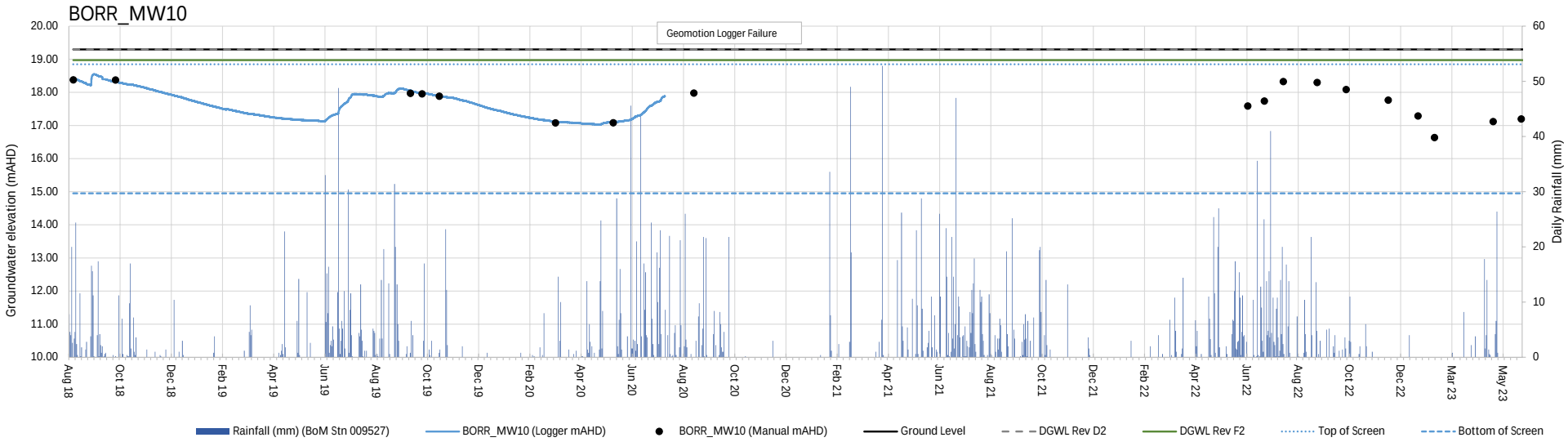
Bottom of Screen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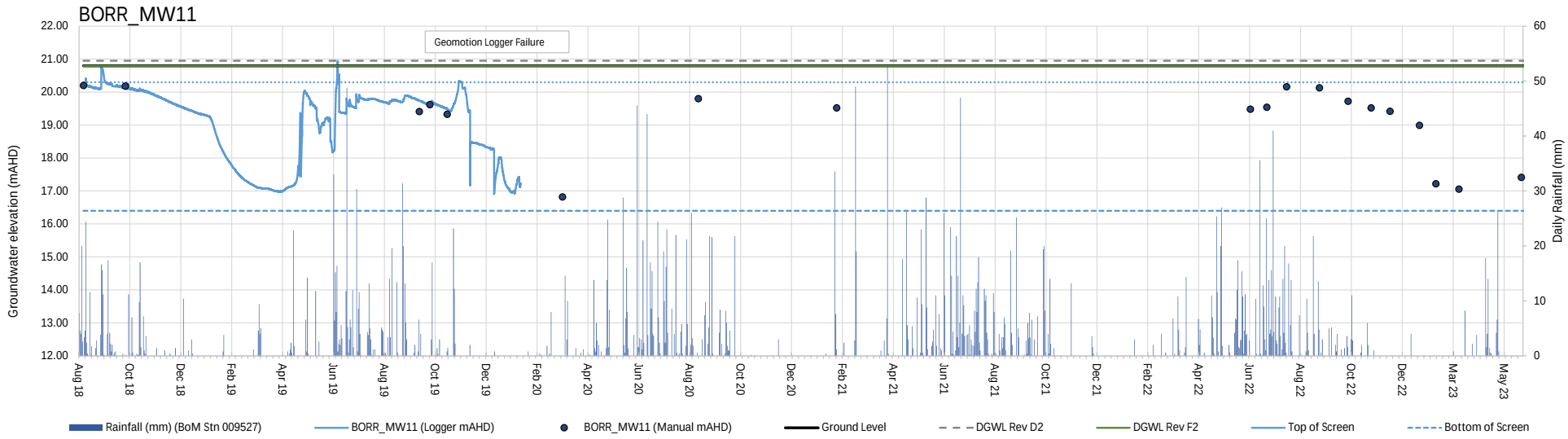
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Rainfall (mm) (BoM Stn 009527)
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BORR_MW11 (Manual mAHD)
Ground Level
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DGWL Rev F2
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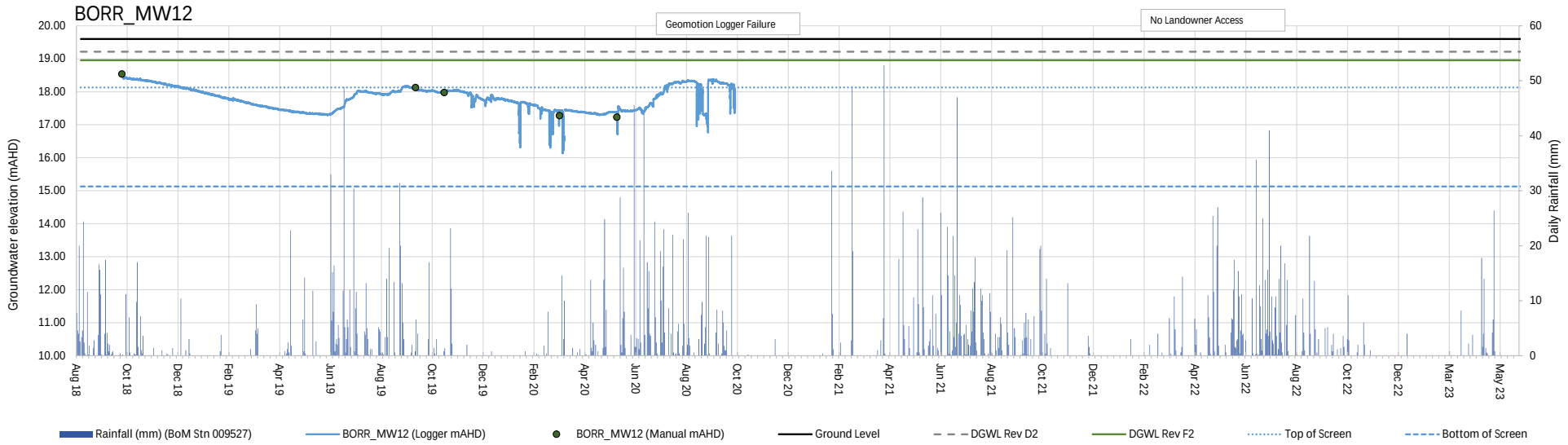
Bottom of Screen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Rainfall (mm) (BoM Stn 009527)
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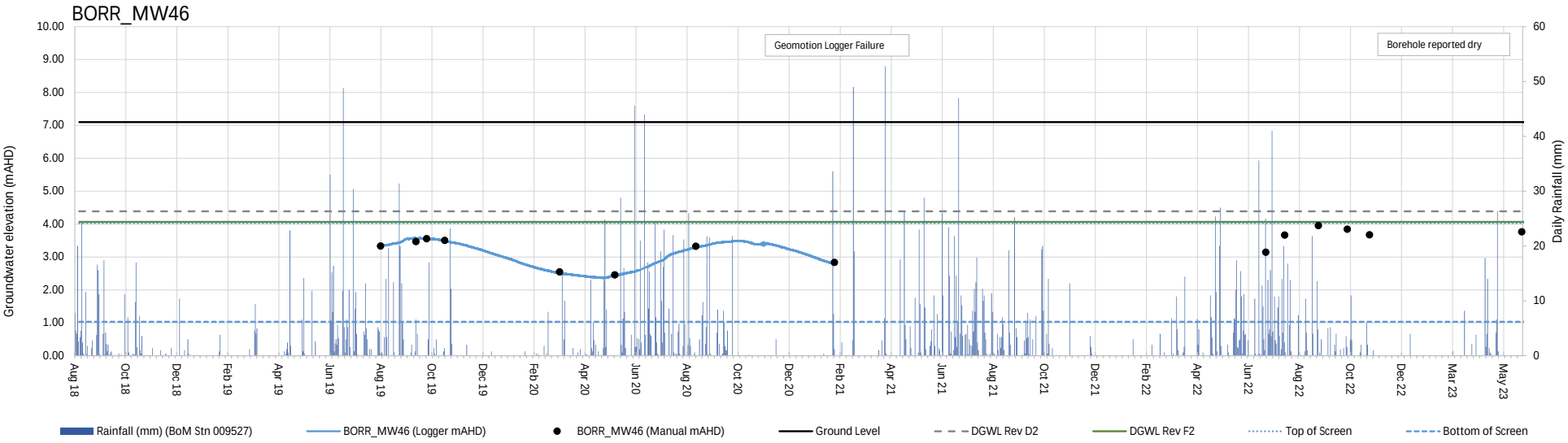
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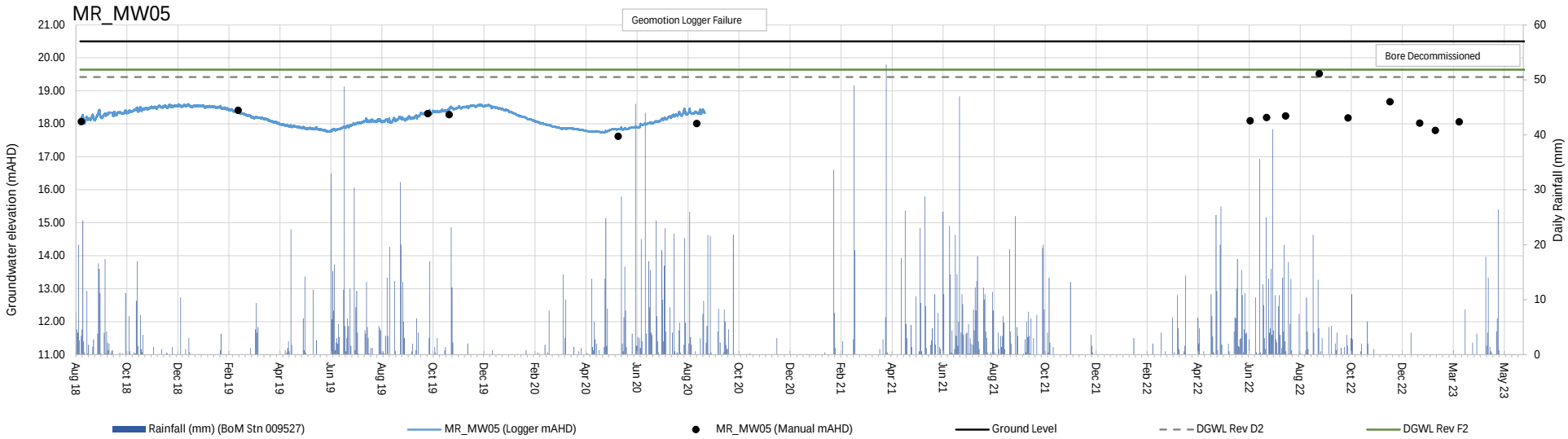
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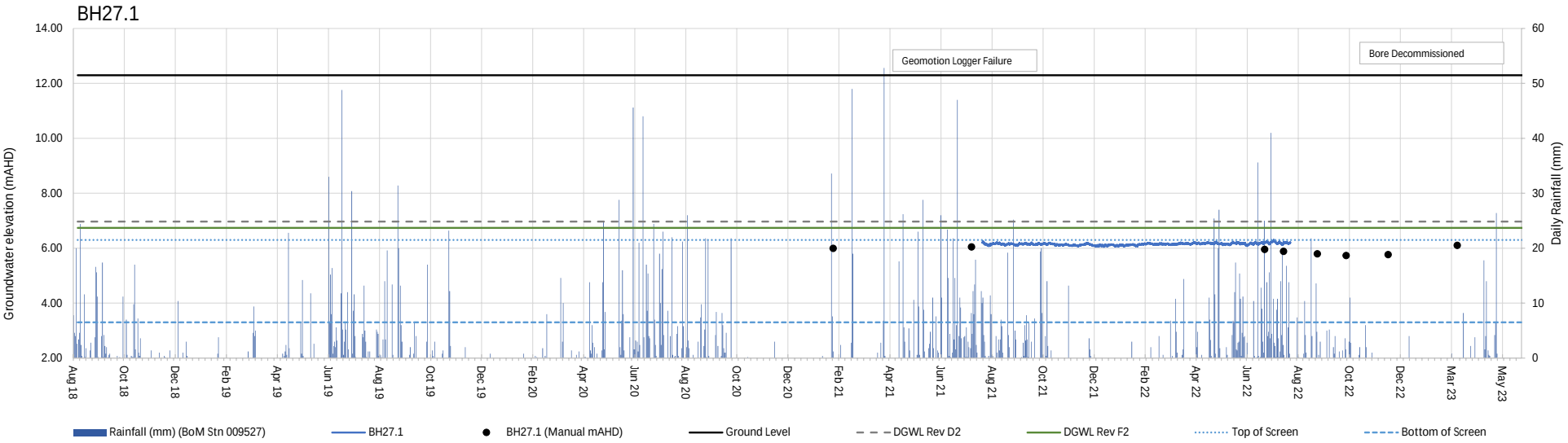
Rainfall (mm) (BoM Stn 009527)
MR_MW05 (Logger mAHD)
MR_MW05 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2


BH27.1
Geomotion Logger Failure
Bore Decommissioned
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BH27.1
BH27.1 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

Bore ID	BORR_MW04		BORR_MW05		BORR_MW06		BORR_MW07		BORR_MW08a		BORR_MW09		BORR_MW10		BORR_MW11		BORR_MW12		BORR_MW46		MR_MW05		BH27.1	
Logger Type	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A	
Easting	370117.70		370680.70		371109.40		372079.40		373588.50		374240.40		374851.40		375281.80		375852.60		373882.60		375313.50		371426.00	
Northing	6297058.10		6298314.70		6299071.60		6300143.90		6300390.20		6301013.40		6301751.80		6302599.20		6304187.10		6305094.10		6302185.30		6299584.00	
Ref Point AHD	9.45		12.24		11.62		15.62		15.95		16.45		19.35		20.80		19.63		7.03		20.51		12.13	
Ground AHD	9.30		12.20		11.60		15.60		15.97		16.40		19.30		20.80		19.60		7.10		20.50			
Date	BORR_MW04 (mbrp)	BORR_MW04 (Manual mAHD)	BORR_MW05 (mbrp)	BORR_MW05 (Manual mAHD)	BORR_MW06 (mbrp)	BORR_MW06 (Manual mAHD)	BORR_MW07 (mbrp)	BORR_MW07 (Manual mAHD)	BORR_MW08a (mbrp)	BORR_MW08a (Manual mAHD)	BORR_MW09 (mbrp)	BORR_MW09 (Manual mAHD)	BORR_MW10 (mbrp)	BORR_MW10 (Manual mAHD)	BORR_MW11 (mbrp)	BORR_MW11 (Manual mAHD)	BORR_MW12 (mbrp)	BORR_MW12 (Manual mAHD)	BORR_MW46 (mbrp)	BORR_MW46 (Manual mAHD)	MR_MW05 (mbrp)	MR_MW05 (Manual mAHD)	BH27.1 (mbrp)	BH27.1 (Manual mAHD)
26/7/2018			5.74	6.50	5.40	6.22	10.04	5.58			3.19	13.26	1.09	18.26	0.58	20.22								
6/8/2018			5.70	6.54	5.33	6.29	10.02	5.60			2.97	13.48	0.97	18.38	0.60	20.20								
7/8/2018																					2.44	18.07		
9/8/2018																								
23/8/2018																								
27/8/2018																								
28/8/2018																								
29/8/2018																								
30/8/2018																								
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4/9/2018																								
7/9/2018																								
10/9/2018																								
14/9/2018																								
21/9/2018									1.84	14.11														
23/9/2018																								
25/9/2018																	1.09	18.54						
26/9/2018	3.71	5.74	5.46	6.78	5.12	6.50	9.89	5.73			2.27	14.18	0.97	18.38	0.62	20.18								
29/9/2018																								
30/9/2018																								
1/10/2018																								
2/10/2018																								
4/10/2018																								
14/10/2018																								
15/10/2018																								
30/10/2018																								
31/10/2018																								
1/11/2018																								
8/11/2018	3.95	5.51							2.29	13.67														
9/11/2018																								
22/11/2018																								
29/11/2018																								
30/11/2018																								
1/12/2018																								
3/12/2018																								
10/12/2018																								
15/12/2018																								
29/12/2018																								
31/12/2018																								
1/1/2019																								
6/1/2019																								
23/1/2019																								
30/1/2019																								
31/1/2019																								
1/2/2019	4.49	4.96																						
5/2/2019																								
13/2/2019																								
14/2/2019																					2.10	18.41		
25/2/2019																								
28/2/2019																								
1/3/2019																								
5/3/2019																								
15/3/2019																								
18/3/2019																								
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5/6/2019																								

Bore ID	BORR_MW04		BORR_MW05		BORR_MW06		BORR_MW07		BORR_MW08a		BORR_MW09		BORR_MW10		BORR_MW11		BORR_MW12		BORR_MW46		MR_MW05		BH27.1	
Logger Type	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A	
Easting	370117.70		370680.70		371109.40		372079.40		373588.50		374240.40		374851.40		375281.80		375852.60		373882.60		375313.50		371426.00	
Northing	6297058.10		6298314.70		6299071.60		6300143.90		6300390.20		6301013.40		6301751.80		6302599.20		6304187.10		6305094.10		6302185.30		6299584.00	
Ref Point AHD	9.45		12.24		11.62		15.62		15.95		16.45		19.35		20.80		19.63		7.03		20.51		12.13	
Ground AHD	9.30		12.20		11.60		15.60		15.97		16.40		19.30		20.80		19.60		7.10		20.50			
Date	BORR_MW04 (mbrp)	BORR_MW04 (Manual mAHD)	BORR_MW05 (mbrp)	BORR_MW05 (Manual mAHD)	BORR_MW06 (mbrp)	BORR_MW06 (Manual mAHD)	BORR_MW07 (mbrp)	BORR_MW07 (Manual mAHD)	BORR_MW08a (mbrp)	BORR_MW08a (Manual mAHD)	BORR_MW09 (mbrp)	BORR_MW09 (Manual mAHD)	BORR_MW10 (mbrp)	BORR_MW10 (Manual mAHD)	BORR_MW11 (mbrp)	BORR_MW11 (Manual mAHD)	BORR_MW12 (mbrp)	BORR_MW12 (Manual mAHD)	BORR_MW46 (mbrp)	BORR_MW46 (Manual mAHD)	MR_MW05 (mbrp)	MR_MW05 (Manual mAHD)	BH27.1 (mbrp)	BH27.1 (Manual mAHD)
6/6/2019																								
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8/7/2019																								
11/7/2019																								
19/7/2019																								
26/7/2019																								
27/7/2019																								
30/7/2019																								
1/8/2019																								
3/8/2019																								
6/8/2019																								
7/8/2019																			3.69	3.34				
10/8/2019																								
14/8/2019																								
15/8/2019																								
19/8/2019																								
21/8/2019																								
23/8/2019																								
30/8/2019																								
31/8/2019																								
1/9/2019																								
3/9/2019																								
6/9/2019																								
16/9/2019																								
17/9/2019																								
18/9/2019	3.88	5.57			5.41	6.21	10.10	5.52	2.07	13.88	3.14	13.31	1.38	17.98			1.50	18.13						
19/9/2019			5.65	6.59											1.39	19.41			3.56	3.47				
22/9/2019																								
24/9/2019																								
30/9/2019																								
1/10/2019																								
2/10/2019	3.91	5.54	5.65	6.59	5.28	6.34	9.97	5.65	2.33	13.62	3.13	13.32	1.39	17.96	1.18	19.62			3.47	3.56	2.20	18.31		
3/10/2019																								
4/10/2019																								
5/10/2019																								
6/10/2019																								
8/10/2019																								
21/10/2019																								
22/10/2019																								
23/10/2019											3.16	13.29	1.46	17.89	1.47	19.33	1.65	17.98						
24/10/2019																				3.51				
28/10/2019	4.10	5.36	5.64	6.61	5.31	6.31			2.72	13.23											2.23	18.28		
31/10/2019																								
31/10/2019																								
1/11/2019																								
2/11/2019																								
3/11/2019																								
14/11/2019																								
18/11/2019																								
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28/12/2019																								
30/12/2019																								
31/12/2019																								
1/1/2020																								
1/1/2020																								
9/1/2020																								
9/1/2020																								
17/1/2020																								
20/1/2020																								
21/1/2020																								

Bore ID	BORR_MW04		BORR_MW05		BORR_MW06		BORR_MW07		BORR_MW08a		BORR_MW09		BORR_MW10		BORR_MW11		BORR_MW12		BORR_MW46		MR_MW05		BH27.1	
Logger Type	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A	
Easting	370117.70		370680.70		371109.40		372079.40		373588.50		374240.40		374851.40		375281.80		375852.60		373882.60		375313.50		371426.00	
Northing	6297058.10		6298314.70		6299071.60		6300143.90		6300390.20		6301013.40		6301751.80		6302599.20		6304187.10		6305094.10		6302185.30		6299584.00	
Ref Point AHD	9.45		12.24		11.62		15.62		15.95		16.45		19.35		20.80		19.63		7.03		20.51		12.13	
Ground AHD	9.30		12.20		11.60		15.60		15.97		16.40		19.30		20.80		19.60		7.10		20.50			
Date	BORR_MW04 (mbrp)	BORR_MW04 (Manual mAHD)	BORR_MW05 (mbrp)	BORR_MW05 (Manual mAHD)	BORR_MW06 (mbrp)	BORR_MW06 (Manual mAHD)	BORR_MW07 (mbrp)	BORR_MW07 (Manual mAHD)	BORR_MW08a (mbrp)	BORR_MW08a (Manual mAHD)	BORR_MW09 (mbrp)	BORR_MW09 (Manual mAHD)	BORR_MW10 (mbrp)	BORR_MW10 (Manual mAHD)	BORR_MW11 (mbrp)	BORR_MW11 (Manual mAHD)	BORR_MW12 (mbrp)	BORR_MW12 (Manual mAHD)	BORR_MW46 (mbrp)	BORR_MW46 (Manual mAHD)	MR_MW05 (mbrp)	MR_MW05 (Manual mAHD)	BH27.1 (mbrp)	BH27.1 (Manual mAHD)
22/1/2020																								
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23/1/2020																								
31/1/2020																								
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29/2/2020																								
1/3/2020																								
2/3/2020																								
4/3/2020																								
5/3/2020																								
9/3/2020																								
12/3/2020	4.83	4.62	5.97	6.27	5.74	5.88	10.21	5.41	3.96	11.99	4.08	12.37	2.27	17.08	3.98	16.82	2.35	17.28	4.48	2.55				
17/3/2020																								
27/3/2020																								
29/3/2020																								
30/3/2020																								
31/3/2020																								
1/4/2020																								
1/4/2020																								
3/4/2020																								
15/4/2020																								
16/4/2020																								
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30/4/2020																								
1/5/2020																								
3/5/2020																								
4/5/2020																								
6/5/2020																								
7/5/2020																								
18/5/2020	4.52	4.93	6.03	6.21	5.72	5.91	10.29	5.33	4.24	11.71									4.57	2.46				
19/5/2020																								
20/5/2020																								
21/5/2020											4.47	11.98	2.27	17.09			2.40	17.23			2.89	17.62		
22/5/2020																								
24/5/2020																								
25/5/2020																								
26/5/2020																								
27/5/2020																								
31/5/2020																								
1/6/2020																								
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2/7/2020																								
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16/7/2020																								
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1/8/2020																								
6/8/2020																								
10/8/2020																								
11/8/2020																								
12/8/2020																								
13/8/2020																								
22/8/2020																								
23/8/2020																								
24/8/2020															1.00	19.80			3.70	3.33	2.50	18.01		
25/8/2020																								
26/8/2020	4.03	5.42	5.76	6.48	5.38	6.24	10.14	5.48	1.94	14.01	3.81	12.64	1.37	17.98										
27/8/2020																								
29/8/2020																								
31/8/2020																								
1/9/2020																								

Bore ID	BORR_MW04		BORR_MW05		BORR_MW06		BORR_MW07		BORR_MW08a		BORR_MW09		BORR_MW10		BORR_MW11		BORR_MW12		BORR_MW46		MR_MW05		BH27.1	
Logger Type	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A	
Easting	370117.70		370680.70		371109.40		372079.40		373588.50		374240.40		374851.40		375281.80		375852.60		373882.60		375313.50		371426.00	
Northing	6297058.10		6298314.70		6299071.60		6300143.90		6300390.20		6301013.40		6301751.80		6302599.20		6304187.10		6305094.10		6302185.30		6299584.00	
Ref Point AHD	9.45		12.24		11.62		15.62		15.95		16.45		19.35		20.80		19.63		7.03		20.51		12.13	
Ground AHD	9.30		12.20		11.60		15.60		15.97		16.40		19.30		20.80		19.60		7.10		20.50			
Date	BORR_MW04 (mbrp)	BORR_MW04 (Manual mAHD)	BORR_MW05 (mbrp)	BORR_MW05 (Manual mAHD)	BORR_MW06 (mbrp)	BORR_MW06 (Manual mAHD)	BORR_MW07 (mbrp)	BORR_MW07 (Manual mAHD)	BORR_MW08a (mbrp)	BORR_MW08a (Manual mAHD)	BORR_MW09 (mbrp)	BORR_MW09 (Manual mAHD)	BORR_MW10 (mbrp)	BORR_MW10 (Manual mAHD)	BORR_MW11 (mbrp)	BORR_MW11 (Manual mAHD)	BORR_MW12 (mbrp)	BORR_MW12 (Manual mAHD)	BORR_MW46 (mbrp)	BORR_MW46 (Manual mAHD)	MR_MW05 (mbrp)	MR_MW05 (Manual mAHD)	BH27.1 (mbrp)	BH27.1 (Manual mAHD)
2/9/2020																								
4/9/2020																								
10/9/2020																								
19/9/2020																								
1/10/2020																								
3/10/2020																								
29/10/2020																								
31/10/2020																								
1/11/2020																								
10/11/2020																								
11/11/2020																								
20/11/2020																								
21/1/2021																								
8/2/2021																								
9/2/2021	4.53	4.92	5.87	6.37	5.65	5.97	10.12	5.48	3.58	12.37	3.96	12.49			1.28	19.52			4.19	2.84			6.13	6.00
10/2/2021																								
11/2/2021																								
27/7/2021	3.94	5.51			5.34	6.28	10.20	5.48	1.87	14.08	3.60	12.85	1.19		0.82				3.52		2.28		6.08	6.05
29/7/2021																								
19/8/2021																								
24/8/2021																								
20/9/2021																								
25/10/2021																								
22/11/2021																								
20/12/2021																								
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21/2/2022																								
22/2/2022																								
15/3/2022																								
20/4/2022																								
31/5/2022																								
1/6/2022																								
28/6/2022	4.22	5.23			5.61	6.01					4.07	12.38	1.76	17.59	1.32	19.48					2.42	18.09		
18/7/2022	4.09	5.36			5.56	6.06	10.46	5.16	3.86	12.09	3.91	12.54	1.61	17.74	1.26	19.54			3.88	3.15	2.32	18.19	6.17	5.96
9/8/2022																								
10/8/2022			5.73	6.51	5.42	6.20			1.78	14.17			1.02	18.33					3.36	3.67	2.27	18.24	6.24	5.89
11/8/2022	4.04	5.41													0.64	20.16								
11/9/2022											3.35	13.10												
20/9/2022	3.94	5.51	5.58	6.66	5.27	6.35	10.13	5.49	1.84	14.11			1.05	18.30	0.67	20.13			3.07	3.96	0.99	19.52	6.33	5.80
25/10/2022	3.97	5.48	5.55	6.69	5.30	6.32	10.10	5.52	2.18	13.77	2.77	13.68	1.26	18.09	1.08	19.72			3.18	3.85	2.33	18.18	6.39	5.74
21/11/2022	4.11	5.34	5.66	6.58			10.09	5.53	2.54	13.41									3.35	3.68				
22/11/2022															1.28	19.52								
23/11/2022																								
15/12/2022	4.43	5.02	5.61	6.63	5.43	6.19	10.17	5.45	2.82	13.13	3.00	13.45	1.58	17.77	1.38	19.42					1.84	18.67	6.36	5.77
20/1/2023	4.81	4.64			5.61	6.01			3.22	12.73			2.06	17.29	1.81	18.99					2.49	18.02		
8/2/2023																					2.71	17.80		
9/2/2023							10.43	5.19	3.49	12.46	3.43	13.02	2.71	16.64	3.58	17.22								
10/2/2023	4.98	4.47			5.55	6.07																		
9/3/2023	5.05	4.40			5.83	5.79	10.27	5.35	3.64	12.31	3.68	12.77			3.74	17.06					2.45	18.06	6.02	6.11
21/4/2023	4.85	4.60			5.48	6.14					4.00	12.45	2.23	17.12										
24/5/2023	4.70	4.75			5.50	6.12									3.39	17.41								
25/5/2023											4.34	12.11	2.15	17.20					3.26	3.77				
26/5/2023																								

Dry

Destroyed as part of construction activities

Appendix C

Groundwater Quality Data

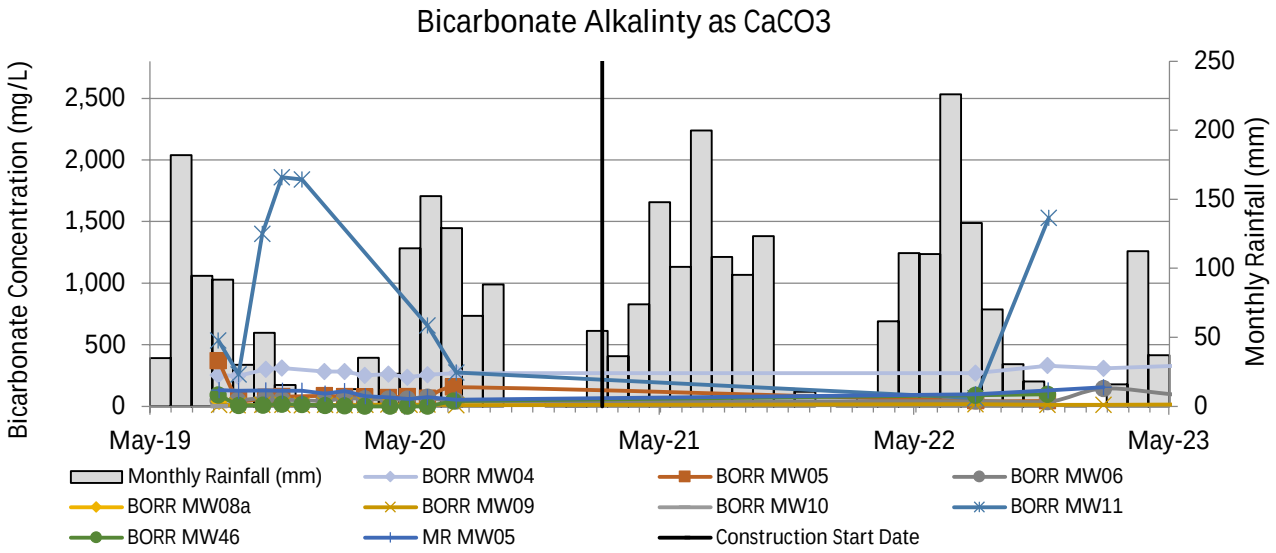
Appendix C.

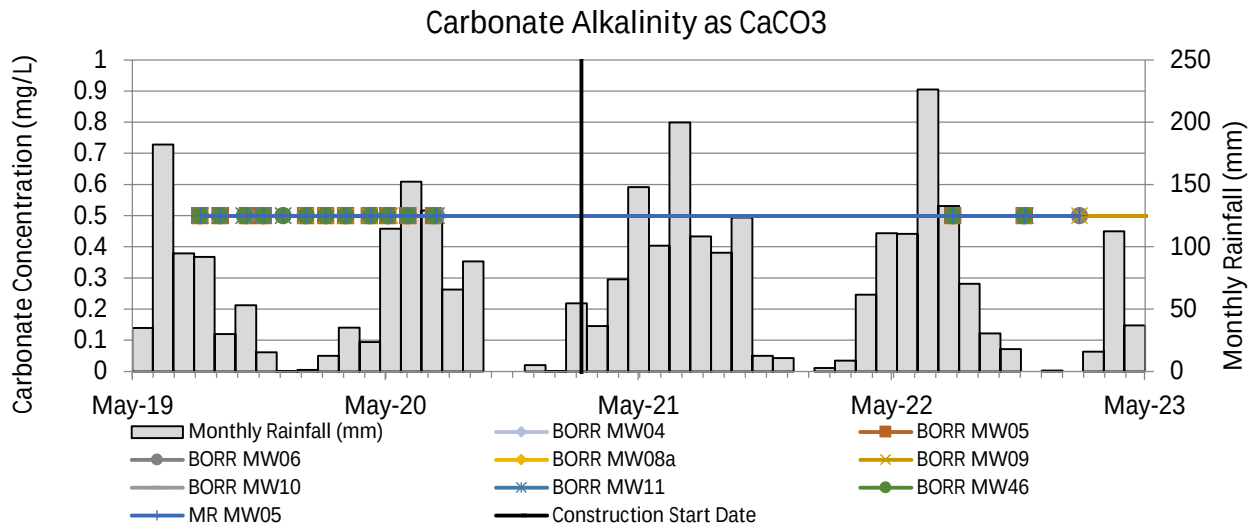
Table C 1. Analytical Groundwater Results.

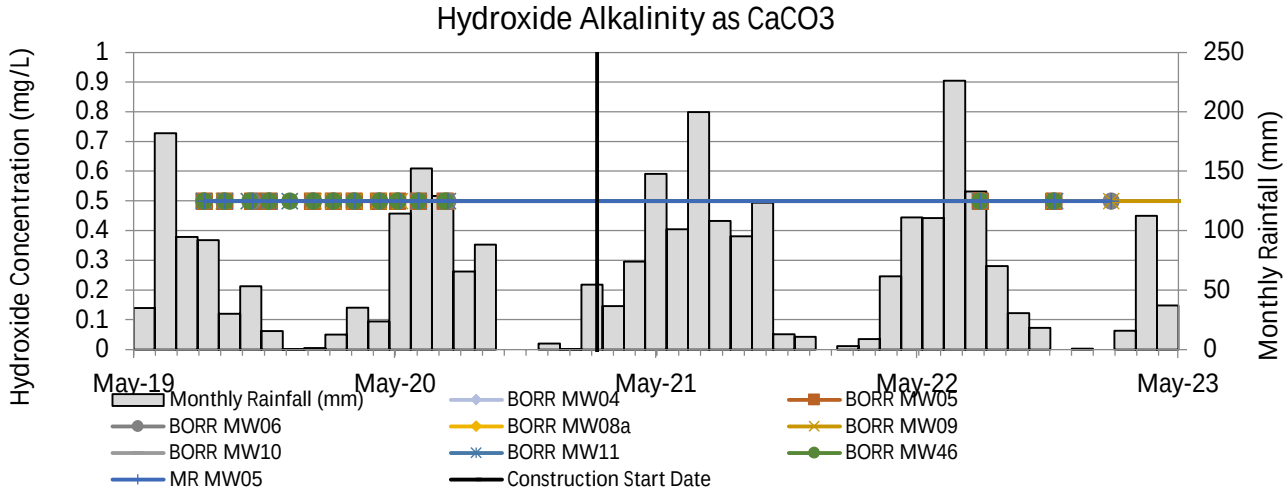
			Inorganics			Acidity & Alkalinity					Nutrients		Metals						BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs - standard 16
			pH (Lab)	Electrical conductivity (lab)	Total Dissolved Solids	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Nitrogen (Total)	Phosphorus (Total)	Arsenic (filtered)	Cadmium (filtered)	Copper (filtered)	Lead (filtered)	Nickel (filtered)	Zinc (filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene
			pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			0.01	1	10	1	1	1	1	1	0.1	0.01	0.001	0.0001	0.001	0.001	0.001	0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100	20	50	100	50	50	5
ANZECC 2000 FW slightly/moderately disturbed ecosystems											1.5	0.06	2	0.0002	0.0014	0.0034	0.011	0.008																				
DER 2014 Non-potable Groundwater Use (NPUG)													0.1	0.02	20	0.1	0.2	3	10	25	3			20														
DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values													0.1	0.02	20	0.1	0.2	3	10	25	3			20				1,000		900	900							
Location Code	**Date**	**Lab Report Number**																																				
BORR MW04	21/08/2019	EP1908496	7.29	3,160	2,080	<1	253	<1	253	31	0.4	0.29	0.002	<0.0001	<0.001	<0.001	<0.001	0.007	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	7.61	2,890	1,720	<1	246	<1	246	14	4.5	0.52	0.003	<0.0001	0.008	<0.001	0.01	0.047	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	7.19	3,940	2,410	<1	301	<1	301	26	0.4	0.08	0.002	<0.0001	0.01	<0.001	0.009	0.066	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	7.26	4,080	2,430	<1	310	<1	310	18	0.4	0.12	0.002	<0.0001	0.012	<0.001	0.014	0.095	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	7.04	4,080	2,450	<1	281	<1	281	20	0.4	0.11	0.002	<0.0001	0.01	<0.001	0.011	0.078	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	7.20	4,280	2,850	<1	282	<1	282	18	0.3	0.06	0.002	<0.0001	0.012	<0.001	0.014	0.053	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/03/2020	EP2002968	7.40	3,850	2,420	<1	250	<1	250	16	0.4	0.1	0.002	<0.0001	0.008	<0.001	0.003	0.036	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	7.33	4,260	2,670	<1	260	<1	260	22	0.5	0.03	0.002	<0.0001	0.002	<0.001	0.001	0.017																				
	18/05/2020	EP2005242	7.46	3,750	2,310	<1	236	<1	236	19	0.3	0.08	0.002	<0.0001	<0.001	<0.001	<0.001	0.005																				
	16/06/2020	EP2006304	7.28	3,630	2,190	<1	256	<1	256	16	0.2	0.06	0.001	<0.0001	0.013	<0.001	0.007	0.052																				
	27/07/2020	EP2007908	7.62	3,680	2,120	<1	270	<1	270	39	0.3	0.11	0.001	<0.0001	0.01	<0.001	0.002	0.012	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	10/08/2022	EP2210049	7.25	3790	-	<1	268	<1	268	48,000	0.4	0.07	<0.001	<0.0001	0.002	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	7.51	4870	-	<1	330	<1	330	55,000	0.6	0.04	<0.001	<0.0001	<0.001	<0.001	0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	9/02/2023	EP2301758	7.25	5000	-	<1	308	<1	308	71,000	0.6	0.05	0.002	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	26/05/2023	EP2306972	7.26	5180	-	<1	328	<1	328	90,000	0.5	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW05	21/08/2019	EP1908496	6.73	938	666	<1	68	<1	68	22	1.7	0.12	<0.001	<0.0001	0.004	<0.001	0.005	0.068	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	7.12	1,030	576	<1	73	<1	73	11	1.1	0.03	<0.001	<0.0001	0.012	<0.001	0.015	0.046	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	6.80	1,160	683	<1	79	<1	79	14	1.6	0.09	0.001	<0.0001	0.008	0.001	0.013	0.115	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	7.08	1,140	722	<1	86	<1	86	12	1.1	0.02	0.001	<0.0001	0.011	0.001	0.014	0.072	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	6.97	1,140	654	<1	80	<1	80	28	1.1	0.04	0.001	<0.0001	0.01	0.001	0.013	0.01	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	6.97	1,200	742	<1	76	<1	76	19	1.1	0.05	<0.001	<0.0001	0.01	<0.001	0.009	0.033	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/03/2020	EP2002968	7.09	1,230	744	<1	72	<1	72	13	1.3	0.04	0.001	<0.0001	0.008	<0.001	0.003	0.041	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	7.06	1,210	788	<1	79	<1	79	16	1.4	<0.01	0.001	<0.0001	0.005	<0.001	0.001	0.007																				
	18/05/2020	EP2005242	7.13	1,140	686	<1	66	<1	66	15	1.1	0.08	0.001	<0.0001	0.005	0.001	0.002	0.035																				
	16/06/2020	EP2006304	7.11	1,050	614	<1	156	<1	156	12	0.9	0.06	<0.001	<0.0001	0.006	<0.001	0.002	0.017																				
	23/07/2020	EP2007769	7.19	454	392	<1	45	<1	45	11	0.9	0.09	<0.001	<0.0001	0.003	<0.001	<0.001	<0.005																				
	10/08/2022	EP2210049	6.34	659	-	<1	45	<1	45	30,000	9.2	0.99	0.008	<0.0001	0.007	<0.001	0.005	0.062	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	7.04	1360	-	<1	45	<1	45	20,000	0.4	0.02	0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW06	21/08/2019	EP1908496	6.96	438	302	<1	49	<1	49	13	1.3	0.06	<0.001	<0.0001	0.025	0.002	0.014	0.126	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	7.08	384	273	<1	48	<1	48	11	1.7	0.03	<0.001	<0.0001	0.009	0.003	0.008	0.061	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	6.76	690	492	<1	71	<1	71	16	2.3	0.12	<0.001	<0.0001	0.001	<0.001	0.001	0.01	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	6.74	605	466	<1	56	<1	56	16	1.7	0.06	0.001	<0.0001	0.011	0.002	0.018	0.073	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	6.88	370	260	<1	47	<1	47	13	1.1	0.04	0.001	<0.0001	0.006	0.001	0.003	0.04	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	7.03	546	440	<1	68	<1	68	10	0.8	0.07	<0.001	<0.0001	0.007	<0.001	0.013	0.12	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/03/2020	EP2002968	7.15	629	432	<1	60	<1	60	17	1	0.05	<0.001	<0.0001	0.005	<0.001	0.002	0.03	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	7.09	721	479	<1	58	<1	58	17	1	0.32	<0.001	<0.0001	0.002	<0.001	<0.001	0.009																				
	18/05/2020	EP2005242	7.11	779	532	<1	59	<1	59	13	1.5	0.05	<0.001	<0.0001	0.007	0.001	0.011	0.095																				
	16/06/2020	EP2006304	7.20	702	499	<1	74	<1	74	12	1.4	0.07	<0.001	<0.0001	0.018	<0.001	0.008	0.047																				
	27/07/2020	EP2007908	7.21	555	390	<1	42	<1	42	21	0.9	0.08	<0.001	<0.0001	0.011	<0.001	0.004	0.011	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	10/08/2022	EP2210049	6.68	356	-	<1	42	<1	42	20,000	0.5	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	7.03	330	-	<1	37	<1	37	19,000	0.4	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	9/02/2023	EP2301758	7.62	1080	-	<1	144	<1	144	10,000	1.6	0.06	0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	26/05/2023	EP2306972	7.24	770	-	<1	94	<1	94	26,000	1.5	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW07	22/08/2019	EP1908496	6.84	513	386	<1	40	<1	40	20	<0.1	0.09	<0.001	<0.0001	0.012	<0.001	0.013	0.036	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	6.71	576	474	<1	34	<1	34	22	0.8	0.37	<0.001	<0.0001	0.009	<0.001	0.009	0.112	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW08a	22/08/2019	EP1908496	6.10	578	474	<1	40	<1	40	34	1.8	0.82	<0.001	<0.0001	0.012	<0.001	0.015	0.075	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	6.61	507	368	<1	46	<1	46	20	1.4	0.58	0.002	<0.0001	0.007	<0.001	0.005	0.074	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	6.19	534	584	<1	48	<1	48	23	2.9	1.01	0.002	<0.0001	0.011	<0.001	0.012	0.083	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	6.36	550	411	<1	48	<1	48	18	1.6	0.67	0.002	<0.0001	0.009	0.001	0.018	0.085	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	6.80	607	418	<1	58	<1	58	18	1.9	1.06	<0.001	<0.0001	0.01	0.002	0.016	0.097	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	6.31	575	366	<1	44	<1	44	19	1.3	0.59	<0.001	<0.0001	0.007	<0.001	0.004	0.042	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	6.52	510	416	<1	53	<1	53	17	1.8	0.86	<0.001	<0.0001	0.005	<0.001	0.005	0.033	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/03/2020	EP2002968	6.49	498	370	<1	52	<1	52	18	2.4	1.22	<0.001	<0.0001	0.005	<0.001	0.003	0.038	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	6.69	529	393	<1	51	<1	51	20	2.0	0.96	0.001	<0.0001	0.001	<0.001	0.001	0.054																				
	18/05/2020	EP2005242	6.70	557	368	<1	49	<1	49	19	1.6	0.83	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005																				
	16/06/2020	EP2006304	6.52	566	385	<1	55	<1	55	18	1.9	0.85	<0.001	<0.0001	0.014	<0.001	0.007	0.046																				
	21/11/2022	EP2215830	6.69	692	-	<1	61	<1	61	52,000	2	0.59	0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	9/02/2023	EP2301758	6.75	659	-	<1	71	<1	71	41,000	2.3	0.76	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW09	22/08/2019	EP1908496	6.59	430	280	<1	11	<1	11	9	0.9	0.01	<0.001	<0.0001	0.028	<0.001	0.015	0.118	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	6.63	393	258	<1	10	<1	10	7	1.2	<0.01	<0.001	<0.0001	0.014	<0.001	0.008	0.12	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/10/2019	EP1910998	6.80	271	164	<1	11	<1	11	6	3.2	<0.02	<0.001	<0.0001	0.011	<0.001	0.009	0.055	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	6.62	192	116	<1	11	<1	11	7	2.9	<0.01	<0.001	<0.0001	0.02	0.001	0.017	0.042	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	6.82	215	138	<1	10	<1	10	7	1.3	<0.01	<0.001	<0.0001	0.014	0.001	0.014	0.06	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	6.68	210	93	<1	12	<1	12	8	0.8	<0.01	<0.001	<0.0001	0.014	0.001	0.006	0.047	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	6.71	168	94	<1	10	<1	10	15	0.6	0.01	<0.001	<0.0001	0.012	<0.001	0.01	0.045	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/03/2020	EP2002968	6.70	171	114	<1	11	<1	11	8	0.4	0.02	<0.001	<0.0001	0.011	<0.001	0.003	0.039	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	6.82	196	127	<1	13	<1	13	9	0.2	0.03	<0.001	<0.0001	0.003	<0.001	<0.001	0.027																				
	21/05/2020	EP2005328	6.71	247	152	<1	12	<1	12	8	0.1	<0.01	<0.001	<0.0001	0.005	<0.001	0.004	0.027																				
	16/06/2020	EP2006304	6.68	257	154	<1	14	<1	14	7	<0.1	0.02	<0.001	<0.0001	0.024	<0.001	0.006	0.053																				
	27/07/2020	EP2007908	6.64	599	446	<1	9	<1	9	15	1.4	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	10/08/2022	EP2210049	6.72	98	-	<1	17	<1	17	12,000	0.6	0.01	<0.001	<0.0001	0.002	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	6.82	223	-	<1	12	<1	12	17,000	5.5	0.01	<0.001	<0.0001	0.006	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	9/02/2023	EP2301758	6.65	153	-	<1	12	<1	12	10,000	0.8	0.02	<0.001	<0.0001	0.003	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	25/05/2023	EP2306972	6.71	221	-	<1	13	<1	13	25,000	0.7	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW10	22/08/2019	EP1908496	6.49	516	382	<1	28	<1	28	28	1.2	0.06	0.001	<0.0001	0.011	<0.001	0.016	0.066	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	6.81	414	264	<1	39	<1	39	10	0.9	<0.01	<0.001	<0.0001	0.011	<0.001	0.009	0.053	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/10/2019	EP1910998	6.49	392	262	<1	22	<1	22	13	0.8	<0.01	<0.001	<0.0001	0.008	<0.001	0.007	0.074	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	6.38	411	266	<1	21	<1	21	15	0.8	<0.01	0.001	<0.0001	0.013	<0.001	0.012	0.055	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	6.54	465	288	<1	21	<1	21	16	0.6	<0.01	0.001	<0.0001	0.009	<0.001	0.01	0.055	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	6.19	457	273	<1	16	<1	16	17	0.6	<0.01	0.002	<0.0001	0.012	<0.001	0.013	0.073	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	6.40	466	334	<1	21	<1	21	14	0.8	0.02	0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/03/2020	EP2002968	6.44	553	380	<1	24	<1	24	18	1.1	0.02	0.002	<0.0001	0.009	<0.001	0.003	0.05	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/04/2020	EP2004114	6.48	598	409	<1	23	<1	23	20	1.2	0.07	0.002	<0.0001	0.006	<0.001	0.002	0.017																				
	21/05/2020	EP2005328	6.51	623	424	<1	27	<1	27	13	0.9	<0.01	0.002	<0.0001	0.007	<0.001	0.003	0.05																				
	16/06/2020	EP2006304	6.51	585	366	<1	28	<1	28	16	0.8	0.02	<0.001	<0.0001	0.023	<0.001	0.006	0.046																				
	23/07/2020	EP2007769	6.54	504	336	<1	27	<1	27	27	1.2	0.02	0.001	<0.0001	<0.001	<0.001	<0.001	<0.005																				
	10/08/2022	EP2210049	7.63	234	-	<1	76	<1	76	6000	0.3	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	6.81	383	-	<1	35	<1	35	36,000	0.5	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	25/05/2023	EP2306972	6.43	496	-	<1	21	<1	21	54,000	0.7	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW11	21/08/2019	EP1908496	7.74	4,150	2,490	<1	535	<1	535	34	2.3	0.76	0.002	<0.0001	0.025	<0.001	0.02	0.099	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	7.23	2,300	1,570	<1	258	<1	258	24	1.5	0.28	0.004	<0.0001	0.009	<0.001	0.008	0.039	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/10/2019	EP1910998	7.76	12,900	7,430	<1	1,400	<1	1,400	51	4.2	0.33	0.006	<0.0001	0.01	0.001	0.017	0.09	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	7.67	19,600	12,700	<1	1,860	<1	1,860	36	6.3	0.15	0.007	<0.0001	0.024	0.002	0.041	0.077	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	290	<100	290	<20	<50	210	120	330	<5
	19/12/2019	EP1913643	7.93	24,600	15,000	<1	1,840	<1	1,840	16	6.2	0.17	0.009	<0.0005	0.01	<0.005	0.018	0.404	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	16/06/2020	EP2006304	7.87	12,600	7,520	<1	656	<1	656	12	3.0	0.13	0.002	<0.0001	0.03	<0.001	0.013	0.07																				
	27/07/2020	EP2007909	7.79	1,940	1,380	<1	275	<1	275	29	1.4	0.21	<0.001	<0.0001	0.031	<0.001	0.004	0.011																				
	10/08/2022	EP2210049	6.61	1700	-	<1	67	<1	67	37,000	0.6	0.05	<0.001	<0.0001	0.006	<0.001	0.002	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	23/11/2022	EP2215830	7.72	16,400	-	<1	1530	<1	1530	97,000	6.5	0.3	0.009	<0.0001	0.008	<0.001	0.015	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
BORR MW46	21/08/2019	EP1908496	6.78	216	234	<1	91	<1	91	19	0.5	0.01	<0.001	<0.0001	0.041	0.002	0.012	0.104	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	5.77	541	445	<1	7	<1	7	12	0.6	0.01	0.004	<0.0001	0.017	0.001	0.012	0.07	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	24/10/2019	EP1910998	5.97	474	405	<1	8	<1	8	73	0.6	0.01	0.004	<0.0001	0.012	<0.001	0.012	0.115	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	6.07	377	312	<1	17	<1	17	40	0.8	0.02	0.002	<0.0001	0.016	0.001	0.015	0.07	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	6.28	408	316	<1	14	<1	14	46	1.4	<0.01	0.002	<0.0001	0.016	<0.001	0.012	0.062	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	5.78	397	284	<1	7	<1	7	49	0.3	<0.01	0.004	<0.0001	0.012	<0.001	0.012	0.033	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	5.30	376	298	<1	3	<1	3	51	0.3	0.03	0.003	<0.0001	0.014	<0.001	0.012	0.047	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/03/2020	EP2002968	4.54	444	296	<1	<1	<1	<1	73	0.6	0.02	0.006	<0.0001	0.01	<0.001	0.006	0.061	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/04/2020	EP2004276	3.24	652	386	<1	<1	<1	<1	59	0.8	0.02	0.003	<0.0001	0.011	<0.001	0.004	0.038																				
	18/05/2020	EP2005242	3.72	468	302	<1	<1	<1	<1	37	0.4	0.05	0.003	<0.0001	0.008	<0.001	0.007	0.028																				
	16/06/2020	EP2006304	3.53	547	296	<1	<1	<1	<1	35	0.4	0.05	<0.001	<0.0001	0.033	0.001	0.012	0.064																				
	23/07/2020	EP2007775	6.55	319	244	<1	43	<1	43	57	0.6	0.05	<0.001	<0.0001	0.009	<0.001	0.003	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	10/08/2022	EP2210049	7.04	362	-	<1	90	<1	90	28,000	2.5	0.02	<0.001	<0.0001	0.001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	21/11/2022	EP2215830	6.95	306	-	<1	98	<1	98	80,000	0.6	0.07	0.003	<0.0001	<0.0001	<0.001	<0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
MR MW05	22/08/2019	EP1908496	6.43	22,600	13,900	<1	130	<1	130	78	2.0	0.09	0.016	0.0001	0.013	0.002	0.014	0.119	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	230	<100	230	<20	<50	280	<50	280	<5
	19/09/2019	EP1909602	6.47	22,200	14,300	<1	125	<1	125	39	1.3	0.09	0.010	<0.0005	0.008	<0.005	0.009	0.052	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	160	<100	160	<20	<50	190	<50	190	<5
	28/10/2019	EP1911129	6.29	19,900	15,300	<1	129	<1	129	51	1.1	0.12	0.009	<0.0005	<0.005	<0.005	0.007	0.068	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	100	<100	100	<20	<50	140	<50	140	<5
	21/11/2019	EP1912321	6.25	21,400	14,800	<1	125	<1	125	46	0.9	0.08	0.013	<0.0001	0.004	<0.001	0.006	0.031	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	140	<100	140	<20	<50	170	<50	170	<5
	19/12/2019	EP1913643	6.39	22,200	13,600	<1	125	<1	125	47	2.0	0.08	0.009	<0.0005	<0.005	<0.005	0.014	0.069	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	240	<100	240	<20	<50	270	<50	270	<5
	21/01/2020	EP2000762	6.16	23,100	14,900	<1	102	<1	102	35	0.8	0.07	0.010	<0.0001	0.006	<0.001	0.016	0.057	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/02/2020	EP2001737	6.34	23,600	17,400	<1	122	<1	122	41	1.5	0.15	0.018	<0.0005	<0.005	<0.005	0.008	0.053	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	110	<100	110	<20	<50	120	<50	120	<5
	19/03/2020	EP2002968	6.20	22,300	16,600	<1	81	<1	81	36	1.1	0.1	0.012	<0.0005	<0.005	<0.005	<0.005	0.03	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/04/2020	EP2004276	6.81	23,500	15,600	<1	71	<1	71	22	0.9	0.07	0.007	<0.0001	0.008	<0.001	0.007	0.057																				
	21/05/2020	EP2005328	6.34	22,500	16,500	<1	59	<1	59	30	0.4	0.08	<0.005	<0.0005	0.008	<0.005	0.007	0.043																				
	16/06/2020	EP2006304	6.41	23,200	14,200	<1	74	<1	74	26	0.4	0.07	0.001	<0.0001	0.027	0.001	0.01	0.072																				
	27/07/2020	EP2007909	6.51	22,100	15,600	<1	55	<1	55	84	0.5	0.06	0.004	<0.0001	0.052	<0.001	0.039	0.042																				
	10/08/2022	EP2210049	6.22	23,100	-	<1	98	<1	98	157,000	0.5	0.05	0.006	<0.0002	<0.001	<0.002	<0.002	<0.01	-	-	-	-	-	-									-	-	-	-	-	-
	22/11/2022	EP2215830	6.41	23,100	-	<1	128	<1	128	151,000	0.8	0.05	0.006	<0.0001	<0.001	<0.001	0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-
	9/02/2023	EP2301758	6.5	25,200	-	<1	155	<1	155	178,000	0.6	0.07	0.006	<0.0001	<0.001	<0.001	0.001	<0.005	-	-	-	-	-	-									-	-	-	-	-	-

Table C2. Field RPDs (relative percent difference).

		Lab Report Field ID Sample Date	EP2215830 MW05 Nov-22	EP2215830 WQA01 Nov-22	RPD	EP2306972 MW10 May-23	EP2306972 WQA04_250523 May-23	RPD
Analyte	**Units**	**LOR**						
Metals								
Arsenic (Filtered)	mg/L	0.001	0.001	<0.001	0	<0.001	<0.001	0
Cadmium (Filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Copper (Filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Lead (Filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Nickel (Filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Zinc (Filtered)	mg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0
Inorganics								
pH (Lab)	pH Units	0.01	7.04	7.06	0	6.43	6.33	2
Electrical conductivity (lab)	µS/cm	1	1360	1390	2	496	486	2
Nutrients								
Total Nitrogen	mg/L	0.1	0.4	0.4	0	0.7	0.8	13
Phosphorus	mg/L	0.01	0.02	0.02	0	0.05	0.03	50
Acidity and Alkalinty								
Bicarbonate Alkalinity as CaCO3	mg/L	1	45	47	4	21	21	0
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	0	<1	<1	0
Total Alkalinity as CaCO3	mg/L	1	45	47	4	21	21	0
Acidity (as CaCO3)	µg/L	1000	20000	21000	5	54000	44000	20
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<1	0







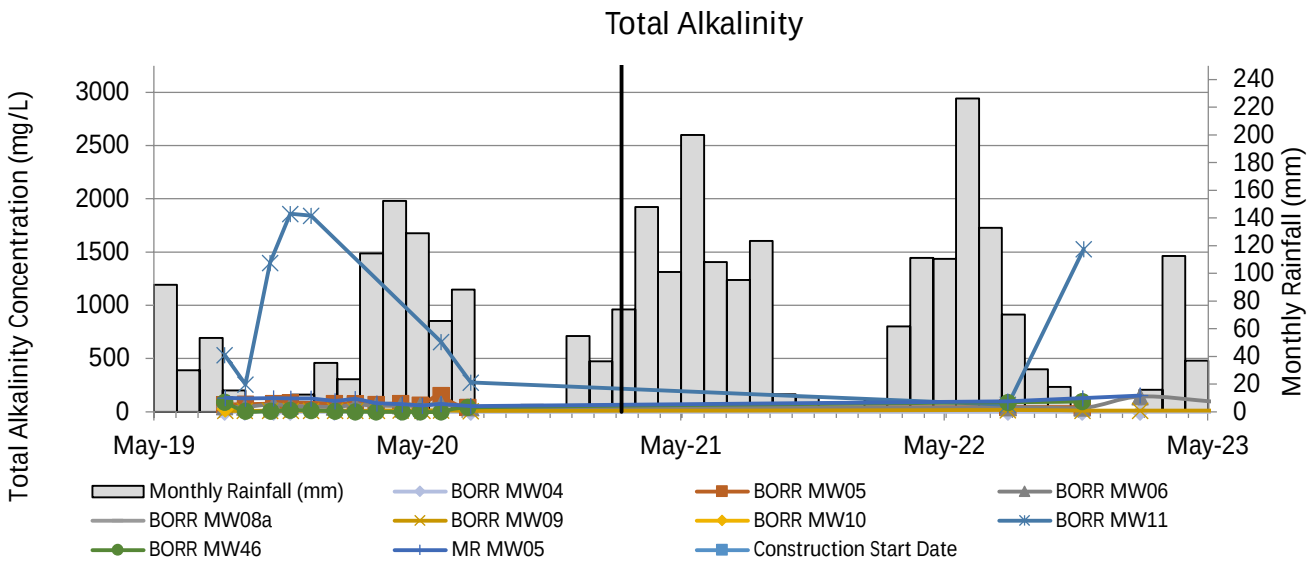
PROJECT ID	60644386
CREATED BY	SJ
APPROVED BY	GRB
LAST MODIFIED	2/08/2023

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Southern Section
Groundwater Monitoring Review - to May 2023

CONCENTRATION OF BICARBONATE ALKALINITY, CARBONATE ALKALIITY AND HYDROXIDE ALKALINITY

Figure
C1



PROJECT ID	60644386
CREATED BY	SJ
APPROVED BY	GRB
LAST MODIFIED	2/08/2023

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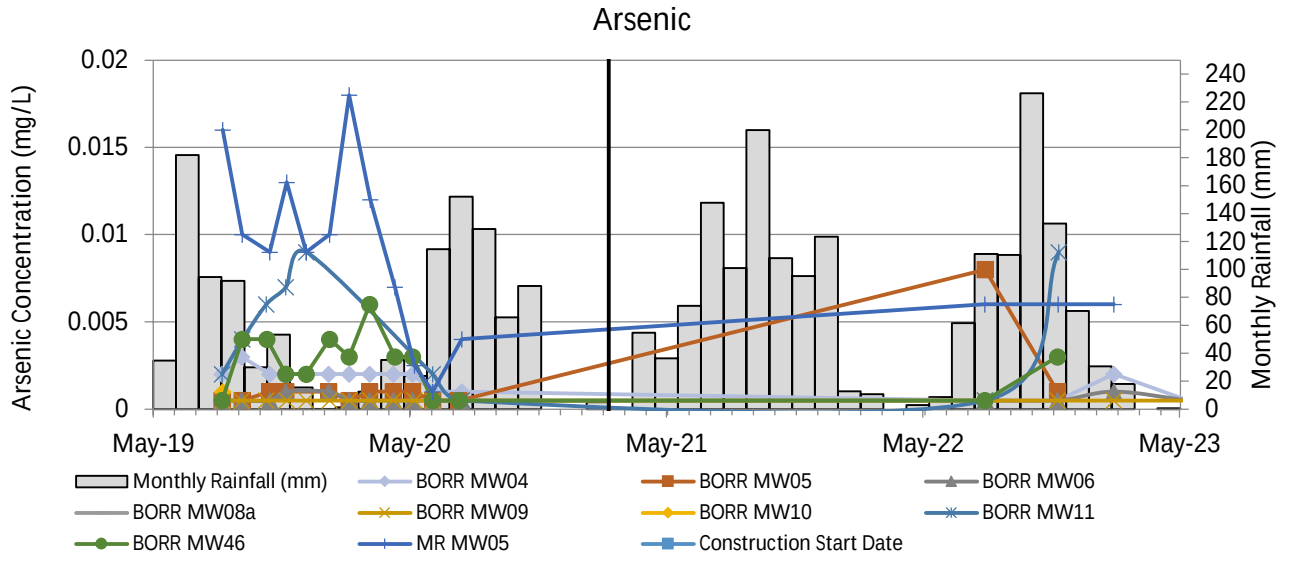
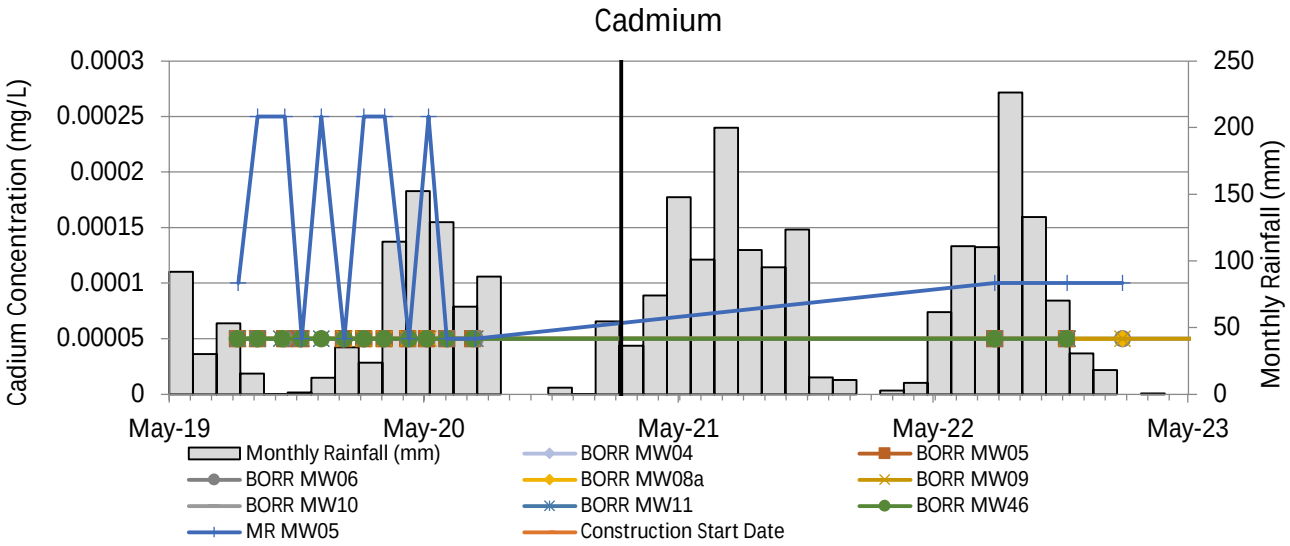
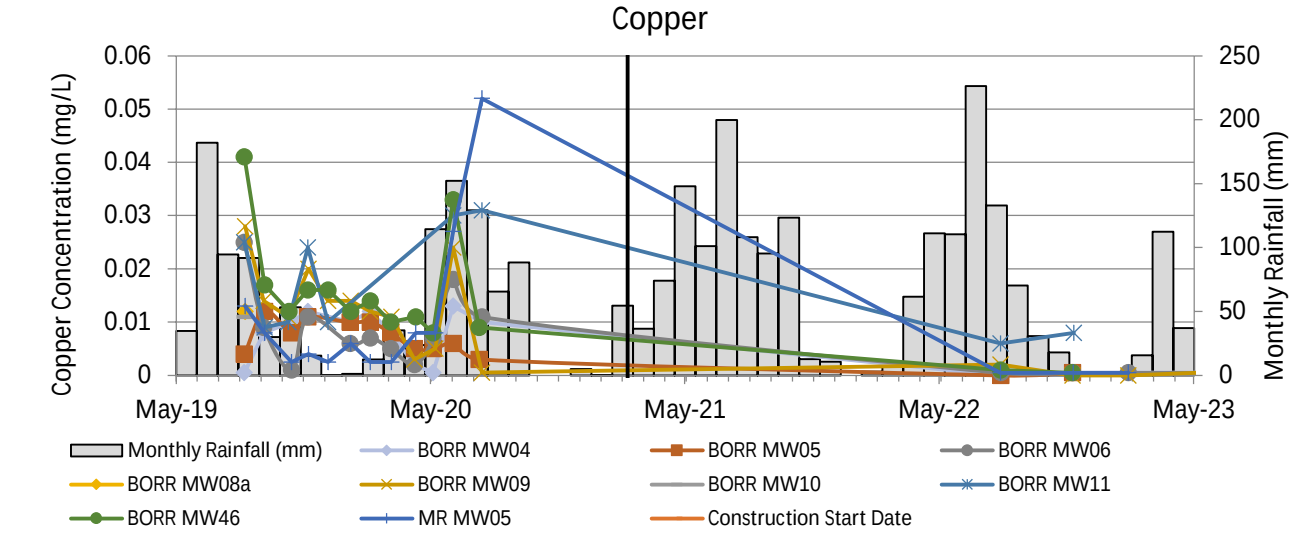
CONCENTRATION OF TOTAL ALKALINITY

Figure
C2







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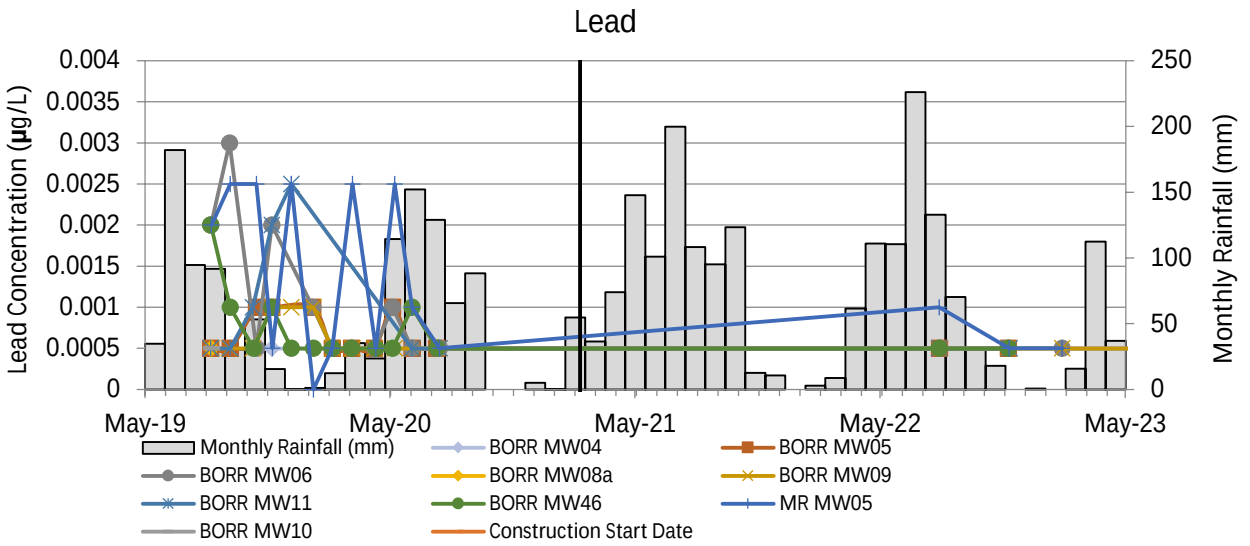
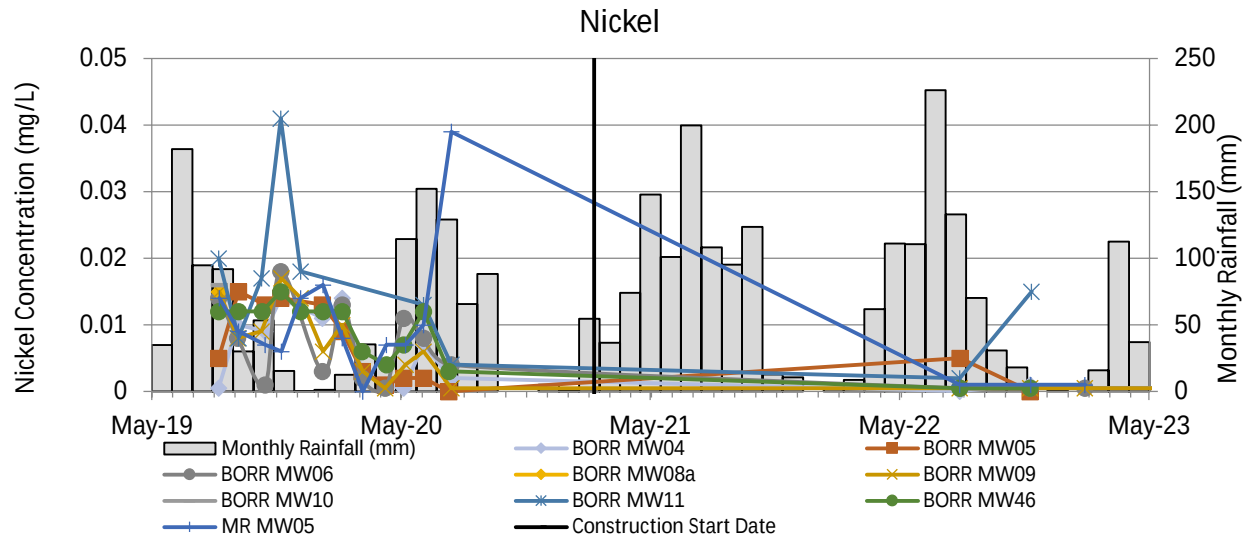
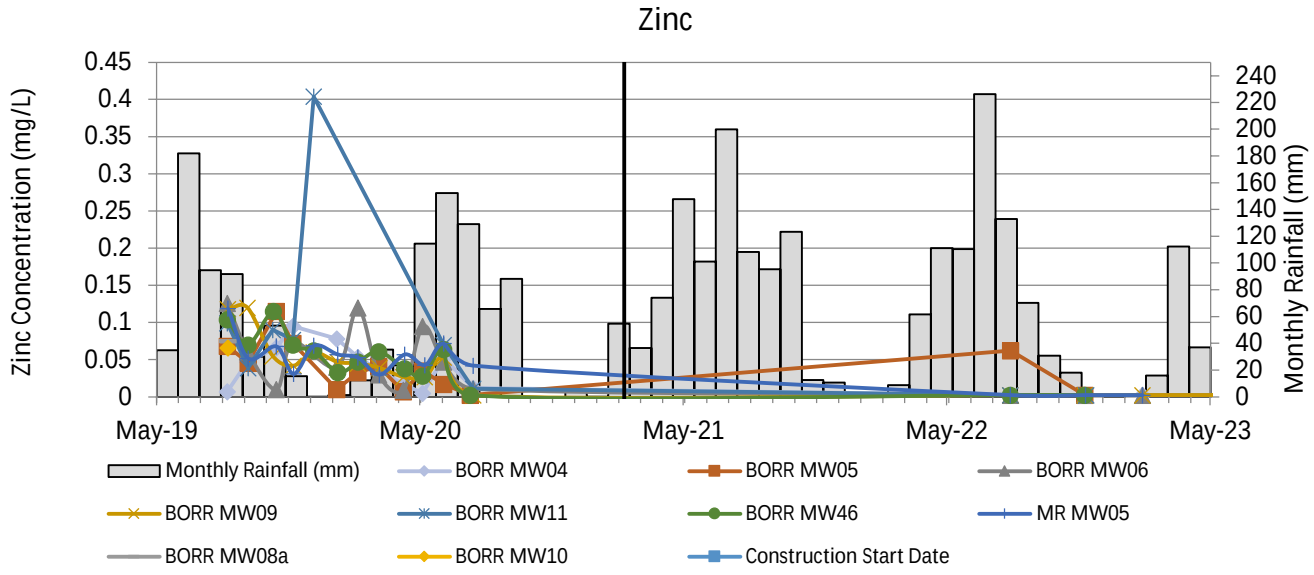
CONCENTRATION OF ARSENIC, CADMConcenConIUM AND COPPER

Figure
C3







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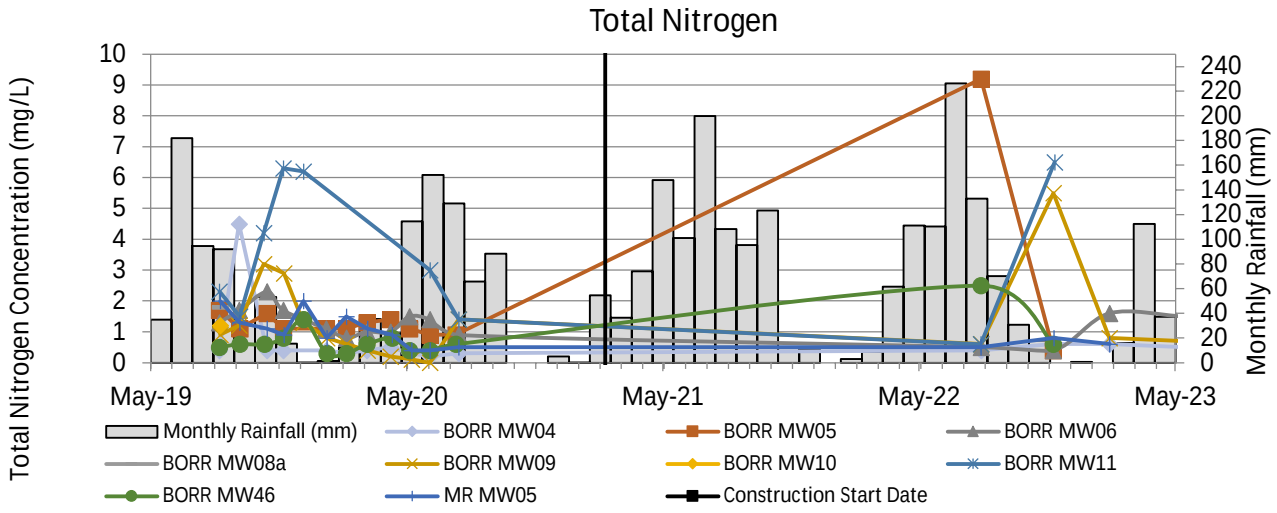
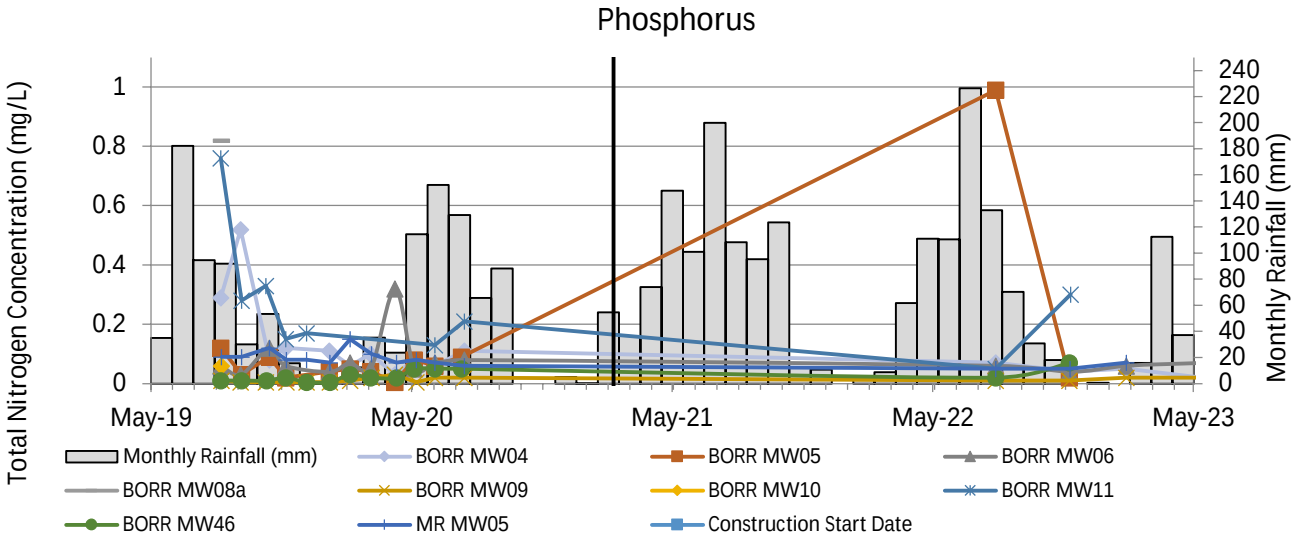
CONCENTRATION OF LEAD AND ZINC

Figure
C4





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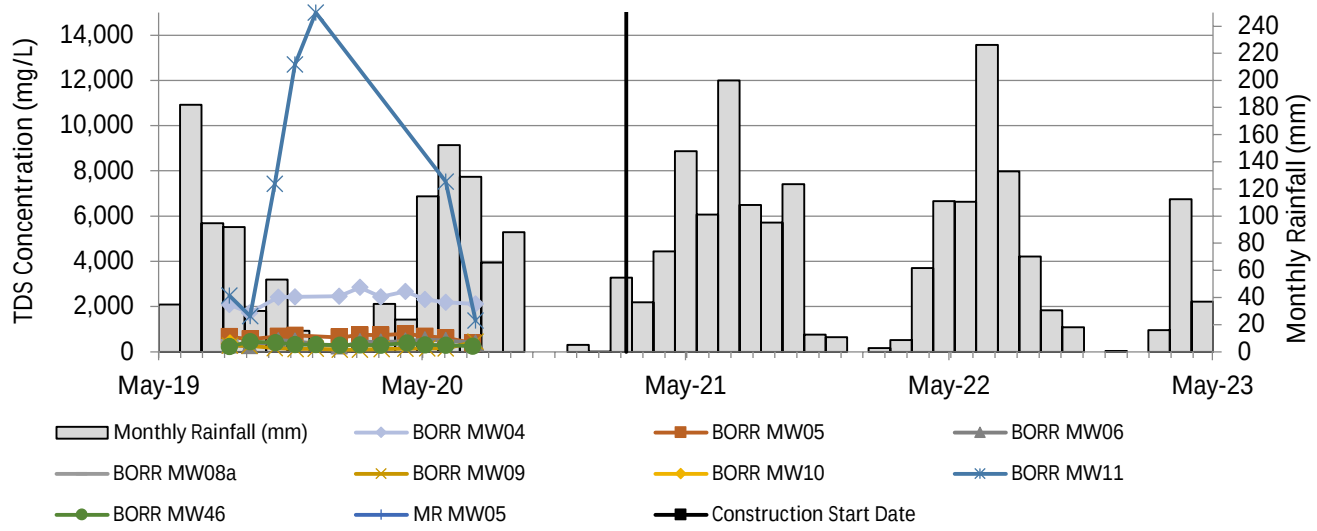
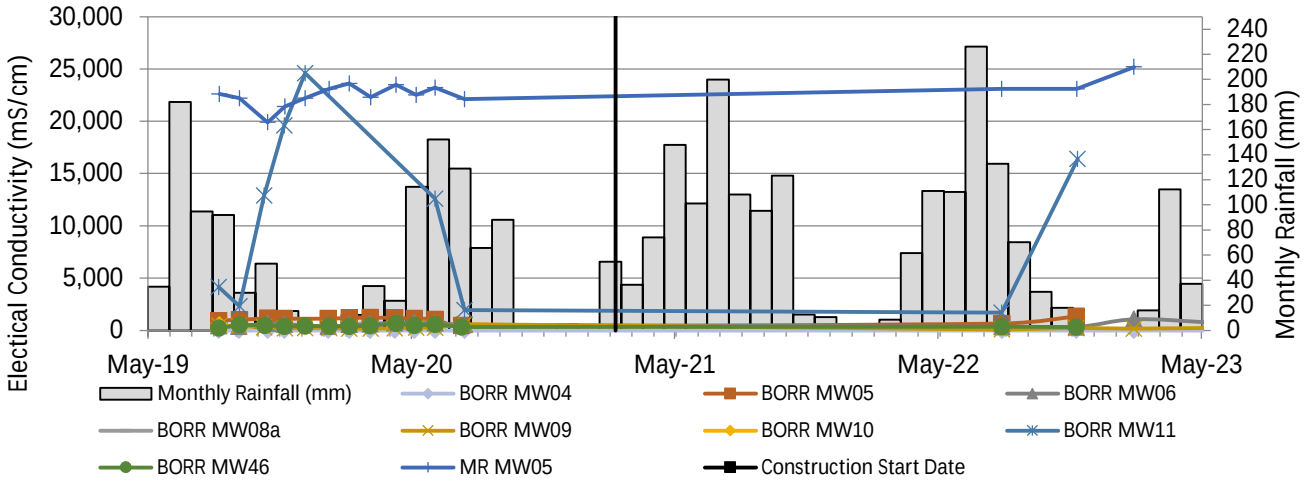
CONCENTRATION OF TOTAL NITROGEN AND PHOSPHORUS

Figure
C5

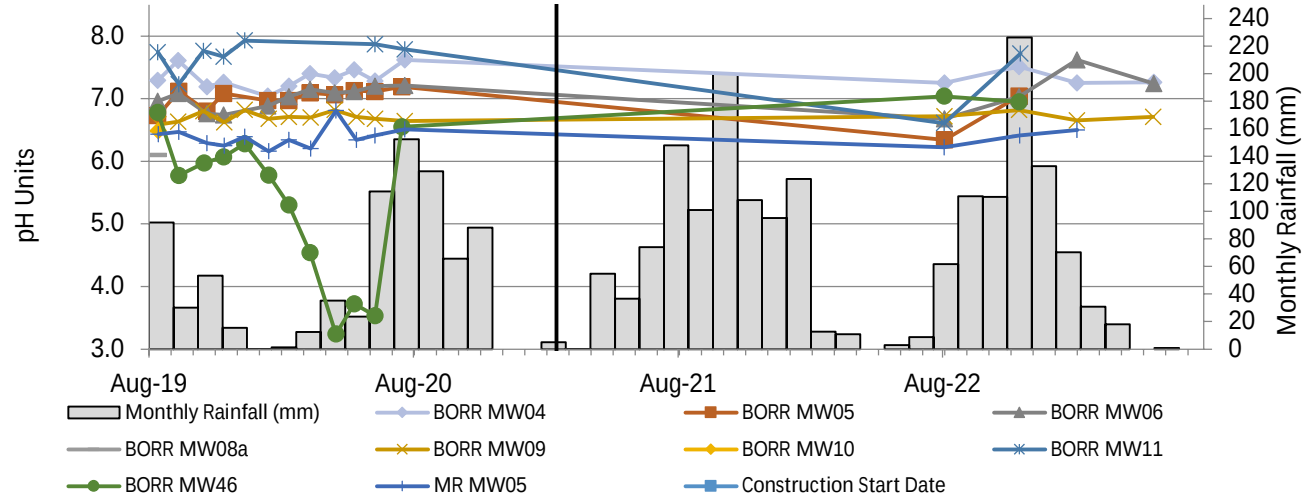
Total Dissolved Solids



Electical Conductivity



pH



PROJECT ID	60644386
CREATED BY	SJ
APPROVED BY	GRB
LAST MODIFIED	2/08/2023

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Southern Section
Groundwater Monitoring Review - to May 2023

CONCENTRATION OF TDS, EC and pH

Figure
C6

Appendix D
Laboratory Certificates

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2210146**	Page	: 1 of 12
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara Western Australia Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 11-Aug-2022 16:45
Order number	: BORR TEC/ PEC Drainage Monitoring	Date Analysis Commenced	: 15-Aug-2022
C-O-C number	: 41025	Issue Date	: 18-Aug-2022 22:03
Sampler	: SHANNON De MELO		
Site	: BORR		
Quote number	: EP/675/21_V2		
No. of samples received	: 16		
No. of samples analysed	: 15		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, Western Australia
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, Western Australia
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, Western Australia

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020: Metals LOR for sample EP2210146 -002 raised due to high TDS content.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW46	MR MW05	MW11	MW10	MW09
			Sampling date / time	10-Aug-2022 07:38	10-Aug-2022 08:27	10-Aug-2022 09:16	10-Aug-2022 09:53	10-Aug-2022 10:17
Compound	CAS Number	LOR	Unit	EP2210146-001	EP2210146-002	EP2210146-003	EP2210146-004	EP2210146-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.04	6.22	6.61	7.63	6.72
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	362	23100	1700	234	98
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	90	98	67	76	17
Total Alkalinity as CaCO3	----	1	mg/L	90	98	67	76	17
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	28	157	37	6	12
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	2.04	<0.01	0.03	<0.01	0.52
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.5	0.6	0.3	0.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	2.5	0.5	0.6	0.3	0.6
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.02	0.05	0.05	0.07	0.01

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	BH27.1	MW04	MW05	MW06	MW13
			Sampling date / time	10-Aug-2022 11:52	10-Aug-2022 12:20	10-Aug-2022 13:54	10-Aug-2022 14:51	11-Aug-2022 08:10
Compound	CAS Number	LOR	Unit	EP2210146-006	EP2210146-007	EP2210146-008	EP2210146-010	EP2210146-013
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.70	7.25	6.34	6.68	7.08
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1390	3790	659	356	755
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	268	45	42	302
Total Alkalinity as CaCO3	----	1	mg/L	<1	268	45	42	302
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	83	48	30	20	51
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	<0.0001
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	<0.001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	0.002
Lead	7439-92-1	0.001	mg/L	----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	<0.0001
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	0.001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	0.002
Lead	7439-92-1	0.001	mg/L	----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	0.06	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.4	9.2	0.4	1.2

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH27.1	MW04	MW05	MW06	MW13
				Sampling date / time	10-Aug-2022 11:52	10-Aug-2022 12:20	10-Aug-2022 13:54	10-Aug-2022 14:51	11-Aug-2022 08:10
Compound	CAS Number	LOR	Unit		EP2210146-006	EP2210146-007	EP2210146-008	EP2210146-010	EP2210146-013
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.8**	**0.4**	**9.2**	**0.5**	**1.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.06**	**0.07**	**0.99**	**0.06**	**0.04**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW17	MW15	WQA03	----	----
			Sampling date / time	11-Aug-2022 08:47	11-Aug-2022 08:47	11-Aug-2022 08:52	----	----
Compound	CAS Number	LOR	Unit	EP2210146-014	EP2210146-015	EP2210146-016	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.19**	**6.34**	**6.36**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**164**	**194**	**203**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**51**	**20**	**21**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**51**	**20**	**21**	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**7**	**30**	**29**	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.001**	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.001**	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.16**	**0.30**	**0.30**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**1.5**	**1.7**	----	----

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)				Sample ID	**MW17**	**MW15**	**WQA03**	**----**	**----**
				Sampling date / time	11-Aug-2022 08:47	11-Aug-2022 08:47	11-Aug-2022 08:52	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2210146-014**	**EP2210146-015**	**EP2210146-016**	**--------**	**--------**
					Result	Result	Result	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**1.5**	**1.8**	**2.0**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.04**	**0.03**	**----**	**----**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	MW46	MR MW05	MW11	MW10	MW09
				Sampling date / time	10-Aug-2022 07:38	10-Aug-2022 08:27	10-Aug-2022 09:16	10-Aug-2022 09:53	10-Aug-2022 10:17
					EP2210146-001	EP2210146-002	EP2210146-003	EP2210146-004	EP2210146-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.006**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.002	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.002	**0.006**	<0.001	**0.002**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.002	**0.002**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.002	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.010	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.010**	<0.001	**0.004**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.003**	**0.007**	**0.005**	**0.007**	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.009**	**0.006**	**0.007**	**0.001**	**0.006**
Nickel	7440-02-0	0.001	mg/L		**0.001**	<0.002	**0.003**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.002	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.011**	**0.005**	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)			Sample ID	BH27.1	MW04	MW05	MW06	WQA02
			Sampling date / time	10-Aug-2022 11:52	10-Aug-2022 12:20	10-Aug-2022 13:54	10-Aug-2022 14:51	10-Aug-2022 14:52
Compound	CAS Number	LOR	Unit	EP2210146-006	EP2210146-007	EP2210146-008	EP2210146-010	EP2210146-011
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	----	----	----	----	**5.39**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	----	----	----	<1
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	----	----	----	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	----	----	----	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	----	----	----	<1
Total Alkalinity as CaCO3	----	1	mg/L	----	----	----	----	<1
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	----	----	----	----	**1**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.008**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	**0.005**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.002**	**0.007**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.010**	<0.001	**0.005**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.028**	<0.005	**0.062**	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.001**	**0.007**	**0.026**	**0.002**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	**0.0003**	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.007**	<0.001	**0.495**	**0.003**	<0.001
Copper	7440-50-8	0.001	mg/L	**0.034**	**0.004**	**0.367**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.014**	<0.001	**0.102**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.004**	<0.001	**0.115**	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.039**	<0.005	**0.528**	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	----	----	----	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	----	----	----	<0.1

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	BH27.1	MW04	MW05	MW06	WQA02
				Sampling date / time	10-Aug-2022 11:52	10-Aug-2022 12:20	10-Aug-2022 13:54	10-Aug-2022 14:51	10-Aug-2022 14:52
					EP2210146-006	EP2210146-007	EP2210146-008	EP2210146-010	EP2210146-011
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		----	----	----	----	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	----	----	----	<0.01

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)			Sample ID	**TBW 946 Trip blank**	**----**	**----**	**----**	**----**
			Sampling date / time	10-Aug-2022 14:56	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2210146-012**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	**----**	**----**	**----**	**----**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	**----**	**----**	**----**	**----**
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	**----**	**----**	**----**	**----**
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	**----**	**----**	**----**	**----**
Toluene	108-88-3	2	µg/L	<2	**----**	**----**	**----**	**----**
Ethylbenzene	100-41-4	2	µg/L	<2	**----**	**----**	**----**	**----**
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	**----**	**----**	**----**	**----**
ortho-Xylene	95-47-6	2	µg/L	<2	**----**	**----**	**----**	**----**
^ **Total Xylenes**	----	2	µg/L	<2	**----**	**----**	**----**	**----**
^ **Sum of BTEX**	----	1	µg/L	<1	**----**	**----**	**----**	**----**
Naphthalene	91-20-3	5	µg/L	<5	**----**	**----**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**106**	**----**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%	**97.9**	**----**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%	**99.1**	**----**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **RINSATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2210146**	Page	: 1 of 7
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara Western Australia Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 11-Aug-2022
Order number	: BORR TEC/ PEC Drainage Monitoring	Date Analysis Commenced	: 15-Aug-2022
C-O-C number	: 41025	Issue Date	: 18-Aug-2022
Sampler	: SHANNON De MELO		
Site	: BORR		
Quote number	: EP/675/21_V2		
No. of samples received	: 16		
No. of samples analysed	: 15		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, Western Australia
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, Western Australia
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, Western Australia

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 4524159)									
EP2210138-018	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.05	6.05	0.0	0% - 20%
EP2210128-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.29	5.26	0.6	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4524163)									
EP2210146-003	MW11	EA005-P: pH Value	----	0.01	pH Unit	6.61	6.69	1.2	0% - 20%
EP2210155-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.30	7.32	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4524160)									
EP2210128-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	2560	2550	0.8	0% - 20%
EP2210146-003	MW11	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1700	1740	2.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4524161)									
EP2210138-018	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	14	14	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	14	14	0.0	0% - 50%
EP2210128-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4524164)									
EP2210146-003	MW11	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	67	66	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	67	66	0.0	0% - 20%
EP2210155-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 4524164) - continued									
EP2210155-002	Anonymous	ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	15	14	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	15	14	0.0	0% - 50%
ED038A: Acidity (QC Lot: 4518249)									
EP2210146-001	MW46	ED038: Acidity as CaCO3	----	1	mg/L	28	34	18.8	0% - 20%
EP2210146-011	WQA02	ED038: Acidity as CaCO3	----	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4519871)									
EP2210146-006	BH27.1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.010	0.011	10.4	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.028	0.025	10.1	No Limit
EP2210109-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0004	0.0003	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.019	0.019	0.0	0% - 50%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.057	0.057	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.482	0.480	0.3	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4520981)									
EP2210116-032	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0066	0.0074	11.2	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.068	0.073	7.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.021	<0.021	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.021	<0.021	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.033	0.035	7.5	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.026	0.026	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.287	0.292	1.8	No Limit
EP2210146-008	MW05	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0003	0.0003	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.026	0.026	0.0	0% - 20%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.495	0.485	2.0	0% - 20%
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.367	0.374	1.8	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.115	0.116	0.0	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.102	0.098	4.8	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.528	0.539	2.1	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 4519872)									
EP2210146-001	MW46	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2210146-013	MW13	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4521040)									
EP2210116-034	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0002	<0.0002	0.0	No Limit
EP2210146-007	MW04	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4524890)									
EP2210146-011	WQA02	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2209900-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4521288)									
EP2210126-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.8	1.9	0.0	0% - 50%
EP2210146-011	WQA02	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4521289)									
EP2210126-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.04	45.2	No Limit
EP2210146-011	WQA02	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4516194)									
EP2210119-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2210141-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4516194)									
EP2210119-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2210141-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4516194)									
EP2210119-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2210141-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 4524159)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 4524163)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA010P: Conductivity by PC Titrator (QCLot: 4524160)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	95.5	92.1	105
ED037P: Alkalinity by PC Titrator (QCLot: 4524161)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	87.8	118
				<1	200 mg/L	98.7	87.8	118
ED037P: Alkalinity by PC Titrator (QCLot: 4524164)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	108	87.8	118
				<1	200 mg/L	98.6	87.8	118
ED038A: Acidity (QCLot: 4518249)								
ED038: Acidity as CaCO3	----	----	mg/L	----	19.5 mg/L	101	77.4	128
EG020F: Dissolved Metals by ICP-MS (QCLot: 4519871)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	106	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	101	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	103	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	89.5	112
EG020T: Total Metals by ICP-MS (QCLot: 4520981)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	91.8	111

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 4520981) - continued								
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.8	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.5	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	101	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	90.7	113
EG035F: Dissolved Mercury by FIMS (QCLot: 4519872)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	94.4	85.6	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4521040)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	100	83.7	120
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4524890)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.6	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4521288)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	87.0	75.8	100
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4521289)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	81.0	70.0	110
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4516194)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	105	73.6	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4516194)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	105	73.9	115
EP080: BTEXN (QCLot: 4516194)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	103	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	99.5	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	98.2	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	100	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	99.8	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	104	77.0	118

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4519871)							
EP2210109-017	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	108	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4519871) - continued							
EP2210109-017	Anonymous	EG020A-F: Cadmium	7440-43-9	0.05 mg/L	104	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	104	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	102	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	98.3	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	108	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	104	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4520981)							
EP2210116-033	Anonymous	EG020A-T: Arsenic	7440-38-2	4 mg/L	119	70.0	130
		EG020A-T: Cadmium	7440-43-9	1 mg/L	108	70.0	130
		EG020A-T: Chromium	7440-47-3	4 mg/L	114	70.0	130
		EG020A-T: Copper	7440-50-8	4 mg/L	106	70.0	130
		EG020A-T: Lead	7439-92-1	4 mg/L	99.6	70.0	130
		EG020A-T: Nickel	7440-02-0	4 mg/L	107	70.0	130
		EG020A-T: Zinc	7440-66-6	4 mg/L	111	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4519872)							
EP2210146-002	MR MW05	EG035F: Mercury	7439-97-6	0.005 mg/L	100	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4521040)							
EP2210146-001	MW46	EG035T: Mercury	7439-97-6	0.005 mg/L	99.7	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4524890)							
EP2209900-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	92.0	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4521288)							
EP2210146-001	MW46	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	96.6	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4521289)							
EP2210146-001	MW46	EK067G: Total Phosphorus as P	----	1 mg/L	98.3	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4516194)							
EP2210119-002	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	94.0	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4516194)							
EP2210119-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	87.1	77.0	137
EP080: BTEXN (QCLot: 4516194)							
EP2210119-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	105	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	95.3	73.5	126

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2210146**	Page	: 1 of 9
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 11-Aug-2022
Site	: BORR	Issue Date	: 18-Aug-2022
Sampler	: SHANNON De MELO	No. of samples received	: 16
Order number	: BORR TEC/ PEC Drainage Monitoring	No. of samples analysed	: 15

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
MW46,	MR MW05,	----	----	----	17-Aug-2022	10-Aug-2022	**7**
MW11,	MW10,						
MW09,	BH27.1,						
MW04,	MW05,						
MW06,	WQA02						
Clear Plastic Bottle - Natural							
MW13,	MW17,	----	----	----	17-Aug-2022	11-Aug-2022	**6**
MW15,	WQA03						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
MW46,	MR MW05,	**10-Aug-2022**	**----**	----	----	**17-Aug-2022**	10-Aug-2022	×
MW11,	MW10,							
MW09,	BH27.1,							
MW04,	MW05,							
MW06,	WQA02							
Clear Plastic Bottle - Natural (EA005-P)								
MW13,	MW17,	**11-Aug-2022**	**----**	----	----	**17-Aug-2022**	11-Aug-2022	×
MW15,	WQA03							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**17-Aug-2022**	07-Sep-2022	✓
Clear Plastic Bottle - Natural (EA010-P)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**17-Aug-2022**	08-Sep-2022	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**17-Aug-2022**	24-Aug-2022	✓
Clear Plastic Bottle - Natural (ED037-P)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**17-Aug-2022**	25-Aug-2022	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**15-Aug-2022**	24-Aug-2022	✓
Clear Plastic Bottle - Natural (ED038)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**15-Aug-2022**	25-Aug-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**16-Aug-2022**	06-Feb-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**16-Aug-2022**	07-Feb-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**16-Aug-2022**	06-Feb-2023	✓	**16-Aug-2022**	06-Feb-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**16-Aug-2022**	07-Feb-2023	✓	**16-Aug-2022**	07-Feb-2023	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**16-Aug-2022**	07-Sep-2022	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**16-Aug-2022**	08-Sep-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**16-Aug-2022**	07-Sep-2022	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**16-Aug-2022**	08-Sep-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**----**	----	----	**18-Aug-2022**	07-Sep-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**----**	----	----	**18-Aug-2022**	08-Sep-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**17-Aug-2022**	07-Sep-2022	✓	**17-Aug-2022**	07-Sep-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**17-Aug-2022**	08-Sep-2022	✓	**17-Aug-2022**	08-Sep-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW46, MR MW05, MW11, MW10, MW09, BH27.1, MW04, MW05, MW06, WQA02	**10-Aug-2022**	**17-Aug-2022**	07-Sep-2022	✓	**17-Aug-2022**	07-Sep-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW13, MW17, MW15, WQA03	**11-Aug-2022**	**17-Aug-2022**	08-Sep-2022	✓	**17-Aug-2022**	08-Sep-2022	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
TBW 946 - Trip blank	**10-Aug-2022**	**15-Aug-2022**	24-Aug-2022	✓	**15-Aug-2022**	24-Aug-2022	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber VOC Vial - Sulfuric Acid (EP080)							
TBW 946 - Trip blank	**10-Aug-2022**	**15-Aug-2022**	24-Aug-2022	✓	**15-Aug-2022**	24-Aug-2022	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
TBW 946 - Trip blank	**10-Aug-2022**	**15-Aug-2022**	24-Aug-2022	✓	**15-Aug-2022**	24-Aug-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by Auto Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2215830**	Page	: 1 of 16
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 23-Nov-2022 17:00
Order number	: BORR TEC/ PEC Drainage Monitoring	Date Analysis Commenced	: 28-Nov-2022
C-O-C number	: 45119	Issue Date	: 06-Dec-2022 19:52
Sampler	: SHANNON De MELO		
Site	: Borr		
Quote number	: EP/675/21_V2		
No. of samples received	: 26		
No. of samples analysed	: 26		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP204 conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020: It is recognised that total (element) concentration is less than dissolved for sample (sample ID). However, the difference is within experimental variation of the methods.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW46	MW04	MW05	WQA01	MW06
			Sampling date / time	21-Nov-2022 09:36	21-Nov-2022 10:17	21-Nov-2022 10:44	21-Nov-2022 00:00	21-Nov-2022 11:09
Compound	CAS Number	LOR	Unit	EP2215830-001	EP2215830-002	EP2215830-003	EP2215830-004	EP2215830-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.95**	**7.51**	**7.04**	**7.06**	**7.03**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**306**	**4870**	**1360**	**1390**	**330**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**98**	**330**	**45**	**47**	**37**
Total Alkalinity as CaCO3	----	1	mg/L	**98**	**330**	**45**	**47**	**37**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**80**	**55**	**20**	**21**	**19**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.003**	<0.001	**0.001**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.004**	<0.001	<0.001	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	**0.001**
Copper	7440-50-8	0.001	mg/L	**0.003**	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	**0.05**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.6**	**0.6**	**0.4**	**0.4**	**0.4**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW46	MW04	MW05	WQA01	MW06
				Sampling date / time	21-Nov-2022 09:36	21-Nov-2022 10:17	21-Nov-2022 10:44	21-Nov-2022 00:00	21-Nov-2022 11:09
Compound	CAS Number	LOR	Unit		EP2215830-001	EP2215830-002	EP2215830-003	EP2215830-004	EP2215830-005
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.6**	**0.6**	**0.4**	**0.4**	**0.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.07**	**0.04**	**0.02**	**0.02**	**0.04**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW08a	NC4	MW09	MW10	WQA02
			Sampling date / time	21-Nov-2022 12:33	21-Nov-2022 12:38	21-Nov-2022 13:31	21-Nov-2022 13:55	21-Nov-2022 13:56
Compound	CAS Number	LOR	Unit	EP2215830-006	EP2215830-007	EP2215830-008	EP2215830-009	EP2215830-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.69**	----	**6.82**	**6.81**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**692**	----	**223**	**383**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**61**	----	**12**	**35**	----
Total Alkalinity as CaCO3	----	1	mg/L	**61**	----	**12**	**35**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**52**	----	**17**	**36**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	----	----	<0.01
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.006**	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Manganese	7439-96-5	0.001	mg/L	----	----	----	----	<0.001
Selenium	7782-49-2	0.01	mg/L	----	----	----	----	<0.01
Iron	7439-89-6	0.05	mg/L	----	----	----	----	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	----	----	<0.01
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.002**	**0.008**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	----	----	----	----	<0.05
EG035F: Dissolved Mercury by FIMS								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW08a	NC4	MW09	MW10	WQA02
				Sampling date / time	21-Nov-2022 12:33	21-Nov-2022 12:38	21-Nov-2022 13:31	21-Nov-2022 13:55	21-Nov-2022 13:56
Compound	CAS Number	LOR	Unit		EP2215830-006	EP2215830-007	EP2215830-008	EP2215830-009	EP2215830-010
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS - Continued									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	**4.92**	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.0**	----	**0.6**	**0.5**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**2.0**	----	**5.5**	**0.5**	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.59**	----	**0.01**	**0.01**	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW13	MR-MWO5	MW11	MW22	WQA03
			Sampling date / time	21-Nov-2022 14:34	22-Nov-2022 08:06	23-Nov-2022 08:36	22-Nov-2022 09:31	22-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EP2215830-012	EP2215830-013	EP2215830-014	EP2215830-015	EP2215830-016
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.08**	**6.41**	**7.72**	**6.28**	**6.33**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**698**	**23100**	**16400**	**12800**	**12800**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**265**	**128**	**1530**	**25**	**25**
Total Alkalinity as CaCO3	----	1	mg/L	**265**	**128**	**1530**	**25**	**25**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**89**	**151**	**97**	**95**	**90**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.006**	**0.009**	**0.003**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.003**	**0.004**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.008**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.001**	**0.015**	**0.074**	**0.077**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.041**	**0.038**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.010**	**0.014**	**0.003**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.009**	**0.030**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.002**	**0.026**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	**0.019**	**0.075**	**0.073**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	**0.004**	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.034**	**0.037**	**0.038**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**2.0**	**0.6**	**6.5**	**0.2**	**0.2**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	MR-MWO5	MW11	MW22	WQA03
				Sampling date / time	21-Nov-2022 14:34	22-Nov-2022 08:06	23-Nov-2022 08:36	22-Nov-2022 09:31	22-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EP2215830-012	EP2215830-013	EP2215830-014	EP2215830-015	EP2215830-016
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**2.0**	**0.6**	**6.5**	**0.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.18**	**0.05**	**0.30**	**0.03**	<0.01

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	WQA04	MW31	WQA05	MW27	MW28
			Sampling date / time	22-Nov-2022 00:00	22-Nov-2022 11:24	22-Nov-2022 11:19	22-Nov-2022 12:13	22-Nov-2022 13:27
Compound	CAS Number	LOR	Unit	EP2215830-017	EP2215830-018	EP2215830-019	EP2215830-020	EP2215830-021
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	----	5.48	5.38	5.60	6.57
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	236	<1	114	1160
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	4	<1	5	272
Total Alkalinity as CaCO3	----	1	mg/L	----	4	<1	5	272
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	----	42	1	35	155
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.012
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	<0.001	0.001	0.002
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.013
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.001	0.001	<0.001	0.004	0.003
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	<0.001	0.005	<0.001
Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	<0.001	0.002	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.003
Zinc	7440-66-6	0.005	mg/L	0.013	<0.005	<0.005	0.013	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.01	<0.01	0.06	0.03
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	1.1	<0.1	1.2	8.6

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	WQA04	MW31	WQA05	MW27	MW28
				Sampling date / time	22-Nov-2022 00:00	22-Nov-2022 11:24	22-Nov-2022 11:19	22-Nov-2022 12:13	22-Nov-2022 13:27
Compound	CAS Number	LOR	Unit		EP2215830-017	EP2215830-018	EP2215830-019	EP2215830-020	EP2215830-021
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**----**	**1.1**	<0.1	**1.3**	**8.6**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**----**	**0.01**	<0.01	**0.03**	**0.11**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW25	MW17	WQA06	MW15	----
			Sampling date / time	22-Nov-2022 14:17	23-Nov-2022 09:06	23-Nov-2022 09:07	23-Nov-2022 09:40	----
Compound	CAS Number	LOR	Unit	EP2215830-022	EP2215830-023	EP2215830-024	EP2215830-025	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.55**	**7.36**	**7.38**	**6.58**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3540**	**281**	**281**	**308**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**62**	**71**	**72**	**28**	----
Total Alkalinity as CaCO3	----	1	mg/L	**62**	**71**	**72**	**28**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**86**	**18**	**19**	**33**	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.012**	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.016**	<0.005	<0.005	<0.005	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.002**	**0.002**	**0.001**	----
Copper	7440-50-8	0.001	mg/L	**0.006**	**0.002**	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.012**	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.017**	<0.005	<0.005	<0.005	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.18**	**0.20**	**0.14**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.4**	**0.4**	**0.4**	**2.2**	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW25	MW17	WQA06	MW15	----
				Sampling date / time	22-Nov-2022 14:17	23-Nov-2022 09:06	23-Nov-2022 09:07	23-Nov-2022 09:40	----
Compound	CAS Number	LOR	Unit		EP2215830-022	EP2215830-023	EP2215830-024	EP2215830-025	--------
					Result	Result	Result	Result	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.4**	**0.6**	**0.6**	**2.3**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.07**	<0.01	**0.02**	**0.01**	**----**

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	WQA02	TBW 1552 Trip blank	TBW 1551 Trip blank	----	----
				Sampling date / time	21-Nov-2022 13:56	21-Nov-2022 13:58	23-Nov-2022 09:55	----	----
Compound	CAS Number	LOR	Unit		EP2215830-010	EP2215830-011	EP2215830-026	--------	--------
					Result	Result	Result	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.06**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	<20	<20	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		----	<20	<20	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	<1	<1	----	----
Toluene	108-88-3	2	µg/L		----	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		----	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		----	<2	<2	----	----
^ Total Xylenes	----	2	µg/L		----	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L		----	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		----	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	**102**	**103**	----	----
Toluene-D8	2037-26-5	2	%		----	**96.2**	**97.0**	----	----
4-Bromofluorobenzene	460-00-4	2	%		----	**102**	**108**	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	NC4	WQA04	----	----	----
			Sampling date / time	21-Nov-2022 12:38	22-Nov-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EP2215830-007	EP2215830-017	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.05**	**8.03**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**2800**	**2900**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**17**	**21**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**181**	**159**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**181**	**159**	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**6**	**5**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.0**	**1.0**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.0**	**1.0**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.06**	**0.06**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	WQA04	----	----	----
				Sampling date / time	21-Nov-2022 12:38	22-Nov-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EP2215830-007	EP2215830-017	--------	--------	--------
					Result	Result	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**102**	**99.9**	----	----	----
Toluene-D8	2037-26-5	2	%		**93.4**	**97.1**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**101**	**99.8**	----	----	----

Surrogate Control Limits

Sub-Matrix: **RINSATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2215830**	Page	: 1 of 12
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 23-Nov-2022
Order number	: BORR TEC/ PEC Drainage Monitoring	Date Analysis Commenced	: 28-Nov-2022
C-O-C number	: 45119	Issue Date	: 06-Dec-2022
Sampler	: SHANNON De MELO		
Site	: Borr		
Quote number	: EP/675/21_V2		
No. of samples received	: 26		
No. of samples analysed	: 26		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 4738369)									
EP2215830-002	MW04	EA005-P: pH Value	----	0.01	pH Unit	7.51	7.51	0.0	0% - 20%
EP2215830-013	MR-MWO5	EA005-P: pH Value	----	0.01	pH Unit	6.41	6.45	0.6	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4738373)									
EP2215830-023	MW17	EA005-P: pH Value	----	0.01	pH Unit	7.36	7.37	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4738368)									
EP2215830-002	MW04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	4870	4870	0.0	0% - 20%
EP2215830-013	MR-MWO5	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	23100	23000	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4738372)									
EP2215830-023	MW17	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	281	281	0.0	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4729813)									
EP2215746-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	8	6	14.3	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4738370)									
EP2215830-002	MW04	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	330	329	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	330	329	0.0	0% - 20%
EP2215830-013	MR-MWO5	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	128	128	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	128	128	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4738371)									
EP2215839-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 4738371) - continued									
EP2215839-004	Anonymous	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	34	34	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	34	34	0.0	0% - 20%
EP2215830-023	MW17	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	71	71	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	71	71	0.0	0% - 20%
ED038A: Acidity (QC Lot: 4740518)									
EP2215830-001	MW46	ED038: Acidity as CaCO3	----	1	mg/L	80	76	4.4	0% - 20%
EP2215830-012	MW13	ED038: Acidity as CaCO3	----	1	mg/L	89	87	2.0	0% - 20%
ED038A: Acidity (QC Lot: 4740519)									
EP2215830-023	MW17	ED038: Acidity as CaCO3	----	1	mg/L	18	16	16.8	0% - 50%
EP2215893-001	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	5	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4738934)									
EP2215830-001	MW46	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.033	0.033	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	11.8	12.1	1.9	0% - 20%
EP2215830-012	MW13	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.010	0.010	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.01	0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	3.61	3.61	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4738936)									
EP2215830-022	MW25	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4738936) - continued									
EP2215830-022	MW25	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.030	0.029	0.0	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.513	0.516	0.6	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.012	0.012	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.016	0.016	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	9.96	10.0	0.6	0% - 20%
EP2215893-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.020	0.020	0.0	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.08	0.08	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.10	1.08	1.7	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4739012)									
EP2215486-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.023	0.023	0.0	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.040	0.039	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EP2215830-007	NC4	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 4739012) - continued									
EP2215830-007	NC4	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.68	0.75	9.4	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	2.36	2.37	0.5	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4739013)									
EP2215830-018	MW31	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	1.10	1.13	2.1	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.81	0.82	0.0	0% - 50%
EP2215915-003	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.02	0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4738935)									
EP2215830-003	MW05	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2215830-013	MR-MWO5	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4738937)									
EP2215830-023	MW17	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4739010)									
EP2215830-003	MW05	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2215830-014	MW11	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4739011)									
EP2215830-025	MW15	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2216018-003	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4725226)									
EP2215830-001	MW46	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2215830-012	MW13	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4731336)									
EP2215821-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.03	0.0	No Limit
EP2215833-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	3.70	3.74	1.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4740688)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4740688) - continued									
EP2215830-001	MW46	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.6	0.0	No Limit
EP2215830-012	MW13	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.0	2.1	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4740690)									
EP2215830-022	MW25	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4740689)									
EP2215830-001	MW46	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.07	0.07	0.0	No Limit
EP2215830-012	MW13	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.18	0.17	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4740691)									
EP2215934-007	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.04	0.04	0.0	No Limit
EP2215830-022	MW25	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.07	0.06	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4725367)									
EP2215790-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<0.02 mg/L	<20	0.0	No Limit
EP2215830-007	NC4	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4725367)									
EP2215790-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<0.02 mg/L	<20	0.0	No Limit
EP2215830-007	NC4	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4725367)									
EP2215790-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<0.001 mg/L	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<0.002 mg/L	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<0.002 mg/L	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<0.002 mg/L	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<0.002 mg/L	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<0.005 mg/L	<5	0.0	No Limit
EP2215830-007	NC4	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP204: Glyphosate and AMPA (QC Lot: 4742274)									
EP2215830-007	NC4	EP204: Glyphosate	1071-83-6	10	µg/L	<10	<10	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 4738369)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 4738373)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA010P: Conductivity by PC Titrator (QCLot: 4738368)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	98.3	92.1	105
EA010P: Conductivity by PC Titrator (QCLot: 4738372)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	98.7	92.1	105
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4729813)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	95.8	89.8	116
				<5	1000 mg/L	101	89.8	116
ED037P: Alkalinity by PC Titrator (QCLot: 4738370)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	105	87.8	118
				<1	200 mg/L	95.8	87.8	118
ED037P: Alkalinity by PC Titrator (QCLot: 4738371)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	108	87.8	118
				<1	200 mg/L	98.7	87.8	118
ED038A: Acidity (QCLot: 4740518)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	109	70.0	130
ED038A: Acidity (QCLot: 4740519)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	101	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738934)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	105	90.2	111
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	105	90.3	113

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738934) - continued								
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	106	87.3	107
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	105	88.8	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	103	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	104	89.4	106
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	87.6	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	87.2	108
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	96.8	83.8	102
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	89.5	112
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	89.9	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738936)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	106	90.2	111
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	106	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	105	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	105	87.3	107
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	105	88.8	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	105	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	89.4	106
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	87.6	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	104	87.2	108
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	92.3	83.8	102
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	106	89.5	112
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	103	89.9	120
EG020T: Total Metals by ICP-MS (QCLot: 4739012)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	107	91.6	114
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	109	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	107	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	104	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	106	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	104	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	90.7	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	113	95.0	132
EG020T: Total Metals by ICP-MS (QCLot: 4739013)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	105	91.6	114
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	105	90.9	109

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 4739013) - continued								
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	101	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	103	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.2	90.7	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	112	95.0	132
EG035F: Dissolved Mercury by FIMS (QCLot: 4738935)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	101	85.6	120
EG035F: Dissolved Mercury by FIMS (QCLot: 4738937)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	87.0	85.6	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4739010)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	94.6	83.7	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4739011)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	109	83.7	120
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4725226)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.8	90.5	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4731336)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	94.4	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4740688)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	91.3	75.8	100
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4740690)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	89.7	75.8	100
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4740689)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	93.9	70.0	110
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4740691)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	99.0	70.0	110
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4725367)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	101	73.6	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4726817)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	375 µg/L	63.2	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	392 µg/L	69.3	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	331 µg/L	61.7	42.5	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4725367)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	104	73.9	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4726817)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	375 µg/L	65.8	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	524 µg/L	66.8	46.2	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4726817) - continued								
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	206 µg/L	65.4	24.7	137
EP080: BTEXN (QCLot: 4725367)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	90.2	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	90.9	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	94.0	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	94.8	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	93.4	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	94.7	77.0	118
EP204: Glyphosate and AMPA (QCLot: 4742274)								
EP204: Glyphosate	1071-83-6	10	µg/L	<10	50 µg/L	91.1	70.0	134

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738934)							
EP2215830-002	MW04	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	117	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	114	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	116	70.0	130
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	115	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	111	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	106	70.0	130
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	112	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	112	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	117	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738936)							
EP2215866-039	Anonymous	EG020A-F: Arsenic	7440-38-2	2 mg/L	123	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.5 mg/L	114	70.0	130
		EG020A-F: Chromium	7440-47-3	2 mg/L	115	70.0	130
		EG020A-F: Cobalt	7440-48-4	2 mg/L	120	70.0	130
		EG020A-F: Copper	7440-50-8	2 mg/L	116	70.0	130
		EG020A-F: Lead	7439-92-1	2 mg/L	111	70.0	130
		EG020A-F: Manganese	7439-96-5	2 mg/L	109	70.0	130
		EG020A-F: Nickel	7440-02-0	2 mg/L	118	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4738936) - continued							
EP2215866-039	Anonymous	EG020A-F: Zinc	7440-66-6	2 mg/L	119	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4739012)							
EP2215486-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	112	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	112	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	111	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	109	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	118	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	109	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	109	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4739013)							
EP2215830-019	WQA05	EG020A-T: Arsenic	7440-38-2	1 mg/L	105	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	108	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	111	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	107	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	114	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	105	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	103	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4738935)							
EP2215830-004	WQA01	EG035F: Mercury	7439-97-6	0.005 mg/L	100	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4738937)							
EP2215830-024	WQA06	EG035F: Mercury	7439-97-6	0.005 mg/L	90.5	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4739010)							
EP2215830-004	WQA01	EG035T: Mercury	7439-97-6	0.005 mg/L	95.4	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4739011)							
EP2215830-024	WQA06	EG035T: Mercury	7439-97-6	0.005 mg/L	107	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4725226)							
EP2215830-001	MW46	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	70.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4731336)							
EP2215821-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	77.3	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4740688)							
EP2215830-002	MW04	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	99.4	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4740690)							
EP2215830-023	MW17	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	92.2	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4740689)							
EP2215830-002	MW04	EK067G: Total Phosphorus as P	----	1 mg/L	89.7	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4740691)							
EP2215830-023	MW17	EK067G: Total Phosphorus as P	----	1 mg/L	93.7	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4725367)							
EP2215790-002	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	92.2	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4725367)							
EP2215790-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	90.1	77.0	137
EP080: BTEXN (QCLot: 4725367)							
EP2215790-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	104	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	107	73.5	126
EP204: Glyphosate and AMPA (QCLot: 4742274)							
EP2215830-007	NC4	EP204: Glyphosate	1071-83-6	50 µg/L	86.4	57.0	125

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2215830**	Page	: 1 of 13
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Telephone	: +61-8-9406 1301
Project	: BORR TEC/ PEC Drainage Monitoring	Date Samples Received	: 23-Nov-2022
Site	: Borr	Issue Date	: 06-Dec-2022
Sampler	: SHANNON De MELO	No. of samples received	: 26
Order number	: BORR TEC/ PEC Drainage Monitoring	No. of samples analysed	: 26

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	----	----	----	01-Dec-2022	21-Nov-2022	**10**
Clear Plastic Bottle - Natural						
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	----	----	----	01-Dec-2022	22-Nov-2022	**9**
Clear Plastic Bottle - Natural						
MW11, MW17, WQA06, MW15	----	----	----	01-Dec-2022	23-Nov-2022	**8**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	**21-Nov-2022**	**----**	----	----	**01-Dec-2022**	21-Nov-2022	×
Clear Plastic Bottle - Natural (EA005-P)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**01-Dec-2022**	22-Nov-2022	×
Clear Plastic Bottle - Natural (EA005-P)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**01-Dec-2022**	23-Nov-2022	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	**21-Nov-2022**	**----**	----	----	**01-Dec-2022**	19-Dec-2022	✓
Clear Plastic Bottle - Natural (EA010-P)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**01-Dec-2022**	20-Dec-2022	✓
Clear Plastic Bottle - Natural (EA010-P)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**01-Dec-2022**	21-Dec-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
NC4	**21-Nov-2022**	**----**	----	----	**28-Nov-2022**	28-Nov-2022	✓
Clear Plastic Bottle - Natural (EA025H)							
WQA04	**22-Nov-2022**	**----**	----	----	**28-Nov-2022**	29-Nov-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**----**	----	----	**01-Dec-2022**	05-Dec-2022	✓
Clear Plastic Bottle - Natural (ED037-P)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**01-Dec-2022**	06-Dec-2022	✓
Clear Plastic Bottle - Natural (ED037-P)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**01-Dec-2022**	07-Dec-2022	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	**21-Nov-2022**	**----**	----	----	**01-Dec-2022**	05-Dec-2022	✓
Clear Plastic Bottle - Natural (ED038)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**01-Dec-2022**	06-Dec-2022	✓
Clear Plastic Bottle - Natural (ED038)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**01-Dec-2022**	07-Dec-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**----**	----	----	**06-Dec-2022**	20-May-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**06-Dec-2022**	21-May-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**06-Dec-2022**	22-May-2023	✓
EG020T: Total Metals by ICP-MS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**01-Dec-2022**	20-May-2023	✓	**06-Dec-2022**	20-May-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**01-Dec-2022**	21-May-2023	✓	**06-Dec-2022**	21-May-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**01-Dec-2022**	22-May-2023	✓	**06-Dec-2022**	22-May-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	**21-Nov-2022**	**----**	----	----	**02-Dec-2022**	19-Dec-2022	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**02-Dec-2022**	20-Dec-2022	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**02-Dec-2022**	21-Dec-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, MW13	**21-Nov-2022**	**----**	----	----	**01-Dec-2022**	19-Dec-2022	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**----**	----	----	**01-Dec-2022**	20-Dec-2022	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**01-Dec-2022**	21-Dec-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**----**	----	----	**06-Dec-2022**	19-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW25	**22-Nov-2022**	**----**	----	----	**05-Dec-2022**	20-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28	**22-Nov-2022**	**----**	----	----	**06-Dec-2022**	20-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW17, WQA06, MW15	**23-Nov-2022**	**----**	----	----	**05-Dec-2022**	21-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW11	**23-Nov-2022**	**----**	----	----	**06-Dec-2022**	21-Dec-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**02-Dec-2022**	19-Dec-2022	✓	**06-Dec-2022**	19-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**02-Dec-2022**	20-Dec-2022	✓	**06-Dec-2022**	20-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW11, MW17, WQA06, MW15	**23-Nov-2022**	**02-Dec-2022**	21-Dec-2022	✓	**06-Dec-2022**	21-Dec-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW46, MW04, MW05, WQA01, MW06, MW08a, NC4, MW09, MW10, WQA02, MW13	**21-Nov-2022**	**02-Dec-2022**	19-Dec-2022	✓	**06-Dec-2022**	19-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MR-MWO5, MW22, WQA03, WQA04, MW31, WQA05, MW27, MW28, MW25	**22-Nov-2022**	**02-Dec-2022**	20-Dec-2022	✓	**06-Dec-2022**	20-Dec-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW11, MW17, WQA06, MW15	**23-Nov-2022**	**02-Dec-2022**	21-Dec-2022	✓	**06-Dec-2022**	21-Dec-2022	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
NC4	**21-Nov-2022**	**28-Nov-2022**	28-Nov-2022	✓	**01-Dec-2022**	07-Jan-2023	✓
Amber Glass Bottle - Unpreserved (EP071)							
WQA04	**22-Nov-2022**	**28-Nov-2022**	29-Nov-2022	✓	**01-Dec-2022**	07-Jan-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
NC4, TBW 1552 - Trip blank	**21-Nov-2022**	**28-Nov-2022**	05-Dec-2022	✓	**28-Nov-2022**	05-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
WQA04	**22-Nov-2022**	**28-Nov-2022**	06-Dec-2022	✓	**28-Nov-2022**	06-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TBW 1551 - Trip blank	**23-Nov-2022**	**28-Nov-2022**	07-Dec-2022	✓	**28-Nov-2022**	07-Dec-2022	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
NC4	**21-Nov-2022**	**28-Nov-2022**	28-Nov-2022	✓	**01-Dec-2022**	07-Jan-2023	✓
Amber Glass Bottle - Unpreserved (EP071)							
WQA04	**22-Nov-2022**	**28-Nov-2022**	29-Nov-2022	✓	**01-Dec-2022**	07-Jan-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
NC4, TBW 1552 - Trip blank	**21-Nov-2022**	**28-Nov-2022**	05-Dec-2022	✓	**28-Nov-2022**	05-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
WQA04	**22-Nov-2022**	**28-Nov-2022**	06-Dec-2022	✓	**28-Nov-2022**	06-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TBW 1551 - Trip blank	**23-Nov-2022**	**28-Nov-2022**	07-Dec-2022	✓	**28-Nov-2022**	07-Dec-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) NC4, TBW 1552 - Trip blank	**21-Nov-2022**	**28-Nov-2022**	05-Dec-2022	✓	**28-Nov-2022**	05-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA04	**22-Nov-2022**	**28-Nov-2022**	06-Dec-2022	✓	**28-Nov-2022**	06-Dec-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080) TBW 1551 - Trip blank	**23-Nov-2022**	**28-Nov-2022**	07-Dec-2022	✓	**28-Nov-2022**	07-Dec-2022	✓
EP204: Glyphosate and AMPA							
Amber Bottle Unpreserved for Specialist Organics (EP204) NC4	**21-Nov-2022**	**----**	----	----	**05-Dec-2022**	05-Dec-2022	✓
Amber Bottle Unpreserved for Specialist Organics (EP204) WQA04	**22-Nov-2022**	**----**	----	----	**05-Dec-2022**	06-Dec-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	3	30	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	3	30	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	27	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by Auto Titrator	ED037-P	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Glyphosate and AMPA	EP204	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Glyphosate and AMPA	EP204	WATER	In house: Pre-column derivatisation LCMS (ES in negative mode). Water samples are derivatised with 9-fluorenyl methoxycarbonyl chloroformate (FMOC) in alkaline condition. The derivatives of glyphosate and AMPA are separated by a C8 column and determined by MS.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2301758**	Page	: 1 of 14
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: 60644386	Date Samples Received	: 10-Feb-2023 16:50
Order number	: 60644386	Date Analysis Commenced	: 13-Feb-2023
C-O-C number	: ----	Issue Date	: 20-Feb-2023 16:54
Sampler	: S.Humphries, S.Johnstone		
Site	: BORR monitoring		
Quote number	: EP/675/21_V2		
No. of samples received	: 23		
No. of samples analysed	: 23		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP204 conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP080: Poor matrix spike recovery due to possible matrix effects and interferences. Chromatograms have been reviewed.
- EG020: LCS recovery for Arsenic falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.
- EG020: It is recognised that various total metal concentrations are less than dissolved for various samples. However, the difference is within experimental variation of the methods.
- EA010-P (Conductivity): Sample EP2301758-19 positive result verified by re-analysis.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW31	MW28	MW27	MW25b	MW22b
			Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit	EP2301758-001	EP2301758-002	EP2301758-003	EP2301758-004	EP2301758-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.59**	**6.50**	**6.00**	**6.41**	**6.00**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**422**	**1560**	**162**	**3850**	**12800**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**11**	**491**	**25**	**76**	**17**
Total Alkalinity as CaCO3	----	1	mg/L	**11**	**491**	**25**	**76**	**17**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**73**	**228**	**53**	**124**	**106**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.015**	<0.001	**0.002**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	**0.002**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	<0.001	**0.008**	**0.078**
Lead	7439-92-1	0.001	mg/L	<0.001	**0.003**	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.012**	**0.042**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.015**	<0.001	**0.006**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.004**	**0.004**	**0.015**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.001**	**0.022**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	**0.001**	**0.012**	**0.071**
Lead	7439-92-1	0.001	mg/L	<0.001	**0.004**	**0.001**	**0.003**	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.036**	**0.037**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.6**	**10.8**	**1.9**	**1.0**	**0.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW31	MW28	MW27	MW25b	MW22b
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit		EP2301758-001	EP2301758-002	EP2301758-003	EP2301758-004	EP2301758-005
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**1.6**	**10.8**	**1.9**	**1.0**	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.14**	**0.07**	**0.21**	**0.01**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW17	MW15	MW13	MW08a	BH27.1
			Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit	EP2301758-006	EP2301758-007	EP2301758-008	EP2301758-009	EP2301758-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.96**	**6.19**	**6.79**	**6.75**	**5.27**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**369**	**333**	**810**	**659**	**1240**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**63**	**28**	**318**	**71**	**2**
Total Alkalinity as CaCO3	----	1	mg/L	**63**	**28**	**318**	**71**	**2**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**22**	**44**	**102**	**41**	**61**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	**0.002**	<0.001	**0.004**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	**0.009**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.007**	<0.001	**0.002**	**0.002**	**0.002**
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	**0.002**	<0.001	**0.006**
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	**0.002**	<0.001	**0.004**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.008**	<0.005	**0.008**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.01**	<0.01	<0.01	**0.02**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.2**	**1.6**	**2.5**	**2.3**	**0.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW17	MW15	MW13	MW08a	BH27.1
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit		EP2301758-006	EP2301758-007	EP2301758-008	EP2301758-009	EP2301758-010
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**1.2**	**1.6**	**2.5**	**2.3**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.04**	**0.28**	**0.76**	**0.03**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	MW04	MW06	MW09	WM10	MR MW05
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
					EP2301758-011	EP2301758-012	EP2301758-013	EP2301758-014	EP2301758-015
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.25**	**7.62**	**6.65**	**6.39**	**6.50**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**5000**	**1080**	**153**	**412**	**25200**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**308**	**144**	**12**	**23**	**155**
Total Alkalinity as CaCO3	----	1	mg/L		**308**	**144**	**12**	**23**	**155**
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**71**	**10**	**10**	**35**	**178**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	**0.001**	<0.001	**0.002**	**0.006**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	**0.003**
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.003**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	**0.001**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	<0.001	**0.002**	**0.007**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	**0.003**	**0.010**
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.006**	<0.001	**0.003**
Nickel	7440-02-0	0.001	mg/L		**0.001**	<0.001	<0.001	**0.001**	**0.002**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.007**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	**0.61**	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.6**	**1.6**	**0.2**	**0.8**	**0.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW04	MW06	MW09	WM10	MR MW05
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit		EP2301758-011	EP2301758-012	EP2301758-013	EP2301758-014	EP2301758-015
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.6**	**1.6**	**0.8**	**0.8**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.06**	**0.02**	**0.04**	**0.07**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	NC4	WQA01_080223	WQA02_080223	WQA03_080223	WQA04_080223
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
					EP2301758-016	EP2301758-017	EP2301758-018	EP2301758-019	EP2301758-020
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.29**	**6.01**	**7.33**	**5.53**	**6.43**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**2440**	**424**	**2520**	**1**	**344**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	**----**	<5	**----**	**----**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**45**	**11**	**45**	<1	**26**
Total Alkalinity as CaCO3	----	1	mg/L		**45**	**11**	**45**	<1	**26**
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**6**	**53**	**4**	**2**	**35**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NC4	WQA01_080223	WQA02_080223	WQA03_080223	WQA04_080223
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit		EP2301758-016	EP2301758-017	EP2301758-018	EP2301758-019	EP2301758-020
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.7**	**1.6**	**0.7**	<0.1	**1.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.7**	**1.6**	**0.7**	<0.1	**1.6**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.03**	<0.01	**0.06**	<0.01	**0.04**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	<20	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	<50	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	<100	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	<20	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	<100	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	<100	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	<100	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	<1	----	----
Toluene	108-88-3	2	µg/L		<2	----	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	<2	----	----
^ Total Xylenes	----	2	µg/L		<2	----	<2	----	----
^ Sum of BTEX	----	1	µg/L		<1	----	<1	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	<5	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	----	<10	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**97.3**	----	**92.2**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NC4	WQA01_080223	WQA02_080223	WQA03_080223	WQA04_080223
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00
Compound	CAS Number	LOR	Unit		EP2301758-016	EP2301758-017	EP2301758-018	EP2301758-019	EP2301758-020
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
Toluene-D8	2037-26-5	2	%		**101**	**----**	**100**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**106**	**----**	**103**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WQA05_080223	TBW112	TBW111	----	----
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EP2301758-021	EP2301758-022	EP2301758-023	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**5.57**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	----	----	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**2**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WQA05_080223	TBW112	TBW111	----	----
				Sampling date / time	09-Feb-2023 00:00	09-Feb-2023 00:00	09-Feb-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EP2301758-021	EP2301758-022	EP2301758-023	--------	--------
					Result	Result	Result	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	<20	<20	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		----	<20	<20	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	<1	<1	----	----
Toluene	108-88-3	2	µg/L		----	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		----	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		----	<2	<2	----	----
^ Total Xylenes	----	2	µg/L		----	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L		----	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		----	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	92.3	91.5	----	----
Toluene-D8	2037-26-5	2	%		----	98.8	99.4	----	----
4-Bromofluorobenzene	460-00-4	2	%		----	102	101	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2301758**	Page	: 1 of 11
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 8 6230 5600	Telephone	: +61-8-9406 1301
Project	: 60644386	Date Samples Received	: 10-Feb-2023
Order number	: 60644386	Date Analysis Commenced	: 13-Feb-2023
C-O-C number	: ----	Issue Date	: 20-Feb-2023
Sampler	: S.Humphries, S.Johnstone		
Site	: BORR monitoring		
Quote number	: EP/675/21_V2		
No. of samples received	: 23		
No. of samples analysed	: 23		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 4868802)									
EP2301751-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.38	7.47	1.2	0% - 20%
EP2301758-002	MW28	EA005-P: pH Value	----	0.01	pH Unit	6.50	6.49	0.2	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4868805)									
EP2301758-018	WQA02_080223	EA005-P: pH Value	----	0.01	pH Unit	7.33	7.36	0.4	0% - 20%
EP2301758-011	MW04	EA005-P: pH Value	----	0.01	pH Unit	7.25	7.21	0.6	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4868799)									
EP2301724-005	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	958	970	1.2	0% - 20%
EP2301758-002	MW28	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1560	1560	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4868804)									
EP2301758-018	WQA02_080223	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	2520	2480	1.6	0% - 20%
EP2301758-011	MW04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	5000	4970	0.6	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4872783)									
EP2301734-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1700	1540	9.6	0% - 20%
EP2301883-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1990	1950	1.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4868801)									
EP2301751-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	340	339	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	340	339	0.0	0% - 20%
EP2301758-002	MW28	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	491	489	0.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	491	489	0.5	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 4868803)									
EP2301758-018	WQA02_080223	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	45	45	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	45	45	0.0	0% - 20%
EP2301758-011	MW04	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	308	304	1.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	308	304	1.4	0% - 20%
ED038A: Acidity (QC Lot: 4873518)									
EP2301758-001	MW31	ED038: Acidity as CaCO3	----	1	mg/L	73	64	12.2	0% - 20%
EP2301758-010	BH27.1	ED038: Acidity as CaCO3	----	1	mg/L	61	59	3.3	0% - 20%
ED038A: Acidity (QC Lot: 4873519)									
EP2301769-008	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	10	12	18.8	0% - 50%
EP2301769-009	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	13	13	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4874737)									
EP2301236-025	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EP2301758-009	MW08a	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4874740)									
EP2301791-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.010	0.010	0.0	0% - 50%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.037	0.036	0.0	No Limit
EP2301768-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4874740) - continued									
EP2301768-001	Anonymous	EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.008	0.008	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4869281)									
EP2301756-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0055	0.0064	15.4	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.052	<0.052	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.052	<0.052	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	3.60	3.53	2.0	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.227	0.228	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.704	0.655	7.2	0% - 50%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.262	<0.262	0.0	No Limit
EP2301758-005	MW22b	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.071	0.071	0.0	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.037	0.035	4.7	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4869282)									
EP2301758-015	MR MW05	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.010	0.009	19.8	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.003	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.007	0.006	0.0	No Limit
EP2301778-012	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4874738)									
EP2301236-026	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2301758-010	BH27.1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4874739)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG035F: Dissolved Mercury by FIMS (QC Lot: 4874739) - continued									
EP2301758-019	WQA03_080223	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2301800-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4869291)									
EP2301751-006	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2301758-010	BH27.1	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4869292)									
EP2301758-020	WQA04_080223	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4869461)									
EP2301758-001	MW31	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2301758-011	MW04	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4872117)									
EP2301883-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.34	0.34	0.0	0% - 20%
EP2301883-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.15	2.17	0.8	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4868398)									
EP2301682-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.5	1.5	0.0	No Limit
EP2301734-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	217	197	9.9	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4868400)									
EP2301758-004	MW25b	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	1.0	0.0	0% - 50%
EP2301758-014	WM10	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.8	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4868397)									
EP2301682-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.12	0.35	100	No Limit
EP2301734-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	37.5	36.3	3.1	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4868399)									
EP2301758-004	MW25b	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.21	0.23	7.0	0% - 20%
EP2301758-014	WM10	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.04	0.02	82.9	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4867016)									
EP2301748-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	40	20	58.6	No Limit
EP2301751-007	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4870491)									
EP2301758-016	NC4	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4867016)									
EP2301748-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	40	20	67.1	No Limit
EP2301751-007	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4870491)									
EP2301758-016	NC4	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4870491) - continued									
EP2301758-016	NC4	EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080: BTEXN (QC Lot: 4867016)									
EP2301748-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2301751-007	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP204: Glyphosate and AMPA (QC Lot: 4875193)									
EP2301758-016	NC4	EP204: Glyphosate	1071-83-6	10	µg/L	<10	<10	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 4868802)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	99.8	98.5	102
EA005P: pH by PC Titrator (QCLot: 4868805)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	99.8	98.5	102
EA010P: Conductivity by PC Titrator (QCLot: 4868799)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	92.5	92.1	105
EA010P: Conductivity by PC Titrator (QCLot: 4868804)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	96.5	92.1	105
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4872783)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	91.6	89.8	116
				<5	1000 mg/L	98.0	89.8	116
ED037P: Alkalinity by PC Titrator (QCLot: 4868801)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	110	87.8	118
				<1	200 mg/L	103	87.8	118
ED037P: Alkalinity by PC Titrator (QCLot: 4868803)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	87.8	118
				<1	200 mg/L	103	87.8	118
ED038A: Acidity (QCLot: 4873518)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	99.7	70.0	130
ED038A: Acidity (QCLot: 4873519)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	98.4	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4874737)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	102	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	89.7	108

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4874737) - continued								
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.0	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.8	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.7	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100.0	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.8	89.5	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 4874740)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	97.3	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.4	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.6	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	104	89.5	112
EG020T: Total Metals by ICP-MS (QCLot: 4869281)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.5	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.8	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	100	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.3	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.5	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.0	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.6	90.7	113
EG020T: Total Metals by ICP-MS (QCLot: 4869282)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	# 92.4	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.1	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	103	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.0	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.9	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.6	90.7	113
EG035F: Dissolved Mercury by FIMS (QCLot: 4874738)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	106	85.6	120
EG035F: Dissolved Mercury by FIMS (QCLot: 4874739)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	102	85.6	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4869291)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	101	83.7	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4869292)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	102	83.7	120
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4869461)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4869461) - continued								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.2	90.5	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4872117)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	92.1	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4868398)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	88.1	75.8	100
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4868400)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	85.8	75.8	100
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4868397)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	90.2	70.0	110
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4868399)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	92.5	70.0	110
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4867016)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	88.3	73.6	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4870491)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	375 µg/L	60.4	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	392 µg/L	78.4	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	331 µg/L	70.4	42.5	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4867016)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	88.3	73.9	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4870491)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	375 µg/L	63.4	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	524 µg/L	78.7	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	206 µg/L	71.0	24.7	137
EP080: BTEXN (QCLot: 4867016)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	86.0	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	88.9	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	86.4	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	90.0	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	87.7	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	83.0	77.0	118
EP204: Glyphosate and AMPA (QCLot: 4875193)								
EP204: Glyphosate	1071-83-6	10	µg/L	<10	50 µg/L	105	70.0	134

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4874737)							
EP2301758-001	MW31	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	98.2	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	104	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	98.9	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	101	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	95.8	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	104	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	100	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4874740)							
EP2301758-020	WQA04_080223	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	100	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	104	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	99.8	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	101	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	97.9	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	103	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	104	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4869281)							
EP2301756-003	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	97.5	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	96.5	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	98.8	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	# Not Determined	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	94.0	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	95.0	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	96.7	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4869282)							
EP2301758-016	NC4	EG020A-T: Arsenic	7440-38-2	1 mg/L	96.0	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	100	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	97.8	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	91.4	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	101	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	94.1	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	95.6	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4874738)							
EP2301758-003	MW27	EG035F: Mercury	7439-97-6	0.005 mg/L	106	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4874739)							
EP2301758-021	WQA05_080223	EG035F: Mercury	7439-97-6	0.005 mg/L	106	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4869291)							
EP2301758-001	MW31	EG035T: Mercury	7439-97-6	0.005 mg/L	108	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4869292)							
EP2301758-021	WQA05_080223	EG035T: Mercury	7439-97-6	0.005 mg/L	108	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4869461)							
EP2301758-001	MW31	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	93.5	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4872117)							
EP2301883-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	84.7	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4868398)							
EP2301682-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	97.9	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4868400)							
EP2301758-005	MW22b	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	92.7	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4868397)							
EP2301682-002	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	97.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4868399)							
EP2301758-005	MW22b	EK067G: Total Phosphorus as P	----	1 mg/L	90.1	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4867016)							
EP2301749-001	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	85.9	77.0	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4870491)							
EP2301758-018	WQA02_080223	EP071: C10 - C14 Fraction	----	375 µg/L	53.2	44.5	122
		EP071: C15 - C28 Fraction	----	392 µg/L	80.0	55.1	143
		EP071: C29 - C36 Fraction	----	331 µg/L	76.7	53.6	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4867016)							
EP2301749-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	84.9	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4870491)							
EP2301758-018	WQA02_080223	EP071: >C10 - C16 Fraction	----	375 µg/L	54.2	44.5	122
		EP071: >C16 - C34 Fraction	----	524 µg/L	76.4	55.1	143
		EP071: >C34 - C40 Fraction	----	206 µg/L	93.3	53.6	128
EP080: BTEXN (QCLot: 4867016)							
EP2301749-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	90.6	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	# 5.0	73.5	126
EP204: Glyphosate and AMPA (QCLot: 4875193)							
EP2301758-016	NC4	EP204: Glyphosate	1071-83-6	50 µg/L	91.3	57.0	125

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2301758**	Page	: 1 of 11
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SHANNON De MELO	Telephone	: +61-8-9406 1301
Project	: 60644386	Date Samples Received	: 10-Feb-2023
Site	: BORR monitoring	Issue Date	: 20-Feb-2023
Sampler	: S.Humphries, S.Johnstone	No. of samples received	: 23
Order number	: 60644386	No. of samples analysed	: 23

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EG020T: Total Metals by ICP-MS	QC-4869282-002	----	**Arsenic**	7440-38-2	92.4 %	92.6-113%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EG020T: Total Metals by ICP-MS	EP2301756--003	Anonymous	**Copper**	7440-50-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080: BTEXN	EP2301749--001	Anonymous	**Toluene**	108-88-3	5.0 %	73.5-126%	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
MW31,	MW28,	----	----	----	14-Feb-2023	09-Feb-2023	**5**
MW27,	MW25b,						
MW22b,	MW17,						
MW15,	MW13,						
MW08a,	BH27.1,						
MW04,	MW06,						
MW09,	WM10,						
MR MW05,	NC4,						
WQA01_080223,	WQA02_080223,						
WQA03_080223,	WQA04_080223,						
WQA05_080223							

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**14-Feb-2023**	09-Feb-2023	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**14-Feb-2023**	09-Mar-2023	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
NC4, WQA02_080223	**09-Feb-2023**	**----**	----	----	**15-Feb-2023**	16-Feb-2023	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**14-Feb-2023**	23-Feb-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**15-Feb-2023**	23-Feb-2023	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**17-Feb-2023**	08-Aug-2023	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**15-Feb-2023**	08-Aug-2023	✓	**15-Feb-2023**	08-Aug-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**17-Feb-2023**	09-Mar-2023	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**15-Feb-2023**	09-Mar-2023	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**----**	----	----	**16-Feb-2023**	09-Mar-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**14-Feb-2023**	09-Mar-2023	✓	**15-Feb-2023**	09-Mar-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW31, MW28, MW27, MW25b, MW22b, MW17, MW15, MW13, MW08a, BH27.1, MW04, MW06, MW09, WM10, MR MW05, NC4, WQA01_080223, WQA02_080223, WQA03_080223, WQA04_080223, WQA05_080223	**09-Feb-2023**	**14-Feb-2023**	09-Mar-2023	✓	**15-Feb-2023**	09-Mar-2023	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
NC4, WQA02_080223	**09-Feb-2023**	**15-Feb-2023**	16-Feb-2023	✓	**17-Feb-2023**	27-Mar-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
NC4, WQA02_080223, TBW112, TBW111	**09-Feb-2023**	**13-Feb-2023**	23-Feb-2023	✓	**14-Feb-2023**	23-Feb-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
NC4, WQA02_080223	**09-Feb-2023**	**15-Feb-2023**	16-Feb-2023	✓	**17-Feb-2023**	27-Mar-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
NC4, WQA02_080223, TBW112, TBW111	**09-Feb-2023**	**13-Feb-2023**	23-Feb-2023	✓	**14-Feb-2023**	23-Feb-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
NC4, WQA02_080223, TBW112, TBW111	**09-Feb-2023**	**13-Feb-2023**	23-Feb-2023	✓	**14-Feb-2023**	23-Feb-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP204: Glyphosate and AMPA							
Amber Bottle Unpreserved for Specialist Organics (EP204)							
NC4, WQA02_080223	**09-Feb-2023**	**----**	----	----	**17-Feb-2023**	23-Feb-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by Auto Titrator	ED037-P	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Glyphosate and AMPA	EP204	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Glyphosate and AMPA	EP204	WATER	In house: Pre-column derivatisation LCMS (ES in negative mode). Water samples are derivatised with 9-fluorenyl methoxycarbonyl chloroformate (FMOC) in alkaline condition. The derivatives of glyphosate and AMPA are separated by a C8 column and determined by MS.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

CERTIFICATE OF ANALYSIS

Work Order	: **EP2306972**	Page	: 1 of 14
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR quarterly monitoring	Date Samples Received	: 26-May-2023 16:45
Order number	: 60644386	Date Analysis Commenced	: 30-May-2023
C-O-C number	: 52581	Issue Date	: 07-Jun-2023 17:01
Sampler	: SOPHIE JOHNSTONE		
Site	: Bunbury outer ring road		
Quote number	: EP/675/21_V2		
No. of samples received	: 20		
No. of samples analysed	: 20		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
David Viner	SENIOR LAB TECH	Perth Organics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020: Results for EP2306972 -003 and -004 have been confirmed by re-preparation and re-analysis.
- EG020: It is recognised that total Zn concentration is less than dissolved for sample EP2306972-004. However, the difference is within experimental variation of the methods

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW31	MW27	MW25	WQA01_240523	MW22
			Sampling date / time	24-May-2023 08:59	24-May-2023 09:54	24-May-2023 12:28	24-May-2023 10:51	24-May-2023 12:25
Compound	CAS Number	LOR	Unit	EP2306972-001	EP2306972-002	EP2306972-003	EP2306972-004	EP2306972-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.86**	**6.41**	**6.36**	**6.39**	**5.91**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**633**	**165**	**4060**	**4070**	**12400**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**10**	**34**	**66**	**63**	**14**
Total Alkalinity as CaCO3	----	1	mg/L	**10**	**34**	**66**	**63**	**14**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**99**	**61**	**153**	**152**	**119**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.002**	**0.001**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	**0.008**	**0.010**	**0.069**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.007**	**0.030**	**0.033**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.003**	**0.005**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.009**	**0.005**	**0.012**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.006**	**0.017**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.003**	**0.009**	**0.012**	**0.074**
Lead	7439-92-1	0.001	mg/L	<0.001	**0.002**	<0.001	**0.002**	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.012**	**0.027**	**0.035**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	**0.40**	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01_240523	MW22
				Sampling date / time	24-May-2023 08:59	24-May-2023 09:54	24-May-2023 12:28	24-May-2023 10:51	24-May-2023 12:25
Compound	CAS Number	LOR	Unit		EP2306972-001	EP2306972-002	EP2306972-003	EP2306972-004	EP2306972-005
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.2**	**1.9**	**0.5**	**0.7**	**0.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.2**	**1.9**	**0.5**	**1.1**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.05**	**0.14**	**0.20**	**0.01**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	NC4	WQA02_240523	MW17	MW15	MW13
			Sampling date / time	24-May-2023 12:26	24-May-2023 13:20	25-May-2023 09:04	25-May-2023 09:40	25-May-2023 09:54
Compound	CAS Number	LOR	Unit	EP2306972-006	EP2306972-007	EP2306972-009	EP2306972-010	EP2306972-011
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	----	7.76	7.18	6.57	7.42
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	2250	230	479	1000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	----	25	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	156	80	52	396
Total Alkalinity as CaCO3	----	1	mg/L	----	156	80	52	396
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	----	10	26	78	101
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.001	0.002	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.002	<0.001	0.003
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	<0.001	<0.001	0.002
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.007	0.008	<0.005	<0.005	0.017
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	NC4	WQA02_240523	MW17	MW15	MW13
				Sampling date / time	24-May-2023 12:26	24-May-2023 13:20	25-May-2023 09:04	25-May-2023 09:40	25-May-2023 09:54
Compound	CAS Number	LOR	Unit		EP2306972-006	EP2306972-007	EP2306972-009	EP2306972-010	EP2306972-011
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.48	0.43	0.37	0.04
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	1.1	0.3	2.3	5.7
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	1.6	0.7	2.7	5.7
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.08	0.03	0.03	0.84
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		----	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		----	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		----	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		----	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		----	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		----	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		----	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		----	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		----	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		----	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	<1	----	----	----
Toluene	108-88-3	2	µg/L		----	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		----	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		----	<2	----	----	----
^ Total Xylenes	----	2	µg/L		----	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		----	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		----	<5	----	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		----	<10	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	NC4	WQA02_240523	MW17	MW15	MW13
				Sampling date / time	24-May-2023 12:26	24-May-2023 13:20	25-May-2023 09:04	25-May-2023 09:40	25-May-2023 09:54
Compound	CAS Number	LOR	Unit		EP2306972-006	EP2306972-007	EP2306972-009	EP2306972-010	EP2306972-011
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	**73.9**	----	----	----
Toluene-D8	2037-26-5	2	%		----	**99.3**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		----	**102**	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	WQA04_250523	MW09	MW10	MW06	MW04
			Sampling date / time	25-May-2023 10:45	25-May-2023 13:08	25-May-2023 13:10	26-May-2023 08:56	26-May-2023 09:25
Compound	CAS Number	LOR	Unit	EP2306972-012	EP2306972-013	EP2306972-014	EP2306972-015	EP2306972-016
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.33**	**6.71**	**6.43**	**7.24**	**7.26**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**486**	**221**	**496**	**770**	**5180**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**13**	**21**	**94**	**328**
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**13**	**21**	**94**	**328**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**44**	**25**	**54**	**26**	**90**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.001**	<0.001	**0.002**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.002**	**0.003**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.002**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	<0.001	**0.016**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.013**	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.06**	**0.47**	<0.01	<0.01	**0.06**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	WQA04_250523	MW09	MW10	MW06	MW04
				Sampling date / time	25-May-2023 10:45	25-May-2023 13:08	25-May-2023 13:10	26-May-2023 08:56	26-May-2023 09:25
Compound	CAS Number	LOR	Unit		EP2306972-012	EP2306972-013	EP2306972-014	EP2306972-015	EP2306972-016
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.7**	**0.2**	**0.7**	**1.5**	**0.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.8**	**0.7**	**0.7**	**1.5**	**0.5**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.03**	**0.02**	**0.05**	**0.07**	**0.02**

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)

Compound	CAS Number	LOR	Unit	Sample ID	WQA03_240523	WQA05_250523	WQA06_260523	TBW 564 TRIP BLANK	TBW 563 TRIP BLANK
				Sampling date / time	24-May-2023 13:43	25-May-2023 14:36	26-May-2023 09:37	26-May-2023 09:45	26-May-2023 09:46
					EP2306972-008	EP2306972-017	EP2306972-018	EP2306972-019	EP2306972-020
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	<0.1	<0.1	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		<0.1	<0.1	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	WQA03_240523	WQA05_250523	WQA06_260523	TBW 564 TRIP BLANK	TBW 563 TRIP BLANK
				Sampling date / time	24-May-2023 13:43	25-May-2023 14:36	26-May-2023 09:37	26-May-2023 09:45	26-May-2023 09:46
					EP2306972-008	EP2306972-017	EP2306972-018	EP2306972-019	EP2306972-020
					Result	Result	Result	Result	Result
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**72.4**	**89.6**	**91.0**	**73.0**	**69.0**
Toluene-D8	2037-26-5	2	%		**101**	**101**	**102**	**99.8**	**99.9**
4-Bromofluorobenzene	460-00-4	2	%		**103**	**114**	**112**	**95.2**	**99.2**

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	NC4	----	----	----	----
			Sampling date / time	24-May-2023 12:26	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2306972-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.73**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**2260**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**29**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**151**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**151**	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**11**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.49**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.0**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.5**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.07**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	----	----	----	----
				Sampling date / time	24-May-2023 12:26	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2306972-006	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	**----**	**----**	**----**	**----**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	**----**	**----**	**----**	**----**
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	**----**	**----**	**----**	**----**
Toluene	108-88-3	2	µg/L		<2	**----**	**----**	**----**	**----**
Ethylbenzene	100-41-4	2	µg/L		<2	**----**	**----**	**----**	**----**
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	**----**	**----**	**----**	**----**
ortho-Xylene	95-47-6	2	µg/L		<2	**----**	**----**	**----**	**----**
^ **Total Xylenes**	----	2	µg/L		<2	**----**	**----**	**----**	**----**
^ **Sum of BTEX**	----	1	µg/L		<1	**----**	**----**	**----**	**----**
Naphthalene	91-20-3	5	µg/L		<5	**----**	**----**	**----**	**----**
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	**----**	**----**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**73.1**	**----**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%		**99.4**	**----**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**97.9**	**----**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: RINSATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

QUALITY CONTROL REPORT

Work Order	: **EP2306972**	Page	: 1 of 12
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Customer Services EP
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR quarterly monitoring	Date Samples Received	: 26-May-2023
Order number	: 60644386	Date Analysis Commenced	: 30-May-2023
C-O-C number	: 52581	Issue Date	: 07-Jun-2023
Sampler	: SOPHIE JOHNSTONE		
Site	: Bunbury outer ring road		
Quote number	: EP/675/21_V2		
No. of samples received	: 20		
No. of samples analysed	: 20		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
David Viner	SENIOR LAB TECH	Perth Organics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 5083750)									
EP2306972-002	MW27	EA005-P: pH Value	----	0.01	pH Unit	6.41	6.36	0.8	0% - 20%
EP2306959-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.99	6.12	2.1	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 5083776)									
EP2306984-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.68	7.67	0.1	0% - 20%
EP2306979-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.49	7.47	0.3	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 5083751)									
EP2306972-002	MW27	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	165	165	0.0	0% - 20%
EP2306959-012	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	21	22	0.0	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 5083775)									
EP2306984-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	2580	2590	0.4	0% - 20%
EP2306979-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	41100	41000	0.2	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5082919)									
EP2306936-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	370	366	1.2	0% - 20%
EP2306979-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	6	<5	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 5083753)									
EP2306972-002	MW27	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	34	34	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	34	34	0.0	0% - 20%
EP2306959-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 5083777)									
EP2306984-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	203	214	5.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	203	214	5.0	0% - 20%
EP2306979-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	218	215	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	218	215	1.3	0% - 20%
ED038A: Acidity (QC Lot: 5087361)									
EP2306972-003	MW25	ED038: Acidity as CaCO3	----	1	mg/L	153	153	0.0	0% - 20%
EP2306972-012	WQA04_250523	ED038: Acidity as CaCO3	----	1	mg/L	44	44	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5087602)									
EP2306972-001	MW31	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EP2306979-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0015	0.0013	16.9	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.017	0.017	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.039	0.036	10.1	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.158	0.155	1.7	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5087703)									
EP2306731-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	0.002	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EP2306972-002	MW27	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.009	0.008	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 5087703) - continued									
EP2306972-002	MW27	EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 5087704)									
EP2306972-012	WQA04_250523	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EP2307035-003	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.020	0.021	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5087603)									
EP2306972-003	MW25	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2306972-012	WQA04_250523	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5087705)									
EP2306972-001	MW31	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2306972-011	MW13	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5084694)									
EP2306972-001	MW31	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2306972-011	MW13	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5087394)									
EP2306961-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.2	0.0	No Limit
EP2306961-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	55.5	49.1	12.3	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5087395)									
EP2306972-006	NC4	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	1.1	0.0	0% - 50%
EP2306972-016	MW04	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5087393)									
EP2306961-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.19	0.18	0.0	0% - 50%
EP2306961-011	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	4.22	4.10	2.8	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5087396)									
EP2306972-006	NC4	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.07	0.04	46.2	No Limit
EP2306972-016	MW04	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.02	<0.01	80.2	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5080340)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5080340) - continued									
EP2307047-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP2307047-002	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5080607)									
EP2306935-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2306935-013	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5083358)									
EP2306972-017	WQA05_250523	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2307048-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5080340)									
EP2307047-001	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP2307047-002	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5080607)									
EP2306935-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2306935-013	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5083358)									
EP2306972-017	WQA05_250523	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2307048-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5080607)									
EP2306935-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2306935-013	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 5080607) - continued									
EP2306935-013	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP080: BTEXN (QC Lot: 5083358)									
EP2306972-017	WQA05_250523	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2307048-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP204: Glyphosate and AMPA (QC Lot: 5082562)									
EP2306972-006	NC4	EP204: Glyphosate	1071-83-6	10	µg/L	<10	<10	0.0	No Limit
ES2317837-004	Anonymous	EP204: Glyphosate	1071-83-6	10	µg/L	<10	<10	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 5083750)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 5083776)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA010P: Conductivity by PC Titrator (QCLot: 5083751)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	95.3	92.1	105
EA010P: Conductivity by PC Titrator (QCLot: 5083775)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	95.3	92.1	105
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5082919)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	102	89.8	116
				<5	1000 mg/L	100	89.8	116
ED037P: Alkalinity by PC Titrator (QCLot: 5083753)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	112	87.8	118
				<1	200 mg/L	105	87.8	118
ED037P: Alkalinity by PC Titrator (QCLot: 5083777)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	114	87.8	118
				<1	200 mg/L	107	87.8	118
ED038A: Acidity (QCLot: 5087361)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	106	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5087602)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	101	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.8	89.7	108

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5087602) - continued								
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.9	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.4	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.4	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.6	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.2	89.5	112
EG020T: Total Metals by ICP-MS (QCLot: 5087703)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	103	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.2	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	100	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	100	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	108	90.7	113
EG020T: Total Metals by ICP-MS (QCLot: 5087704)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	106	92.6	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	91.8	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	103	90.9	109
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	90.8	110
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	104	92.3	108
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	105	89.3	110
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	106	90.7	113
EG035F: Dissolved Mercury by FIMS (QCLot: 5087603)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	97.8	85.6	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5087705)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	97.6	83.7	120
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5084694)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	94.0	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5087394)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	89.0	75.8	100
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5087395)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	88.8	75.8	100
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5087393)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	87.5	70.0	110
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5087396)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5087396) - continued								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	85.0	70.0	110
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5080340)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	341 µg/L	76.4	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	343 µg/L	97.8	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	257 µg/L	92.4	42.5	119
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5080607)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	102	73.6	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5083358)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	92.7	73.6	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5083929)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	341 µg/L	73.5	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	343 µg/L	93.7	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	257 µg/L	89.3	42.5	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5080340)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	346 µg/L	79.4	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	430 µg/L	99.6	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	161 µg/L	97.8	24.7	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5080607)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	101	73.9	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5083358)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	95.9	73.9	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5083929)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	346 µg/L	78.1	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	430 µg/L	95.7	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	161 µg/L	76.7	24.7	137
EP080: BTEXN (QCLot: 5080607)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	112	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	106	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	105	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	107	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	104	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	105	77.0	118
EP080: BTEXN (QCLot: 5083358)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080: BTEXN (QCLot: 5083358) - continued								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	87.4	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	92.5	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	92.9	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	94.5	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	96.1	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	91.3	77.0	118
EP204: Glyphosate and AMPA (QCLot: 5082562)								
EP204: Glyphosate	1071-83-6	10	µg/L	<10	50 µg/L	90.4	70.0	134

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5087602)							
EP2306972-002	MW27	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	100	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	100	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	99.1	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	97.7	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	95.7	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	101	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	104	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5087703)							
EP2306731-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	109	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	107	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	102	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	104	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	103	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	104	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	109	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 5087704)							
EP2306972-013	MW09	EG020A-T: Arsenic	7440-38-2	1 mg/L	110	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	110	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	105	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 5087704) - continued							
EP2306972-013	MW09	EG020A-T: Copper	7440-50-8	1 mg/L	111	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	109	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	109	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	112	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5087603)							
EP2306972-004	WQA01_240523	EG035F: Mercury	7439-97-6	0.005 mg/L	80.5	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5087705)							
EP2306972-003	MW25	EG035T: Mercury	7439-97-6	0.005 mg/L	80.4	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5084694)							
EP2306972-001	MW31	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	121	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5087394)							
EP2306961-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	92.4	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5087395)							
EP2306972-007	WQA02_240523	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	93.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5087393)							
EP2306961-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	91.2	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5087396)							
EP2306972-007	WQA02_240523	EK067G: Total Phosphorus as P	----	1 mg/L	96.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5080340)							
EP2307047-001	Anonymous	EP071: C10 - C14 Fraction	----	341 µg/L	94.9	44.5	122
		EP071: C15 - C28 Fraction	----	343 µg/L	118	55.1	143
		EP071: C29 - C36 Fraction	----	257 µg/L	108	53.6	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5080607)							
EP2306935-002	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	97.3	77.0	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5083358)							
EP2306972-018	WQA06_260523	EP080: C6 - C9 Fraction	----	240 µg/L	96.6	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5080340)							
EP2307047-001	Anonymous	EP071: >C10 - C16 Fraction	----	346 µg/L	95.5	44.5	122
		EP071: >C16 - C34 Fraction	----	430 µg/L	120	55.1	143
		EP071: >C34 - C40 Fraction	----	161 µg/L	103	53.6	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5080607)							
EP2306935-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	91.8	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5083358)							
EP2306972-018	WQA06_260523	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	97.4	77.0	137

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 5080607)							
EP2306935-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	106	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	104	73.5	126
EP080: BTEXN (QCLot: 5083358)							
EP2306972-018	WQA06_260523	EP080: Benzene	71-43-2	20 µg/L	95.2	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	99.8	73.5	126
EP204: Glyphosate and AMPA (QCLot: 5082562)							
EP2306972-006	NC4	EP204: Glyphosate	1071-83-6	50 µg/L	87.2	57.0	125

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2306972**	Page	: 1 of 12
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Telephone	: +61-8-9406 1301
Project	: BORR quarterly monitoring	Date Samples Received	: 26-May-2023
Site	: Bunbury outer ring road	Issue Date	: 07-Jun-2023
Sampler	: SOPHIE JOHNSTONE	No. of samples received	: 20
Order number	: 60644386	No. of samples analysed	: 20

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	----	----	----	01-Jun-2023	24-May-2023	**8**
Clear Plastic Bottle - Natural						
MW17, MW15, MW13, WQA04_250523, MW09, MW10	----	----	----	01-Jun-2023	25-May-2023	**7**
Clear Plastic Bottle - Natural						
MW06, MW04	----	----	----	01-Jun-2023	26-May-2023	**6**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
	2				
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	2	38	5.26	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	1	38	2.63	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	----	----	----	**01-Jun-2023**	24-May-2023	×
Clear Plastic Bottle - Natural (EA005-P)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	----	----	----	**01-Jun-2023**	25-May-2023	×
Clear Plastic Bottle - Natural (EA005-P)							
MW06, MW04	**26-May-2023**	----	----	----	**01-Jun-2023**	26-May-2023	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	----	----	----	**01-Jun-2023**	21-Jun-2023	✓
Clear Plastic Bottle - Natural (EA010-P)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	----	----	----	**01-Jun-2023**	22-Jun-2023	✓
Clear Plastic Bottle - Natural (EA010-P)							
MW06, MW04	**26-May-2023**	----	----	----	**01-Jun-2023**	23-Jun-2023	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
NC4, WQA02_240523	**24-May-2023**	----	----	----	**31-May-2023**	31-May-2023	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	----	----	----	**01-Jun-2023**	07-Jun-2023	✓
Clear Plastic Bottle - Natural (ED037-P)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	----	----	----	**01-Jun-2023**	08-Jun-2023	✓
Clear Plastic Bottle - Natural (ED037-P)							
MW06, MW04	**26-May-2023**	----	----	----	**01-Jun-2023**	09-Jun-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	**----**	----	**----**	**02-Jun-2023**	07-Jun-2023	✓
Clear Plastic Bottle - Natural (ED038)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	**----**	----	**----**	**02-Jun-2023**	08-Jun-2023	✓
Clear Plastic Bottle - Natural (ED038)							
MW06, MW04	**26-May-2023**	**----**	----	**----**	**02-Jun-2023**	09-Jun-2023	✓
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	**----**	----	**----**	**02-Jun-2023**	20-Nov-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	**----**	----	**----**	**02-Jun-2023**	21-Nov-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
MW06, MW04	**26-May-2023**	**----**	----	**----**	**02-Jun-2023**	22-Nov-2023	✓
EG020T: Total Metals by ICP-MS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**02-Jun-2023**	20-Nov-2023	✓	**02-Jun-2023**	20-Nov-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10, WQA05_250523	**25-May-2023**	**02-Jun-2023**	21-Nov-2023	✓	**02-Jun-2023**	21-Nov-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T)							
MW06, MW04, WQA06_260523	**26-May-2023**	**02-Jun-2023**	22-Nov-2023	✓	**02-Jun-2023**	22-Nov-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523	**24-May-2023**	----	----	----	**02-Jun-2023**	21-Jun-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10	**25-May-2023**	----	----	----	**02-Jun-2023**	22-Jun-2023	✓
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
MW06, MW04	**26-May-2023**	----	----	----	**02-Jun-2023**	23-Jun-2023	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523, WQA03_240523	**24-May-2023**	----	----	----	**02-Jun-2023**	21-Jun-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10, WQA05_250523	**25-May-2023**	----	----	----	**02-Jun-2023**	22-Jun-2023	✓
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T)							
MW06, MW04, WQA06_260523	**26-May-2023**	----	----	----	**02-Jun-2023**	23-Jun-2023	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523, WQA03_240523	**24-May-2023**	----	----	----	**06-Jun-2023**	21-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW17, MW15, MW13, WQA04_250523, MW09, MW10, WQA05_250523	**25-May-2023**	----	----	----	**06-Jun-2023**	22-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW06, MW04, WQA06_260523	**26-May-2023**	----	----	----	**06-Jun-2023**	23-Jun-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**02-Jun-2023**	21-Jun-2023	✓	**06-Jun-2023**	21-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW17, MW15, MW13, WQA04_250523, MW09, MW10, WQA05_250523	**25-May-2023**	**02-Jun-2023**	22-Jun-2023	✓	**06-Jun-2023**	22-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW06, MW04, WQA06_260523	**26-May-2023**	**02-Jun-2023**	23-Jun-2023	✓	**06-Jun-2023**	23-Jun-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) MW31, MW27, MW25, WQA01_240523, MW22, NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**02-Jun-2023**	21-Jun-2023	✓	**06-Jun-2023**	21-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) MW17, MW15, MW13, WQA04_250523, MW09, MW10, WQA05_250523	**25-May-2023**	**02-Jun-2023**	22-Jun-2023	✓	**06-Jun-2023**	22-Jun-2023	✓
Clear Plastic Bottle - Sulfuric Acid (EK067G) MW06, MW04, WQA06_260523	**26-May-2023**	**02-Jun-2023**	23-Jun-2023	✓	**06-Jun-2023**	23-Jun-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**30-May-2023**	31-May-2023	✓	**02-Jun-2023**	09-Jul-2023	✓
Amber Glass Bottle - Unpreserved (EP071) WQA05_250523	**25-May-2023**	**01-Jun-2023**	01-Jun-2023	✓	**03-Jun-2023**	11-Jul-2023	✓
Amber Glass Bottle - Unpreserved (EP071) WQA06_260523	**26-May-2023**	**01-Jun-2023**	02-Jun-2023	✓	**03-Jun-2023**	11-Jul-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**31-May-2023**	07-Jun-2023	✓	**01-Jun-2023**	07-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA05_250523	**25-May-2023**	**31-May-2023**	08-Jun-2023	✓	**31-May-2023**	08-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) TBW 564 - TRIP BLANK, TBW 563 - TRIP BLANK	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**01-Jun-2023**	09-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA06_260523	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**31-May-2023**	09-Jun-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**30-May-2023**	31-May-2023	✓	**02-Jun-2023**	09-Jul-2023	✓
Amber Glass Bottle - Unpreserved (EP071) WQA05_250523	**25-May-2023**	**01-Jun-2023**	01-Jun-2023	✓	**03-Jun-2023**	11-Jul-2023	✓
Amber Glass Bottle - Unpreserved (EP071) WQA06_260523	**26-May-2023**	**01-Jun-2023**	02-Jun-2023	✓	**03-Jun-2023**	11-Jul-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**31-May-2023**	07-Jun-2023	✓	**01-Jun-2023**	07-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA05_250523	**25-May-2023**	**31-May-2023**	08-Jun-2023	✓	**31-May-2023**	08-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) TBW 564 - TRIP BLANK, TBW 563 - TRIP BLANK	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**01-Jun-2023**	09-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA06_260523	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**31-May-2023**	09-Jun-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) NC4, WQA02_240523, WQA03_240523	**24-May-2023**	**31-May-2023**	07-Jun-2023	✓	**01-Jun-2023**	07-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA05_250523	**25-May-2023**	**31-May-2023**	08-Jun-2023	✓	**31-May-2023**	08-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) TBW 564 - TRIP BLANK, TBW 563 - TRIP BLANK	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**01-Jun-2023**	09-Jun-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) WQA06_260523	**26-May-2023**	**31-May-2023**	09-Jun-2023	✓	**31-May-2023**	09-Jun-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP204: Glyphosate and AMPA							
Amber Bottle Unpreserved for Specialist Organics (EP204)							
NC4, WQA02_240523	**24-May-2023**	**----**	----	**----**	**02-Jun-2023**	07-Jun-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	19	**21.05**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by Auto Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Glyphosate and AMPA	EP204	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Glyphosate and AMPA	EP204	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	38	**2.63**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Glyphosate and AMPA	EP204	WATER	In house: Pre-column derivatisation LCMS (ES in negative mode). Water samples are derivatised with 9-fluorenyl methoxycarbonyl chloroformate (FMOC) in alkaline condition. The derivatives of glyphosate and AMPA are separated by a C8 column and determined by MS.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

Appendix E
Field Sheets

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW04
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	21/11/2022
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:		Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.11	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0959	0.0	4.11	30%	1.20	4963	10.62	301.1	18.2	clear colourless, odourless
1002	0.5	4.11	↓	0.74	5031	8.74	278.2	18.4	↓
1005	1.0	4.16	↓	0.69	5032	7.50	269.9	18.4	
1008	1.5	↓	↓	0.65	5033	7.45	267.9	18.3	
1011	2.0	↓	↓	0.63	5033	7.45	260.1	18.4	↓ STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic	

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date — Checker Name and Signature — Date

Project Manager Signature — Date — Distribution: Project Central File

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MR MW05
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	22/11/22
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:	SH + SD	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 22/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.98	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0804	0.0	1.98	30%	1.58	23775	3.92	257	17.5	clear colourless ~~odourless~~ Sulphur odour
0807	0.5	↓	↓	0.58	23880	5.78	246.8	17.7	↓
0810	1.0			0.53	23772	5.96	248.0	17.7	
0813	1.5			0.52	23715	5.94	250.0	17.7	
0816	2.0	↓	↓	0.53	23698	5.96	251.4	17.7	↓ STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Commets
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic		High EC, adjacent to quarry

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW05
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	21/11/2022
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:		Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.582	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1020	0.0	5.582	30%	~~0.37~~	~~1.723~~			~~20.0~~	
1023	0.8	5.582	↓	1.94	1723	10.94	329.6	20.1	clear, colourless, odourless
1026	0.5	5.60		0.94	1680	9.37	319.3	20.1	
1029	1.0	↓		0.80	1670	8.99	319.2	20.0	
1032	1.5			0.71	1640	8.82	321.0	20.0	
1035	2.0			0.68	1569	8.79	323.1	20.0	
1038	2.5	↓	↓	0.66	1626	8.78	326.9	20.0	↓ STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Comments
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	WQA01	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic		Duplicate sample WQA01

Approval and Distribution

Fieldwork Staff Signature | Date | Checker Name and Signature | Date

Project Manager Signature | Date | Distribution: Project Control File

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW06
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	21/11/22
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:		Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.37	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	.
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1051	0.0	5.37	30%	1.83	847	11.50	340.7	20.0	Clear, colourless, odourless
1054	0.5			0.85	855	9.11	325.8	19.9	
1057	1.0			0.70	841	8.76	326.1	19.9	
1100	1.5			0.69	702	8.43	326.7	19.8	
1103	2.0			0.69	681	8.40	334.0	19.7	
1106	2.5			0.69	671	8.38	329.2	19.7	STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, rate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Bore ID:	MW07
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:	SD + SH	Sample Date:	21/11/22
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 10.09	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gallic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
									Unable to sample bore with peri or bladder pump
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Comments
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature — Date — Checker Name and Signature — Date

Project Manager Signature — Date — **Distribution:** Project Central File

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW08a
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	21/11/22
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:	SH + SDM	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.54	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☒ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☒ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1233	0.0	2.54	30%	2.26	747	12.80	301.5	19.4	clear, colourless, odourless
1236	0.5	2.550		1.18	745	9.16	283.5	18.8	
1239	1.0			0.86	742	7.92	275.6	18.6	
1242	1.5			0.76	739	7.46	275.0	18.6	
1245	2.0			0.67	740	7.42	276.0	18.5	
1248	2.5			0.66	740	7.49	277.0	18.5	STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

Groundwater/Surface Water Sampling and Purging Record

General Bore Information		Parameter Info.	Decontamination	Sampling Method		Surface Water: ☐ Groundwater: ☑	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.: 17H101156	☐ Decontaminated	☐ Low Flow: Pump rate:		Bore / Location ID:	MW09
Depth to GW (m-pvc): 2.87	Screen Interval (m):	Chem Kit Model: YSI Pro DSS	☑ Dedicated	Intake depth:			
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Peristaltic Pump		Fieldwork Staff:	SH + SD
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)				
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		Sample Date:	21/11/22	Project:	Roe 8 Environmental Monitoring
	Key Type (if applicable):	☐ Retrieved				PM Name:	

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	pH	Temp °C	E.C. (mS/cm or uS/cm)	DO (ppm or mg/L)	Redox (mV)	NTU	Odour, Colour, Turbidity
1328	0.0	2.87	30%	11.24	18.8	286.5	6.54	295.7		Clear colourless odourless
1331	0.5	2.89	↓	8.16	18.4	255.2	5.09	268.8		↓
1334	1.0	↓	↓	7.49	18.3	237.8	4.27	263.0		
1337	1.5			7.16	18.3	235.3	4.16	263.3		
1340	2.0			7.04	18.3	236.2	4.24	263.2		
1343	2.5	↓	↓	7.05	18.4	236.4	4.31	264.6		
1346	3.0			7.00	18.4	236.3	4.33	266.2		↓ STABLE SAMPLED
Acceptable Stabilised Parameter Range for Sampling:				± 0.05	± 0.2 °C	± 3%	± 10%	± 10 mV	± 10% turbidity	
Exceedances (Y/N):					NA		NA	NA		

QA/QC Information	Bottles Collected				Comments / Contingency Actions
		x 40 mL Vial (HCl)		x 50 mL Ferrous	
		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	
		x 250 mL Plastic		x 50 mL metals (HNO_3)	
	Analytes samples for:				

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date	Project Manager Signature	Date	Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW10
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	21/11/22
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:		Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.41	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1353	0.0	1.41	30%	1.69	641	9.90	381.3	18.0	Clear colourless odourless
1356	0.5	1.475		0.86	451.1	6.25	301.4	17.7	
1359	1.0			0.77	407.3	5.91	297.5	17.8	
1402	1.5			0.71	402.6	5.71	296.6	17.8	
1405	2.0			0.68	409.4	5.53	298.3	17.7	
1408	2.5			0.60	415.8	5.37	299.1	17.7	
1411	3.0			0.65	409.7	5.36	301.0	17.7	
1414	3.5			0.64	414.7	5.33	302.1	17.7	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)			Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic			

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW11
Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Sample Date:	22/11/22
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:		Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 22/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.28	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0834	0.0	1.28	30%	1.00	15246	7.23	344.3	18.2	clear, colourless, odourless
0837	0.5	1.36		0.75	15311	7.09	261.2	18.2	
0840	1.0			0.72	15327	7.10	260.6	18.3	
0843	1.5			0.68	15322	7.15	261.5	18.3	
0846	2.0			0.66	15201	7.11	263.6	18.4	
0849	2.5	3.23		3.14	15116	7.15	267.2	18.5	Becoming cloudy, yellow
									Well purged 50%
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic	

Field Commets
Bore volume calculation, bore condition, fate of tubing, redox correction etc.
High EC, adjacent to quarry
slow recharge

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

AECOM

FQM - Groundwater Sampling and Purging Record

Project Name:	BORR	Project Number:	60644386	PM Name:	M. Dunlop	Bore ID:	MW46
Client:	Main Roads	Project Location:	Bunbury	Fieldwork Staff:	S. Perla + SH	Sample Date:	21/11/22
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/11/22	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.35	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0917	0.5	3.35	30%	1.21	507	7.84	252.5	19.6	clear, colourless, odourless
0920	1.0	3.38		0.77	395.5	8.63	261.1	19.8	
0923	1.5			0.63	369.6	8.89	271.1	19.9	
0926	2.0			0.59	369.7	8.95	275.7	20.0	
0929	2.5			0.57	370.1	8.91	274.6	20.0	STABLE SAMPLED
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic	

Field Commets
Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date — Checker Name and Signature — Date

Project Manager Signature — Date — Distribution: Project Central File

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW27.1
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	09/02/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 09/02/23	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 6.072	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
13:00	0.5	6.072	30	0.53	1287	5.44	42.6	22.3	clear, colourless, odourless
13:02	1	↓	↓	0.36	1257	5.24	55.6	22.1	↓
13:04	1.5			0.28	1249	5.15	62.4	21.9	
13:06	2			0.20	1238	5.14	63.0	21.7	
13:08	2.5			0.21	1238	5.15	63.1	21.7	
13:10	3			0.21	1238	5.15	63.1	21.7	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Sample Taken

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	Gatic detached from ground
						1	x60mL plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	09/02/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW04
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	10/02/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 10/02/23	Bore Radius (mm):	Chem Kit Serial No.: IBJ104043	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.983	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:10	0.5	4.983	30	0.49	4361	6.20	63.5	20.3	Clear, colourless, odourless
10:12	1	↓	↓	0.28	4393	6.20	44.7	19.9	↓
10:14	1.5			0.20	4418	6.21	35.0	19.9	
10:16	2			0.21	4448	6.21	34.1	20.0	
10:18	2.5			0.22	4418	6.22	34.5	20.0	
10:20	3			0.20	4494	6.21	36.8	20.1	
				Sample Taken					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)	
A	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	
						1	x 60mL H_2SO_4	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
	10/02/23		
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW05
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
				Well Dry					10/2/2023
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

						Bore ID:	MRWN05
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	09102123
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 09102123	Bore Radius (mm):	Chem Kit Serial No.: 18510840	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.34	Screen Interval (m):	Chem Kit Model: YSI PRO	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☑ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:22	0.5	2.34	30	0.36	23294	5.67	-30.2	19.7	Clear, colourless, odourless
10:24	1	↓	↓	0.53	23211	5.81	-28.1	19.6	↓
10:26	1.5			0.92	23039	5.81	-27.4	19.6	
10:28	2			0.91	22816	5.82	-27.0	19.6	
10:30	2.5			0.92	22610	5.82	-27.1	19.6	
10:32	3	↓	↓	0.91	22789	5.81	-27.2	19.6	↓
				Sample Taken					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	1	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	

Approval and Distribution

Fieldwork Staff Signature	Date: 09/02/23	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW06
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	10/2/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 10/2/23	Bore Radius (mm):	Chem Kit Serial No.: 18J0430	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.674	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☑ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:23	0.5	5.674	30	0.79	1019	6.90	81.1	22.1	Clear, colourless, odourless
9:25	1	↓	↓	0.66	1075	7.10	-28.0	21.8	↓
9:27	1.5			0.62	1080	7.08	-51.1	21.8	
9:29	2			0.14	1080	7.08	-62.5	21.8	
9:31	2.5			0.12	1080	7.08	-62.4	21.8	
9:33	3			0.12	1080	7.09	-63.5	21.8	
					Sample Taken				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected					QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						1	x 60mL H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
	10/02/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW06
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	10/2/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 10/2/23	Bore Radius (mm):	Chem Kit Serial No.: 18J0430	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.674	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☑ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:23	0.5	5.674	30	0.79	1019	6.90	81.1	22.1	Clear, colourless, odourless
9:25	1	↓	↓	0.66	1075	7.10	-28.0	21.8	↓
9:27	1.5			0.62	1080	7.08	-51.1	21.8	
9:29	2			0.14	1080	7.08	-62.5	21.8	
9:31	2.5			0.12	1080	7.08	-62.4	21.8	
9:33	3			0.12	1080	7.09	-63.5	21.8	
					Sample Taken				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected					QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						1	x 60mL H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
	10/02/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW07
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	09/02/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 09/02/23	Bore Radius (mm):	Chem Kit Serial No.:	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 10.432	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		Cannot sample - well too deep for Peri pump

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	09/02/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW07
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	09/02/23
Client:	BORR	Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 09/02/23	Bore Radius (mm):	Chem Kit Serial No.:	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 10.432	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		Cannot sample - well too deep for Peri pump

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	09/02/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW08A
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	9/2/23
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 9/2/23	Bore Radius (mm):	Chem Kit Serial No.: 18J1043410	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.487	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1211	0.0	3.487	30%	1.42	674	5.92	118.0	22.7	clear, colourless, odourless
1213	0.5			0.25	646	5.99	14.9	21.0	
1215	1.0			0.14	644	5.94	10.4	20.9	
1217	1.5			0.08	640	5.96	7.9	20.7	
1219	2.0			0.06	641	5.93	5.8	20.8	
1221	2.5			0.05	638	5.92	4.1	20.8	
1223	3.0			0.05	640	5.91	3.5	20.7	
					STARTED		SAMPLED		
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	ALL	1	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	WQA03 (Run at 8/2/2023)

Approval and Distribution

Fieldwork Staff Signature _____ Date _____ Checker Name and Signature _____ Date _____

Project Manager Signature _____ Date _____ Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW09
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	9/2/23
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 9/2/23	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.432	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve In
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L): | Includes/ excludes bore annulus (circle) | # purge volumes removed: | Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1113	0.0	3.432	30%	3.58	245.5	6.04	63.0	22.8	Clear, colourless, odourless
1115	0.5			2.80	169.8	5.99	72.6	21.6	
1117	1.0			2.71	161.7	5.95	83.1	21.5	
1119	1.5			2.99	159.1	5.88	89.0	21.6	
1121	2.0			2.98	160.1	5.88	94.4	21.7	
1123	2.5			2.95	159.5	5.86	99.0	21.7	
				STABLE		SAMPLED			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	ALL	1	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	

Approval and Distribution

Fieldwork Staff Signature | Date | Checker Name and Signature | Date

Project Manager Signature | Date | Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW14
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	9/2/2023
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 9/2/23	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.694	Screen Interval (m):	Chem Kit Model: YSI PRO	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1054	0.0	2.694	30%	1.86	1655	6.42	-16.2	22.7	Clear, colourless odourless
1056	0.5			0.30	1127	6.10	0.7	21.9	
1058	1.0			0.24	828	6.12	16.3	22.0	
1100	1.5			0.19	578	6.01	25.9	22.1	
1102	2.0			0.22	561	5.99	30.7	22.2	
1104	2.5			0.21	552	5.97	33.1	22.2	
				STABLE		SAMPLED			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	ALL	1	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW11
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	9/2/23
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.581	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
								21.7	Very turbid, sediment.
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		~ 20 cm water in well
									Too turbid, not sufficient
									water in well to sample

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW46
Project Name:	BORR monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	4/2/23
Client:		Project Location:	Bunbury	Fieldwork Staff:	SJ/SH	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
			BORE	DRY					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

Appendix F
Calibration Records

Water Quality Meter Calibration Record

Project Name:	BORR Drainage Monitoring	**Project:**	BORR
Project Location:	Bunbury	**Client:**	Main Roads
PM Name:	M Dunlop	**Fieldwork Staff Name:**	S. DeMeb + S Humphries

This calibration record is intended to prompt fieldwork staff to calibrate water quality meter (WQM) daily before the start of fieldworks.

INSTRUMENT DETAILS

Supplier:	17H101156
Make and Model:	YSI PRO DSS
Serial Number:	

CALIBRATION

CALIBRATE WITH CALIBRATION SOLUTIONS

Date and Time:	21/11/22			
Parameter	Acidity		Conductivity	Redox Potential
Units	pH	pH	µS/cm	mV
Calibration Standard Concentration:	15°C 4.00	15°C 7.04	15°C 10420	15°C 251
Calibration Reading:	4.00	7.00	15.6	242.8
Calibration Temperature:	15.40	15.5°C	10420	15.8

ONGOING CHECKS

BUMP TEST WITH CALIBRATION SOLUTION

Date and Time:				
Parameter	Acidity		Conductivity	Redox Potential
Units	pH	pH	µS/cm	mV
Calibration Standard Concentration:				
Bump Test Reading:				
Bump Test Temperature:				

COMMENTS

Detail any equipment faults, minor maintenance performed, change of batteries or technical support provided.

Approval and Distribution

☐ Each individual instrument has been inspected and calibrated daily and bump tested as required by fieldwork staff.

Fieldwork Staff Signature	Date: 21/11/22

Distribution: Project Central File

Delivery Docket

GK Environmental Equipment
ABN: 18 321 757 566
Unit 4,36 Ledgar Road
Balcatta WA 6021
Phone: 0422 291 430
Email: gaurav.kanwar@gkenvequip.com.au
Website:

Docket No.: 4312

Docket Date: 27/04/2023

Customer PO: Task 1.0

Civic 74256

To:
Aecom Australia Pty Ltd
58 Mounts Bay Road, Level 15, Alluvion Building
Perth WA 6000
Ph: 08 6208 0000

Deliver To:
n Australia Pty
nts Bay Road, ... Alluvion Building
6000
Cor... ophie Johnstone
Ph: 04... 1928

lot 2

Date From: Monday, 22 May 2023 12:00 PM

Date To: Friday, 26 May 2023 5:00 PM

Code	Description	Qty/Items	Delivery	Pickup
PP2007-7	EP All in One Peripump + 12V battery (15A) + charger+cable in Black Case	1	☑	☐
20H100323	EP YSI ProPlus Temp/EC/pH/ORP/DO on 1m cable with Flow Cell + AM200 Yellow Case	1	☑	☐
DEL<25kg	Delivery less than 25kg Civic# 74256 (2 x items)	1	☑	☐
PICK<25kg	Pick Up less than 25kg Civic# 12345 (2 x items)	1	☐	☐

Special Delivery Instructions:

Recipient's Printed Name: _____

Recipient's Signature: _____ **Date/Time:** _____

Driver's Signature: _____ **Date/Time:** _____

South West Gateway Alliance
Suite 3, 3 Craig Street, Burswood
Western Australia 6100

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

South West Gateway Alliance

Report

Annual Aquatic Fauna and Surface Water Report (SLR Consulting, 2023)

Hydrological Regime Reporting

Inland Waters and Aquatic Fauna

South West Gateway Alliance

2 Dryandra Court, Picton, Bunbury, WA 6230

Prepared by:

SLR Consulting Australia

Level 1, 500 Hay Street, Subiaco WA 6008,
Australia

SLR Project No.: 675.072033.00001

28 August 2023

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	27 July 2023	A.Hickling	A.Storey	A.Storey
0.2	27 July 2023	A.Hickling	E.Stead-Richardson A.Gorman	A.Storey
0.3	28 July 2023	A.Hickling	E.Stead-Richardson	A.Storey
0	28 August 2023	A.Hickling	Main Roads	A.Storey

Basis of Report

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

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

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

Executive Summary

The objective of this report aimed to review potential impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

To address these impacts, under Condition 2 of Ministerial Statement 1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there are no project-attributable impacts to the hydrological regime and water quality of 'conservation' category and 'resource enhancement' wetlands, Five Mile Brook, or black-stripe minnow habitat.

There have been no attributable impacts to the hydrological regime and water quality of any black-stripe minnow or UFI wetland sites as part of the BORR southern alignment construction. Data collection at monitoring sites will continue to provide both reference and baseline data, to monitor construction activities that could influence water quality, habitat and BSM populations.

Black-stripe minnow population sampling is scheduled for Spring 2023 and will include all existing black-stripe minnow survey locations. As of May 2023, there has been no recorded BSM in any additional UFI wetlands, as listed in Condition 2-1(2). Both current BSM habitats, and UFI wetlands, will continue to be monitored for water quality and potential changes, in relation to construction activities within the Proposal area.

Table of Contents

Tables in Text

Figures in Text

1.0 Introduction

1.1 Overview and Scope

The Commissioner of Main Roads Western Australia (Main Roads) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the Environmental Protection Act 1986 by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted in relation to Inland Waters, the potential for direct and indirect impacts to hydrological regimes and water quality in adjacent Conservation Category Wetlands (CCWs), Resource Enhancement Wetlands (REWs), the Five Mile Brook and black-stripe minnow habitats.

To address these impacts, under Condition 2 of MS1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there are no project-attributable impacts to the hydrological regime and water quality of 'conservation' category and 'resource enhanced' wetlands, Five Mile Brook, or black-stripe minnow habitat.

MS1191, therefore, includes the following conditions in relation to Inland Waters:

Condition 2-1(2)

No project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

Condition 2-3

The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.

Condition 2-4

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the proposal;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved;

(3) report whether that the outcomes in condition 2-1(2) were achieved; and

(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).

1.2 Background

The Commissioner of Main Roads Western Australia (Main Roads) is constructing the Bunbury Outer Ring Road (BORR). The BORR is a planned Controlled Access Highway linking the Forrest and Bussell Highways and will provide a high standard route for access to the Bunbury Port, improved road user safety, and will facilitate proposed development to the east of the City of Bunbury. The completed BORR will also provide an effective bypass of Bunbury for inter-regional traffic. Project development of the BORR was being conducted through the BORR Integrated Project Team (IPT), composed of Main Roads, GHD and BG&E. The project is now in the construction phase, with on-ground works being conducted through the South West Gateway Alliance (SWGA), comprising Acciona, NRW Contracting, MACA Civil, AECOM and Aurecon, together with Main Roads.

The Proposal passes through or is adjacent to a number of waterbodies. As part of the approval process, it was necessary to document the ecological values of these ecosystems and determine if they support any aquatic fauna species of conservation significance. Based on field surveys undertaken by WRM in 2018 – 2020, some of these wetlands (Table 1, Figure 1) were found to support one State, Federally and internationally listed species:

- Black-stripe minnow *(Galaxiella nigrostriata)*; Endangered (EPBC Act 1999), Endangered (BC Act 2016, Schedule 2 of the Wildlife Conservation Specially Protected Fauna Notice 2018), Endangered (IUCN Redlist 2022).

In August-October 2022 surveys were conducted on nine additional wetlands (see Table 9) within the southern investigation area (WRM 2022), and one of these wetlands were added to the monitoring regime for the Proposal (BSM-S-PI-3).

1.3 Objectives

To review potential impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

As a result of the occurrences of black-stripe minnows within the southern investigation area, it is necessary to monitor the potential effects of the Proposal on potential populations. The monitoring includes:

- quarterly water quality monitoring including in situ parameters (pH, oxygen-reduction potential, dissolved oxygen, electrical conductivity, turbidity and temperature) and laboratory analysis of total suspended solids, hydrocarbons and colour,
- quarterly photopoint monitoring from a permanent stake,
- detailed habitat characteristics including mineral substrate and aquatic habitat composition,
- targeted black-stripe minnow population survey.

Construction commenced in the Proposal area in August 2022, and works in proximity to Five Mile Brook; BSM-S-PI-2 (Table 1, Figure 1), has occurred during 2023, therefore, data will be compared between pre and post disturbance.

2.0 Species of Conservation Significance

Aquatic ecosystems in the south-west of the state support a diverse range of taxa with different local, regional, national and international distributions, and therefore taxa vary in their conservation status depending upon their distribution and evolutionary origins. To assess the conservation significance of aquatic fauna recorded a range of sources were referenced, including:

- Nationally threatened Fauna listed under the EPBC Act 1999,
- Threatened and Priority Fauna in Western Australia under the BC Act 2016 (as listed on the Department of Biodiversity, Conservation and Attractions Threatened and Priority Fauna List (DBCA 2022)),
- Threatened Fauna under the IUCN Redlist of Threatened Species (IUCN 2022), and
- Conservation status of Australian Fishes List (Australian Society for Fish Biology 2016).

One species of conservation significance was specifically targeted during the sampling; the black-stripe minnow. Information on this species is outlined below in Section 2.1.

2.1 Black-stripe Minnow

The black-stripe minnow (*Galaxiella nigrostriata*) is currently listed as Endangered both nationally (EPBC Act 1999) and at a state level in Western Australia (Schedule 2 of the Wildlife Conservation Specially Protected Fauna Notice 2018), as well as Endangered at an international level (IUCN Redlist 2022). The black-stripe minnow is capable of aestivating (burrowing) into soils to survive drying habitat and therefore can inhabit wetlands that dry over summer, appearing in pools within hours following first rains (Morgan et al. 2011). Interestingly, it does not have any specific anatomical or physiological adaptations to aid aestivation and is assumed to survive either within moist soils or within crayfish burrows that contain water through dry periods. Breeding occurs from late autumn to spring, with females releasing multiple batches of eggs over several weeks. It appears that most individuals only live for one year, dying shortly after spawning (Morgan et al. 2011).

Black-stripe minnows inhabit tannin stained, vegetated, ephemeral wetlands of approximately 300 mm deep with a pH range of 3 - 8 (Morgan and Gill 2000, Galeotti et al. 2008). Other than these general observations, and anecdotal information, little is known about the preferred physio-chemical water properties of their habitats, with no correlations found between physio-chemical variables measured in wetlands across the south-west (Galeotti 2013). However, individual populations appear to be sensitive to sudden, localised changes in water quality variables (Knott et al. 2002). Little is known about the salinity tolerances of the black-stripe minnow, although the authors have previously recorded them in wetlands with salinity levels above 3330 µS/cm.

The black-stripe minnow is endemic to south-western Australia and rare throughout its distribution. Its main distribution lies within the Warren sub-region, where numerous populations are found between Albany and Augusta. However, there are isolated populations on the Swan Coastal Plain, including Lake Chandala (near Gingin), Melaleuca Park (north of Perth), and wetlands within the Kemerton Nature Reserve (north of Bunbury) (Morgan et al. 1998, Allen et al. 2002). A survey by WRM in October 2018 within the BORR southern alternate investigation area also recorded a population of black-stripe minnow in Gelorup (WRM 2019). It is thought that the populations on the Swan Coastal Plain are

remnants of a once wider distribution (Morgan et al. 1998), suggesting that the loss of habitat caused by urban and rural development during the previous hundred years has had a significant impact on the extent of this species. As such, their biggest threat is loss of suitable habitat through urbanisation and rural development.

3.0 Methodology

3.1 Licenses, Standards and Guidelines

This study was conducted under DPIRD Fisheries Licence EXEM 3407 (*Instruments of Exemption to the Fish Resources Management Act 1994* for Scientific Research Purposes). As a condition of this licence, taxa lists and reports are required to be submitted to DPIRD. The study was also conducted under DBCA Fauna Taking (Biological Assessment) Licence BA27000105-2. As a condition of this licence, a fauna return including taxa lists and locations, is required upon project completion.

Water quality for physio-chemical parameters and nutrients have been compared against ANZECC/ARMCANZ (2000) freshwater guideline values for the protection of slightly/moderately disturbed wetland ecosystems in the south west of Western Australia as these are the most recent locally specific guidelines. It is noted that the ANZECC and ARMCANZ (2000) are now referred to as Australia and New Zealand Guidelines (ANZG) (2018) and came into effect on 4 September 2018 (ANZG, 2018). Preliminary review of these guidelines has identified that new default guideline values are not yet provided for SW WA. For the purposes of this wetland study, ANZECC and ARMCANZ (2000) criteria have been adopted until these values are updated. Results have also been compared to historical data from the pre-development monitoring program (BORR IPT 2020, SWGA 2021).

3.2 Sites and Sampling Design

Three sites were included in initial the monitoring program for black-stripe minnows, including one reference site and two potential impact sites (Table 1; Figure 1). The reference site was established for the purposes of providing comparative species and population trend data. One potential impact site (BSM-S-PI-3) was added after additional wetland studies in August-October 2022 (WRM 2022).

All UFI listed sites to be monitored as per Ministerial Conditions 2-1(2) and their current status (including the current presence/absence of BSM) are outlined in Table 2.

Table 1. Summary of all sampling locations for black-stripe minnows (wetlands) within and adjacent to the southern investigation area. GPS points relate to photopoint locations.

Southern targeted wetlands: Black-stripe minnow				
Site name	**Easting**	**Northing**	**Site type**	**Previous name code**
BSM-S-R-1	373503	6298065	Reference	WRM Site 3 (2018 – alternate alignment)
BSM-S-PI-1	373329	6300480	Potential impact	Five Mile Brook - not previously sampled
BSM-S-PI-2	373608	6300320	Potential impact	WRM South 8 (2019)
BSM-S-PI-3	373836	6301723	Potential Impact	UFI-931, downstream Five Mile Brook

Table 2. Summary of UFI sites in the southern alignment, and the current monitoring status, as per the ministerial reporting requirements. CCW = Conservation Category Wetland, MUW = Multiple-Use Wetland, REW = Resource Enhancement Wetland.

UFI	Wetland Type	Surface Water Location ID	BSM (presence)	Comments
UFI-931	CCW	BSM-S-PI-1	Y	BSM found during annual monitoring in 2021. Monitoring will continue throughout the development of the project.
UFI-1163	MUW	BSM-S-PI-2	Y	BSM found during annual monitoring in 2021. Monitoring will continue throughout the development of the project.
UFI-1163	MUW	BSM-S-PI-3	Y	Downstream site of BSM-S-PI-2. BSM found during annual monitoring in 2022. Monitoring will continue throughout the development of the project.
UFI-1117	REW	UFI-1117	N	Low levels of water holding during 2022 annual surveys. Topography also unsuited for wetland. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.
UFI-14478	CCW	UFI-14478	N	Initial surveys during May 2022 indicate healthy, wetland habitats that had recently dried due to seasonality. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.
UFI-15493	REW	UFI-15493	N	Initial surveys during May 2022 indicate healthy, wetland habitats that had recently dried due to seasonality. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.

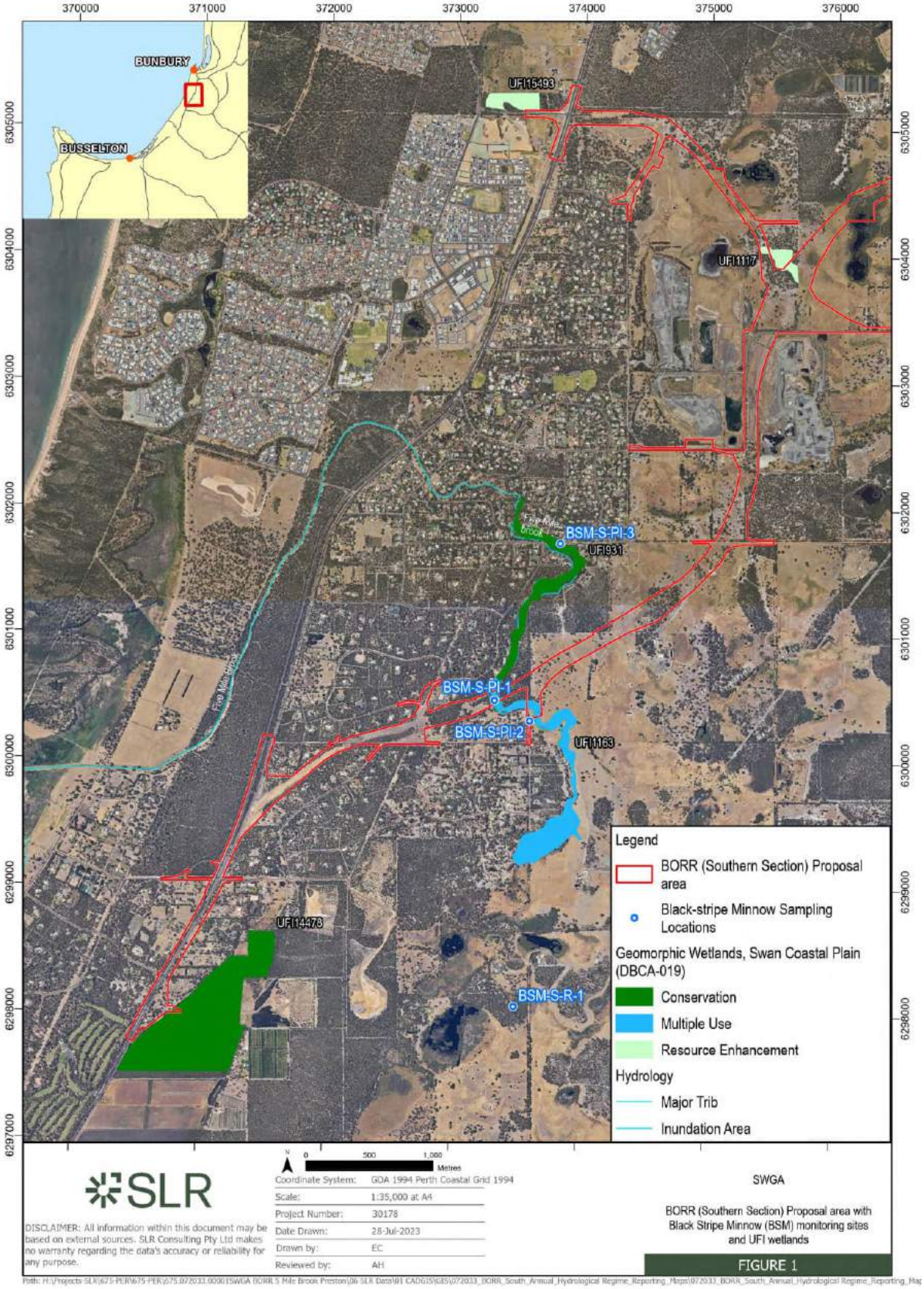


Figure 1. BORR (Southern Section) Proposal Area with Black-Stripe Minnow (BSM) and UFI wetlands (conservation, multiple use and resource enhancement) areas overlayed.

3.3 Surface Water Sampling

During each quarterly monitoring event, in situ water quality data were recorded at each site, if it held water, using portable field meters at a depth of approximately 10 cm below the water surface. Variables recorded included pH, oxygen-reduction potential, DO (% and mg/L), EC (µS/cm), turbidity (NTU) and water temperature (°C).

Undisturbed water samples were also collected quarterly from each site, if it held water, for laboratory analysis of colour, total suspended solids, and total recoverable hydrocarbons. All samples were collected from a depth of approximately 15 cm below the water surface. All water samples were kept cool in an esky while in the field and were refrigerated as soon as possible for subsequent transport to the laboratory. All laboratory analyses were conducted by the ChemCentre, Bentley, WA (a NATA accredited laboratory).

Photo points were set up at each site during the 2020 monitoring. Photo points were marked permanently with a stake and their locations recorded using a handheld GPS. Photos were taken from the top of the stake (or similar where stakes were not permitted). Photopoints were revisited on every sampling occasion to note general changes in water level and habitat.

Details of aquatic mineral substrate and in-stream habitat characteristics were made at each black-stripe minnow site during each sampling event. Habitat characteristics recorded included percent cover by inorganic sediment, submerged macrophyte, floating macrophyte, emergent macrophyte, algae, large woody debris, detritus, roots and trailing vegetation. Details of substrate composition were also recorded and included percent cover by bedrock, boulders, cobbles, pebbles, gravel, sand, silt and clay.

3.4 Black-stripe Minnow

Annual sampling for populations of black-stripe minnow used a standardised catch per unit effort (CPUE) approach to provide abundance data on minnows at each site, to allow comparisons of numbers and population structure over time. CPUE was calculated by dividing 24 (hours) by the number of hours fished (net set time), then multiplying by the raw abundance of fish per net. This gave the abundance of fish per net caught within a 24-hour time period. CPUE was then expressed as abundance per site. Six double wing fyke nets comprising a double 10 m leader/wing (4 - 6 mm mesh, 1 m drop) and a 5 m hoop, and one single wing fyke net comprising a 5.5 m leader/wing (4 - 6 mm mesh, 0.8 m drop) and a 3 m hoop were set overnight at each site. Net set and pick up times were recorded in order to calculate CPUE. Exclusion screens were placed on the opening on each net, to keep out water rats and/or turtles. A floating fauna platform was placed at the cod-end (closest to the bank) of each fyke net to provide an air space for freshwater turtles / water rats if caught (i.e. broke through exclusion screen).

4.0 Results

4.1 Habitat

Confirmed black-stripe minnow sites within the Proposal area have a diversity of aquatic habitat types including large woody debris, emergent macrophyte, submerged macrophyte, trailing vegetation, floating macrophyte and detritus (Table 3). All sites had a sand substrate.

Table 3. Average percentage of different habitat types of black-stripe minnow sites sampled 2020 – 2023. Note: data from 2023 is inclusive of Q1 (February) and Q2 (May) monitoring only.

Location ID	Year	Mineral substrate	Emergent macrophyte	Submerged macrophyte	Floating macrophyte	Algal cover	Detritus	Trailing vegetation	Large woody debris
BSM-S-R-1	2020	32.5	7.5	10	12.5	0	15	10	12.5
	2021	23.75	6.25	7.5	25	0.75	9.25	14.5	13
	2022	27.4	3.8	2.5	33.9	0	3.8	8.8	20
	2023	65	0	1	0	5	5	24	0
BSM-S-PI-1	2020	20	40	5	0	0	20	5	10
	2021	50	10	10	2.5	0	10	12.5	5
	2022	77.5	5	0	0	0	10	5	2.5
	2023	DRY							
BSM-S-PI-2	2020	40	2.5	5	0	0	5	42.5	5
	2021	45	5	17.5	7.5	0	6.5	6	12.5
	2022	90	0	0	0	0	5	2.5	2.5
	2023	95	0	0	0	0	5	0	0
BSM-S-PI-3*	2022	55	0	2	3	0	5	30	5
	2023	DRY							

* Site only recorded from Q3 2022

4.2 Surface Water

Four sites inhabited by black-stripe minnow in the Proposal Area and surrounding area; including one reference (BSM-S-R-1) and three potential impact sites (BSM-S-PI-1, BSM-S-PI-2 and BSM-S-PI-3), are part of the scope of routine quarterly water quality monitoring. All sites have been monitored since May 2020, with the exception of BSM-S-PI-3, which was added to the sampling design in Q3, 2022 (Table 4). All sites were dry during Q2 (May) 2023 monitoring, and only BSM-S-R-1 held water during Q1 (January) 2023 monitoring (Table 4). All sites were holding water during Q3 and Q4 in 2022, with an extra sample taken during Q3 monitoring at BSM-S-PI-3 to be used for future pre-impact data analysis.

In situ water quality within the black-stripe minnow sites during the 2022-23 monitoring period was characterised by acidic to neutral pH, very low to low dissolved oxygen levels, and fresh to brackish electrical conductivities (EC; Table 4). EC values were above the ANZG (2018) default guideline range for slightly disturbed wetlands in the southwest of Western Australia (300 – 1500 µS/cm) during Q1 2023 at BSM-S-R-1, and Q2 2023 at BSM-S-PI-2. pH was below the default guideline values (DGVs) (ANZG 2018) for the protection of

slightly/moderately disturbed wetland ecosystems in the southwest of W.A. (pH 7 – 8.5) during Q3 2022 at both BSM-S-R-1 (6.45) and BSM-S-PI-1 (6.79). Similar to previous monitoring years, dissolved oxygen concentrations were below the default guideline low value of 90% at all sites on all sampling occasions (Table 4).

Total recoverable hydrocarbons were recorded at all sites on at least one sampling occasion for this monitoring period (Table 5). All sites have influences from road and/or farmland runoff, which are likely sources of hydrocarbons. Silica gel clean-up identified that F3 fractions of TRH found at both BSM-S-R-1, BSM-S-PI-1 and BSM-S-PI-2 were most likely from organic sources, however TRH fractions of F2 at BSM-S-PI-3 are likely from a contamination source (Table 6).

Table 4. *In situ* water quality results from all black-stripe minnow sites sampled from 2020 – 2023.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO %	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
BSM-S-R-1	29-05-2020	Not sampled						
	07-08-2020	13.1	820	7.15	-19.8	4.9	72.1	7.88
	28-10-2020	18.8	1056	6.71	18.8	4.86	31	2.2
	28-01-2021	16.4	2610	7.26	8.5	10.64	31.4	9.91
	25-05-2021	11	2810	5.58	7.96	2.76	48.7	5.56
	27-08-2021	8.2	619.6	7.82	-40.2	2.13	48.4	5.68
	13-10-2021	11.5	742.7	6.89	10.1	3.25	55.5	5.97
	31-01-2022	21.1	1360	6.75	27.5	8.96	5	0.51
	01-06-2022	8.5	1947	5.02	118.1	6.8	54.4	6.12
	15-08-2022	12.6	613.5	6.45	25.4	11.59	30.2	3.27
	06-10-2022	14.2	676	7.03	6.3	3.71	61.7	6.17
	31-01-2023	21.7	1519	7.22	-6.8	26.78	26.2	2.83
	15-05-2023	DRY						
BSM-S-PI-1	29-05-2020	DRY						
	07-08-2020	14.1	837	7.24	-24.9	1.52	72.2	7.55
	28-10-2020	DRY						
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	10.2	520.9	7.36	-14.7	6.61	63.5	7.09
	14-10-2021	13.9	778.9	7.12	-1.5	5.95	83	8.34
	31-01-2022	DRY						
	01-06-2022	DRY						
	15-08-2022	14.4	492.9	6.79	14	5.34	54.8	4.4

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO %	DO (mg/L)
	05-10-2022	19.7	596.3	7.3	-1.6	3.98	55	5
	31-01-2023	DRY						
	15-05-2023	DRY						
BSM-S-PI-2	29-05-2020	DRY						
	08-08-2020	11	846	7.41	-34.8	3.55	76.9	8.47
	28-10-2020	20.5	1125	6.96	5.3	26.57	34.4	3.35
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	10.1	528.1	7.74	-36	6.78	55	6.78
	14-10-2021	16.6	716.1	7.31	-13.5	4.87	83.5	8.43
	31-01-2022	DRY						
	01-06-2022	DRY						
	15-08-2022	15.7	505.6	6.8	13	5.89	53.4	5.24
	05-10-2022	21.5	607	7.11	0.4	3.81	63	5.65
	31-01-2023	25.7	1087	8.04	-55.2	12.71	114.3	8.94
	15-05-2023	16.6	1600	7.33	-24.6	6.42	21.8	1.73
BSM-S-PI-3	17-08-2022	14.1	524.4	7.17	-10.7	6.61	40.3	4.17
	15-09-2022	18.5	508	6.63	20.9	4.6	25.5	2.39
	12-10-2022	12.7	760.9	7.3	7.6	5.69	20.8	2.22
	31-01-2023	DRY						
	15-05-2023	DRY						

Table 5. Laboratory analysed water quality results from all black-stripe minnow sites sampled from 2020 – 2023.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TRH				
				F1 (µg/L)	F2 (µg/L)	F3 (µg/L)	F4 (µg/L)	Total TRH (µg/L)
BSM-S-R-1	29-05-2020	Not sampled						
	07-08-2020	700	17	<25	<25	<100	<100	<250
	28-10-2020	790	130	<25	110	650	100	860
	28-01-2021	520	9	<25	48	340	<100	<250
	25-05-2021	200	1	<25	<25	140	<100	<250
	27-08-2021	670	3	<25	<25	<100	<100	<250
	13-10-2021	560	6	<25	400	130	<100	530
	31-01-2022	740	18	<25	<25	180	<100	<250
	01-06-2022	390	16	<25	<25	180	<100	<250
	15-08-2022	750	5	<25	<25	<100	<100	<250
	11-11-2022	640	N/A	<25	<25	<100	<100	<250
	31-01-2023	790	61	<25	<25	260	<100	260
	15-05-2023	DRY						
BSM-S-PI-1	29-05-2020	DRY						
	07-08-2020	640	1	<25	<25	<100	<100	<250
	28-10-2020	DRY						
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	650	4	<25	<25	<100	<100	<250
	14-10-2021	560	4	<25	<25	130	<100	<250
	31-01-2022	DRY						
	01-06-2022	DRY						
	15-08-2022	720	1	<25	<25	<100	<100	<250
	09-11-2022	990	N/A	<25	<25	200	<100	<250
	31-01-2023	DRY						
	15-05-2023	DRY						
BSM-S-PI-2	29-05-2020	DRY						
	08-08-2020	640	1	<25	<25	<100	<100	<250
	28-10-2020	800	22	<25	<25	140	<100	<250
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	650	7	No sample taken				
	14-10-2021	590	3	<25	48	120	<100	<250
	31-01-2022	DRY						

Location ID	Date	Colour (TCU)	TSS (mg/L)	TRH F1 (µg/L)	TRH F2 (µg/L)	TRH F3 (µg/L)	TRH F4 (µg/L)	Total TRH (µg/L)
	01-06-2022	DRY						
	15-08-2022	720	3	<25	<25	<100	<100	<250
	09-11-2022	870	N/A	<25	<25	240	<100	<250
	31-01-2023	380	18	<25	<25	310	<100	310
	15-05-2023	180	15	<25	26	340	<100	360
BSM-S-PI-3	17-08-2022	710	4	<25	<25	<100	<100	<250
	15-09-2022	660	46	<25	<25	<100	<100	<250
	12-10-2022	760	5	<25	140	<100	<100	<250
	31-01-2023	DRY						
	15-05-2023	DRY						

Table 6. TRH Gel silica clean up of black-stripe minnow sites in the southern alignment. Silica clean up was only performed from 2022 on samples with detectable TRH.

Location ID	Date	TRH (after silica gel clean-up) F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
BSM-S-R-1	31-01-2022	<25	<100	<100
	01-06-2022	<25	<100	<100
	31-01-2023	<25	<100	<100
BSM-S-PI-1	09-11-2022	<25	<100	<100
BSM-S-PI-2	09-11-2022	<25	<100	<100
	31-01-2023	<25	<100	<100
	15-05-2023	<25	<100	<100
BSM-S-PI-3	12-10-2022	37	<100	<100

Conservation Category and Resource Enhancement Wetlands UFI-14478, UFI-1117 and UFI-15493 were sampled over three months in late-2022, coinciding with annual BSM surveys (Table 7). *In situ* water quality within these sites was characterised by acidic to neutral pH, very low to low dissolved oxygen levels, and fresh to brackish electrical conductivities (EC; Table 7).

Total recoverable hydrocarbons were recorded at all sites on at least one sampling occasion for this monitoring period (Table 8). All sites have influences from road and/or farmland runoff, which are likely sources of hydrocarbons. Silica gel clean-up identified that F2 and F3 fractions of TRH found at both UFI-1117 and UFI-14478 were most likely from organic sources, however TRH fractions of F2 at UFI-15493 are likely from a contamination source (Table 9).

Table 7. *In situ* water quality results from UFI wetland sites sampled in 2022.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO (%)	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
UFI-1117	17-08-2022	7.6	458	5.42	8.7	5.29	41	5.35
	15-09-2022	24	744.5	4.77	139.4	1.9	27.4	2.27
	11-10-2022	22.1	1175	5.77	79.8	6.68	27	2.32
UFI-14478	17-08-2022	14.9	2904	6.3	40.4	1.91	24.8	1.53
	15-09-2022	19.2	1521	6.81	10.4	3.8	25.5	2.18
	11-10-2022	15.9	1700	6.96	9.8	1.01	27.4	1.01
UFI-15493	16-08-2022	16.3	483	6.71	17.6	0.55	17	1.75
	16-09-2022	14.5	619.5	7.33	-17.1	2.99	9.6	0.82
	10-10-2022	20.7	792.8	7.57	-26.9	1.75	42.6	3.87

Table 8. Laboratory analysed water quality results from UFI wetland sites sampled in 2022.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TRH F1 (µg/L)	TRH F2 (µg/L)	TRH F3 (µg/L)	TRH F4 (µg/L)	TRH Total TRH (µg/L)
UFI-1117	18-08-2022	1700	3	<25	<25	110	<100	<250
	15-09-2022	2800	4	<25	<25	190	<100	<250
	11-10-2022	5300	16	<25	62	340	<100	400
UFI-14478	17-08-2022	340	4	<25	<25	<100	<100	<250
	15-09-2022	710	1	<25	<25	<100	<100	<250
	12-10-2022	810	2	<25	63	110	<100	<250
UFI-15493	16-08-2022	160	6	<25	<25	<100	<100	<250
	16-09-2022	220	3	<25	50	<100	<100	<250
	12-10-2022	120	2	<25	<25	<100	<100	<250

Table 9. TRH Gel silica clean up of UFI wetland sites in the southern alignment.

Location ID	Date	TRH (after silica gel clean-up) F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
UFI-1117	18-08-2022	<25	<100	<100
	15-09-2022	<25	<100	<100
	11-10-2022	<25	<100	<100
UFI-14478	12-10-2022	<25	<100	<100
UFI-15493	16-09-2022	42	<100	<100

Three additional wetlands were surveyed in late 2022, over the same three month period, coinciding with annual BSM surveys (UFI-959, UFI-13228, UFI-1106). These sites were identified as potential BSM habitats in EPA Report 1714 in relation to the Proposal and associated MS1191, and reviewed in MS1191 M2-2 SWGA Baseline Hydrological Regime Report (SWGA 2022). A summary of *in-situ* water quality analysis can be found in Table 10.

Table 10. *In situ* water quality results from potential BSM sites sampled in 2022.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO (%)	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
UFI-959	17-08-2022	13	142	6.69	17.3	2.36	47.3	4.91
	15-09-2022	21.3	109.4	6.31	43.1	2.51	92.7	8.28
	11-10-2022	18	197.5	7.84	-38.5	4.31	85.8	7.8
UFI-13228	17-08-2022	12.8	238	6.63	21.5	7.61	6.6	0.78
	Sep-22	No Sample						
	Oct-22	No Sample						
UFI-1106	17-08-2022	13.4	1207	7.03	-0.5	0.96	28.4	2.5
	15-09-2022	19	1350	7.19	-10.2	1.43	48.6	4.55
	10-10-2022	19.6	1315	7.63	-29.9	2.01	106	9.97

During the reporting period and as of May 2023, there have been no direct 'impacts' from construction or clearing works to Conservation Category wetland (UFI-14478) or Resource Enhancement wetland (UFI-15493).

There has been disturbance adjacent but no direct impacts to Five Mile Brook (UFI-931 and UFI-1163); and disturbance in proximity to Resource Enhancement wetland (UFI-1117); with monitoring ongoing at all sites.

Ongoing analysis will test for significant differences between reference, baseline, and impacted areas within the Proposal, and for significant differences in water quality between baseline and post-works sampling events.

4.3 Annual Black-Stripe Minnow Population Sampling

Due to water availability and the width of the channel at BSM-S-PI-1, only four nets are set to effectively catch black-stripe minnows. For comparability in the data analysis, catch within the four nets was adjusted up proportionally to represent seven nets (as per catch rates at all other sites). As part of an expansion of the wetland scope in the southern alignment (WRM 2022), nets were also set at BSM-S-PI-3, located further downstream from BSM-S-PI-1.

No BSM were recorded at UFI-1117, UFI-14478 or UFI-15493 during the October 2022 annual sampling event.

The annual BSM 2022 survey recorded a total of 33 individual black-stripe minnows, in contrast to previous surveys where only 1 individual was found in 2020, and 98 individuals were recorded in 2021. There was a significant difference in abundance between BSM-S-R-1 and all other sites (Table 7).

Table 11. ANOVA results for differences in 2022 fish total abundance between sites, with Tukey's post-hoc tests. Groups joined by a common line are not significantly different. Groups are arranged in order of total abundance descending value, left-to-right, with means indicated in brackets.

Source	df	F	*p*	Tukey's post-hoc test			
Average abundance (per net)	3	8.1	<0.05	BSM-S-R-1 (3.57)	BSM-S-PI-3 (0.71)	BSM-S-PI-2 (0.29)	BSM-S-PI-1 (0.25)

Catch per unit effort varied considerably in 2022, with the lowest value of 1.3 individuals recorded at BSM-S-PI-1 and the highest value of 27.6 individuals at BSM-S-R-1. However, all sites demonstrated a decline in catch per unit effort from the previous year, as shown in Figure 2. This reduction is likely attributable to the decrease in rainfall and resulting decline in water availability observed in 2022. Surveys conducted within the Kemerton area, north of Bunbury, have shown that black-stripe minnow populations will disperse in years of high rainfall and black-stripe minnows were declared extinct in one of the pools, only to be recorded in subsequent surveys (MBS Environmental 2009). Due to the high mobility of the species and increased connectivity between wetlands in wetter years, it is possible that black-stripe minnows migrate between wetlands. It is also possible that seasonal fluctuations of presence/abundance of black-stripe minnows may occur, with the highest activity occurring between late June/early July and late September/early October (Smith et al. 2002).

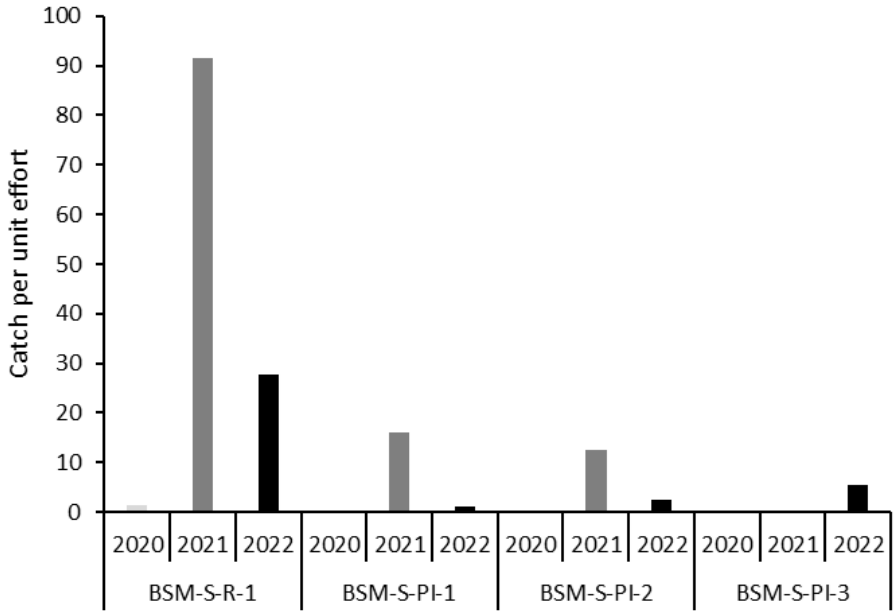


Figure 2. Calculated catch per unit effort data of Black-Stripe Minnow from August 2020, October 2021 and October 2022 sampling.

Additionally, no BSM were found in additional UFI wetlands UFI-959, UFI-13228, UFI-1106 as part of the October 2022 annual survey. Multiple Use Wetland UFI-1106 was sampled by WRM in the 2018 and 2019 baseline surveys (WRM 2021), and again in 2022 (WRM 2022). This is an extremely large seasonal wetland (over 24 hectares) that has a large area of intact native riparian vegetation, is fenced entirely, and has minimal human/livestock disturbance. Black-stripe minnows were not recorded within this wetland despite extensive survey efforts from 2018 - 2022. The habitat and conditions at this wetland (large, tannin-stained wetland with large areas of intact riparian vegetation) are similar to sites that black-stripe minnow were recorded in at nearby wetlands (e.g. wetlands within the area surveyed for the BORR Northern and Central Section). It is considered likely that this wetland once supported black-stripe minnows, however, the population may have become isolated and subsequently died out.

5.0 Summary and Conclusions

There have been no attributable impacts to the hydrological regime and water quality of any black-stripe minnow or UFI wetland sites as part of the Proposal construction during the reporting period. Current data collection will continue to assess any potential impacts associated with construction.

The following sites will continue to be monitored for surface water quality, in relation to Condition 2-1(2):

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

Black-stripe minnow population sampling is scheduled for Spring-2023 and will include all of the existing potential impact BSM survey locations (BSM-S-PI-1, BSM-S-PI-2, and BSM-S-PI-3) as well as the reference site (BSM-S-R-1). As of May 2023, there has been no BSM recorded in any additional wetlands listed in Condition 2-1(2), however further surveys will be reviewed in these locations.

6.0 References

Allen GR, Midgley SH, Allen M (2002) Field Guide to the Freshwater Fishes of Australia. Western Australian Museum, Perth WA.

ANZG (2018) Guidelines for Water Quality Management. http://www.waterquality.gov.au/guidelines.

Australian Society of Fish Biology (2016) Conservation Status of Australian Fishes. http://www.asfb.org.au/commitees/threatened-species-committee/

Bunbury Outer Ring Road Integrated Planning Study (BORR IPT) 2020 Groundwater and Surface Water Quality Monitoring 2019-20. Report prepared for Main Roads Western Australia

Department of Biodiversity, Conservation and Attractions (2021). Threatened and Priority Fauna List. December 2021.

Environmental Protection Authority, 2021. Bunbury Outer Ring Road Southern Section, Commissioner for Main Roads Western Australia. Report 1714, October 2021. Environmental Protection Authority, Perth, Western Australia.

Galeotti DM, McCullogh CD, Lund MA (2008) Current state of knowledge of the black-stripe minnow Galaxiella nigrostriatal (Pisces: Galaxiidae) in Western Australia. Centre for Ecosystem Management report 2008-12.

Galeotti DM (2013) Metapopulation theory explains black-stripe minnow (Pisces: Galaxiidae, Galaxiella nigrostriata) distribution in seasonal wetlands in south-western Western Australia. Retrieved from https://ro.ecu.edu/theses/708

IUCN (2022) IUCN Red List of Threatened Species. Version 2017.3. www.iucnredlist.org Downloaded in December 2022.

Knott B, Jasinka J, Smith K (2002). Limnology and aquatic fauna of EPP173, Melaleuca Park, refuge for an outlier population of the Black-stripe minnow Galaxiella nigrostriata (Galaxiidae), in southwestern Australia. Records of the Western Australian Museum 21: 291-298.

MBS Environmental (2009). Kemerton Silica Sand: Public Environmental Review Extension of Kemerton Silica Sand, Dredge Mining. A report prepared for Kemerton Silica Sand Pty. Ltd.

Morgan DL, Gill HS, Potter IC (1998) Distribution, identification and biology of freshwater fishes in south-western Australia. Records of the Western Australian Museum. Supplement No. 56. Western Australian Museum, Perth.

Morgan DL, Gill HS (2000) Fish associations within the different inland habitats of lower south-western Australia. Records of the Western Australian Museum 20: 31-37.

Morgan DL, Beatty SJ, Klunzinger MW, Allen MG, Burnham QF (2011) A field guide to freshwater fishes, crayfishes and mussels of southwestern Australia. SERCUL and Freshwater Fish Group, Perth WA.

Smith K, Knott B, Jaskina E (2002) Biology of the Black-stripe minnow Galaxiella nigrostriata, (Galaxiidae) in acidic, black-water lake in Melaleuca Park near Perth, Western Australia. Records of the Western Australian Museum 21: 277-284.

SWGA (2021) Bunbury Outer Ring Road, Northern and Central Sections Hydrological Regime Report. South West Gateway Alliance. Unpublished report to Environmental Protection Authority, January 2021.

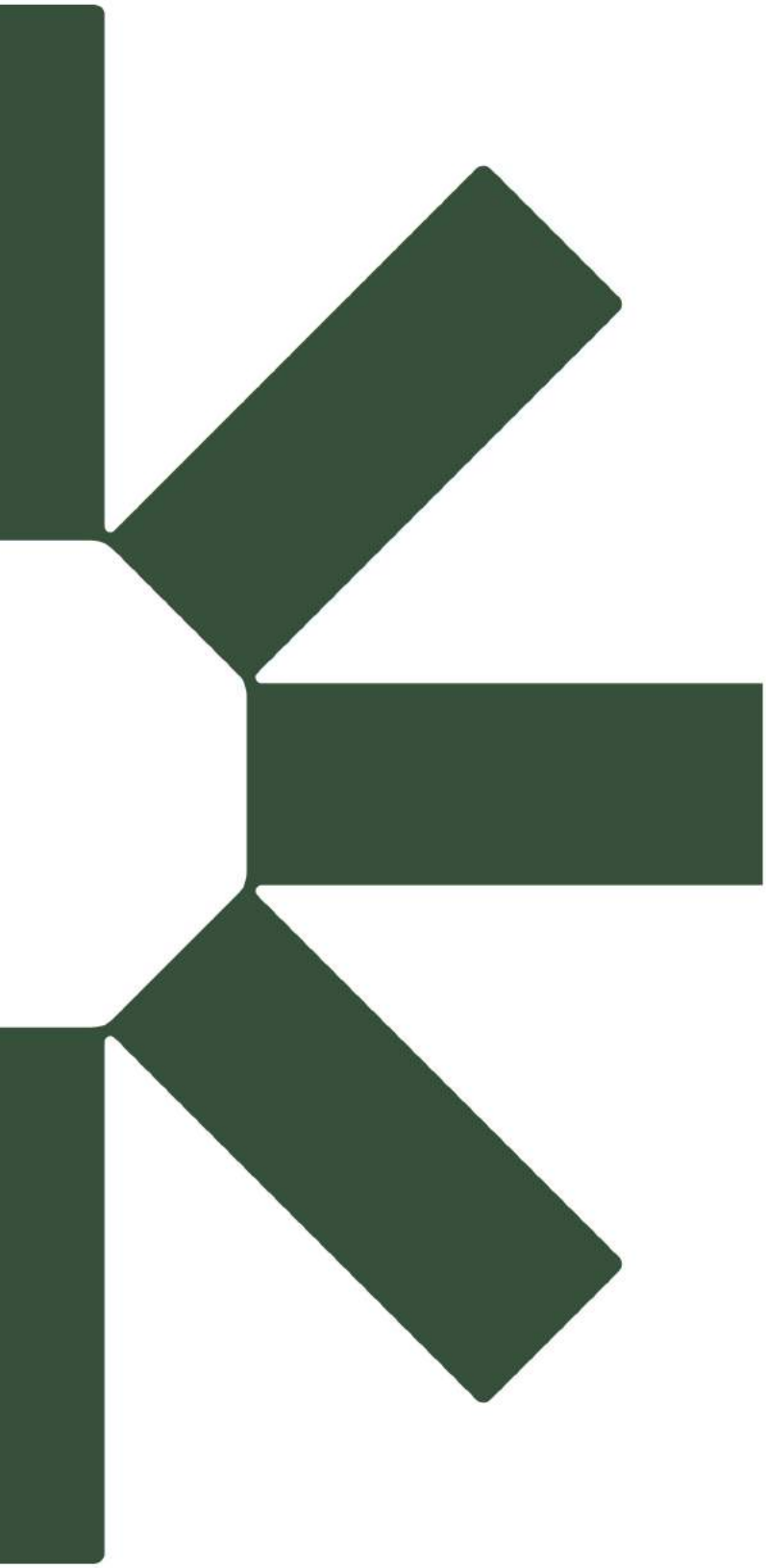
SWGA (2022) Bunbury Outer Ring Road, Southern Section Hydrological Regime Report. South West Gateway Alliance. Unpublished report to the Environmental Protection Authority, July 2022.

WRM (2019) Bunbury Outer Ring Road: Targeted Conservation Significant Aquatic Fauna Survey 2018. Unpublished final v2 report by Wetland Research & Management to BORR Team Pty Ltd. January 2019.

WRM (2021) Bunbury Outer Ring Road Southern Section: Targeted Conservation Significant Aquatic Fauna Monitoring 2021. Unpublished report by Wetland Research & Management to SWGA. December 2021.

WRM (2022) BORR Sampling Southern Alignment and Alternate Mussel Translocation Sites – October 2022. *Wetland Research and Management.* Unpublished memorandum.

WRM-SLR (2023) Bunbury Outer Ring Road Southern Investigation Area: Targeted Conservation Significant Aquatic Fauna Monitoring 2022. Unpublished report by Wetland Research & Management part of SLR to SWGA Team. February 2023.



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Suite 3, 3 Craig Street, Burswood
Western Australia 6100

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Appendix H

M3.4 Environmental Performance Report – Flora and Vegetation (PEC)

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M3-4

Environmental Performance Report

Flora and Vegetation (2022 – 2023)

Priority Ecological Communities

Main Roads WA

Revision 0

29-Aug-23

South West Gateway Alliance

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Document control record

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Document control						
Report title		Ministerial Statement 1191 | M2-4 Environmental Performance Report – PEC				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	6-Aug-23	EcoEdge Review	C.S.	D.B.		D.B.
B	07-Aug-23	SWGA Review	D.B.	E.R.		A.H.
C	09-Aug-23	Main Roads Review	E.R.	Main Roads		A.H.
0	29-Aug-23	Issued	C.S	D.B	E.R.	M.S.
Current revision		**0**				

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Report

Environmental Performance Report - Priority Ecological Communities (EcoEdge, 2023)

Figures

Tables

1 Introduction

1.1 Proposal

Main Roads Western Australia (Main Roads) is constructing a 27-kilometre highway, the Bunbury Outer Ring Road (BORR), that links Forrest Highway to Bussell Highway.

The BORR Southern Section (the Proposal) includes 11 kilometres (km) of dual carriageway connecting the South-Western Highway to Bussell Highway (Figure 1). The Proposal area is located approximately 200 km south of Perth and occurs within the City of Bunbury and Shire of Capel.

1.2 Overview and Scope

The Commissioner of Main Roads has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (Environmental Protection Authority (EPA) Report 1714, October 2021), the EPA noted that in relation to Flora and Vegetation, the following Priority Ecological Communities (PECs) (Priority 3) were identified in the development envelope (Figure 2):

- Banksia woodlands of the Swan Coastal Plain (referred to as the Banksia Woodlands TEC/PEC)
- Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain (referred to as the Tuart Woodlands TEC/PEC)
- Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* woodlands (FCT 25) (referred to as the Tuart-Peppermint Woodlands PEC).

Two of these communities are listed as Threatened Ecological Communities (TECs) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and are considered Matters of National Environmental Significance for the Commonwealth assessment. The Banksia Woodlands is listed as Endangered, and the Tuart Woodlands is listed as Critically Endangered.

The proposal has the potential to directly impact these communities through clearing, and potential indirect impacts which include the introduction/spread of weeds and disease (including dieback *Phytophthora cinnamomi*) and altered hydrological regimes.

To address these impacts, the EPA recommended Condition 3. Ministerial Statement 1191, therefore, includes the following conditions in relation to Flora and Vegetation:

Condition 3-1

The proponent shall implement the proposal to achieve the following environmental outcomes:

(1) clear no more than:

(a) 23.4 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands);

(b) 4.4 ha of vegetation representative of the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and

(c) 4.5 ha of vegetation representative of the Southern Swan Coastal Plain Eucalyptus gomphocephala – Agonis flexuosa Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.

(2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1).

Condition 3-2

Prior to ground-disturbing activities, the proponent shall undertake monitoring of the values listed in condition 3-1(2) and submit a report about the preconstruction baseline conditions to the CEO.

Condition 3-3

The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.

2 Environmental Performance Report

2.1 Purpose and Objective

The purpose of this Environmental Performance Report (EPR) is to address the compliance of the BORR Southern Section with condition 3-4 set out in MS 1191.

Condition 3-4 of MS 1191 requires an annual environmental performance report to be submitted to the Chief Executive Officer (CEO) of the EPA as part of the Compliance Assessment Report (CAR).

Condition 3-4

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the proposal;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved;

(3) report whether that the outcomes in condition 3-1(1) and 3-1(2) were achieved; and

(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 3-1(1) and 3-1(2).

This EPR has been produced in accordance with condition M3-4, and incorporates a 12-month audit period from 31 May 2022 to 31 May 2023. This is the first EPR for M3-4 to be submitted under MS 1191.

The report prepared by EcoEdge (2023) is attached.

2.2 Priority Ecological Communities

The areas of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the Development Envelope are indicated in Figure 3, noting the Tuart-Peppermint Woodlands PEC largely overlaps the Tuart Woodlands TEC/PEC.

The monitoring locations of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the development are indicated in Figure 4.

2.3 Clearing metrics in relation to Flora and Vegetation (PEC) during the reporting period

Construction of the Proposal commenced on 1 August 2022.

Clearing and disturbance of Priority Ecological Community (PEC) during the reporting period is summarised in Table 1 and Figure 5.

Table 1. Clearing metrics during the reporting period.

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during this reporting period (and total cleared)
Vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands)	23.4 ha	11.49 ha
Vegetation representative of the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands)	4.4 ha	2.06 ha
Vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC	4.5ha	2.15 ha

…

Figure 1. Proposal area (Proposal area as shown in Ministerial Statement 1191)

COLLEGE GROVE

DALYELLUP

GELORUP

STRATHAM

HENTY PLAINS

Bussell Highway

Western Highway

SLIP

LEGEND

- Proposal Area
- Retention Vegetation Area
- Clearing Exclusion Areas
- Major Road

HARVEY
BUNBURY
CAPEL
BUSSELTON

Paper Size ISO A3

0 250 500 750 1,000

Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Proposal Area

FIGURE 1

Figure 2. Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area

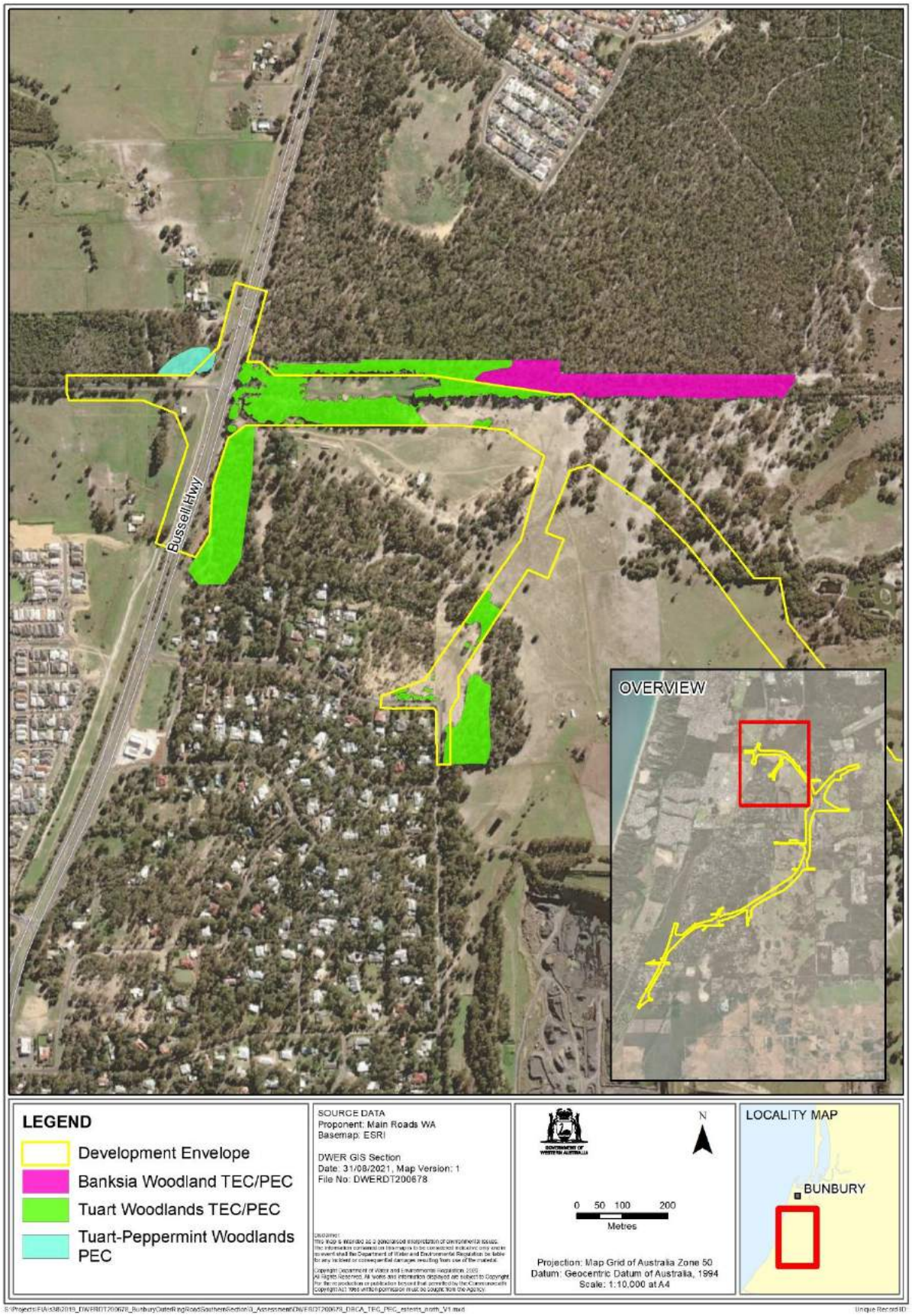

Figure 2a Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/ PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area.

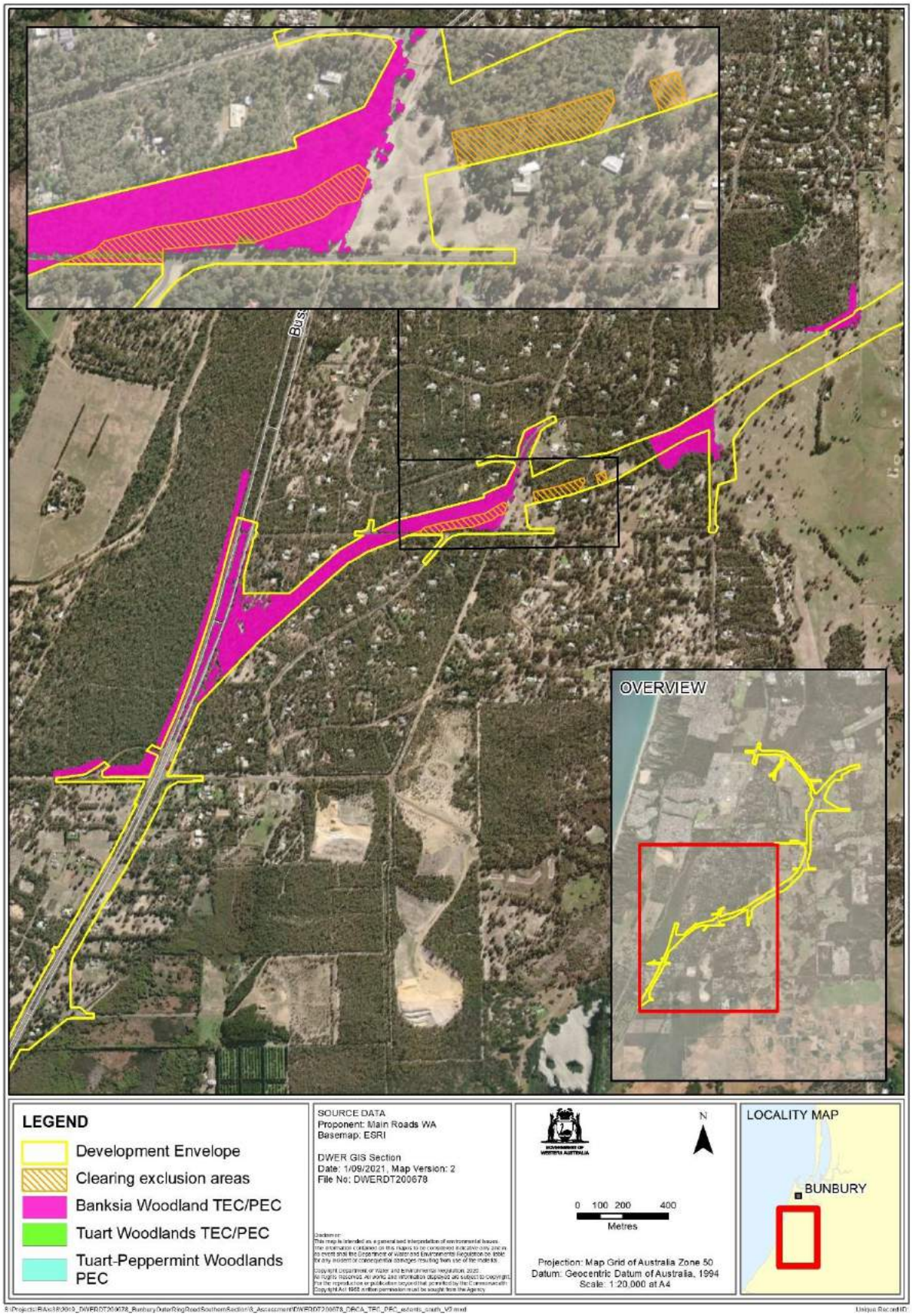

Figure 2b **Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/ PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area.**

Figure 3. Distribution of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the Development Envelope

Note: A 60 m buffer to the Development Envelope is included for Tuart Woodlands TEC/PEC in this figure in relation to monitoring requirements under Commonwealth Approval Notice EPBC 2019/8543.

LEGEND

- Major road
- Banksia Woodland TEC
- Tuart Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

33500 33600 33700 33800 33900 34000 34100 34200 34300 34400 34500

104900 104800 104700 104600 104500 104400 104300 104200 104100 104000 103900 103800 103700 103600

1 2 3 4 5 6

USHER
COLLEGE GROVE
TW-S-PI-2
TW-S-PI-2
BW-S-PI-1
Centenary Rd
TW-S-PI-3
Bussell Hwy
DALYELLUP
Neslite Rd
Ashberg Link
Starlite Bend
Rutile Lane
Ferndale Av
Ferndale Av
Holly Hill Av
GELORUP
TW-S-PI-4
Sleaford Dr
Epidote Loop
Logan Lane
Meadow View Rd
Maynard Pde
Crystal Bend
Dunmow Rise
Jules Rd
TW-S-PI-4

SLIP

Paper Size ISO A3

0 20 40 60 80

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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TEC/PEC adjacent to the Proposal Area

Project No. 61-37041
Revision No. 6
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FIGURE 3

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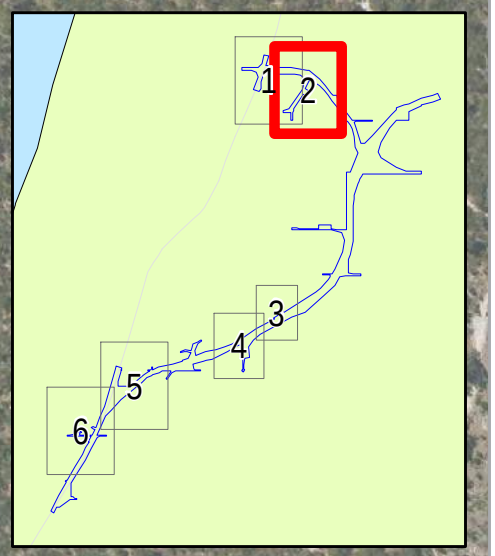
LEGEND

- Banksia Woodland TEC
- Tuart Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

34200 34300 34400 34500 34600 34700 34800 34900 35000 35100 35200

104800 104700 104600 104500 104400 104300 104200 104100 104000 103900 103800 103700 103600 103500 103400



COLLEGE GROVE

TW-S-PI-2

BW-S-PI-1

BW-S-PI-1

Centenary Rd

NORTH BOYANUP

TW-S-PI-4

GELORUP

TW-S-PI-4

Sleaford Dr

Dunmow Rise

Jules Rd

Maynard Pde

SLIP

Paper Size ISO A3

0 20 40 60 80

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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TEC/PEC adjacent to the Proposal Area

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Date 30/06/2022

FIGURE 3

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33900 34000 34100 34200 34300 34400 34500

100800 100700 100600 100500 100400 100300 100200 100100 100000

LEGEND

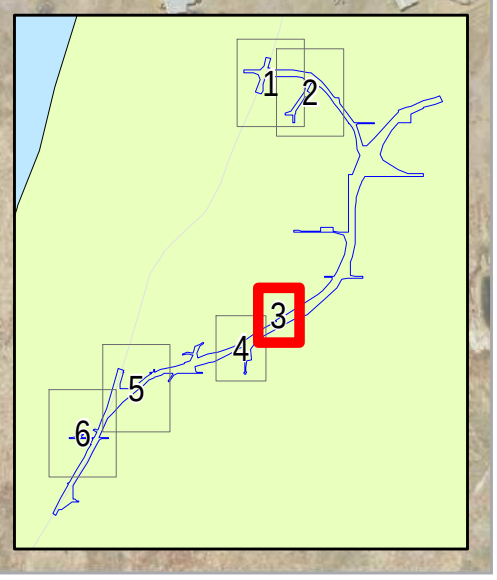
- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Marchetti Rd

GELORUP

BW-S-PI-3

SLIP



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33200 33300 33400 33500 33600 33700 33800 33900

100400 100300 100200 100100 100000 99900 99800 99700 99600 99500 99400

LEGEND

- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Yalinda Dr

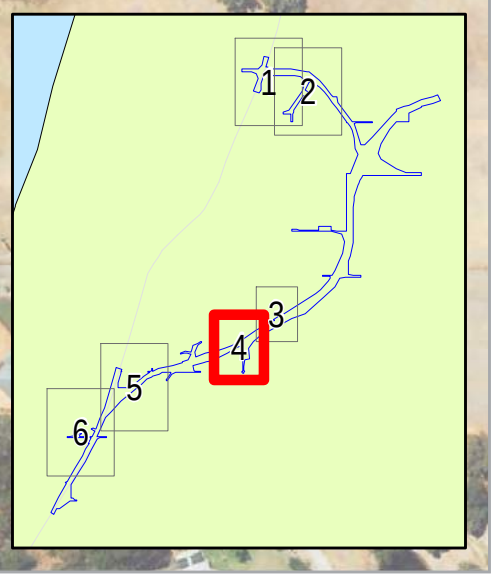
BW-S-PI-4

GELORUP

Woods Rd

Jilley Rd

SLIP



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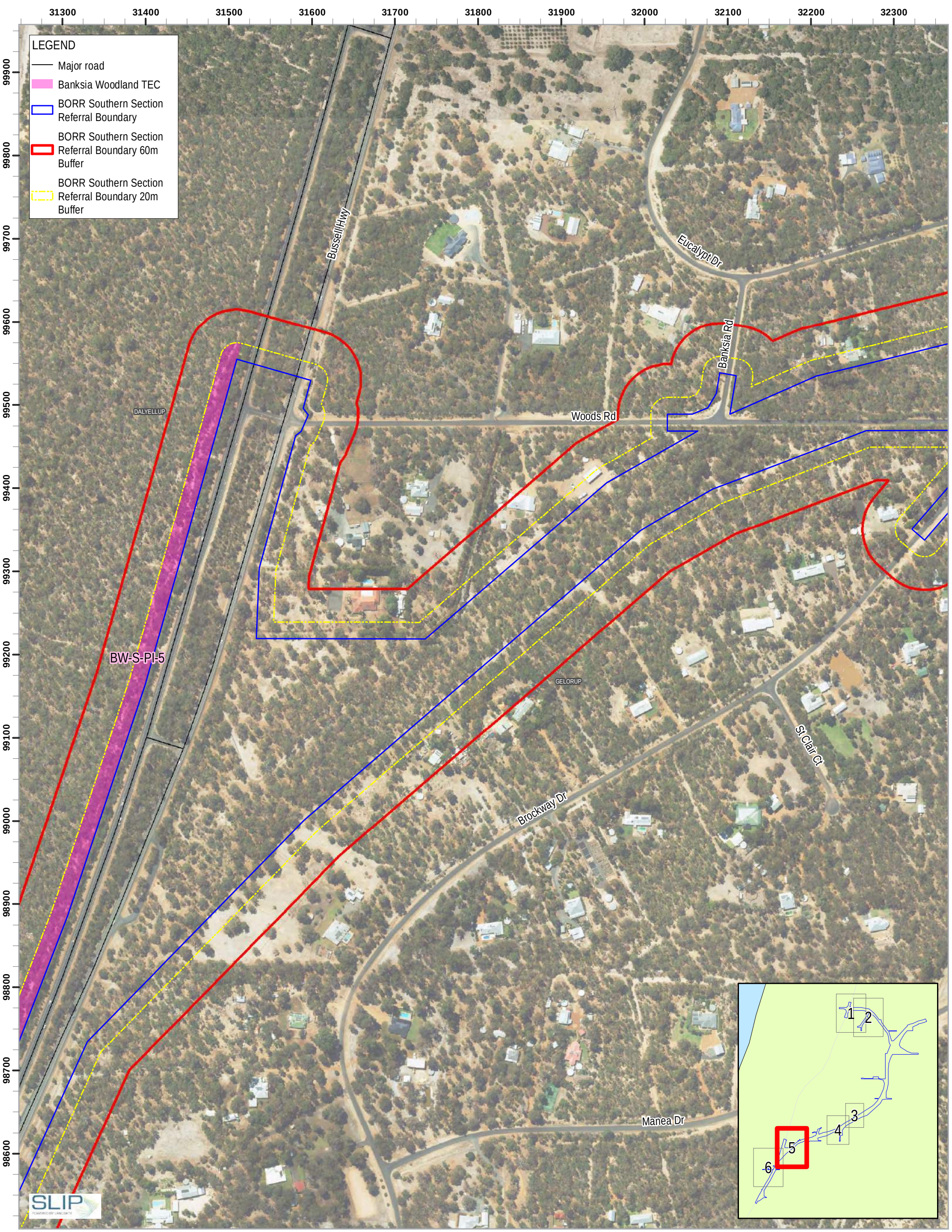

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TEC/PEC adjacent to the Proposal Area

Project No.	61-37041
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Date	30/06/2022

FIGURE 3

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30400 30500 30600 30700 30800 30900 31000 31100 31200 31300 31400

99200 99100 99000 98900 98800 98700 98600 98500 98400 98300 98200 98100 98000 97900 97800

LEGEND

- Major road
- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Quambi Dr

DALYELLUP

BW-S-PI-5

GELORUP

Lakes Rd

Bussell Hwy

BW-S-PI-5

Tamra Cl

BW-S-PI-5

Calinup Rd

STRATHAM

Jaym

SLIP

1 2 3 4 5 6

Paper Size ISO A3

0 20 40 60 80

Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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TEC/PEC adjacent to the Proposal Area

Project No.	61-37041
Revision No.	6
Date	30/06/2022

FIGURE 3

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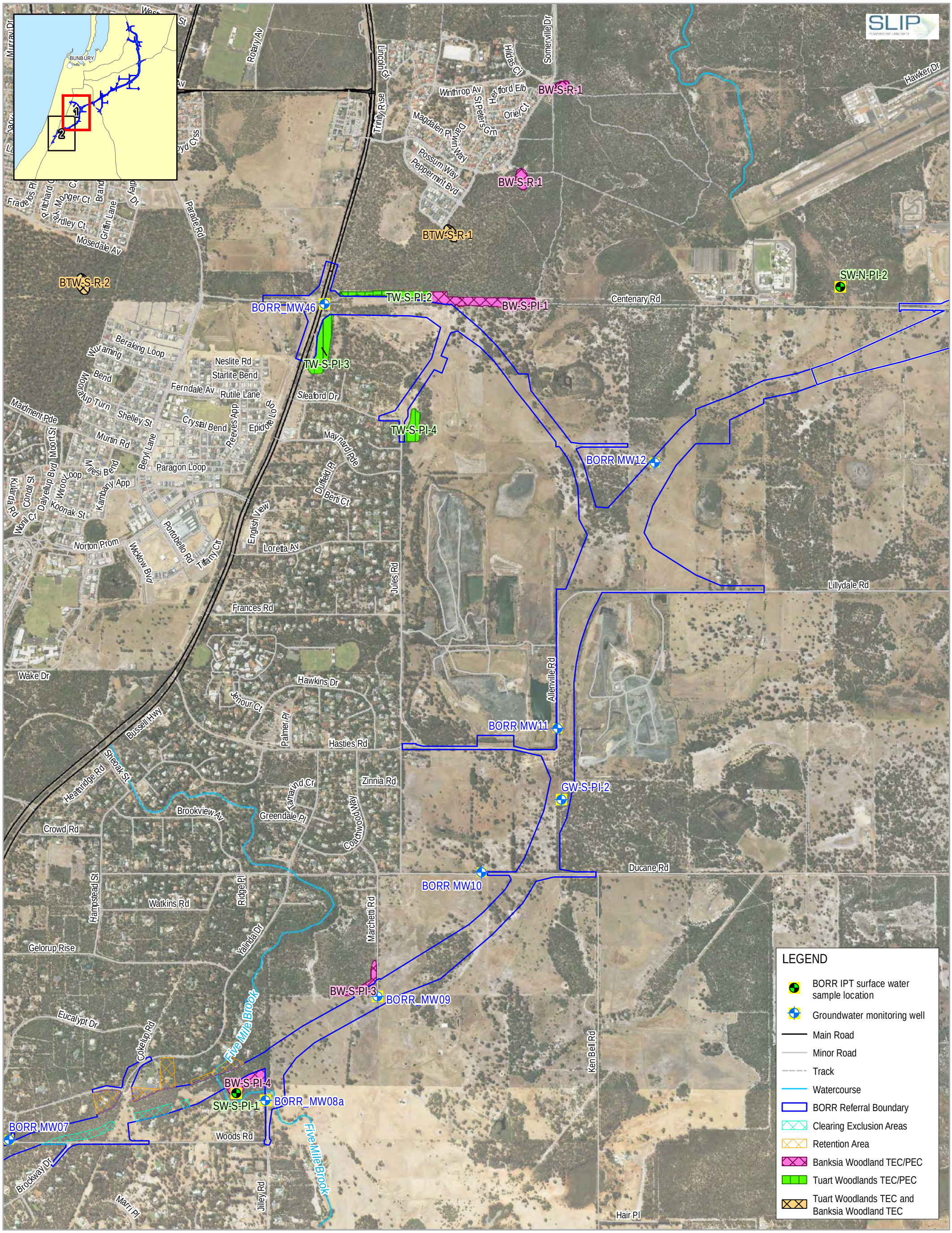
Figure 4. Overview of monitoring location for Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC



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TEC/PEC potential impact monitoring locations

Project No. 61-37041
Revision No. 0
Date 30/06/2022

FIGURE 4

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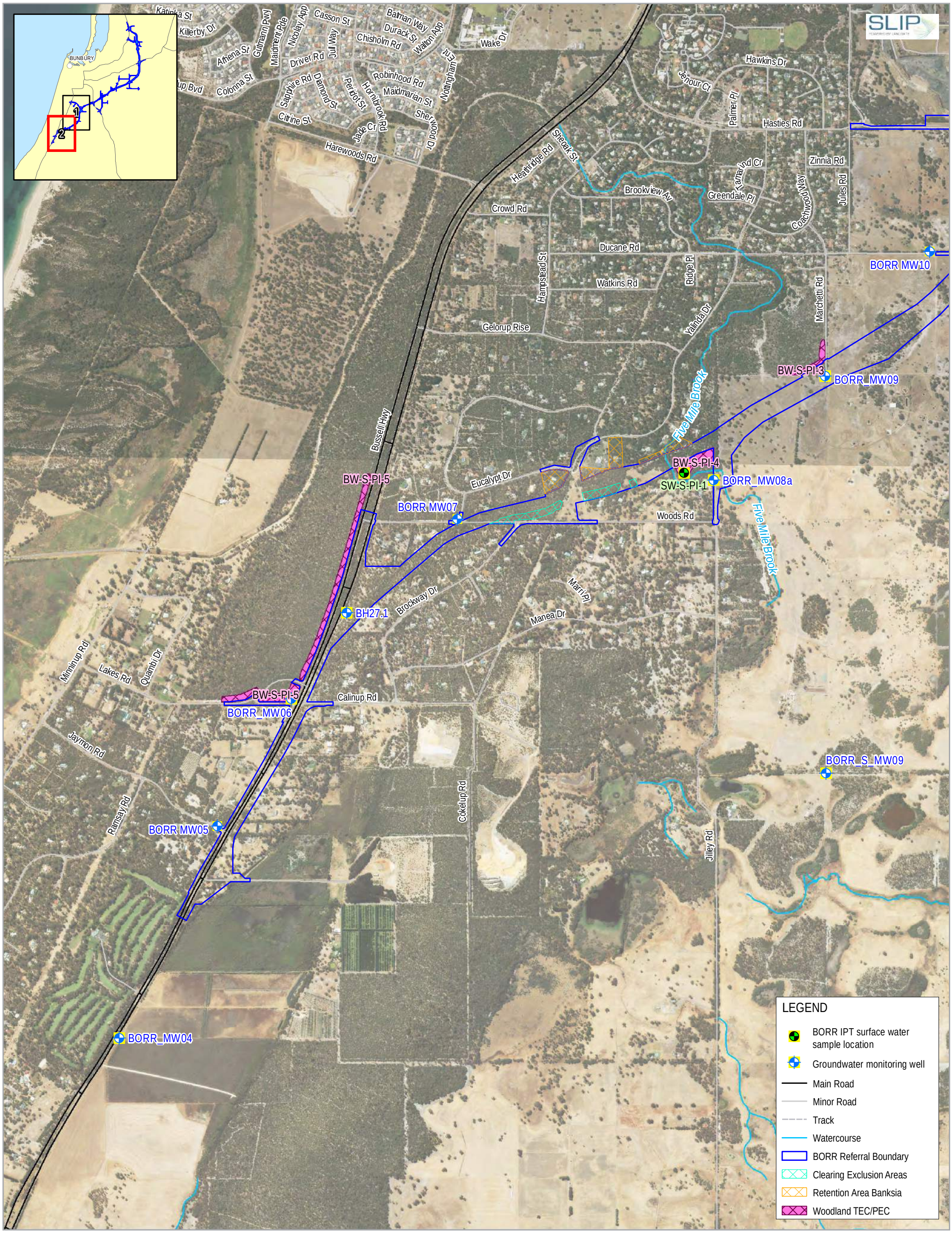
Data source: BORR: BORR North Referral Boundary - 20191016, BORR South Referral Boundary - 20191212; TEC/PEC: 2020; Biota: Western Ringtail Possum reference sites - 20200714; WRM: Sampling sites - 20200713; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20220630. Created by: mmikkonen



Paper Size ISO A3

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BORR Team

Australian Government

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road

TEC/**PEC** potential impact monitoring locations

Project No.	61-37041
Revision No.	0
Date	30/06/2022

FIGURE **4**

G:\61\37041\19_0_GIS\Maps\Working\BORR South EPBC ARI\DAWE submission\Vegetation Management Plan\6137041_005_BORRSouthTECMonitoring_Rev0.mxd
Print date: 30 Jun 2022 - 16:17

Data source: BORR: BORR North Referral Boundary - 20191016, BORR South Referral Boundary - 20191212; TEC/PEC: 2020; Biota: Western Ringtail Possum reference sites - 20200714; WRM: Sampling sites - 20200713; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20220630. Created by: mmikkonen

Figure 5. Ground disturbance and clearing extents during the reporting period in relation to TEC/PEC vegetation

Legend

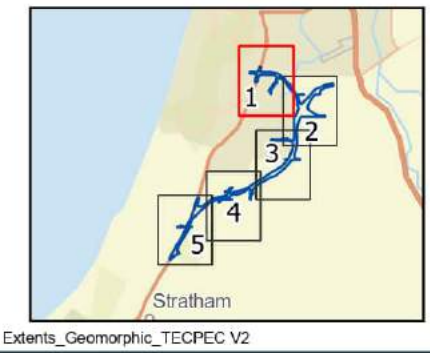
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



A3 scale: 1:8,000

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Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

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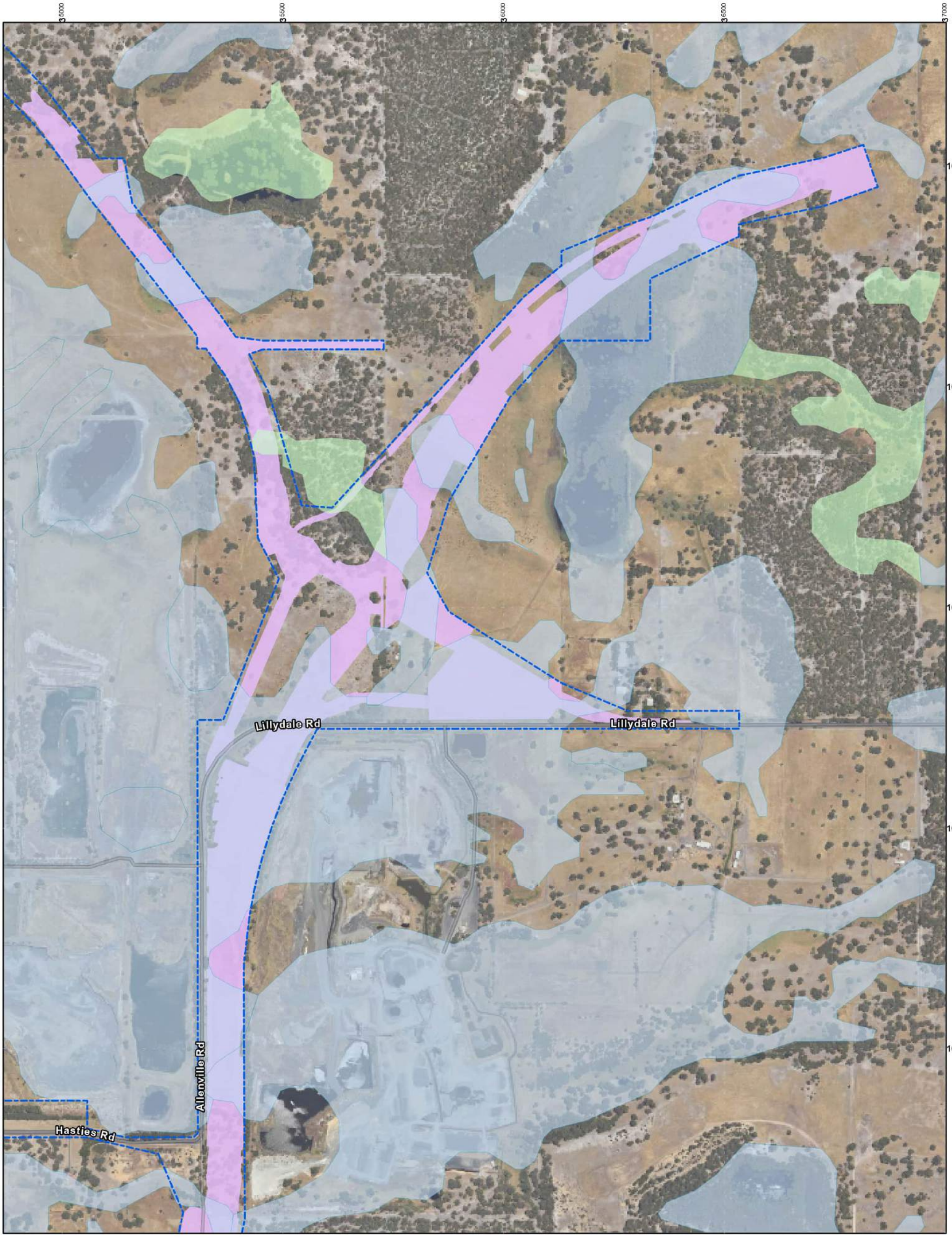
Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 1 of 5

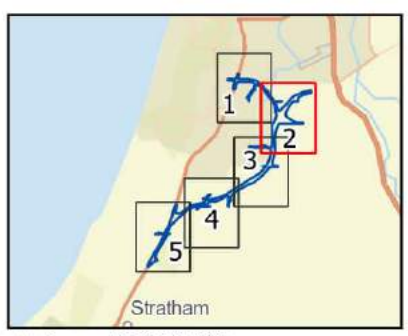


Legend

- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Resource Enhancement Wetlands
- Multiple Use wetlands



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A3 scale: 1:8,000

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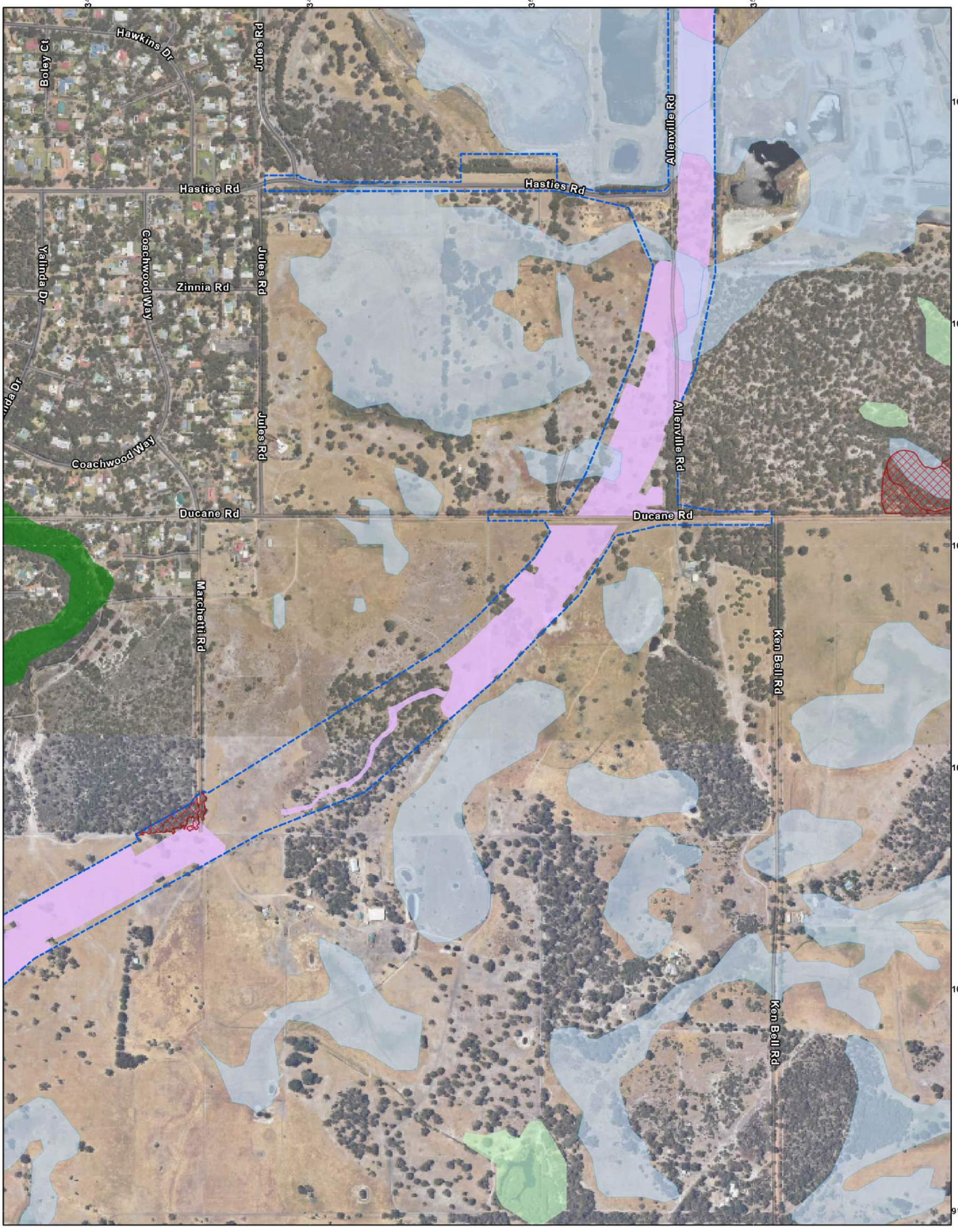
Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 2 of 5



Legend

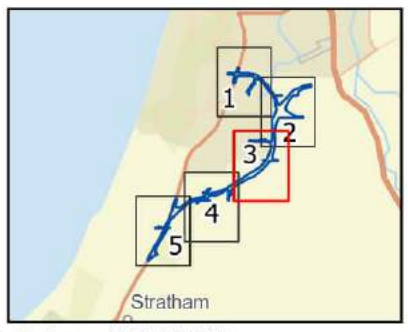
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



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A3 scale: 1:8,000

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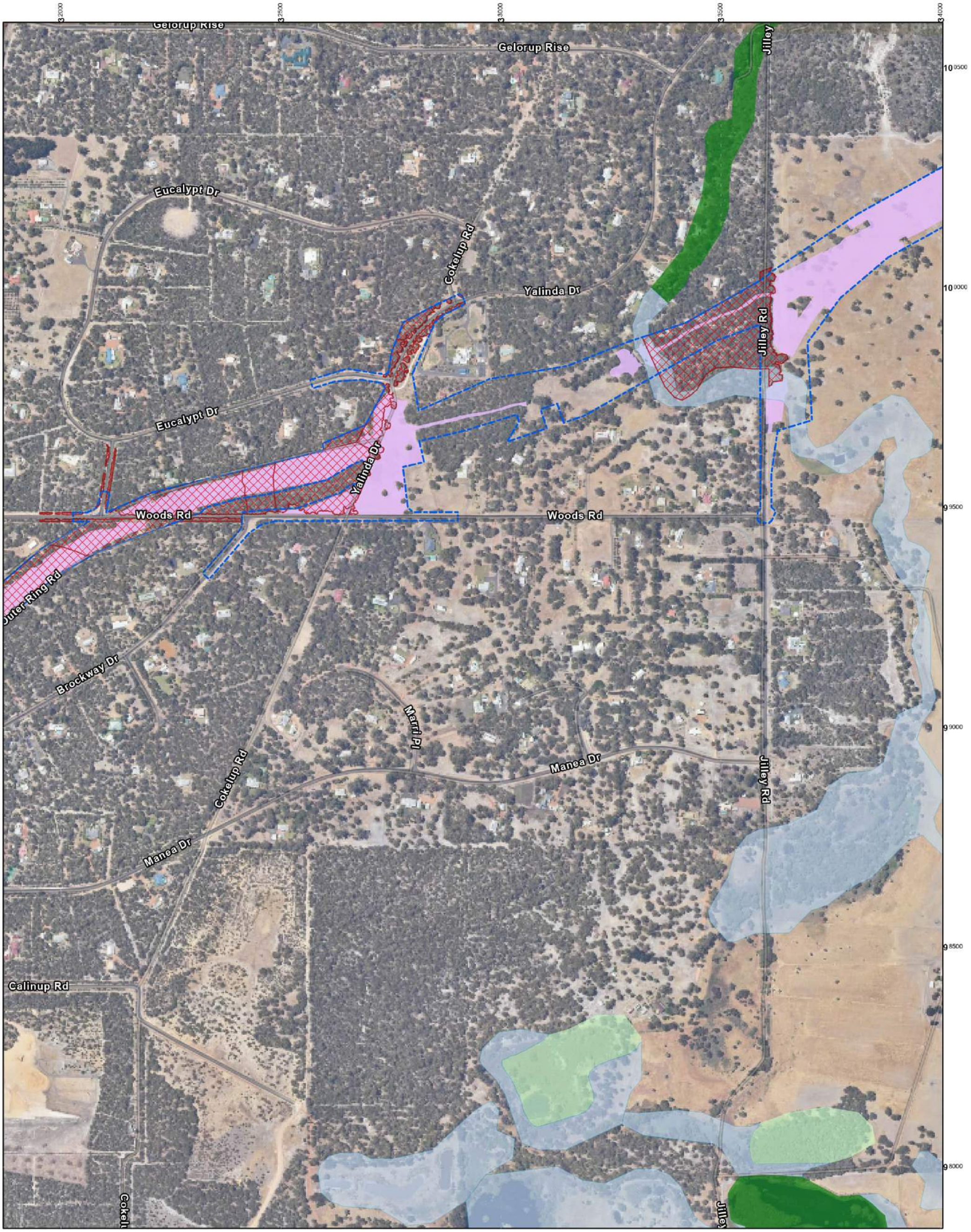
Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 3 of 5



Legend

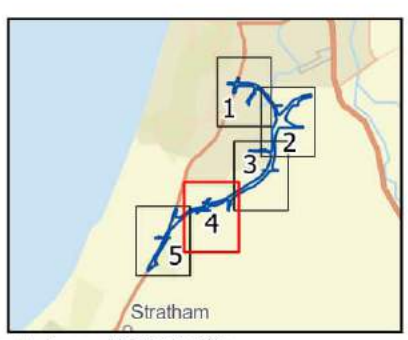
- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Resource Enhancement Wetlands
- Multiple Use wetlands



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Delivering the Bunbury Outer Ring Road

A3 scale: 1:8,000

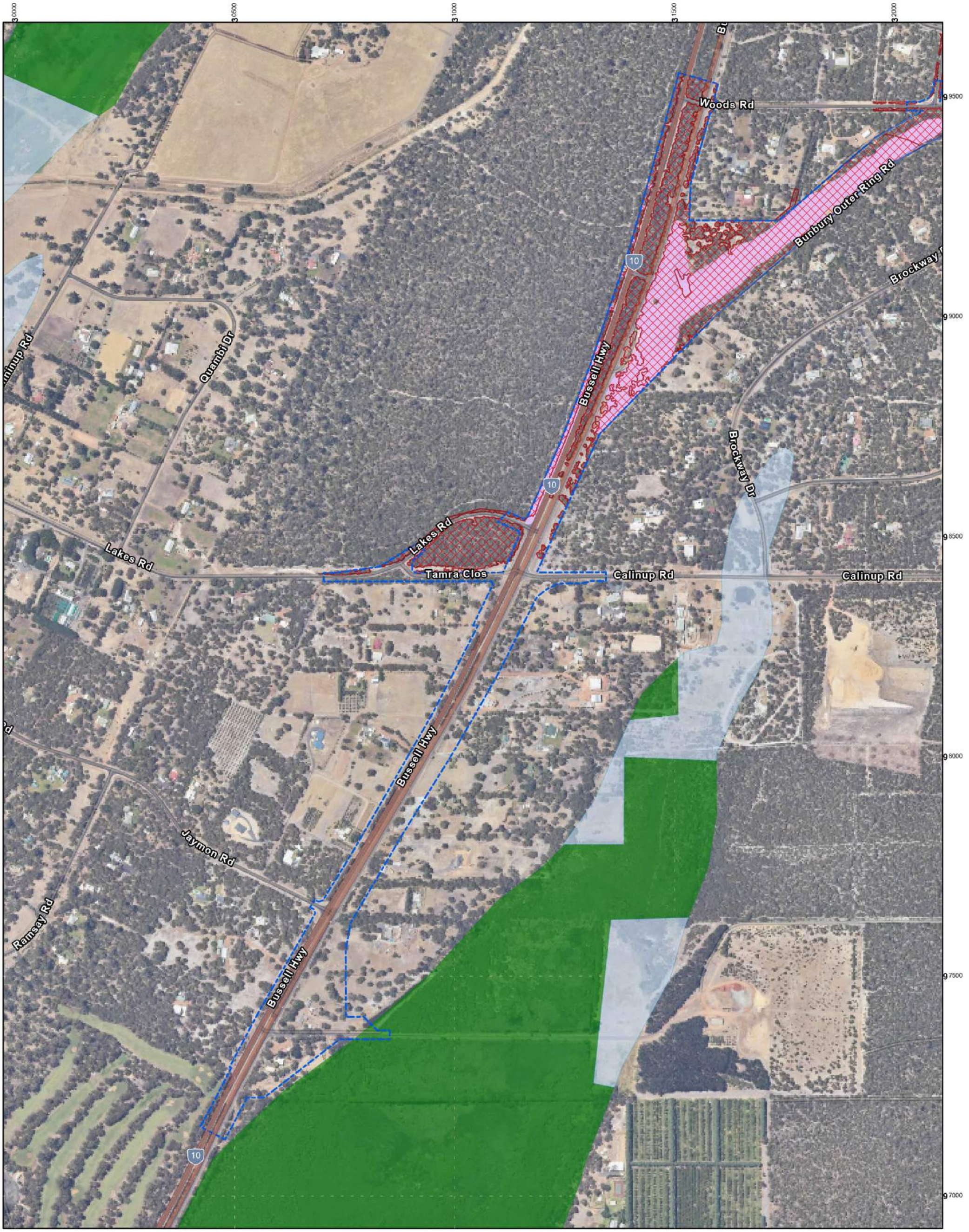
0 200 400 Metres

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 4 of 5



Legend

- Proposal Approval Boundary
- Ground Disturbance and Clearing Extents (up to 31 May 2023)

TEC PEC

- Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use wetlands

A3 scale: 1:8,000

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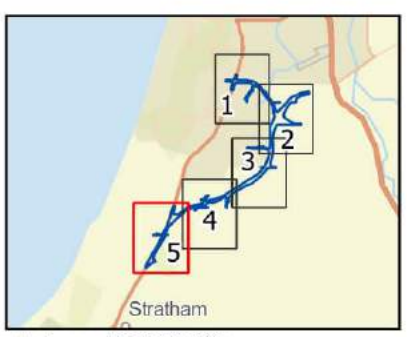

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Delivering the Bunbury Outer Ring Road

Date:2/08/2023 Author: justine.belcher Ref:17_02_005_Clearing Extents_Geomorphic_TECPEC V2

Coordinate System: GDA 1994 Perth Coastal Grid 1994

Bunbury Outer Ring Road

Figure 5. Ground disturbance and clearing extents in relation to TEC PEC and Geomorphic Wetlands. Map 5 of 5

South West Gateway Alliance

Report

Environmental Performance Report - Priority Ecological Communities (EcoEdge, 2023)

Bunbury Outer Ring Road

Southern Section

Threatened and Priority Ecological Communities

Annual Monitoring Report

31 May 2022 – 30 May 2023

Prepared for
Southwest Gateway Alliance
2023

PO Box 9179, Picton WA 6229

0484 771 825|enquiries@ecoedge.com.au

Version	Origin	Review	Review date	Release approval	Issue date
Rev A	CS	DB		Ecoedge	6/8/2023
Rev B	SWGA	Main Roads			9/8/2023
Rev 0	SWGA	Ecoedge	25/8/2023	Main Roads	31/8/2023

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Statement of Limitations

Reliance on Data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

This first annual Threatened and Priority Ecological Community (TEC PEC) monitoring report is prepared in view of conditions stipulated under approvals issued by both the Western Australian State Minister for the Environment and the Commonwealth Environment Minister for the Bunbury Outer Ring Road (BORR) Southern Section Project. These conditions relate to the protection and mitigation of impacts to Threatened Ecological Communities protected under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Threatened and Priority Ecological Communities protected under the State *Environmental Protection Act 1986* (EP Act).

These communities include[1]:

- Banksia woodlands of the Swan Coastal Plain, listed as both a TEC (Commonwealth (Cth)) and Priority 3 PEC (state) (Banksia woodlands TEC PEC)
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain, listed as both a TEC (Cth) and Priority 3 PEC (state) (Tuart woodlands TEC PEC[2]).
- Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (floristic community type 25)[3]

The conditions relevant to this TEC PEC monitoring report are presented below.

EPBC Approval 2019/8543

Approval date: 29 June 2022

Relevant conditions:

> '4. The approval holder must not cause a reduction in habitat quality within the clearing exclusion areas.
>
> 5. For the protection of listed threatened species and communities the approval holder must not cause a reduction in habitat quality, for:
>
> a. any Banksia Woodland TEC within 20 metres of the proposal area

[1] An additional state and Commonwealth protected TEC, the Herb Rich Shrublands in Claypans (Floristic Community Type (FCT) 08 TEC, part of the Federally protected Claypans of the Swan Coastal Plain TEC (Claypan TEC) was also monitored. This community is NOT subject to any environmental approvals associated with the proposal, but for precautionary reasons was included in the TEC PEC monitoring program submitted as part of the referral documentation submitted for State approval in 2020 (BORR Team 2020). The monitoring program states that:

> 'No Claypan TEC occurrences will be impacted by the Proposal however one occurrence, situated approximately 500 m at its nearest from the Proposal Area is being included in the monitoring plan to enable the detection of any indirect impacts resulting from Proposal implementation.'

[2] Tuart woodland and Banksia woodlands co-occur in the Project Area and are referred to as Banksia Tuart Woodlands in this report.

[3] Can be a component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC listed TEC or the Critically Endangered Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain EPBC Act listed TEC.

b. any Tuart Woodlands and Forests TEC within 60 metres of the proposal area'

Condition 12, required a Vegetation Management Plan (VMP) to be prepared that established the environmental management actions to manage, monitor and mitigate direct and potential indirect impacts on the TECs. It also required the identification of the baseline habitat quality of the areas of TEC to be protected.

Condition 28, requires the approval holder to prepare a compliance report for each 12 month period following the date of commencement of the action.

State Approval Ministerial Statement (MS) 1191.

Approval date: 31 May 2022

Relevant conditions:

> **3-1(2**) 'The proponent shall implement the proposal to achieve the following environmental outcome: (2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1) (Minister for Environment 2022).'
>
> **3-3** The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.
>
> **3-4** The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:
>
> **(1)** outline the monitoring that was undertaken during the implementation of the proposal;
>
> **(2)** outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved;
>
> **(3)** report whether that the outcomes in conditions 3-1(1) and 3-1(2) were achieved; and
>
> **(4**) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in conditions 3-1(1) and 3-1(2).

Condition **12-1** requires the first compliance assessment report to be submitted within 15 months of the date of issue of the approval which is the 31 August 2023.

This TEC PEC monitoring report is submitted in respect of condition 12-1 of State approval MS 1191 for the period 31 May 2022 to 31 May 2023. It compares the results of parameters monitored since construction of the BORR Southern Project area commenced in August 2022 with baseline levels established by Ecoedge between October 2019 and July 2022 (Ecoedge 2023).

2 Methods

There are two components to the monitoring program, vegetation monitoring and drainage monitoring.

The vegetation monitoring program focuses on monitoring changes in the status of vegetation at reference sites and potential impact sites, such as its condition, species composition, vegetation structure and plant stress. Vegetation monitoring is carried out bi-annually in autumn and spring.

The drainage monitoring focuses on impacts of drainage and changes in hydrology on vegetation, specifically impacts from erosion, inundation/flooding and drying effects. Drainage monitoring is carried out quarterly in summer, autumn, winter and spring.

Data is collected from all TEC PEC sites that have a potential to be impacted by the project, due to their close proximity to the project and TEC PEC reference sites that are unlikely to be impacted due to their distance away from the project.

2.1 Location of monitoring sites

There are nine potential impact and five reference monitoring sites within the BORR Southern project area (**Table 1**). The location of these sites is shown in **Figure 1** and individual sites shown in **Appendix 1**.

Table 1. Current site name and location within the Southern project area.

No	Site Name	Location
Potential Impact sites		
1	BW-S-PI-1	South of Centenary Road, east of Bussell Hwy
2	BW-S-PI-3	East of Yalinda Drive, west of Marchetti Road
3	BW-S-PI-4	Jilley Road north of Woods Road. Photopoints established along the BORR boundary
4	BW-S-PI-5	West of Bussell Hwy
5	BW-S-PI-8	Woods Road, Gelorup
6	CP-S-PI-1	Manea Park middle claypan, south of CP-NS-R-2
7	TW-S-PI-2	Road reserve on the north side of Centenary Road east of Bussell Hwy, and extending into the adjacent reserve to the north
8	TW-S-PI-3	Bussell Hwy southbound, south of Centenary Road (adjacent the parking bay)
9	TW-S-PI-4	Jules Road near Sleaford Drive
Reference sites		
1	BW-S-R-1	Manea Park (R 32963)
2	BTW-S-R-1	Manea Park corner of Lakeside and Melaleuca Drive
3	BTW-S-R-2	North-side of Centenary Rd east of Bussell Hwy
4	CP-NS-R-1	Waterloo Nature reserve (R46108)
5	CP-NS-R-2	Manea Park (R16044)

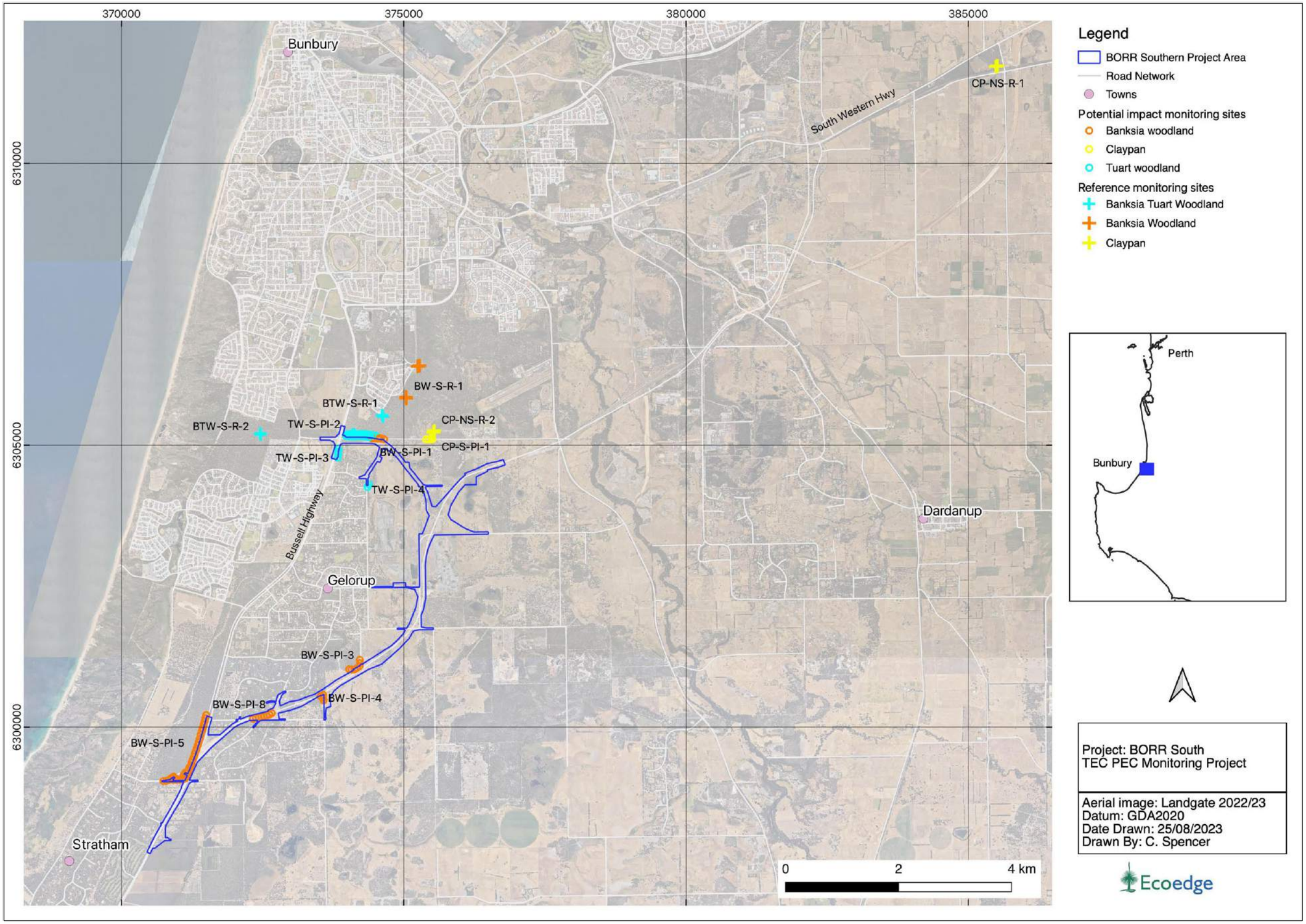


Figure 1. Location of potential impact and reference sites within the BORR Southern vegetation monitoring program.

2.2 Site nomenclature

The naming convention for vegetation monitoring points is as follows:

- Which vegetation TEC PEC type (**BW** = Banksia Woodlands, **BTW** = Banksia Tuart Woodlands, **CP** = Claypan, **TW**= Tuart Woodland)
- Whether it's in the **N**orth or **S**outh (Northern & Central or South referral areas, or **NS** for both)
- Whether it's a **P**otential **I**mpact site, or a **R**eference site.
- Whether it was a transect **T** or boundary photopoint **P** and a
- Site number if more than one site monitored in the TEC PEC.

For example, TW-S-PI-2_P01 is a potential impact Tuart Woodlands TEC site in the Southern referral area.

The naming convention for drainage monitoring points is as follows:

Example monitoring point: BTW-S-R-1_E1(a21)

BTW-S-R-1 - site name

D - drying, **E** - erosion, **I** - inundation

1 - chronological number of particular issue recorded at site.

(**a** - autumn, **w** - winter, **sp** = spring, **su** - summer) – the season first recorded.

21 -2021, the year it was first recorded.

2.3 Timing and frequency of survey

The boundary photopoint vegetation monitoring program is carried out bi-annually in autumn and spring. Transect vegetation monitoring is carried out annually in spring, except for the claypan transects which are carried out twice a year[4], once in mid spring and once in late spring mid to late November. This is in order to maximise the identification of herbaceous annuals which progressively germinate following the steady subsidence of claypan water levels as the weather warms up. Drainage monitoring is conducted quarterly to account for any seasonal variations.

An overview of the aspects of the monitoring program is presented in **Table 2,** and the timing of monitoring rounds conducted to date are presented in **Table 3**.

[4] Claypans were originally to be monitored twice once in late winter and once in spring, but observations showed that they were too inundated to be meaningfully monitored in winter. Instead, the second monitoring round was scheduled for late spring.

Table 2. Annual monitoring program overview.

Monitoring type	Activity	Sites	Frequency	Timing
Vegetation	Transects	BW-S-PI-1, BW-S-PI-5, TW-S-PI-2, CP-S-PI-1, BW-S-R-1, BTW-S-R-1, BTW-S-R-2, CP-NS-R-1, CP-NS-R-2	Annually	Spring
Vegetation	Transects	Claypan TEC	Bi-annually	Dependent on rainfall, but typically October and mid to late November.
Vegetation	Photopoints	Boundary points	Bi-annually	Spring and autumn
Drainage	Visual inspection	All sites	Quarterly	Spring, summer, autumn and winter

Table 3. Monitoring dates of monitoring rounds.

Year	Season	Drainage	Boundary photopoint	Transect/quadrat assessment
2019	Spring / summer	Not started	19 November to 3 December	
2020	Summer	Not started	N/A	
2020	Autumn	29-30 April	20-26 May	N/A
2020	Winter	28 – 31 July	N/A	4 August
2020	Spring	9 October – 28 October		
2020/2021	Summer	10-12 February	N/A	
2021	Autumn	31 May	No monitoring	N/A
2021	Winter	7 September	N/A	N/A
2021	Spring	13 October	13 October	8 September - 14 October
2021/2022	Summer	22 February	1 December	N/A
2022	Autumn	25 May	25 & 26 May	N/A
2022	Winter	20 June	20 June	N/A
2022	Spring	17 October – 20 October	17 October – 20 October	22 September – 21 November 2022
2022/2023	Summer	17 February 2023	N/A	
2023	Autumn	26 May 2023	22 – 26 May	N/A

2.4 Transects and Quadrats

Monitoring transects of 30 m in length were established within both potential impact and reference sites[5]. The ends of each transect were marked with a steel peg which will be left in place until the end of the monitoring program (noting that the stakes were removed from all roadside sites). Along each transect, 2 x 2 m quadrats were established at 10 m intervals, the first at 0 m and the last at 30 m. Each quadrat, marked at the corners with temporarily placed pegs, were placed alternately, left and right of the transect line. A total of four quadrats were established per transect. At most sites, only one transect was established. A photopoint was established at either end of the transect, and a photo taken of each quadrat. The layout of a transect is shown in **Figure 2**.

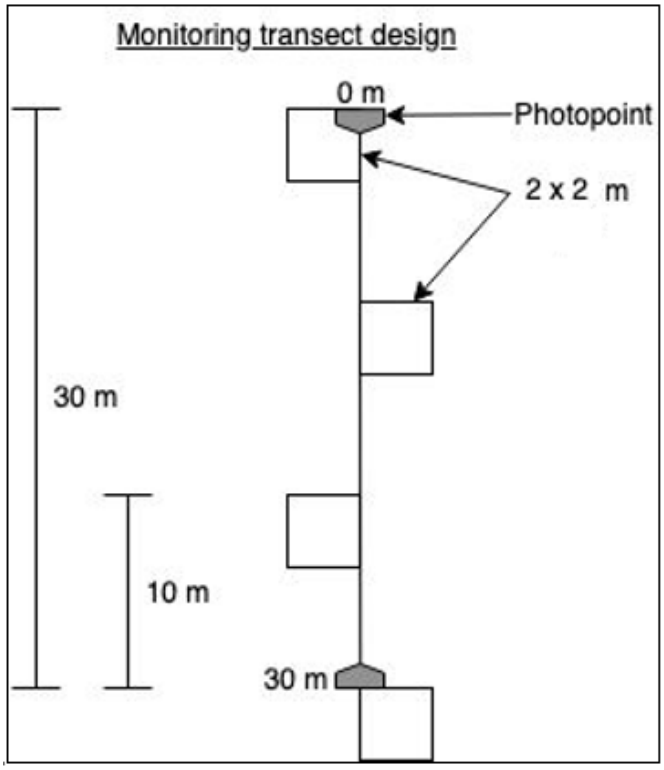


Figure 2. Layout plan for a transect.

To the extent practicable, the locations of transects at reference sites were placed in vegetation that was similar to Potential Impact sites for the Banksia and Tuart Woodlands and Claypan TEC.

The following parameters were recorded for each quadrat: Information on dominant plant species present, species cover, plant stress within transect quadrats. Data was recorded using various methods including Fulcrum application (https://www.fulcrumapp.com/), Excel spreadsheets and/or paper-based data collection sheets.

[5] Transects were not installed in potential impact sites located on private property, or where access was restricted.

The parameters that are to be analysed for each quadrat are: species diversity, species composition, level of plant stress, weed species, plant deaths, vegetation health and ground characteristics. Changes in these parameters within the quadrats, along these transects, are compared between data collected at Reference and Potential Impact sites and between data collected at the same site over time.

The physical characteristics recorded for each quadrat include:

- Species composition: species identified in each quadrat.
- Vegetation cover[6] assessed using the scale presented in **Table 4**.
- Stress of perennial shrubs and trees: assessed using the scale[7] presented in **Table 5**.
- Evidence of obvious plant pests and diseases, such as Phytophthora dieback, Marri Canker and scale.
- Bare ground: assessed using the same scale as the vascular plant cover, from 1 equalling no bare ground to 10, which equalled 100% bare ground.
- Leaf litter: recorded as a % coverage of the quadrat.

Table 4. Cover scores for vascular plants within transect quadrats (BORR Team 2019).

Cover score	Description
1	Seldom found species with insignificant cover
2	Very scattered individuals of a species with less than 1% cover
3	Scattered individuals of a species with 1-5% cover
4	Any number of individuals of a species with 5-10% cover
5	Any number of individuals of a species with 10-25% cover
6	Any number of individuals of a species with 25-33% cover
7	Any number of individuals of a species with 33-50% cover
8	Any number of individuals of a species with 50-75% cover
9	Any number of individuals of a species with greater than 75 % but less than 100%

[6] Vegetation cover scale: Vegetation cover at non-transect monitoring sites is recorded using the National Vegetation Information Vegetation System NVIS scale instead of the Domin-Krajina scale as agreed to previously by the BORR Team. The reason for this is that it more easily applied than the Domin-Krajina scale in non-quadrat estimates of cover and abundance.

7 The vegetation health / plant stress monitoring scale used for assessing plant stress in transects and at boundary photopoint from 2020 was updated from the initial round of baseline survey to include a wider range of plant stress indicators (BORR Team 11 August 2020).

Cover score	Description
10	Any number of individuals of a species with complete cover (100%) in the stand

Table 5. Plant stress scale for shrubs and trees within transect quadrats.

Plant Stress Level	Description
5	Plant with >81 % of the original canopy present; healthy overall; little or no leaf yellowing. No evidence of wilting of foliage. Plants not stressed.
4	Plant with 61-80% of the original canopy present; occasional dead branches (< 20 % of canopy); small patches of leaf yellowing. Plant leaves may show signs of wilting at periphery. Plants potentially stressed.
3	Plant with 41-60 % of the original canopy present; some smaller dead branches evident (21-40 % of canopy); moderate amount of leaf yellowing (21-40 % of canopy). Plant leaves may show signs of wilting with noticeable curling of leaf periphery. Plants exhibiting symptoms of stress.
2	Plant with 21-40 % of original canopy present; some main branches dead (50 – 80 % of canopy; abundant leaf yellowing (> 41 % of canopy). Plant leaves may show signs of wilting with noticeable curling of leaf. Plants exhibiting signs of stress.
1	Plant with <20 % of original canopy; most main branches dead; remaining leaves mostly dying off. Plant leaves may show signs of wilting with noticeable curling of leaf (approaching closure). Plants clearly stressed.

2.5 Boundary photopoints

Boundary photopoints are located at approximately 50 m intervals along the boundary of monitoring sites and the BORR project area (not around the perimeter of monitoring sites). The monitoring boundary for each site is 20 m from the photopoint. That is, 10 m on either side of the observer (photopoint) and 20 m into the vegetation being monitored. It is considered this area can be reasonably observed from a photopoint and will incorporate most elements required to be assessed at the monitoring point, e.g. all vegetation structural layers – upper, middle and understorey elements.

Boundary photographs are taken looking at right angles to the boundary towards the TEC or PEC occurrence using the phone/tablet app Photomon (Northern Agricultural Catchments Council 2014). With the use of the Photomon application, the exact location and direction can be guaranteed, due to the fact the photos has a ghosting feature from a 'guide' photo taken previously.

Photopoints are also situated at each end of transects (transect photopoints), with the vegetation 10 m on either side of the transect being assessed.

An index of photographs taken during all monitoring rounds is provided in **Appendix 2.**

The full set of comparative data collected since monitoring commenced for the key variables recorded at the boundary photopoints sites is presented in **Appendix 3** and for the transect end point photopoints in **Appendix 4.**

At each photopoint, the following information was collected:

- The location using a handheld GPS unit.
- A photograph (using the Photomon app) taken looking into the TEC/PEC or along the length of the transect.
- A description of the vegetation (including dominant tree, shrub, grass, sedge and herbaceous species), weed cover percentage, vegetation condition, evidence of erosion, flooding, pathogens, rubbish and grazing impacts.
- Major weed species and their percentage cover (except at transect photopoints[8]).
- Percentage cover of natives (autumn 2020 onwards) this value was assessed as a single, composite value in the autumn 2020 monitoring round. Prior to this, native cover was assessed as part of the assessment of vegetation structure[9].
- Record the stress of the trees (dominant shrubs, in the absence of trees) within the 20 x 20 m assessment area using the revised stress scale presented in **Table 5.**

Variables of species/cover, disease, disturbance, etc., are recorded using Fulcrum.

Vegetation condition is assessed against the method of the EPA (2016) (**Appendix 5**).

Assessment of vegetation structure is based on the Keighery (1994) structural classification, which is similar to that of the foliage cover of the National Vegetation Information System (NVIS) structural classification system (NVIS 2017).

The percentage cover of natives and weeds vegetation cover at non-transect monitoring sites is recorded using the National NVIS (2017) canopy cover scales.

Impact from Phytophthora dieback and Marri canker were recorded as part of standard vegetation monitoring undertaken at all monitoring locations. Four scales of impact were recorded:

1. Low impact: 1-2 plants
2. Medium impact: active front visible, some death
3. Heavy impact: active front visible, numerous deaths
4. Old impact site: vegetation structure altered.

2.6 Transect and photopoint monitoring site summary

Transects were established at two potential impact Banksia sites (BW-S-PI-1 and BW-S-PI-5), one potential impact Tuart site (TW-S-PI-2) and one potential impact Claypan site (CP-S-PI-

[8] This information was not collected at photopoints associated with transects because it was collected for the transect quadrats.

[9] The method of assessment for native vegetation cover was not stipulated in the original scope for the project, just that it should be assessed as a percentage.

1). The remaining potential impact sites are monitored via photopoints only. All reference sites have transects and photopoints. A breakdown of the number and type of transects and/or photopoints within each monitoring site is provided **Table 6**.

Table 6. Breakdown of monitoring points at each site.

Number	Site	Number boundary monitoring sites	Number transects (number of photopoints in brackets)
Potential impact sites			
1	BW-S-PI-1	5	1 (2)
2	BW-S-PI-3	7	-
3	BW-S-PI-4	4	-
4	BW-S-PI-5	34	1 (2)
5	BW-S-PI-8	8	-
6	TW-S-PI-2	20	1(2)
7	TW-S-PI-3	4	-
8	TW-S-PI-4	3	-
9	CP-S-PI-1	3	1 (2)
	Total	**88**	**4(8)**
Reference sites			
1	BW-S-R-1		2 (4)
2	BTW-S-R-1		1 (2)
3	BTW-S-R-2		1 (2)
4	CP-NS-R-1[10]		1 (2)
5	CP-NS-R-2		1 (2)
	Total		**6(12)**
	Grand Total	**88**	**10(20)**

[10] The CP-NS-R-1 and CP-NS-R-2 sites serve as Reference Sites for both the BORR Northern & Central Section and BORR Southern Section due to the limited number of suitable Claypan TEC occurrences within reasonable proximity to the referral area.

2.7 Drainage monitoring

Drainage monitoring was first undertaken in autumn 2020. Drainage monitoring is carried out quarterly (each season).

Drainage monitoring is conducted via a foot traverse along the length of potential impact site boundaries and along the transects within Reference sites. Three drainage disturbance variables are measured: flooding/inundation, erosion and non-seasonal drying effects (**Table 7**). If drainage disturbance is noticed, the location of this point are recorded using a hand-held GPS, and a photograph and description of the disturbance are taken. Where a disturbance is considered to have impacted vegetation, a plant stress assessment is conducted using the scale shown in **Table 5**. This scale was used to describe non-seasonal drying effects, i.e., those that would not normally be expected during the particular season.

The drainage monitoring information recorded has been based on the visual assessment field sheet created by the BORR IPT and provided in **Appendix 6.** This information is currently collected using the infield app, Fulcrum.

Table 7. Descriptions of the three disturbance variables recorded during drainage monitoring.

Disturbance Variable	Description
Flooding/Inundation	Flooding or inundation of vegetation resulting from run-off from a roadway
Erosion	Erosion, primarily caused by water that has resulted from runoff from a roadway
Drying effects	Drying off (yellowing and/or death) of vegetation that may have been caused by changes in hydrology caused by roadway construction. (Potentially as a result of new *Phytophthora* disease infection, but not including normal seasonal leaf drop in summer and early autumn).

The triggers for investigation with regards to 'drainage disturbance impacts' are:

1. If TEC vegetation is inundated or flooded for 24 hours as a result of project activities.
2. Evidence of new erosion in monitored TEC vegetation.
3. TEC vegetation health declined relative to reference sites.

2.8 Comparative analysis

Comparative analysis of data occurs on two bases: between different monitoring rounds for the same sites, and between Potential Impact and Reference sites of the same community type. The analysis considers changes with regard to absolute number (e.g., number of species) and category score (e.g., cover or stress rating)

While it is not considered likely that statistical analysis will be required to detect changes reaching either specified trigger or threshold levels (BORR Team 2020, Main Roads 2022), where warranted, a paired t-test or repeated measures ANOVA may be used, noting that, due to differences in some vegetation characteristics between Potential Impact and Reference sites, and the relatively low number of sites, the tests would have a low "power" to detect a real difference between the two means.

A change is potentially significant and worthy of further investigation when there is a negative variation in the result for any measured variable, in particular for dominant

vegetation structure, vegetation condition, weed cover, native diversity and cover at anyone monitoring point. For example, a change worthy of investigation may include:

- Vegetation structure: A Banksia Low Woodland changing to a Banksia Open Low Woodland
- Vegetation condition: Good condition vegetation changing to Degraded condition vegetation
- Weed cover: <2% weed cover changing to 2-10% weed cover
- Native cover: 30-70% native cover changing to 10-30% native cover and
- Plant Stress: trees / largest shrubs within the survey area changing by one grade point, for example, from a 5 to 4.

These changes are compared against reference sites of the same vegetation type, or data from previous rounds at the same site, to determine whether the change is the result of project-attributable impacts, or of other more regional scale impacts, such as drought.

2.9 Reportable decline

The Vegetation Monitoring Plan (BORR Team 2020) submitted as part of the State environmental approval defines a change or decline considered to be a reportable decline as 'where monitoring shows a 20% decline in the species composition and / or health / stress attributes of the TEC / PEC potential impact sites against the change at reference sites'.

The process for determining whether a reportable decline has occurred is outlined chronologically in the following steps:

1. Determine whether a significant change/decline has occurred

2. If yes, determine whether the significant change/decline is project attributable

3. If yes, then a reportable decline has occurred.

It is understood for the purposes of the monitoring that the reportable declines are to be relative to baseline levels across a site or data from reference sites. The baseline levels for this project, reported in Ecoedge (2023) are based on TEC PEC monitoring data collected from spring 2019 to winter 2022 prior to the commencement of the project which commenced in August 2022.

3 Personnel

The TEC PEC monitoring for the period May 31 2022 to May 31 2023 was conducted by Colin Spencer, lead botanist (flora permit FB62000169), Ben Eckermann, botanist (flora permit FB62000262), and Debbie Brace botanist (flora permit FB62000504).

4 Limitations

Limitations with regard to this reporting period are addressed in **Table 8.**

Table 8. Limitations of the field monitoring with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Proportion of flora identified	Minor	Spring transect monitoring was carried out from 22 September to 21 November 2022, which covers the optimum time for identification of flora within the Bunbury region.
Climatic and seasonal effects	Minor	About average rainfall and temperatures were recorded for the 2022 survey period, when compared to the 27-year average for the Bunbury Weather Station (No. 9965).
Availability of contextual information	Not a constraint	Data and reports from numerous studies conducted on Swan Coastal Plain vegetation are available to provide context for the monitoring program.
Completeness of the survey	Not a constraint	All monitoring sites were accessible and able to be easily assessed.
Skill and knowledge of the botanists	Minor	The lead botanist has eight years' of experience in undertaking botanical survey and over 20 years' experience in vegetation management on the Swan Coastal Plain
Consistency of monitoring personnel	Minor	The lead botanist has participated in all vegetation monitoring episodes since the project commenced in spring 2019 and has ensured consistency in assessment of monitored parameters including vegetation condition, plant stress and weed cover. However, it is noted that some variation in assessment values due to interpretation of field conditions between observers may occur.
Disturbance (fire, grazing, clearing etc.)	Minor	At the time of survey, no sites were impacted/disturbed, such that they could not be meaningfully surveyed.
Collection and storage of data	Minor	Data was collected and stored using various applications on electronic devices and pen/paper notebooks. A coordinated approach is required, so data does not get lost or corrupt.

5 Results

5.1 Weather

Rainfall and temperature statistics for the 2019–2022 survey period as compared to the 1995-2022 average for the Bunbury Weather Station (No.9965) are shown in **Figure 3** and **Figure 4.**

This information provides context to observed changes or trends in vegetation that may arise from variations in weather, for example, from prolonged, unseasonal drought impacts reducing plant germination and increasing plant stress.

The statistics show that the mean temperature for the period between 2020 – 2022 was generally comparable (+ - 0.2degrees) to the mean temperature measured between 1995 and 2022 (BOM 2023).

2019 was however noticeably warmer (+0.5 degrees) and drier than average (144.2 mm less rainfall for the [11]wet season). 2020 had comparable rainfall to the average, however both 2021 and 2022, in particular 2021, were wetter than average.

For the 2019 to 2022 monitoring period the amount of late spring and summer rainfall, was generally just below average, but the 'reviving rains' which commence in the March-April period were generally above average (**Figure 5, Table 9**).

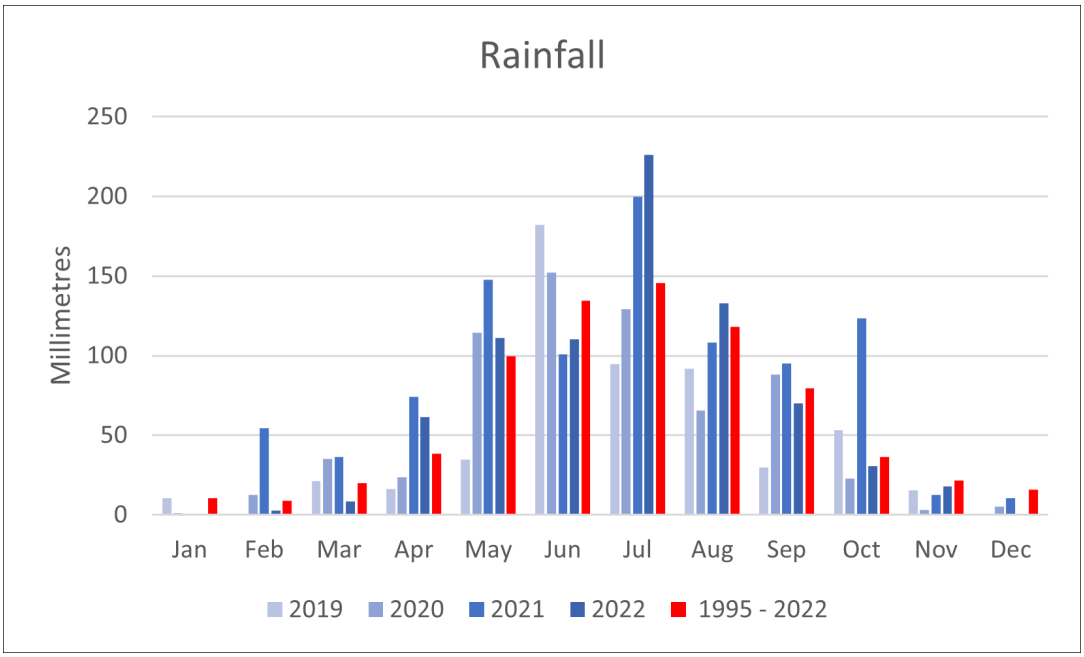


Figure 3. Long term mean and 2019 to 2022 mean rainfall for Bunbury Rain station 9965 BOM (2020).

[11] The 'wet season' – for the purposes of this report is from May to September as this is when most of the annual rainfall occurs.

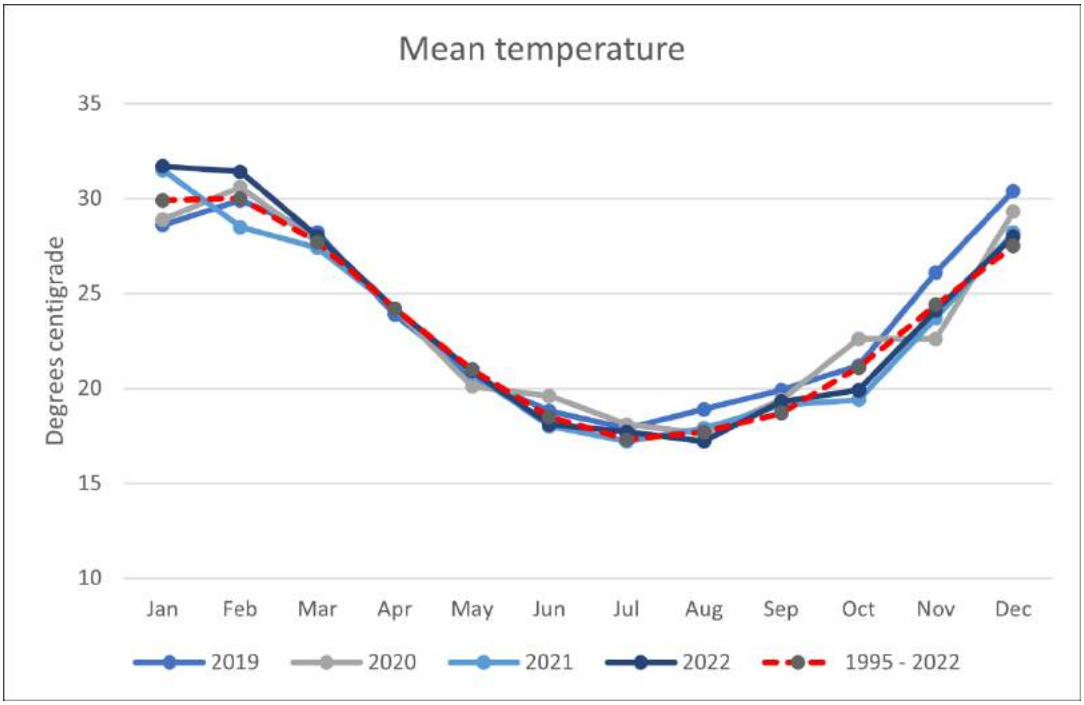


Figure 4. Long term mean and 2019 to 2022 mean temperature for Bunbury Rain station 9965 BOM (2023).

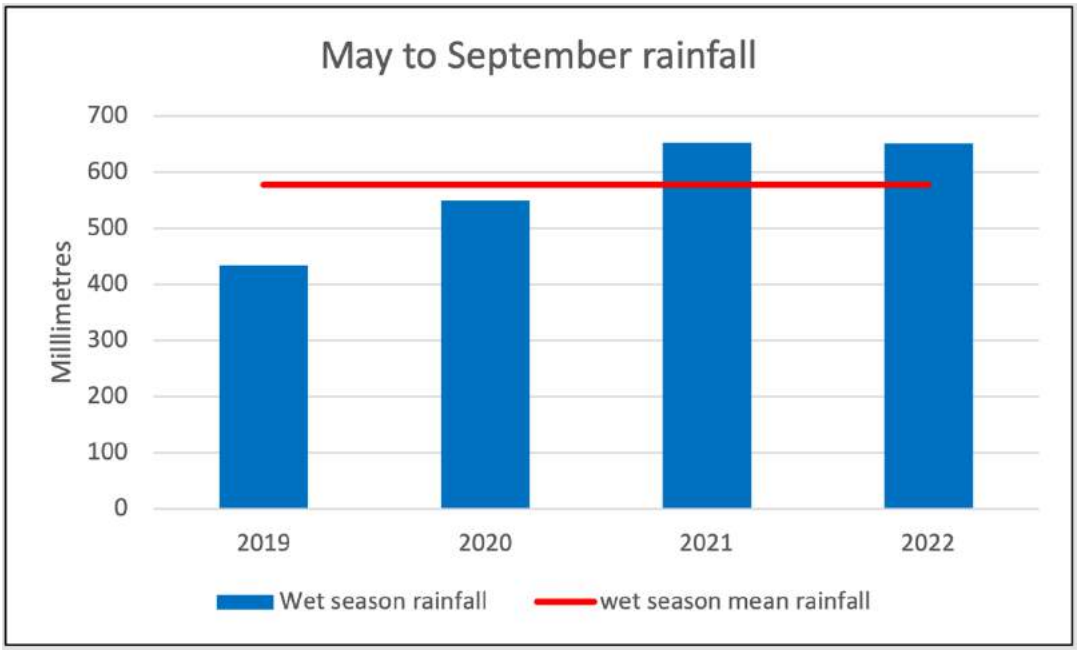


Figure 5. Long term and 2019 to 2022 mean wet season (May to September) rainfall for Bunbury weather station 9965 BOM

Table 9. Rainfall and temperature statistics for 2019 and 2022 for the Bunbury weather station No. 9965 (BOM 2023).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan – De c
Rainfall Totals													
2019	10.6	0	21.2	16.2	34.8	182	94.6	91.8	30	53.2	15.4	0.2	550
2020	1.2	12.4	35.2	23.6	114.4	152.2	129	65.6	88.2	23	3	5	652.8
2021	0.2	54.6	36.4	74.0	147.8	101.0	199.8	108.2	95.2	123.4	12.6	10.6	963.8
2022	0	2.8	8.6	61.6	111	110.4	226.2	132.8	70.2	30.6	18	0	772.2
1995 - 2022	10.4	8.8	19.9	38.4	99.5	134.5	145.5	118.2	79.7	36.4	21.4	15.8	730.4
Temperature Averages													
2019	28.6	29.9	28.2	23.9	20.6	18.8	17.9	18.9	19.9	21.2	26.1	30.4	23.7
2020	28.9	30.6	27.7	24.2	20.1	19.6	18.1	17.6	19.4	22.6	22.6	29.3	23.4
2021	31.5	28.5	27.4	24.2	20.8	18.0	17.2	17.9	19.1	19.4	23.7	28.2	23
2022	31.7	31.4	28	24.2	20.9	18.1	17.7	17.2	19.3	19.9	24.1	28	23.4
1995 - 2022	29.8	30	27.7	24.2	21	18.6	17.3	17.7	18.6	21.2	24.5	27.5	23.2

5.2 Potential impact and reference site vegetation descriptions

A description of the modal vegetation for each monitoring site based on dominant vegetation identified within each structural layer is presented in **Table 10**. These descriptions are based on an assessment of vegetation at each photopoint across the monitoring site. A total of six Banksia Woodlands, two Banksia Tuart Woodlands, three clay pans and three Tuart Woodland sites were monitored.

Table 10. Vegetation descriptions for current monitoring sites

Site Name	Vegetation description Autumn 2023
BW-S-PI-1	*Corymbia calophylla* and *Eucalyptus marginata* Open Woodland over *Banksia attenuata, Agonis flexuosa, Xylomelum occidentale, Banksia grandis* Low Open Woodland over *Kunzea glabrescens* Tall Open Shrubland over *Jacksonia sternbergiana, Acacia extensa, Stirlingia latifolia brunonis* Open Shrubland over *Xanthorrhoea brunonis, Hibbertia hypericoides* and *Macrozamia riedlei* Low Open Shrubland over Lomandra micrantha, *Phlebocarya ciliata* Very Open Herbland and **Ehrharta calycina*, **Briza maxima* Very Open Grassland and *Lepidosperma squamatum* and *Hypolaena exsulca* Very Open Sedgeland.
BW-S-PI-3	*Eucalyptus marginata* Open Woodland over *Banksia attenuata Banksia ilicifolia, Xylomelum occidentale* Low Open Woodland over *Kunzea glabrescens* Tall Open Shrubland over *Macrozamia riedlei, Stirlingia latifolia* Open Shrubland over *Hibbertia hypericoides, Melaleuca thymoides, Acacia pulchella* Low Shrubland over *Phlebocarya ciliata Dasypogon bromeliifolius* Very Open Herbland over *Lepidosperma pubisquameum* Very Open Sedgeland and **Ehrharta calycina* Very Open Grassland.
BW-S-PI-4	*Eucalyptus marginata, Corymbia calophylla* Woodland Corymbia calophylla, Banksia attenuata, Banksia grandis, Xylomelum occidentale Low Open Woodland *Kunzea glabrescens, Persoonia longifolia* Tall Open Shrubland over *Hibbertia hypericoides, Acacia pulchella, Dasypogon bromeliifolius, Opercularia hispidula* Low Shrubland *Phlebocarya ciliata, Lomandra micrantha* Open Herbland *Lepidosperma squamatum, Lyginia imberbis, Lepidosperma pubisquameum* Open Sedgeland
BW-S-PI-5	*Eucalyptus marginata* and *Corymbia calophylla* Open Woodland over *Banksia attenuata, Xylomelum occidentale, Banksia grandis* Low Open Forest over *Hibbertia hypericoides, Xanthorrhoea brunonis* and *Macrozamia riedlei* Low shrubland over *Phlebocarya ciliata*, *Conostylis aculeata*, *Burchardia congesta*, *Orthrosanthus laxus* Very Open Herbland **Ehrharta calycina*, **Briza maxima* Very Open Grassland and *Lepidosperma squamatum*, *Lepidosperma pubisquameum* and *Hypolaena exsulca* Very Open Sedgeland.
BW-S-PI-8	*Eucalyptus marginata, Corymbia calophylla Open Woodland over Agonis flexuosa, Banksia attenuata, Banksia grandis and Xylomelum occidentale Low Open Forest over Spyridium globulosum, Jacksonia horrida, Acacia cochlearis, * Acacia iteaphylla Open Shrubland over Hibbertia hypericoides, Macrozamia riedlei, Xanthorrhoea brunonis, Phyllanthus calycinus and Styphelia racemulosa Low Shrubland to Open Low Heath over Dichopogon capillipes, Lagenophora huegelii, Lomandra micrantha, Orthrosanthus laxus and *Hypochaeris glabra Open Herbland over *Briza maxima, *Ehrharta calycina Open Grass land and Morelotia octandra and Lepidosperma squamatum Very Open Sedgeland.*
BTW-S-R-1	*Eucalyptus gomphocephala, Eucalyptus marginata, Corymbia calophylla* Open Woodland over *Banksia attenuata, Xylomelum occidentale* Low Woodland over *Macrozamia riedlei, Xanthorrhoea brunonis* Open Shrubland over *Hibbertia hypericoides, Phyllanthus calycinus* Low Shrubland over Lomandra caespitosa, **Ursinia anthemoides* Open herbland over **Briza maxima* Very Open Herbland.
BTW-S-R-2	*Eucalyptus gomphocephala* Open Woodland over *Agonis flexuosa*, *Banksia grandis* Low Woodland over *Spyridium globulosum* Tall Open Shrubland over *Macrozamia riedlei* Open Shrubland over *Hibbertia hypericoides* Very Open Shrubland over *Orthrosanthus laxus*, *Phlebocarya ciliata* Open Herbland, *Morelotia octandra*, *Lepidosperma squamatum* Very Open Sedgeland and **Briza maxima* Very Open Grassland.

Site Name	Vegetation description Autumn 2023
BW-S-R-1	*Eucalyptus marginata* Open Woodland over *Banksia attenuata, Eucalyptus marginata* Low Woodland over *Kunzea glabrescens* Tall Shrubland over *Hibbertia hypericoides, Calytrix flavescens, Gompholobium tomentosum, Bossiaea eriocarpa* Low Shrubland over *Lepidosperma squamatum* Very Open Sedgeland.
CP-S-PI-1	*Eucalyptus marginata, Corymbia calophylla* Open Woodland over *Banksia attenuata, Banksia grandis, Banksia ilicifolia* Low Open Woodland over *Macrozamia riedlei* Open Shrubland over *Macrozamia riedlei, Hibbertia hypericoides, Xanthorrhoea brunonis* Low Shrubland over *Lomandra micrantha, Conostylis aculeata, Burchardia congesta* Very Open Herbland over *Lepidosperma squamatum* Very Open Sedgeland and **Briza maxima, *Ehrharta calycina* Open Grassland.
CP-NS-R-1	*Corymbia calophylla, Eucalyptus rudis* Open Woodland over *Melaleuca rhaphiophylla, Acacia saligna Low* Open Woodland over *Viminaria juncea* Tall Shrubland over *Xanthorrhoea preissii, Hakea varia* Shrubland over *Hakea varia, Grevillea bipinnatifida, Hypocalymma angustifolia* Low Open Shrubland over **Babiana angustifolia* Open Herbland over *Mesomelaena tetragona, Morelotia octandra, Cyathochaeta avenacea* Open Sedgeland.
CP-NS-R-2	*Melaleuca viminea Tall Shrubland* over *Blennospora doliiformis, Centrolepis aristatus, *Bartsia viscosa* Herbland.
TW-S-PI-2	*Eucalyptus gomphocephala* Open Woodland over *Banksia attenuata, Agonis flexuosa, Xylomelum occidentale* Low Woodland over *Spyridium globulosum* Tall Open Shrubland over *Hibbertia hypericoides, Xanthorrhoea brunonis* and *Macrozamia riedlei* Low Shrubland over *Orthrosanthus laxus, Dichopogon capillipes*, **Ursinia anthemoides* Very Open Herbland and **Briza maxima, *Avena barbata, *Ehrharta calycina* Open Grassland and *Lepidosperma squamatum* Very Open Sedgeland.
TW-S-PI-3	*Eucalyptus gomphocephala, Corymbia calophylla* and *Eucalyptus marginata* Woodland over *Agonis flexuosa* and *Banksia attenuata Low* Woodland *over Jacksonia furcellata and Daviesia divaricata Open Shrubland over Xanthorrhoea brunonis and Macrozamia riedlei* Very Open Shrubland over *Lomandra micrantha, Conostylis aculeata* var*. preissii* Very Open Herbland and *Ehrharta calycina* Open Grassland.
TW-S-PI-4	*Eucalyptus gomphocephala, Eucalyptus marginata* Woodland over *Agonis flexuosa, Banksia attenuata, Banksia grandis* Low Woodland *over Xanthorrhoea brunonis* Very Open Shrubland *Lomandra suaveolens, Lomandra micrantha, Conostylis aculeata* var*. preissii, *Anagallis sp., Oxalis pes-caprae* Open Herbland *Briza maxima Ehrharta calycina* Open Grassland.

* Denotes introduced species.

5.2.1 Comparison of potential impact and reference site transect monitoring sites

Representative data for the key variables (diversity of natives, including orchids, diversity and cover of weeds and shrub and trees stress) monitored at each transect monitoring site for the 2019 to 2022 spring monitoring periods is presented in **Table 11**. Graphs showing the comparative trends in this data between potential impact sites and reference sites for each TEC PEC type is presented below, **Figure 6** for Banksia woodland sites, **Figure 7** for Claypan sites, **Figure 9** for Banksia Tuart woodland sites and **Figure 9** showing average stress for all TEC/ PEC sites monitored.

The trends are discussed for each TEC PEC and an assessment is made with regards to the need to make a reportable decline and project attributable indirect impacts.

Table 11. Representative data for the six key variables for Potential Impact and Reference sites in the BORR South project area.

Site Name	Year	Total taxa	Natives	Orchids	Weeds	Maximum weed cover	Average stress
BW-S-PI-1_T1	2019	21	17	0	4	3	4.67
	2020	29	23	1	6	6	4.50
	2021	31	23	1	8	6	3.67
	2022	36	28	1	8	5	5.00
BW-S-PI-5_T1	2019	22	20	0	2	3	4.88
	2020	40	36	1	4	8	4.83
	2021	35	31	2	4	5	4.71
	2022	36	32	3	4	5	4.38
BW-S-PI-8_T1	2022	51	44	3	7	4	4.92
BW-S-R-1_T1	2019	58	54	0	4	4	4.86
	2020	30	28	3	2	2	5.00
	2021	26	23	3	3	1	4.71
	2022	35	30	3	5	2	4.89
BW-S-R-1_T2	2020	31	30	5	1	4	5.00
	2021	31	30	5	1	3	4.44
	2022	30	28	4	2	2	4.58
BTW-S-R-1_T1	2020	41	35	0	6	7	4.78
	2021	42	35	2	7	6	4.67
	2022	50	44	3	6	6	4.55
BTW-S-R-2_T1	2020	34	28	1	6	5	3.50
	2021	44	32	3	12	6	4.33
	2022	42	32	4	10	5	3.80
TW-S-PI-2_T1	2019	25	21	4	0	8	5.00
	2020	38	25	13	0	5	4.67

Site Name	Year	Total taxa	Natives	Orchids	Weeds	Maximum weed cover	Average stress
	2021	42	28	14	2	5	4.71
	2022	47	33	14	3	5	4.71
CP-S-PI-1_T1	2019	37	24	13	0	4	5.00[12]
	2020	35	14	21	0	9	5.00
	2021	46	27	19	0	5	
	2022	52	33	19	0	5	
CP-NS-R-1_T1	2019	21	17	0	4	4	4.81
	2020	36	28	0	8	4	3.56
	2021	36	26	0	10	5	4.83
	2022	33	23	0	10	6	4.86
CP-NS-R-2_T1	2020	34	22	1	12	5	
	2021	19	11	0	8	5	5.00
	2022	31	21	1	10	4	4.50

[12] There are no trees or shrubs within this claypan transect. Stress was mistakenly recorded for some herbaceous species in 2019 and 2020, which was not recorded in the 2021 and 2022. This explains the absence of data in 2021 and 2022.

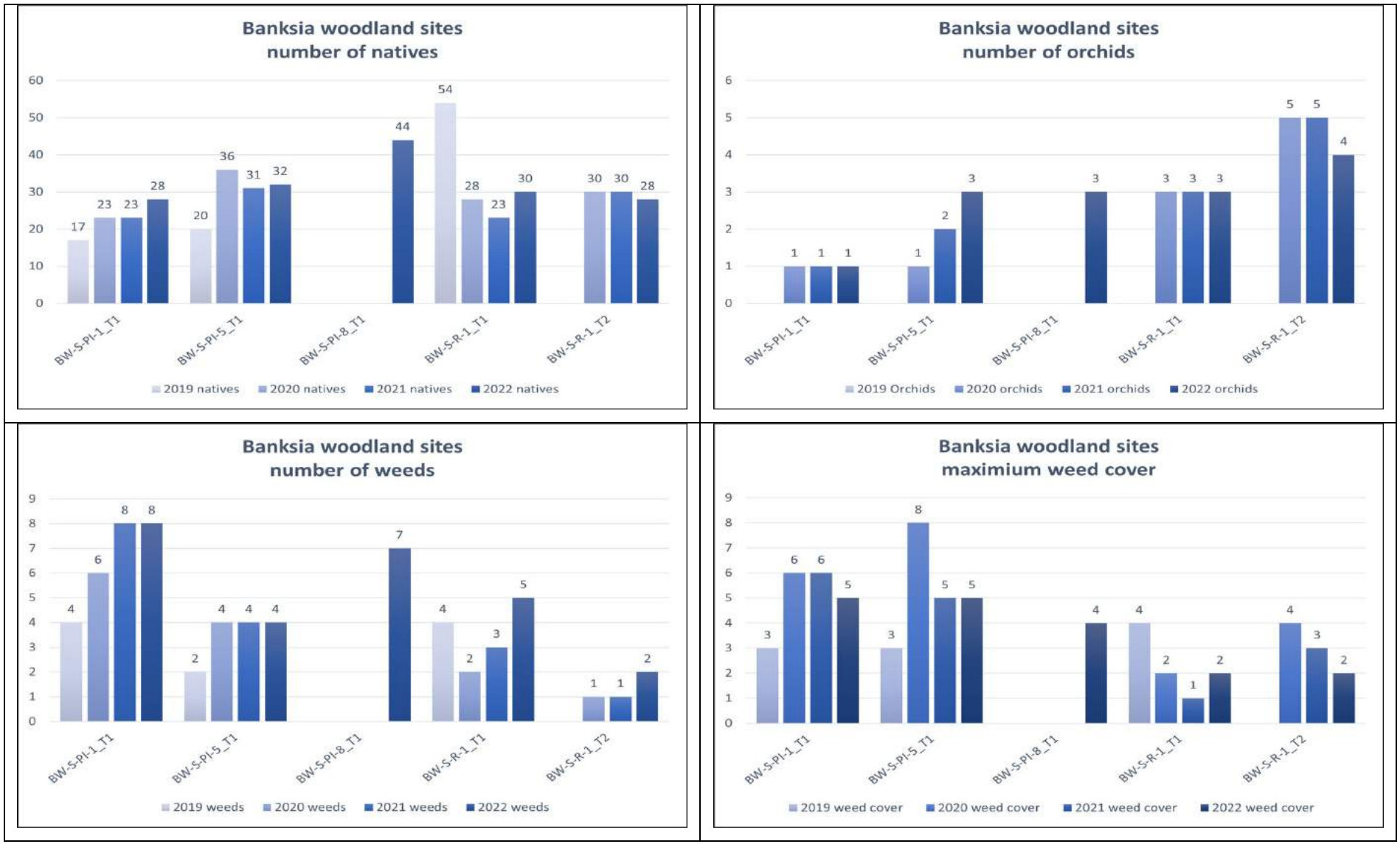


Figure 6. Banksia woodland transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.

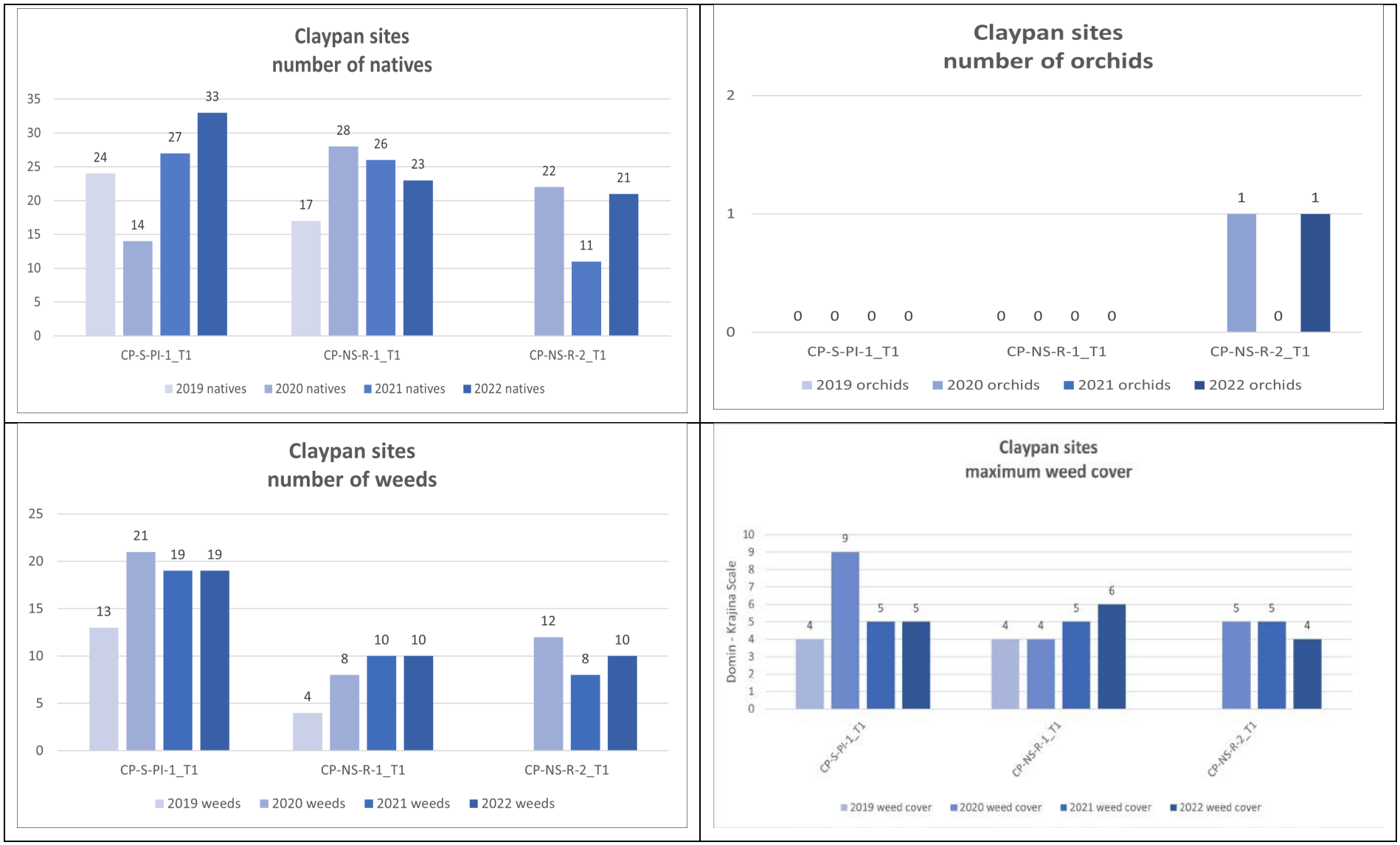


Figure 7. Claypan transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.

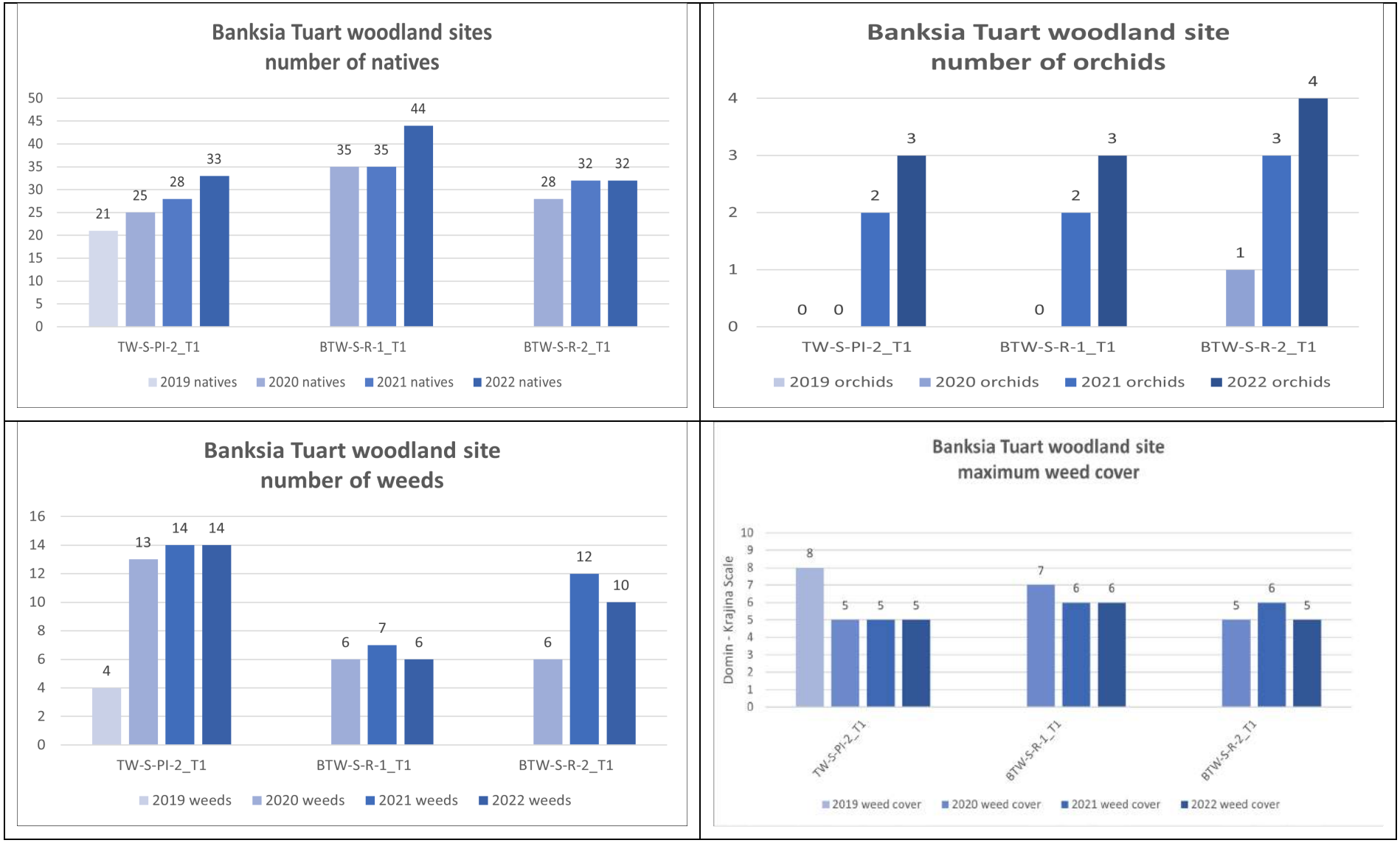
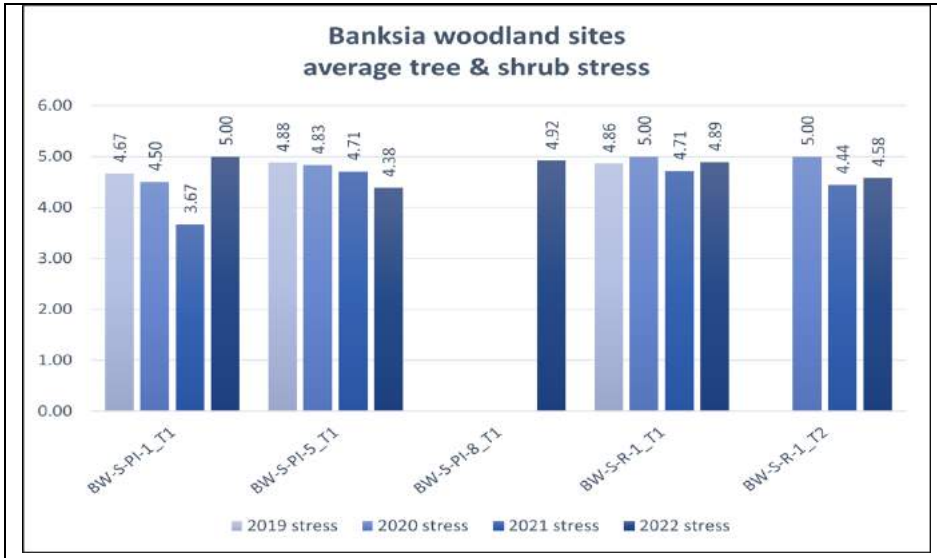
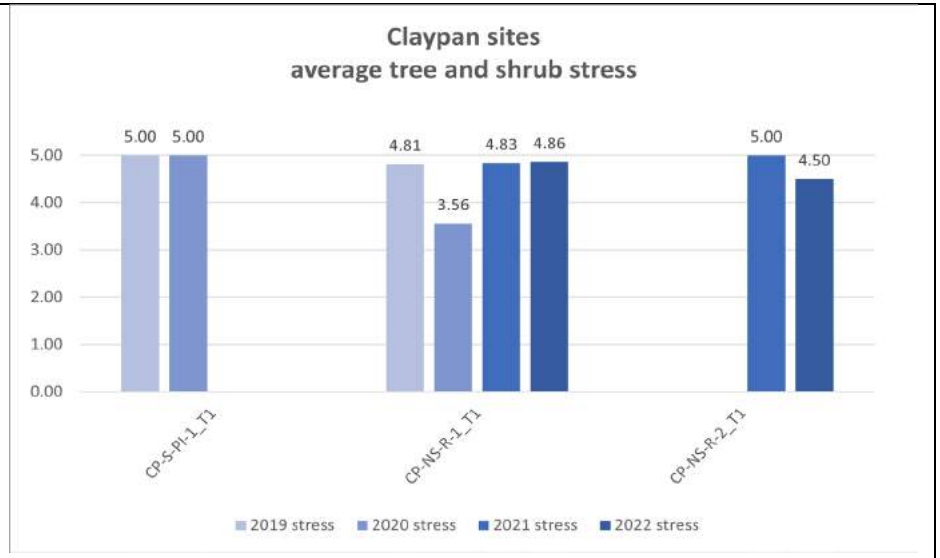


Figure 8. Banksia Tuart woodland transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.





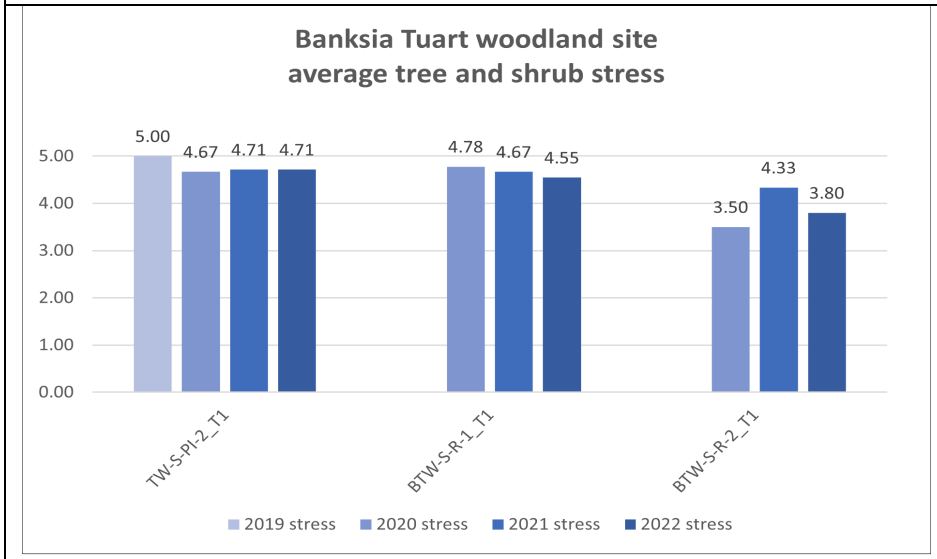


Figure 9. Graphs showing comparative data for potential impact sites and reference sites for average tree and shrub stress in Banksia woodland, Claypan and Banksia Tuart woodland TEC PEC sites.

5.2.2 Weed diversity and cover

Banksia woodlands

The levels of weed diversity were consistent with base line levels for PI sites BW-S-PI-1_T1 and BW-S-PI-5_T1 in the 2022 monitoring period. Maximum weed cover was consistent for BW-S-PI-5 but reduced by one increment for BW-S-PI-1_T1 from 6 (25-33% cover) to 5 (10-25% cover). The reduction is due to a variation in germination of common annual weeds such as *Briza maxima* and *Briza minor*.

By contrast weed diversity increased in reference sites by one species in BW-S-R-1_T2 and two species in BW-S-R-1_T1 relative to base line levels. This increase in diversity was reflected in an increase in maximum weed cover for BW-S-R-1_T1 but the increase in diversity was not matched with increased weed cover for BW-S-R-1_T2, which instead showed a decrease in weed cover.

The variable and apparently contradictory trends in both potential impact sites and reference sites is due to the variable germination of small annual weeds, in particular the common grass *Briza maxima* which is a common feature of most Banksia woodland quadrats.

Monitoring of the BW-S-PI-8_T1 transect only commenced in spring 2022 so no pre-construction baseline data for this transect is available[13].

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts or a requirement to make a reportable decline with regards to weeds for Banksia woodland potential impact TEC sites because there was no increase in weed diversity or weed cover for the potential impact sites.

Claypans

The levels of weed diversity and maximum weed cover were consistent with base line levels for the one Claypan PI site CP-S-PI-1_T1 (**Figure 7**). Weed diversity was also consistent at one reference site CP-NS-R-1_T1 but increased by two species at the other site CP-NS-R-2_T1. Weed diversity remained consistent at CP-NS-R-1_T1 but cover increased from 5 (10-25% cover) to 6 (25%-33%). Maximum weed cover levels did not correlate with increases in weed diversity in CP-NS-R-1 with a decreased weed cover recorded. The claypan weeds tend to be dominated by small annual weeds, which are observed to have a variable germination. Small annuals e.g. < 5 cm have a low potential weed cover, unless present in very high numbers.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts or reportable declines with regards to weeds for Claypan potential impact TEC sites because there was no increase in weed diversity or maximum weed cover within the potential impact site compared to baseline levels.

[13] Boundary point monitoring at BW-S-PI-8 commenced in winter 2022 prior to construction.

Tuart woodlands

The levels of weed diversity and maximum weed cover within the Tuart woodland PI site TW-S-PI-2_T1 were consistent with baseline levels. This trend is generally similar with one of the reference sites BTW-S-R-1_T1 which maintained its weed cover but had a minor reduction of one species in weed diversity. The other reference site also had a minor reduction in weed diversity, two species but also experienced a reduction in maximum weed cover from to 6 (25%-33%) to 5 (10-25% cover). The decrease in diversity and cover is attributed to variable germination in small annual weeds.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to weeds for Tuart woodland potential impact sites because there was no increase in weed diversity or weed cover for potential impact site compared to baseline levels.

5.2.3 Native diversity

Banksia woodlands

The diversity within the Banksia woodland PI sites increased from baseline levels for both BW-S-PI-1_T1 and BW-S-PI-5_T1 consistent with the general increase in diversity for the PI sites since monitoring commenced in 2019[14]. The increases are attributed to higher numbers of small annual herbs, in particular species of the *Isolepis, Centrolepis* and *Hydrocotyle* and new seedlings which are more prevalent in higher rainfall years, such as that which followed the hot and dry 2019. This general increase in diversity was comparable to reference site BW-S-R-1_T1 but contrasted to the small decrease observed for BW-S-R-2_T1. Noting that the 54 species recorded in 2019 for BW-S-R-1_T1 is an anomaly most likely due to a recording error, with levels around 30 species more accurately reflecting the site's diversity.

Orchid diversity was stable for BW-S-PI-1_T1 but increased for BW-S-PI-5. The increases again can be attributed to wetter and more moderate seasons which followed the dry 2019 season a spatially variable increase in the occurrence of the common species *Caladenia flava* and *Thelymitra crinita* which is in addition to the already present common orchid *Pyrochis nigricans*.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to native diversity for the Banksia woodland potential impact sites because there was no decrease in native diversity, including orchid diversity compared to baseline levels.

[14] Monitoring of the BW-S-PI-8_T1 transect site only commenced in spring 2022 so no pre-construction baseline data for this transect is available.

Claypans

The diversity of natives in Potential Impact site CP-S-PI-1_T1 increased from baseline levels. This is in contrast to the two reference site transects which experienced a minor decrease in diversity. The variations, both positive and negative, can be attributed to the variable germination in annual herbs within the claypans some of which had low cover / abundance scores of 1 (seldom found species with insignificant cover) or 2 (very scattered individuals of a species with less than 1% cover). This means that they are vulnerable to changes within the local environment.

There were no orchids recorded within the PI site in the post construction period which was consistent with baseline levels.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to native diversity for the Claypan potential impact sites because there was no decrease in native diversity, including orchid diversity compared to baseline levels.

Tuart woodlands

The diversity of natives in the one Tuart woodland potential impact transect site TW-S-PI-2_T1 increased from baseline levels. This increase is consistent with the steady increase in species since monitoring commenced at the site in 2019. Native diversity also increased at Reference site BTW-S-R-1_T1, but rather than steadily it occurred as a spike of nine new species. The additional species were almost all annually regenerating species such as the grass *Austrostipa compressa* and small herbs *Centrolepis pilosa, Hydrocotyle callicarpa, Isolepis marginata* and the orchids *Caladenia flava* and C*. attingens*. BTW-S-R-1_T1 is similar to TW-S-PI-2_T1 in that it has a range of micro-habitats including open areas and large logs conducive to colonisation of annually regenerating species.

By contrast levels of native diversity at reference site BW-S-R-2_T1 were consistent with baseline levels. BTW-S-R-2_T1 has an overall denser understorey with fewer open areas conducive for the colonisation of small annual herbs, so the fluctuation in diversity and number of annual herbs is less likely than for either BTW-S-R_T1 and TW-S-PI-2_T1.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to native diversity for the Tuart woodland potential impact sites because there was no decrease in native diversity, including orchid diversity compared to baseline levels.

5.2.4 Shrub and Tree stress

Banksia woodlands

Stress levels were observed to reduce by over 20% in 2021 for BW-S-PI-1_T1 from prior monitoring levels. This reduction is attributed to the absence of a single *Macrozamia reidlei* which was observed in very poor health with a 1 health rating in 2021 but not recorded in 2022. This *Macrozamia* may be regarded as an outlier which skewed the results in 2021 as the other stress levels were all either 4 or 5. With the exception of this observed variation the overall trend in stress for both potential impact and reference sites is generally

consistent with little variation from baseline levels across all sites. All scores were between a stress level of 4 and the maximum health of 5.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to plant stress for the Banksia woodland potential impact sites because increases in stress were less than 20% and comparable to the reference sites.

Claypans

Stress levels for trees and shrubs in the claypan sites remained stable for CP-S-PI-1_T1 consistent with the generally low and stable stress levels for the reference sites, the only exception being in 2020 at reference site CP-NS-R-1 where there was more than a 20% decline in health. This was attributed to a decline in health of *Viminaria juncea* and *Hypocalymma angustifolia* likely due to drought stress experienced from the previous year. The stress ratings for this site reduced to 2019 levels for the 2021 and 2022 reporting period with an observed increase in the health of the *Viminaria*.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to plant stress for the monitored Claypan Potential Impact sites because stress levels were stable relative to baseline levels.

Tuart woodlands[15]

The average stress level within the potential impact site TW-S-PI-2_T1 was consistent with baseline levels which have remained generally stable since 2020. Stress levels within the reference site BTW-S-R-1_T1 have been low but with a slow increasing trend. The other reference site BTW-S-R-1_T2 is the most stressed site and is also observed to have the largest fluctuations in stress. Most of this stress is attributed to observed levels of stress in *Macrozamia riedlei* which were recorded with the greatest stress in the transect. The stress recorded for the other trees and shrubs was generally lower with ratings of 4 or 5. Interestingly ongoing observations of *Macrozamia* across the BORR project area and in bushland in general has showed that the observed decline, expressed as death of outer leaves, which was recorded as evidence of stress is likely just part of the normal growth cycle of healthy *Macrozamia* plants.

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts, or reportable declines with regards to plant stress for the monitored Tuart woodland potential impact sites because stress levels were stable relative to baseline levels.

[15] The Tuart PI transect sites are compared with Banksia Tuart woodland transect reference sites due to the absence of transect reference sites within just Tuart woodland.

5.2.5 Plant deaths

Plant deaths for all perennial shrubs and trees have been recorded within potential impact and reference site transects since monitoring commenced in 2019. During this time there have been no deaths recorded.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to plant deaths for the monitored TEC and PEC community types relative to baseline levels.

5.3 Comparison of biannual photopoints

5.3.1 Vegetation structure

There were no significant changes in dominant species or vegetation structure at any of the 108 photopoints monitored between autumn 2023 and the commencement of monitoring in spring 2019. This means that there was no change in the vegetation descriptions described for the monitoring sites.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts, or reportable declines with regards to vegetation structure at any of the monitored TEC and PEC community types relative to baseline levels.

5.3.2 Vegetation condition

There were only two changes in vegetation condition out of the 125 monitoring points between the 2019 and 2023 monitoring rounds for all monitored Banksia woodland, Claypan and Tuart woodland PEC/TEC occurrences and for all other monitored vegetation types.

Both were recorded in the Banksia woodland community, one at BW-S-PI-4_P02 on 17 October 2022 and the other at BW-S-PI-5_P04 in 20 October 2022. The condition of both these monitoring points was downgraded from Excellent to Very Good due to the significant establishment of weeds. For BW-S-PI-4_P02 it was due to the establishment of the environmental weed *Acacia longifolia* first observed in the area during the autumn 2022 monitoring round and for BW-S-PI-5_P04 it was due to the substantive increase in grass weeds, in particular *Briza maxima.* The impacts of *Acacia longifolia* are clearly evident due to its aggressive competition with most mid story and low story species whereas *Briza maxima's* impacts are more insidious compromising the structure of Excellent vegetation by out competing low herbaceous annuals.

The greatest potential for a downgrading of vegetation condition is within marginally Excellent condition due to the invasion of weeds. This potential is currently observed at BW-S-PI-5_P14 which is currently Excellent but due to increasing presence of weeds may be downgraded to Very Good. This potential was first observed in the spring 2022 monitoring rounds.

The comparative data for vegetation condition recorded at the boundary photopoints sites is presented in **Appendix 8** and for the transect photopoints in **Appendix 9.**

Project attributable indirect impacts and or reportable decline: There was a decline in vegetation condition for two monitored photopoints BW-S-PI-4_P02 and BW-S-PI-5_P04 due to the invasion of weeds, however neither of these can be attributed to BORR project activities as these weeds were present and establishing prior to project commencement.

5.3.3 Weed cover

Weeds cover increased at nine of the 14 sites actively monitored[16] during the baseline monitoring period spring 2019 to Autumn 2022 (**Table 12**). The increases affected all vegetation types, Banksia woodland, Tuart woodland and Claypans, and were evident in potential impact and reference sites. This increase is likely due to the increases in annual rainfall and compounding increases in weed seed set over the monitoring period.

Post baseline monitoring shows that weed cover has continued to increase with cover increasing at two Banksia woodland sites, BW-S-PI-4 and BW-S-PI-5 and one Tuart woodland site TW-S-PI-2. These increases are shown in **Table 13**. These sites already had a high proportion of points with previously recorded increases in weeds.

A full set of comparative transect results for weed cover is available in **Appendix 3** for boundary points and **Appendix 4** for transect end points.

Table 12. Number of monitoring points with a change (increase) in weed during the baseline monitoring period per monitoring site.

Site type	Site	Number of points with a change in weed cover*
Potential impact sites	BW-S-PI-1	4 (5)
	BW-S-PI-3	5 (7)
	BW-S-PI-4	3 (4)
	BW-S-PI-5	11 (35)
	BW-S-PI-8	first monitored in winter 2022
	CP-S-PI-1	2 (3)
	TW-S-PI-2	6 (9)
	TW-S-PI-3	0 (4)
	TW-S-PI-4	1 (3)
Reference sites	BW-S-R-1	0 (4)
	BTW-S-R-1	0 (2)
	BTW-S-R-2	2 (2)
	CP-NS-R-1	1 (2)
	CP-NS-R-2	0 (2)

* The number in the brackets is the total number of monitoring points at a monitoring site.

[16] BW-S-PI-8 was only monitored for the first time in Winter 2022, as this is in the clearing exclusion zone.

Table 13. Site with increased weed cover recorded post the baseline monitoring period.

Monitoring point	Baseline	Post baseline	
	Autumn / Winter 2022	Spring 2022	Autumn 2023
BW-S-PI-4_P01	2-10%	30-70%	30-70%
BW-S-PI-5_P01	<2%	2-10%	2-10%
BW-S-PI-5_P02	30-70%	>70%	>70%
BW-S-PI-5_P04	<2%	10-30%	10-30%
BW-S-PI-5_P06	30-70%	>70%	>70%
BW-S-PI-5_P07	30-70%	>70%	>70%
BW-S-PI-5_P08	30-70%	>70%	>70%
BW-S-PI-5_P14	<2%	2-10%	2-10%
BW-S-PI-5_P15	10-30%	30-70%	30-70%
TW-S-PI-2_P03	10-30%	30-70%	30-70%
TW-S-PI-2_P05	10-30%	>70%	>70%

Banksia woodlands

There was an increase in weed cover of more than 20% at two of the five potential impact Banksia woodland sites, one point at BW-S-PI_4 and 8 points at BW-S-PI-5. All of these increases relate to increases in invasive grasses already present at site. These increases are regarded as comparable to the increase observed for one reference site BW-S-R-1_T1.

Project attributable indirect impacts and or reportable decline: The increases in weed cover at these sites are not regarded as being attributable to the project, and instead are attributable to weeds already within and directly adjacent to the monitoring points. Furthermore, no construction work, including clearing activities, had commenced in proximity to BW-S-PI_4 at the time of monitoring and observations of the cleared area adjacent to BW-S-PI-5 show it to be relatively free of weeds and highly unlikely to be the cause of increase.

The increase in weed cover at these sites is not regarded as a reportable decline because the increases are comparable to the increase observed for the reference site BW-S-R-1_T1.

Claypans

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts nor reportable declines with regards to weed cover for the potential impact claypan site CP-S-PI-1 because there was no increase in weed cover relative to baseline levels.

Tuart woodlands

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts nor reportable declines with regards to weed cover at Tuart woodlands potential impact sites.

The increase in weed cover of more than 20% at two monitoring points within TW-S-PI-2, one at TW-S-PI-2_P03 and the other at TW-S-PI-2_P05, are attributable to increases in

grasses already present within the site. In contrast weed cover at the Tuart woodland reference sites was stable or decreased relative to baseline levels.

The increases in weed cover at all these sites are not regarded as being attributable to the project, and instead is attributable to weeds already within and directly adjacent to the monitoring points. This is because observations of the cleared area adjacent to TW-S-PI-2 show it to be relatively free of weeds and highly unlikely to be the cause of increase (**Figure 10**).

Figure 10. Cleared area adjacent to TW-S-PI-2.

5.3.4 Native cover

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts or reportable declines with regards to native cover for any potential impact sites.

There was no change in the percentage cover of native plants between the 2019 and 2023 monitoring rounds for all monitored sites within the Banksia woodland, Claypan and Tuart woodland PEC/TEC occurrences and for all other monitored vegetation types.

The comparative data for native cover recorded at the boundary photopoints sites is presented in **Appendix 3** and the transect photopoints in **Appendix 4.**

5.3.5 Plant stress

The plant stress of the dominant trees/shrubs within a 20 m x 20 m area of all 88 boundary photopoints and 20 transect end points have been recorded since spring 2020. A comparison of the monitoring data obtained since construction commenced in May 2023 and baseline data is summarised below and presented in graphs in **Figure 11** to **Figure 26**. The full results showing the comparison of plant stress are provided in tables in **Appendix 3** and **Appendix 4**.

Stress levels were recorded to increase by one increment at four potential impact monitoring points and two reference points during this post construction monitoring period (**Table 14**). The increases occurred in Banksia woodland and Tuart woodland sites. Stress levels were also recorded to decrease at 14 potential impact monitoring sites in Banksia woodland in the post construction monitoring period. Increases and decreases of the same magnitude in stress were also recorded in Banksia and Banksia Tuart reference woodland sites.

Stress levels were observed to be stable in Claypan monitoring sites.

It is observed that the trends in plant stress at monitoring sites (e.g. either steadily increasing or steadily decreasing) are generally not fixed with plant health changing in response to environmental factors such as rainfall. The monitoring showed that the fluctuations affected both reference and potential impact sites.

Table 14. Post construction monitoring plant stress increase by monitoring site.

Site type	Site	Number of points with an increase in stress*	Photopoint	Total number of photopoints
Potential impact sites	BW-S-PI-1	0	-	5
	BW-S-PI-3	1	BW-S-PI-3_P06	7
	BW-S-PI-4	0	-	4
	BW-S-PI-5	1	BW-S-PI-5_P04	34
	BW-S-PI-8	1	BW-S-PI-8_P01	8
	CP-S-PI-1	0	-	3
	TW-S-PI-2	1	TW-S-PI-2_P03	20
	TW-S-PI-3	0	-	4
	TW-S-PI-4	0	-	3
Reference sites	BW-S-R-1	1	BW-S-R-1_T1E	4
	BTW-S-R-1	0	-	2
	BTW-S-R-2	1	BTW-S-R-2_T1N	2
	CP-NS-R-1	0	-	2
	CP-NS-R-2	0	-	2

Banksia woodland

Levels of stress were recorded to increase at one monitoring point in three Banksia woodland sites from baseline levels. These points are BW-S-PI-3_P06 (stress level 4 to 3), BW-S-PI-5_P04 (stress level 5 to 4) and BW-S-PI-8_P01 (stress level 5 to 4). This increase in

stress was comparable with increases in stress from stress level 5 to 4 at BW-S-R-1_T1E and BTW-S-R-2_T1N.

Project attributable indirect impacts and or reportable decline: There is no reportable decline at any of the three sites with regard to increases in stress because the stress was comparable to stress increases recorded at both BTW-S-R-2_T1N and BW-S-R-1_T1E.

With regard to attributing the impacts to the project it is highly unlikely for BW-S-PI-3_P06 because no project activities had commenced in proximity to the site at time of recording in autumn 2023 and because this monitoring point is observed to be impacted by an old infestation of Phytophthora dieback which is the cause of stress at the site.

Whilst works had commenced in proximity to BW-S-PI-5_P04 it is unlikely that the increase in stress could be attributed to them. Primarily because the main cause of stress identified at this site is due to an active front of Phytophthora dieback identified at the point (see subsection 5.5 Phytophthora dieback).

It is possible that the increase in stress from 5 - 4 at monitoring point BW-S-PI-8_P01 could (but not necessarily) be attributed to the project because at this point, which is in the closest proximity to the boundary of the cleared area, the stress increased while all the other points remained stable at a 5 rating. The plant stress for this point relate to reductions in the health of large marri and jarrah trees present at the site. The stress was first observed during the spring 2022 monitoring period soon after the commencement of the project.

However, at the time of preparing this report it is considered unlikely that the increase in stress is project attributed because increases in stress independent of the clearing activities is commonly observed in Jarrah and Marri trees in intact vegetation such as that evidenced at transect BW-S-R_T1E and at the drainage monitoring points BW-S-PI-3_D1 (w20), BW-S-PI-5_D1 (w20) and BW-S-R-1_D1(w20) refer to **Table 15.**

Close attention will be paid to the plant stress at this point and all points within the BW-S-PI-8 monitoring site in future monitoring rounds, to confirm whether this assessment is correct.

Tuart woodland

One point TW-S-PI-2_P03 within Tuart woodland was recorded with an increase in stress level from 5 to 4. The stress rating was applied due to observed thinning in the crowns of *Agonis flexuosa* trees, *Banksia attenuata* and *Spyridium globulosum* trees. Project activities had commenced in proximity to the site at the time of recording in autumn 2023. however, this increased stress cannot be conclusively attributed to the clearing activities because stress levels in trees in shrubs were stable relative to baseline levels for all other monitoring points along the length of the cleared edge of the TW-S-PI-2 monitoring site.

Project attributable indirect impacts and or reportable decline: There is no reportable decline for stress at TW-S-PI-2_P03 because the stress was comparable to stress increases recorded at reference site BTW-S-R-2_T1N. The stress at BTW-S-R-2_T1N was observed in Jarrah and *Agonis flexuosa* and postulated to be due to the summer drought.

Claypans

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts or reportable declineswith regards to plant stress for the potential impact claypan site CP-S-PI-1 because there was no increase in plant stress relative to baseline levels.

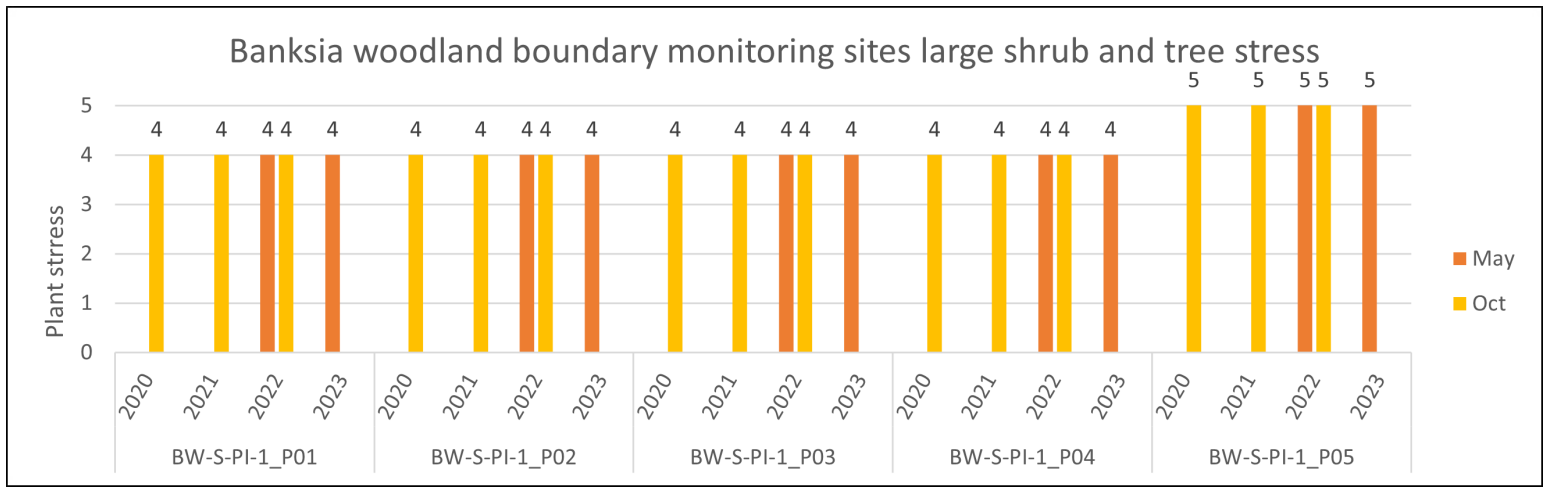


Figure 11. BW-S-PI-1 large shrub and tree stress.

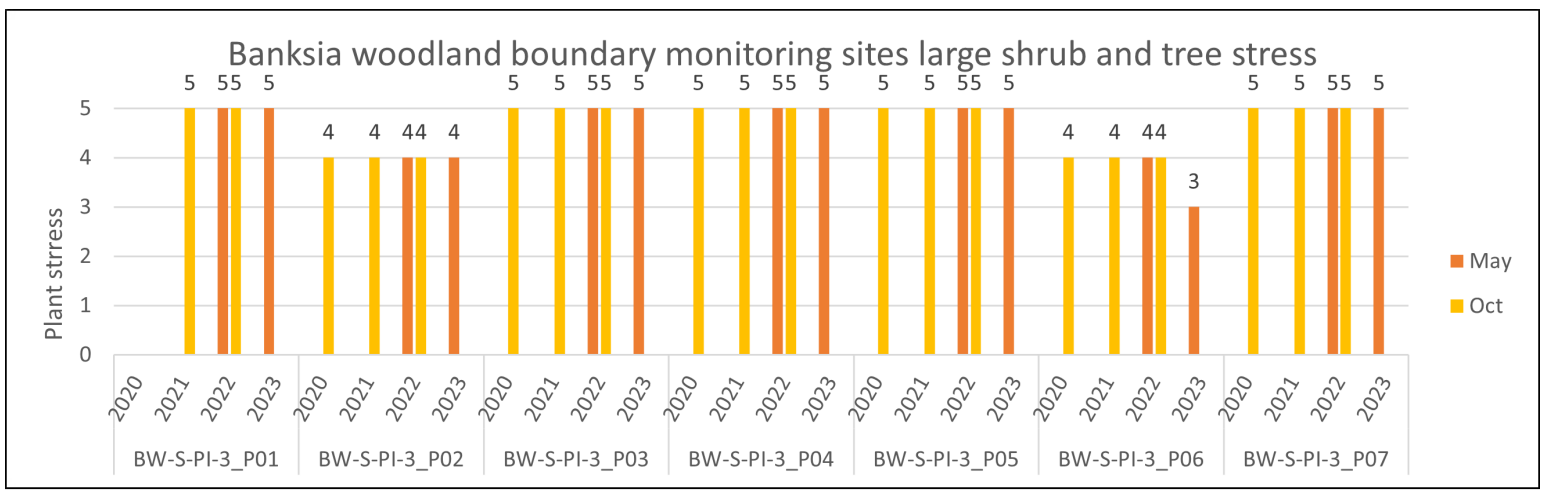


Figure 12. BW-S-PI-3 large shrub and tree stress.

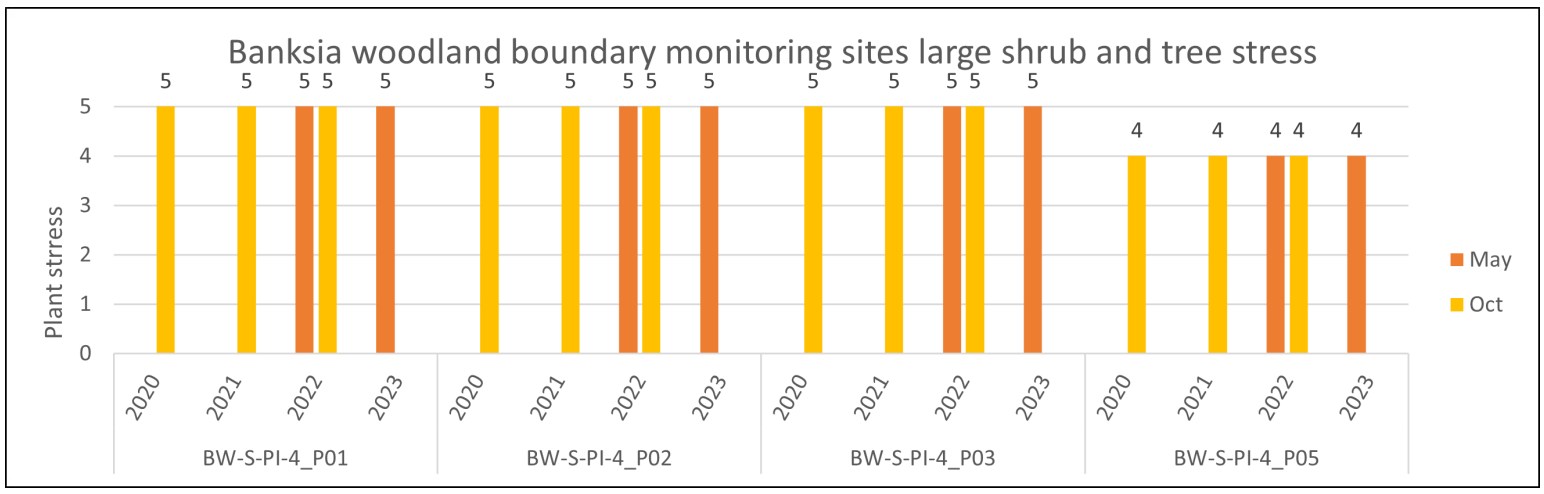


Figure 13. BW-S-PI-4 large shrub and tree stress

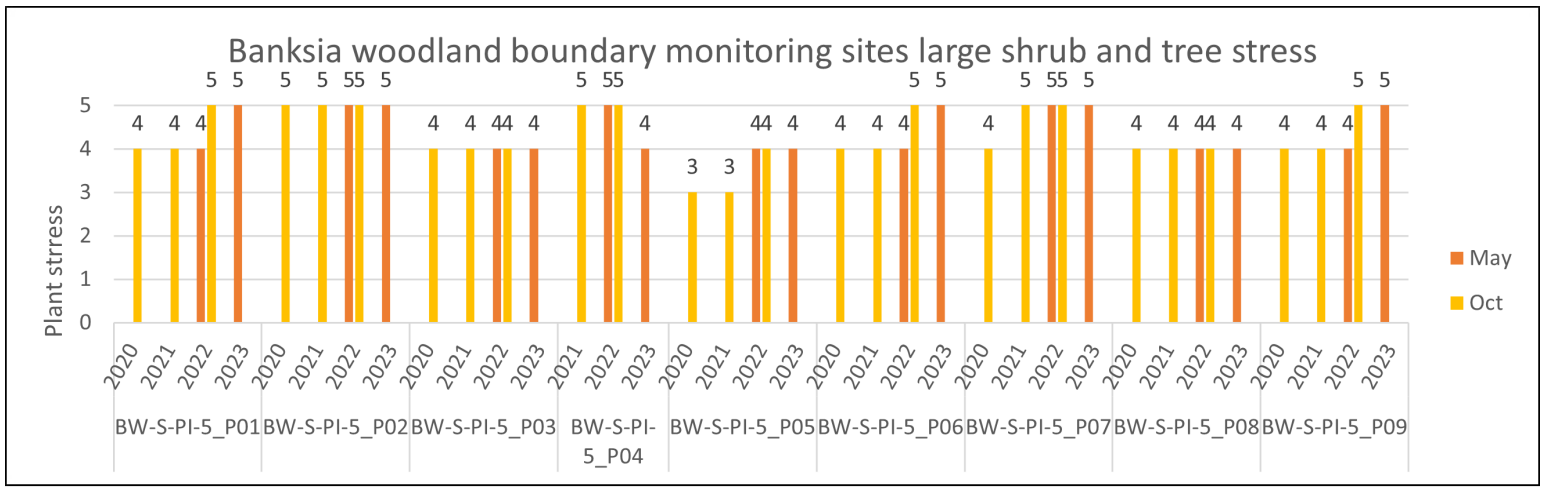


Figure 14. BW-S-PI-5 P01 – P09 large shrub and tree stress.

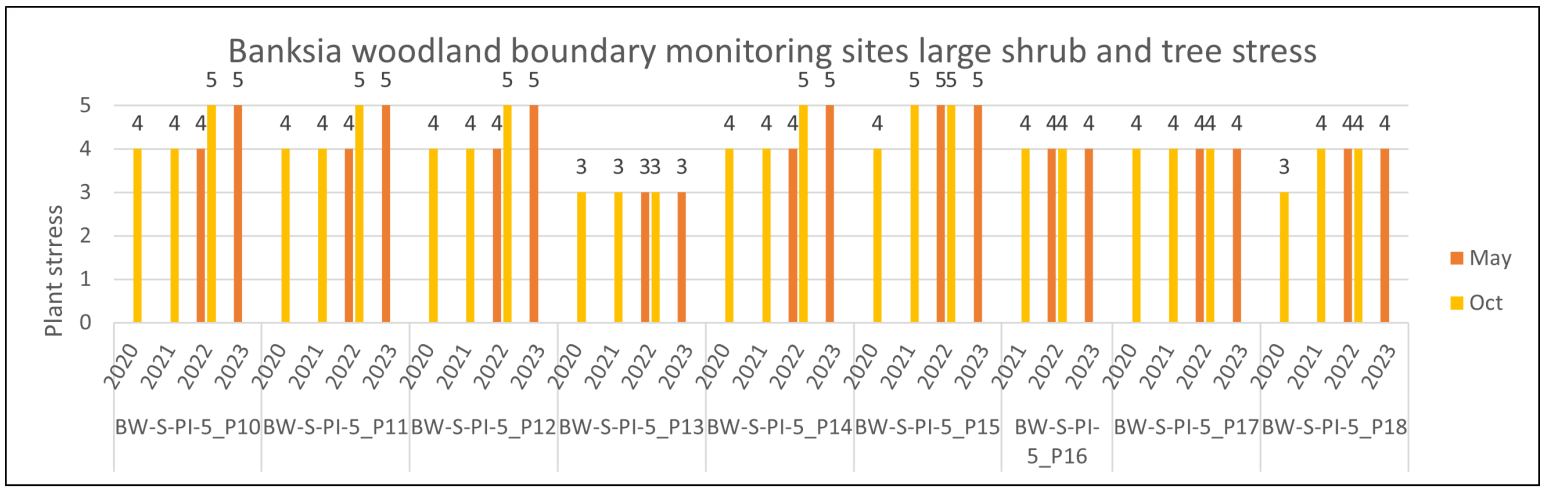


Figure 15. BW-S-PI-5 P10 – P018 large shrub and tree stress.

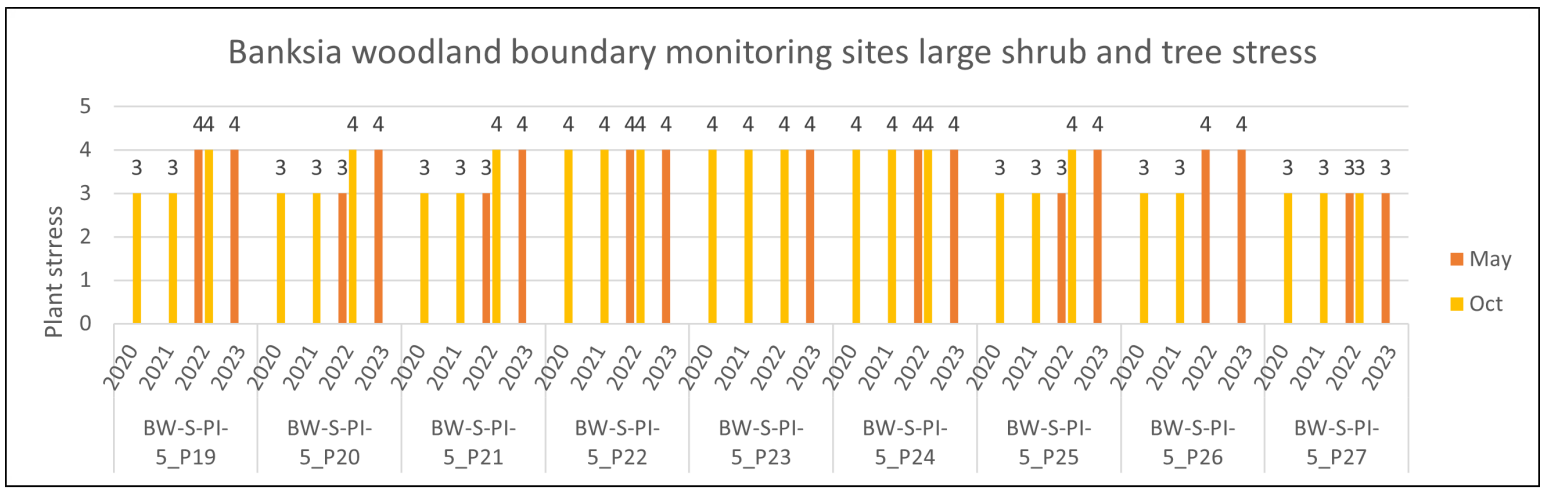


Figure 16. BW-S-PI-5 P19 – P27 large shrub and tree stress.

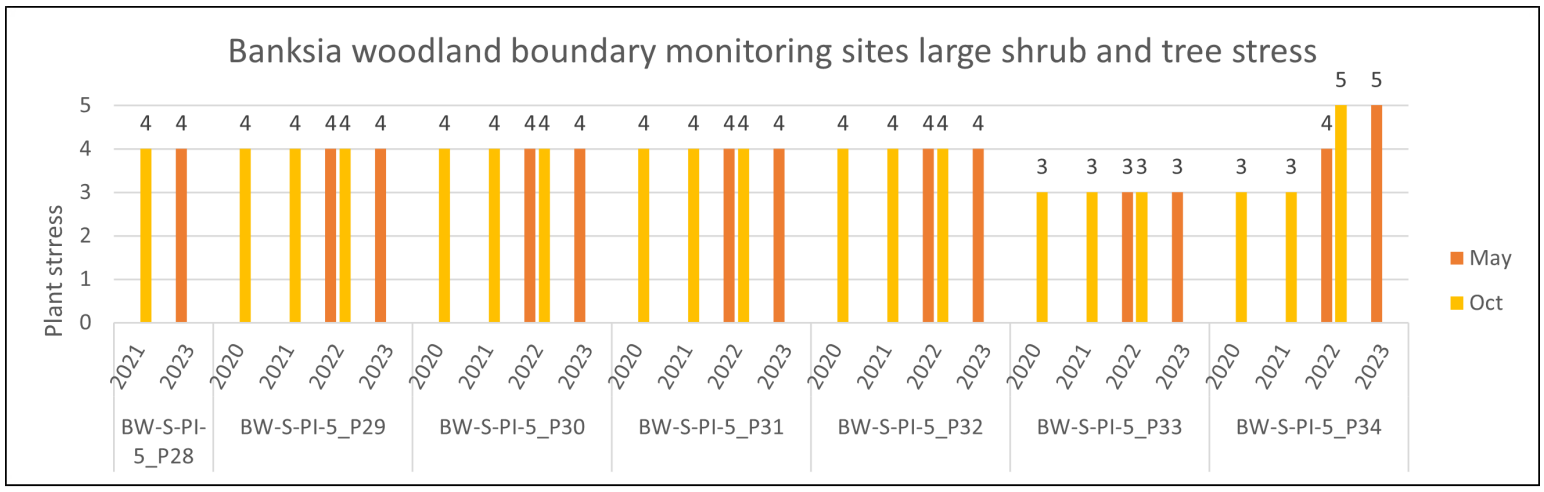


Figure 17. BW-S-PI-5 P28 – P34 large shrub and tree stress.

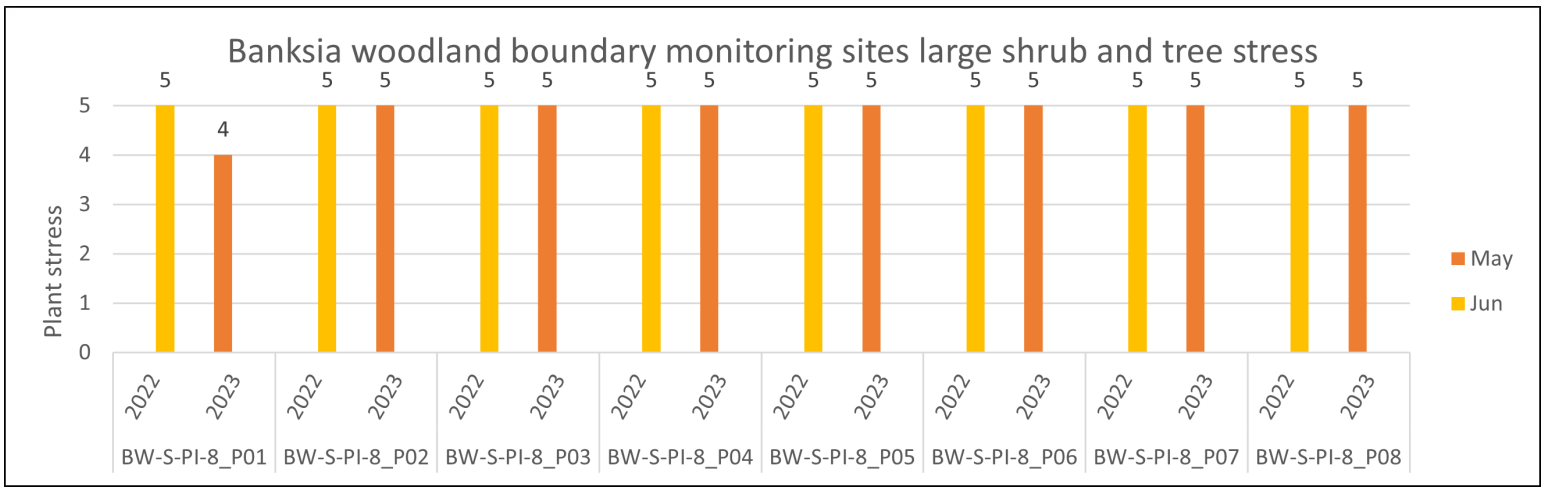


Figure 18. BW-S-PI-8 large shrub and tree stress.

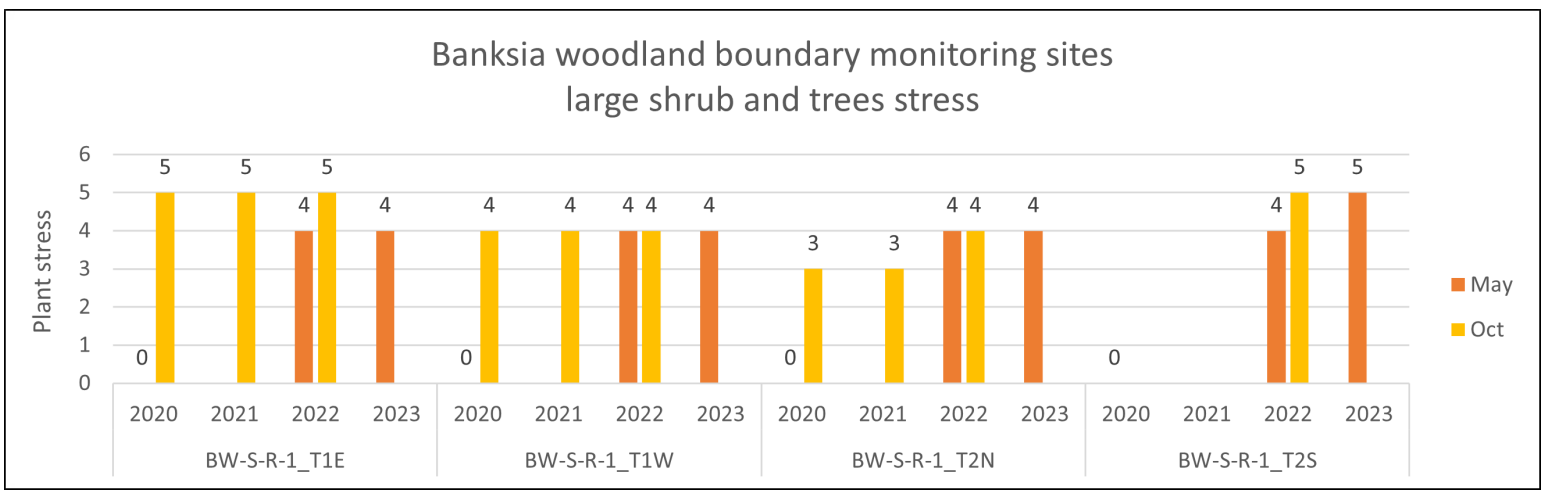


Figure 19. BW-S-R-1 large shrub and tree stress.

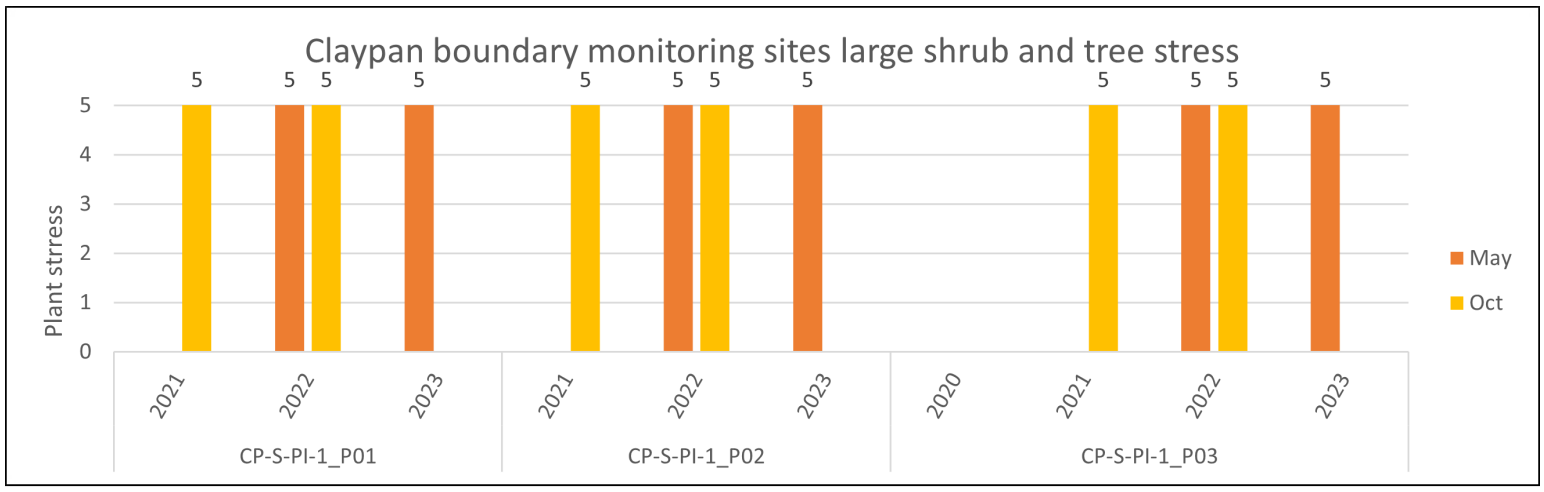


Figure 20. CP-S-PI-1 large shrub and tree stress

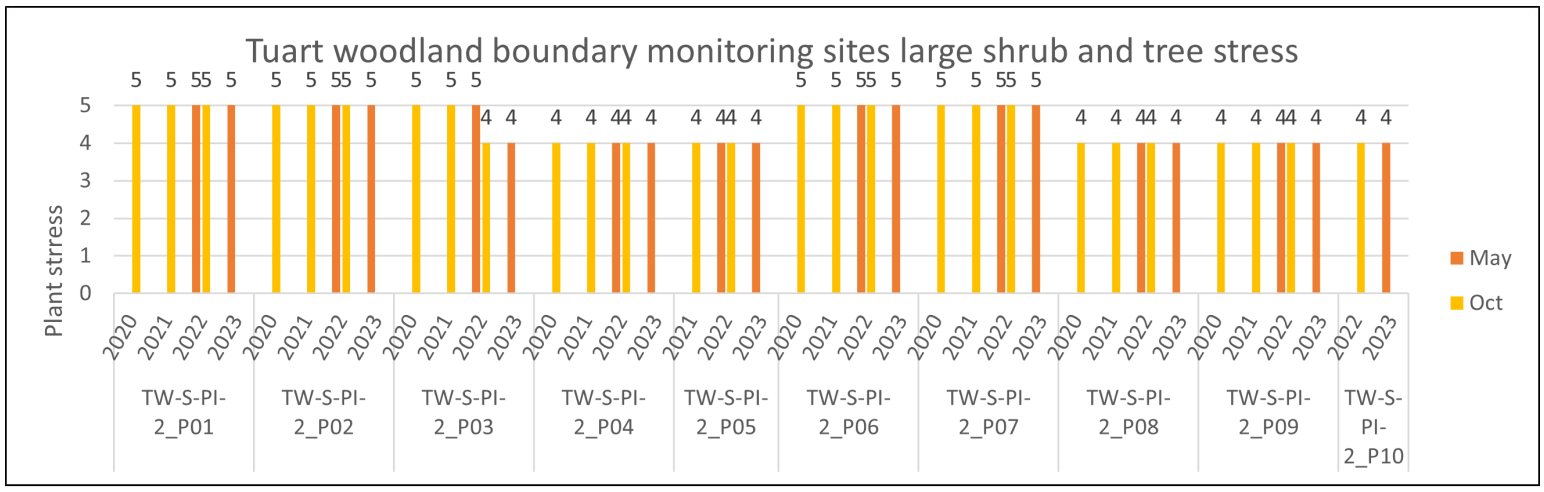


Figure 21. TW-S-PI-2 P1 – P10 large shrub and tree stress

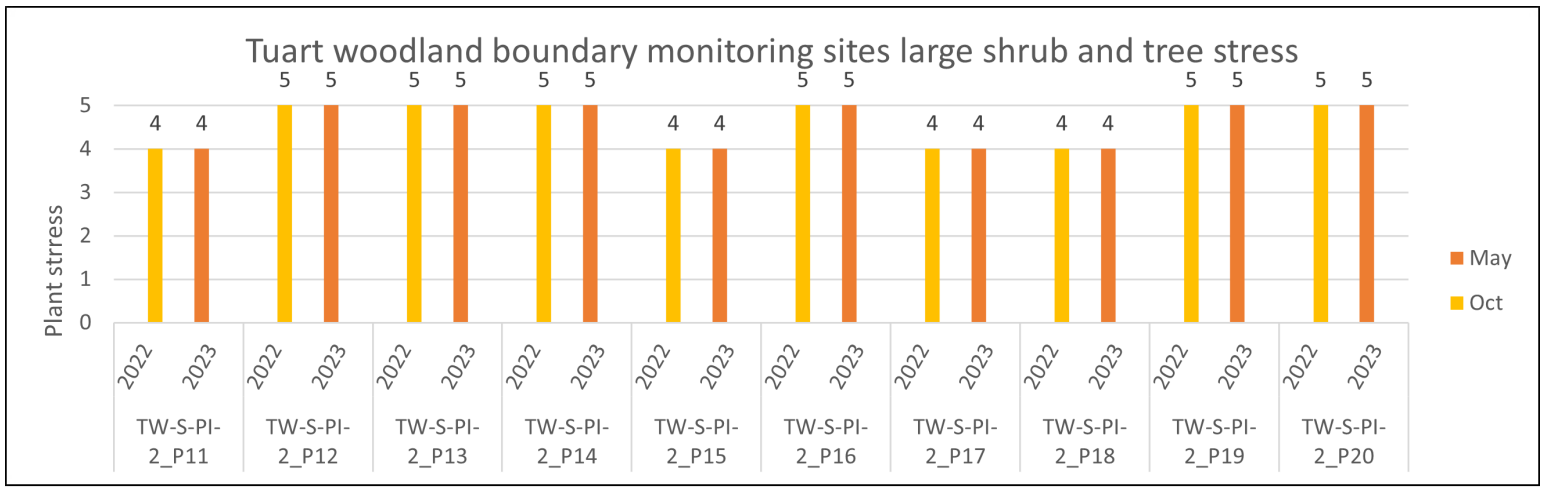


Figure 22. TW-S-PI-2 P10 – P20 large shrub and tree stress

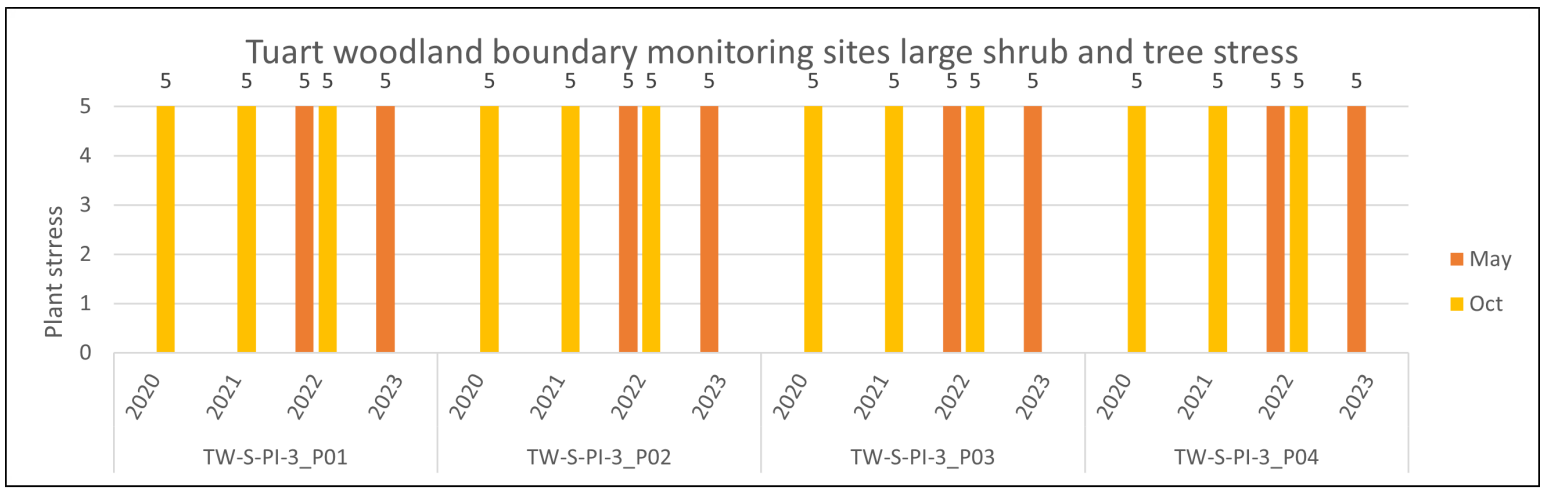


Figure 23. TW-S-PI-3 large shrub and tree stress

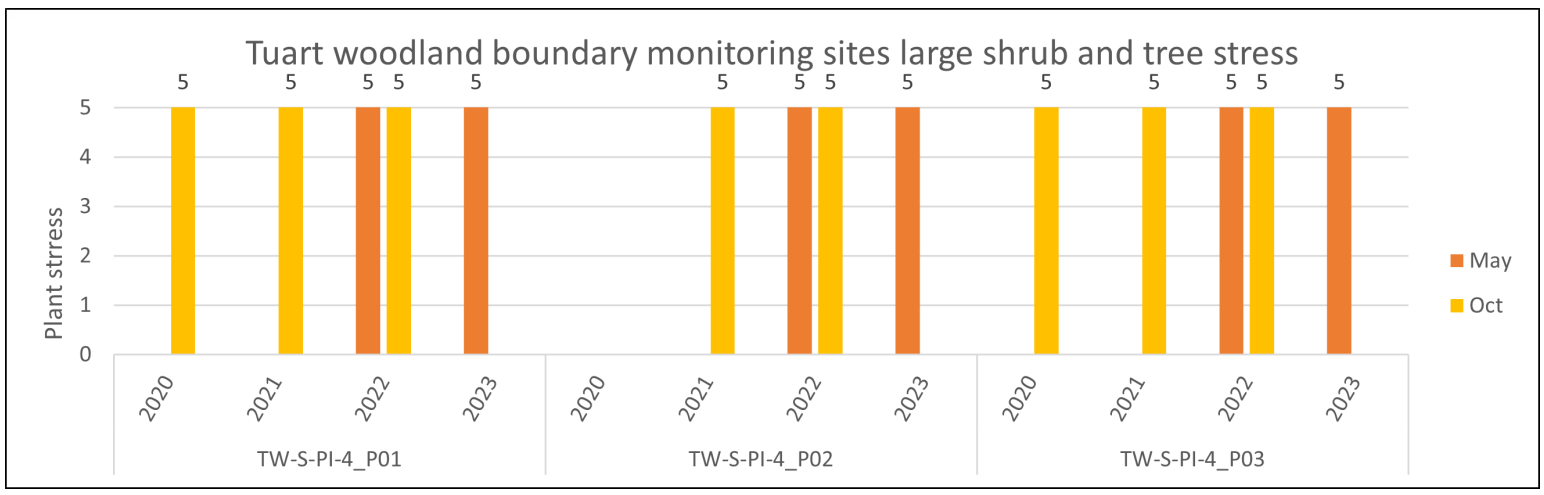


Figure 24. TW-S-PI-4 large shrub and tree stress

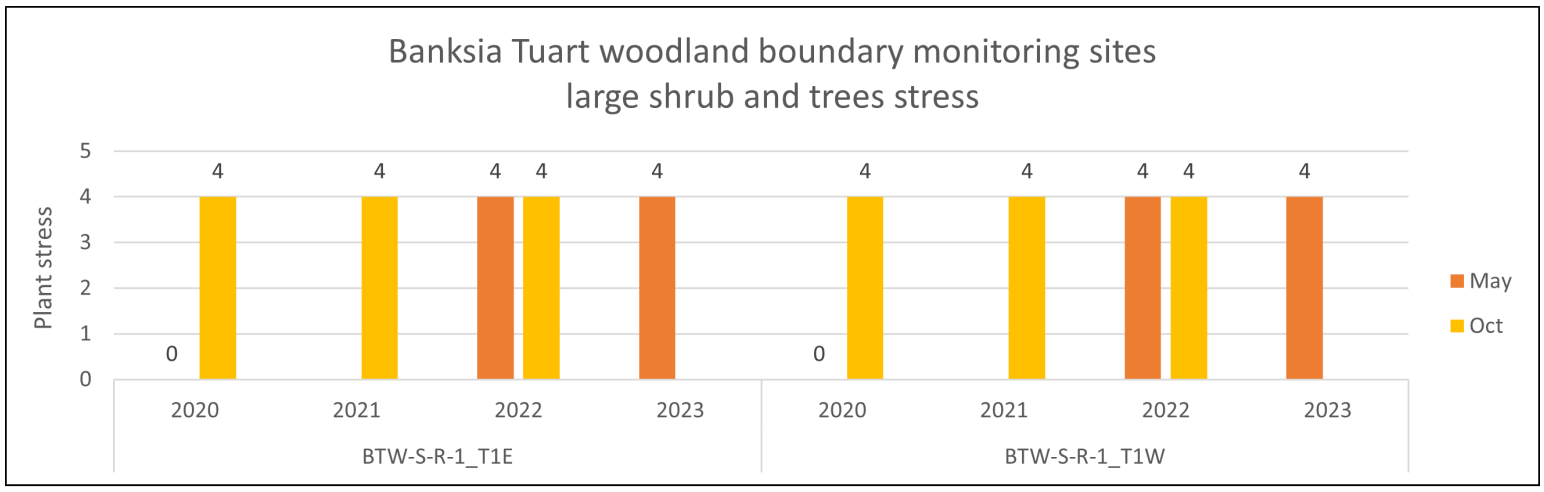


Figure 25. BTW-S-R-1 large shrub and tree stress

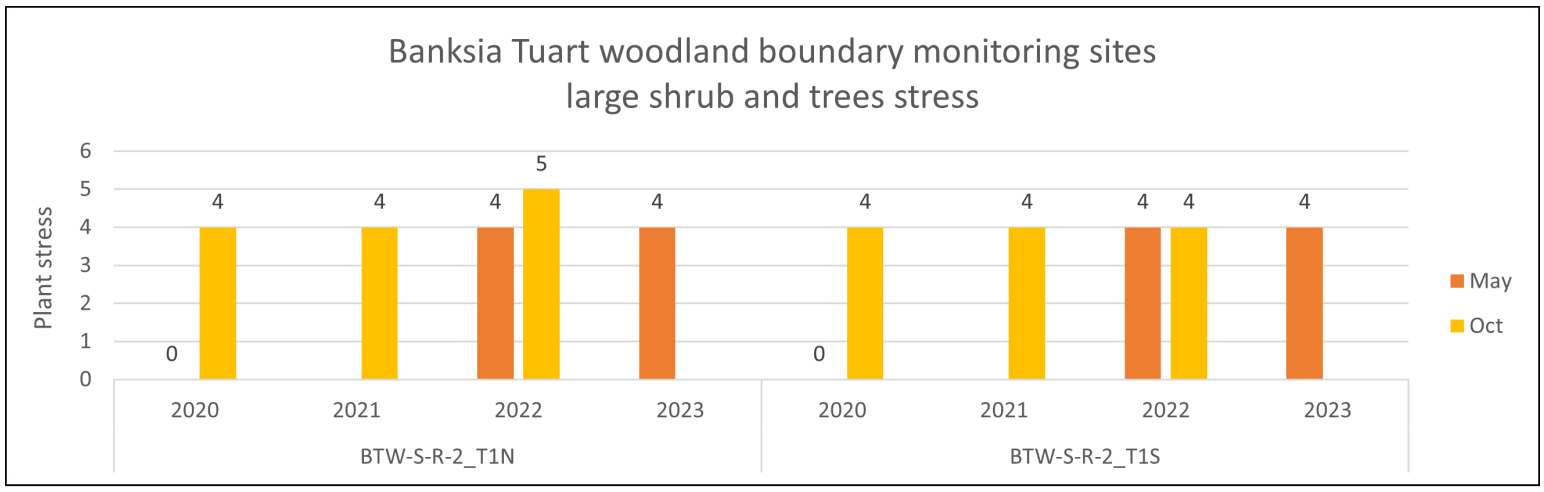


Figure 26. BTW-S-R-2 large shrub and tree stress.

5.4 Drainage Monitoring

Quarterly drainage monitoring targeted erosion, flooding and drying effects associated with attributable indirect impacts and compared the results to the baseline preconstruction conditions of the TEC/PEC, namely the Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands.

Drainage monitoring is conducted four times a year, once in each season. The results of these monitoring rounds is summarised since the baseline monitoring occurred until autumn 2023 (**Table 15).**

Five of the nine potential impact sites recorded drying effects prior to the BORR construction and clearing of vegetation. Sites that were recorded as having drying effects in the baseline monitoring have since recovered during winter and spring monitoring. These sites are indicated in **Table 15,** for example BW-S-PI-5_D1 (w20) and BW-S-PI-5_D2 (a22). The 24 May 2023 monitoring report for this site is provided in **Appendix 7**, showing no drying effects.

5.4.1 Erosion effects on TEC PEC

Project attributable indirect impacts and or reportable decline: No new erosion has been recorded within the TEC PEC vegetation.

There were no project attributable indirect erosion impacts or reportable declines in regard to erosion effects when compared to preconstruction baseline conditions for the Banksia woodland, Tuart woodland or Claypan TEC PEC.Inundation effects on TEC PEC

Project attributable indirect impacts and or reportable decline: There was no TEC PEC vegetation abnormally inundated or flooded for 24 hours as a result of the project activities. There was no project attributable indirect flooding or inundation impacts, when compared to preconstruction baseline conditions to the Banksia woodland, Tuart woodland or Claypan TEC PEC.

The health of the TEC PEC vegetation has not declined relative to the reference sites, and therefore no reportable decline has occurred.

5.4.2 Drying effects on TEC PEC

Project attributable indirect impacts and or reportable decline: Drying was recorded in some sites during the preconstruction baseline monitoring but have since been noted/recorded as not an issue and more likely seasonal and not project attributed. There were no project attributable indirect impacts, when compared to preconstruction baseline conditions to the Banksia woodland, Tuart woodland or Claypan TEC PEC.

The health of the TEC PEC vegetation has not declined relative to the reference sites, and therefore no reportable decline has occurred.

Table 15. Summary of drainage monitoring Southern Project Area.

Number	Current Site Name	Drainage site _Effect (season year)	Issues in previous rounds	2022 Autumn	2022 Winter	2022 Spring	2023 Summer	2023 Autumn
Date					26/05/2022	19/10/2022	17/02/2023	26/05/2023
Potential impact sites								
1	BW-S-PI-1	-	No issues	No issues	No issues	No issues	No issues	No issues
2	BW-S-PI-3	BW-S-PI-3_D1 (w20)	Thinning of canopies in Marri	No issue canopy normal	No issues	No issues	No issues	No issues
3	BW-S-PI-4	BW-S-PI-4_D1(w20)	Yellowing of leaves	No issue	No issues	New growth after winter rain	No issues	No issues
4	BW-S-PI-5	BW-S-PI-5_D1 (w20)	*Eucalyptus marginata, Eucalyptus gomphocephala*	Drying effects on marri and jarrah	No issue in winter	Less stressed after rain	No issues	No issues
		BW-S-PI-5_D2 (a22)	Large *Banksia* fallen over	No issue	No issue	No issue	No issue	No issue
5	BW-S-PI-8	-	-	-	-	New site	No issue	No issue
6	CP-S-PI-1	-	No issue	No issues	No issues	No issues	No issues	No issues
7	TW-S-PI-2	TW_S-PI-2_D1(w20)	Tuart thinning canopy	New tip growth. Looking healthier	No issues	No issues	No issues	No issues
8	TW-S-PI-3	-	No issues	No issues	No issues	No issues	No issues	No issues
9	TW-S-PI-4	-	No issues	No issues	No issues	No issues	No issues	No issues
Reference sites								
1	BW-S-R-1	BW-S-R-1_D1(w20)	Drought-affected site, thinning canopies in Jarrah and Banksia attenuata	No issues	No issues	Recovered after winter - no issues	No issues	No issues
2	BTW-S-R-1	-	No issues	No issues	No issues	No issues	No issues	No issues
3	BTW-S-R-2	-	No issues	No issues	No issues	No issues	No issues	No issues

Number	Current Site Name	Drainage site _Effect (season year)	Issues in previous rounds	2022 Autumn	2022 Winter	2022 Spring	2023 Summer	2023 Autumn
4	CP-NS-R-1	CP-NS-R-1_D1(w20)*	Evidence of yellowing of *X.p* Leaves across site - unknown cause - water table is high at site	No issue - autumn 2022, all leaves of *X.p* green.	No issues	No issues	No issues	No issues
5	CP-NS-R-2	-	No issues	No issues	No issues	No issues	No issues	No issues

An example of site report 2023 autumn (no issues) is provided in **Appendix 7,** (BW-S-PI-5, BW-S-R-1).

5.5 Phytophthora Dieback

Phytophthora cinnamomi is a microscopic, soil borne plant pathogen which impacts about 40% of native vegetation in the Southwest of WA. Impacts on vegetation from *Phytophthora cinnamomi,* referred to as Phytophthora dieback, may appear similar in appearance to impacts of drying but Phytophthora dieback can usually be distinguished from drying and other plant stressors by its rapid impact on Phytophthora sensitive plants, normally occurring at the end of the summer and dry period.

Impact from Phytophthora dieback was assessed as part of standard vegetation monitoring undertaken at all monitoring locations with four scales of impact being recorded:

1. Low impact: 1-2 plants
2. Medium impact: active front visible, some death
3. Heavy impact: active front visible, lots of death
4. Old impact site: vegetation structure altered.

Ten monitoring points were recorded with Phytophthora dieback during the baseline monitoring period. These impacts were mostly recorded in Banksia Woodland, with relatively little observed impact within the Banksia/Tuart Woodland and no evidence recorded in the Claypan sites. This is not unusual as the Banksia/Tuart Woodland, which typically occurs on more alkaline soils which is not favoured by *Phytophthora cinnamomi*.

There was no change in the number of photo points recorded to have symptoms of Phytophthora dieback relative to baseline monitoring levels. A breakdown of impacts from Phytophthora dieback at each monitoring site is provided in **Table 16.**

Table 16. Breakdown of observed impacts of Phytophthora dieback per monitoring sites relative to Autumn 22 baseline levels.

Site	Aut 22 Low	Aut 23 Low	Aut 22 Medium	Aut 23 Medium	Aut 22 Heavy	Aut 23 Heavy	Aut 22 Old*	Aut 23 Old*	Aut 22 Site total	Aut 23 Site total	Total Photopoints
Potential impact sites											
BW-S-PI-1									0	0	5
BW-S-PI-3							4	4	4	4	7
BW-S-PI-4	1	1							1	1	4
BW-S-PI-5	1	1	2	2					3	3	34
BW-S-PI-8									0	0	8
CP-S-PI-1									0	0	3
TW-S-PI-2									0	0	20
TW-S-PI-3									0	0	4
TW-S-PI-4									0	0	3
Reference sites											
BW-S-R-1			2	2					2	2	4
BTW-S-R-1									0	0	2
BTW-S-R-2									0	0	2
CP-NS-R-1									0	0	2
CP-NS-R-2									0	0	2
Totals	**2**	**2**	**4**	**4**	**0**	**0**	**4**	**4**	**10**	**10**	**100**

* The site is devoid of *P. cinnamomi*-susceptible species and therefore *P. cinnamomi* is not perceived to be actively causing death

6 Conclusion

Final concluding statements are provided with respect to TEC and PEC monitoring conducted for the first post construction monitoring period 31 May 2022 to 31 May 2023.

6.1 Vegetation monitoring

6.1.1 Banksia woodland TEC

Native species diversity

There are no project attributable indirect impacts associated with native species diversity associated with the Banksia woodland TEC for this reporting period.

There are no reportable declines in native species diversity associated with the Banksia Woodland TEC for this reporting period.

Native cover

There are no project attributable indirect impacts associated with the cover of native species associated with the Banksia woodland TEC for this reporting period.

There are no reportable declines in the cover of native species associated with the Banksia woodland TEC for this reporting period.

Weed diversity and weed cover

There are no project attributable indirect impacts associated with weed species diversity or weed cover diversity associated with the Banksia woodland TEC for this reporting period.

There are no reportable declines in weed species diversity or weed cover associated with the Banksia woodland TEC for this reporting period.

Plant stress

There is one possible indirect impact affecting plant stress at one monitoring point within monitoring site BW-S-PI-8, at BW-S-PI-8_P01 because stress increased at this site while all the other point remained stable at a 5 rating. At the time of report preparation it is unlikely that this is attributable to the project because increases in stress independent of the clearing activities is commonly observed in Jarrah and Marri trees in intact vegetation such as that evidenced at transect BW-S-R_T1E and at the drainage monitoring points BW-S-PI-3_D1 (w20), BW-S-PI-5_D1 (w20) and BW-S-R-1_D1(w20). However, this point and points in its proximity will be paid particular attention in future monitoring rounds to confirm whether this assessment is correct.

There are no reportable declines in plant stress associated with the Banksia Woodland TEC for this reporting period.

Plant deaths

There are no project attributable indirect impacts causing plant deaths within the Banksia woodland TEC for this reporting period.

There are no reportable declines with regards to plant deaths within the Banksia woodland TEC for this reporting period.

6.1.2 Tuart woodland TEC

Native species diversity:

There are no project attributable indirect impacts associated with native species diversity associated with the Tuart woodland TEC for this reporting period.

There are no reportable declines in native species diversity associated with the Tuart woodland TEC for this reporting period.

Native cover:

There are no project attributable indirect impacts associated with the cover of native species associated with the Tuart woodland TEC for this reporting period.

There are no reportable declines in the cover of native species associated with the Tuart woodland TEC for this reporting period.

Weed diversity and weed cover:

There were increases in weed cover greater than 20% relative to Tuart woodland reference sites at two out of the 20 photopoints at the Tuart woodland potential impact site TW-S-PI-2, one at TW-S-PI-2_P03 and the other at TW-S-PI-2_P05. This increase in weed cover was not regarded as an attributable indirect impact associated with the project or a reportable decline because the increases were caused by the spread of weeds already within the monitoring points and not from the adjacent recently cleared area which was relatively free of weeds.

Plant stress

It is possible that the increase in stress at TW-S-PI-2_P03 could be attributed to the project because project activities had commenced in proximity to the site at the time of recording in autumn 2023. However, the increase in stress cannot conclusively be attributed to the clearing activities to because stress levels in trees in shrubs were stable relative to baseline levels for all other monitoring points along the length of the cleared edge of the TW-S-PI-2 monitoring site. This point and points in its proximity will be paid particular attention in future monitoring rounds to confirm whether this assessment is correct.

There were no reportable declines in plant stress associated with the Tuart woodland TEC for this reporting period.

Plant deaths

There are no project attributable indirect impacts causing plant deaths within the Tuart woodland TEC for this reporting period.

There are no reportable declines with regards to plant deaths within the Tuart woodland TEC for this reporting period.

6.1.3 Claypan TEC

Native species diversity:

There are no project attributable indirect impacts associated with native species diversity associated with the Claypan TEC for this reporting period.

There are no reportable declines in native species diversity associated with the Claypan TEC for this reporting period.

Native cover:

There are no project attributable indirect impacts associated with the cover of native species associated with the Claypan TEC for this reporting period.

There are no reportable declines in the cover of native species associated with the Claypan TEC for this reporting period.

Weed diversity and weed cover:

There are no project attributable indirect impacts associated with weed species diversity or weed cover diversity associated with the Claypan TEC for this reporting period.

There are no reportable declines in weed species diversity or weed cover associated with the Claypan TEC for this reporting period.

Plant stress

There are no reportable declines with regards to plant stress within the Claypan TEC for this reporting period.

There are no project attributable indirect impacts causing plant stress within the Claypan TEC for this reporting period.

Plant deaths

There are no project attributable indirect impacts causing plant deaths within the Claypan TEC for this reporting period.

There are no reportable declines with regards to plant deaths within the Claypan TEC for this reporting period.

6.2 Drainage Monitoring

Quarterly drainage monitoring targeting erosion, flooding and drying effects found that there was no project attributable indirect impacts or reportable decline, to the potential impact areas adjacent the BORR footprint since the baseline conditions until May 2023.

7 References

BORR Team (2019). BORR Baseline TEC/PEC Vegetation Monitoring Scope.

BORR Team (2020). TEC Vegetation Monitoring Program, Appendix I. Updated Environmental Referral Supporting Document and Additional Information REV 2.

Bureau of Meteorology (BOM) (2023). Climate Data Online, Bunbury Weather Station, Station No. 9965, http://www.bom.gov.au/climate/data/index.shtml

Ecoedge (2023) Bunbury Outer Ring Road Southern Project Area Threatened and Priority Ecological Communities Vegetation and Drainage Monitoring Baseline Report. Prepared for the South West Gateway Alliance.

Environmental Protection Authority of WA (2016). *Technical Guidance Flora and Vegetation Surveys for Environmental Impact.* EPA, Perth, Western Australia. http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA_Technical Guidance - Flora and Vegetation survey

Keighery, B. (1994). *Bushland Plant Survey, A Guide to Plant Community Survey for the Community.* Wildflower Society of WA (Inc.).

Main Roads (2022) Bunbury Outer Ring Road – Southern Section Vegetation Management Plan

Northern Agricultural Catchments Council (2014). U*sing Photomon for Monitoring Environmental Change.* https://www.nacc.com.au/wp-content/uploads/2015/05/Photomon-Users-Guide.pdf

NVIS Technical Working Group (2017) *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0.* Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds).

8 Appendices

Appendix 1. Location of current boundary and transect photopoints (with current and baseline vegetation condition, percentage cover for weeds and native plants at site).

Appendix 2. Index to all photographs taken during the monitoring survey.

Appendix 3. Boundary photopoint comparative data for vegetation condition, crown extent density, weed cover and native cover from spring / summer 2019 to autumn 2023.

Appendix 4. Transect boundary photopoint comparative data for vegetation condition, crown extent density, weed cover and native cover spring 2019 to Autumn 2023.

Appendix 5. Vegetation condition scale (EPA, 2016).

Appendix 6. Recording sheet template

Appendix 7. An example of drainage monitoring report.

Appendix 1. Location of current boundary and transect photopoints, (with current and baseline vegetation condition, percentage cover for weeds and native plants at site).

Maps are arranged in order from north to south of their location within the BORR southern section Project area.

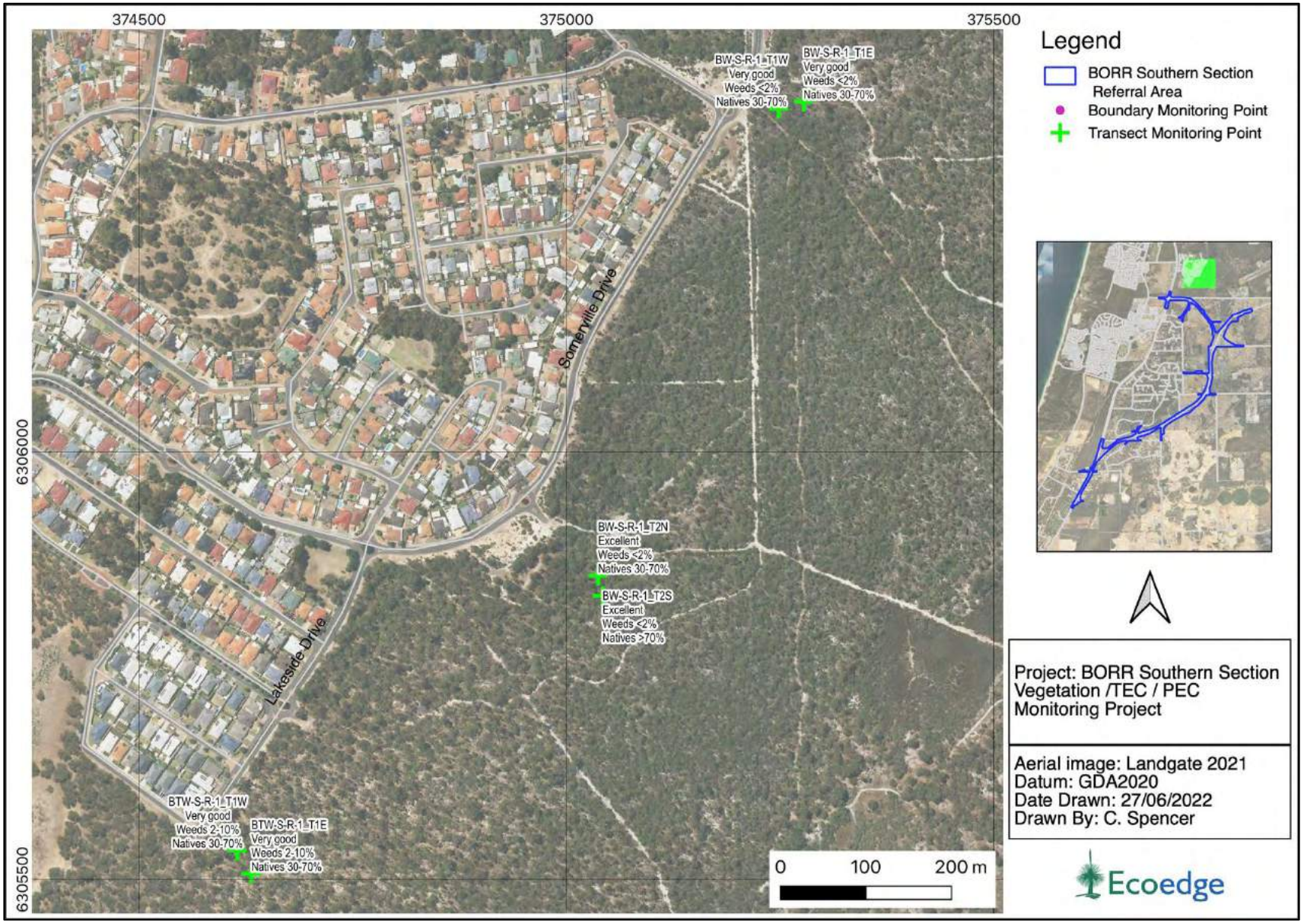


Figure 1. Baseline reference site BW-S-R-1 and BTW-S-R-1 vegetation condition, weed and native cover.

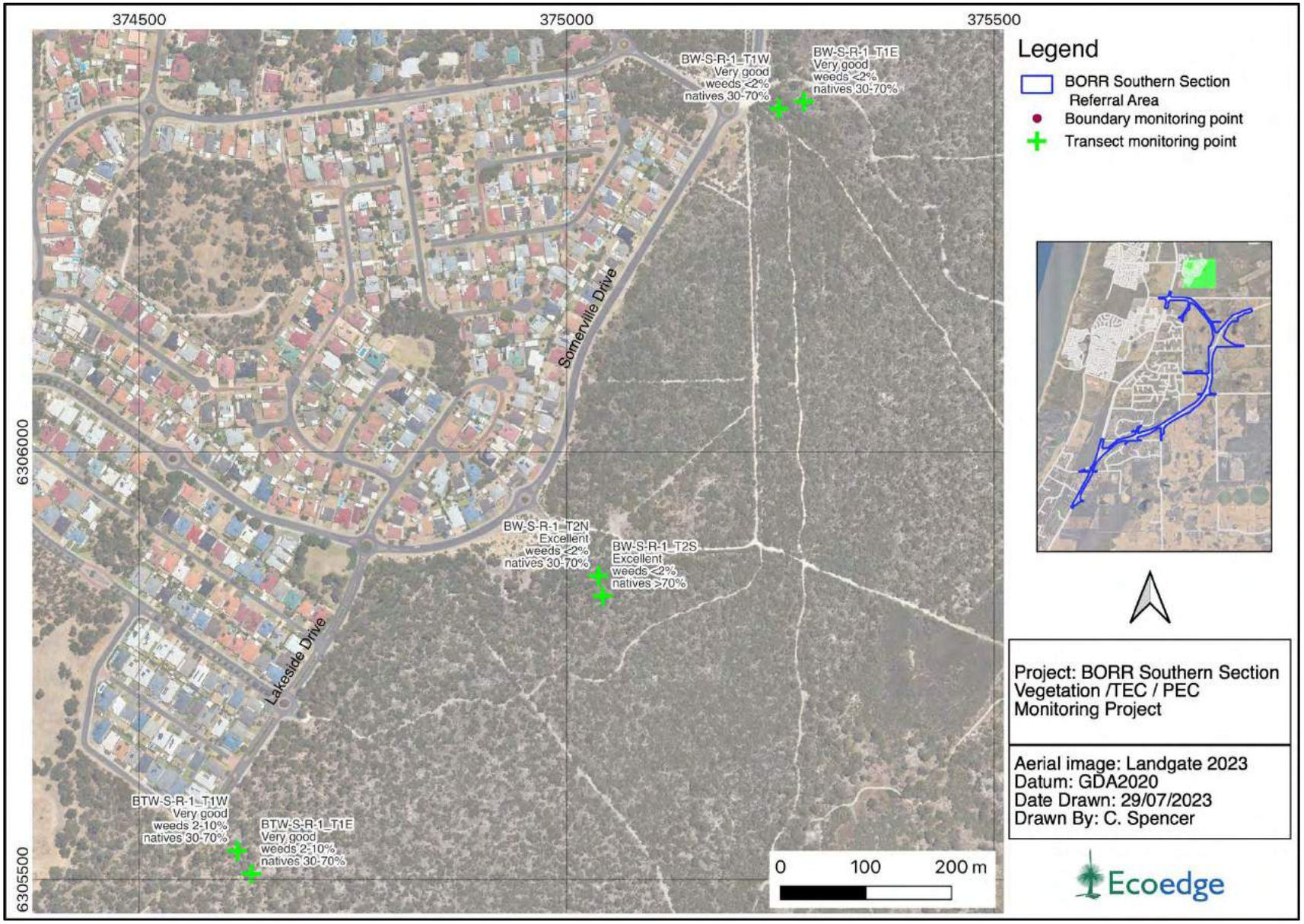


Figure 2. 2023 reference site BW-S-R-1 and BTW-S-R-1 vegetation condition, weed and native cover.

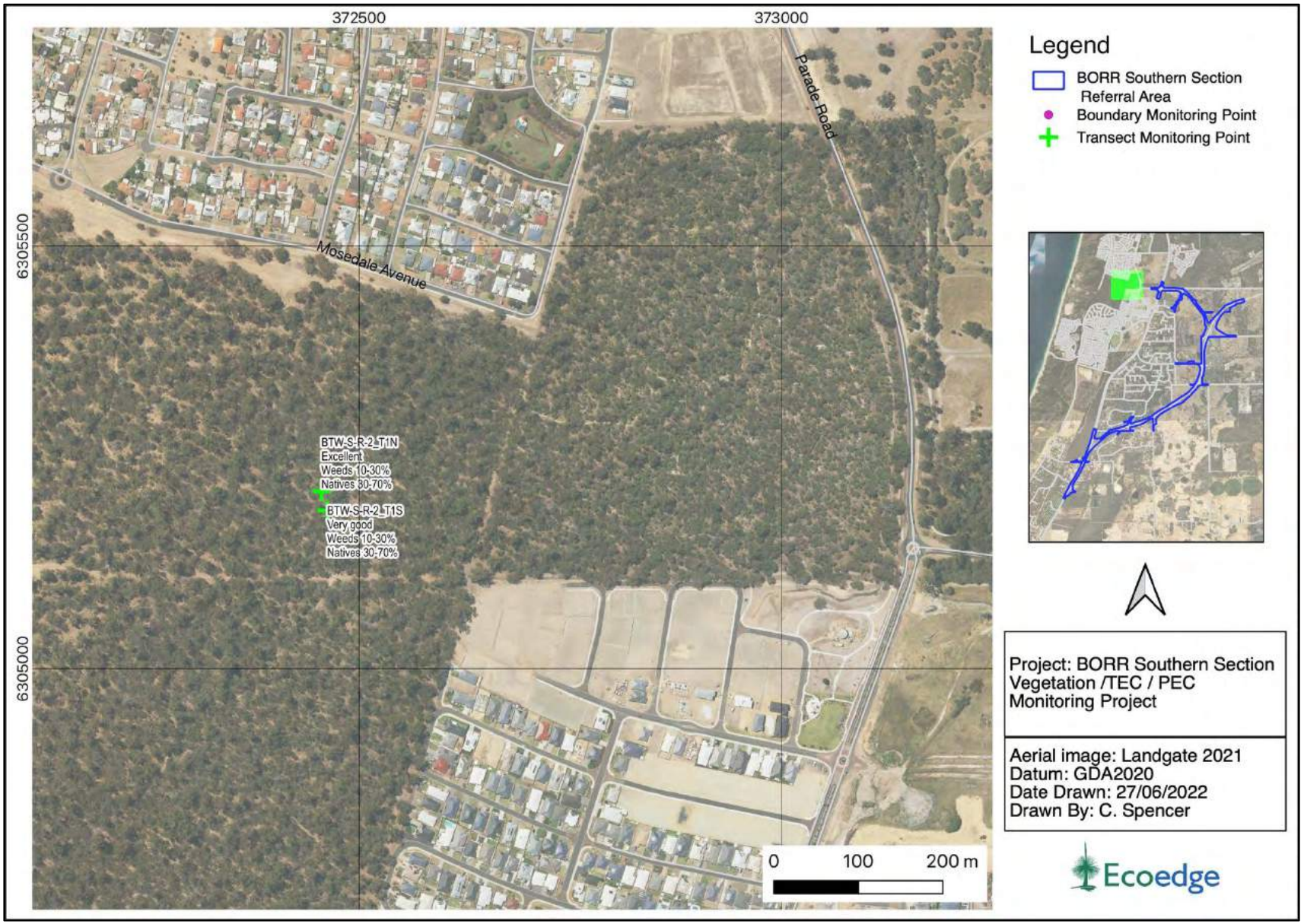


Figure 3. Baseline reference site BTW-S-R-2 vegetation condition, weed and native cover.

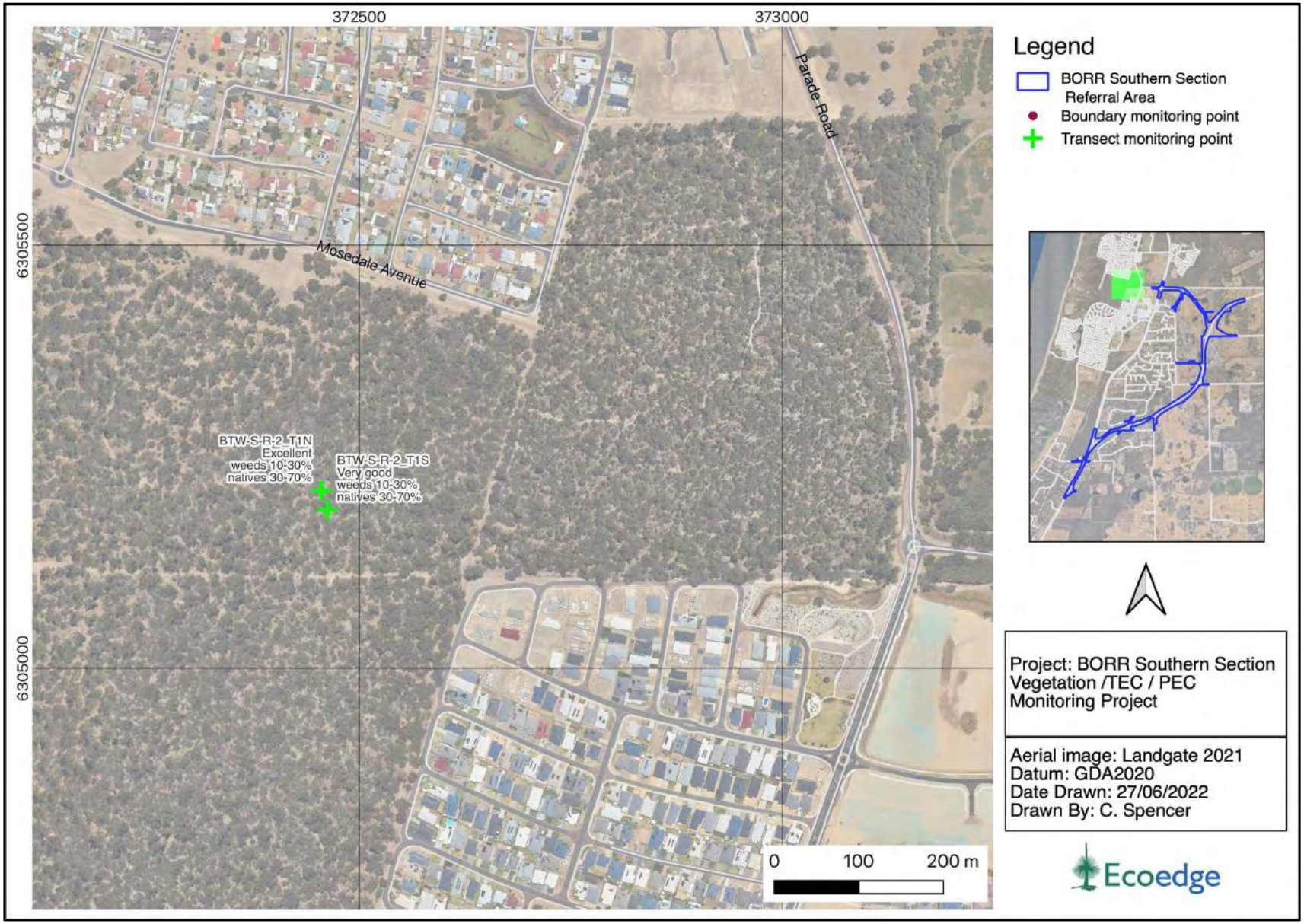


Figure 4. 2023 reference site site BTW-S-R-2 vegetation condition, weed and native cover.

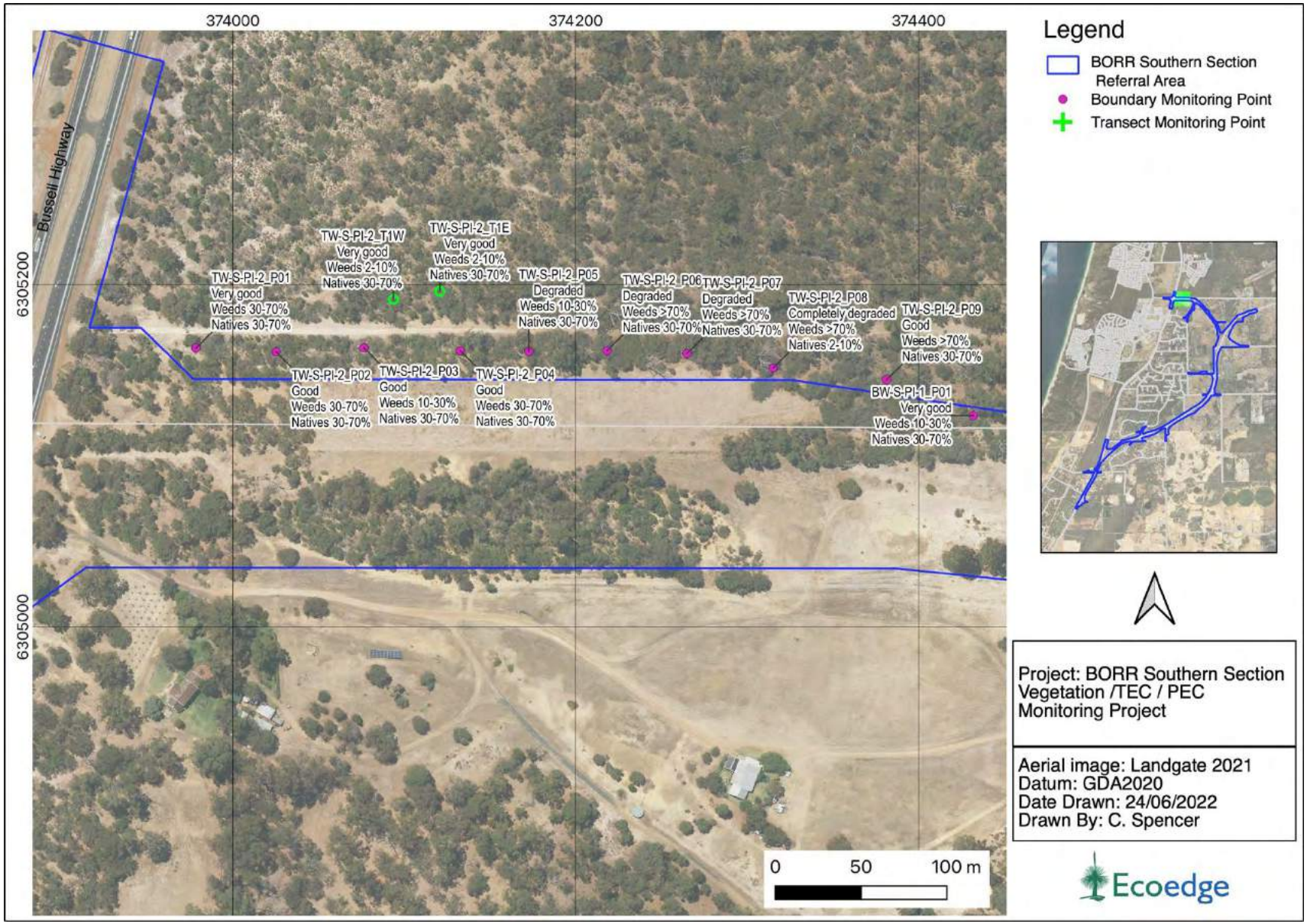


Figure 5. Baseline potential impact site TW-S-PI-2 vegetation condition, weed and native cover.

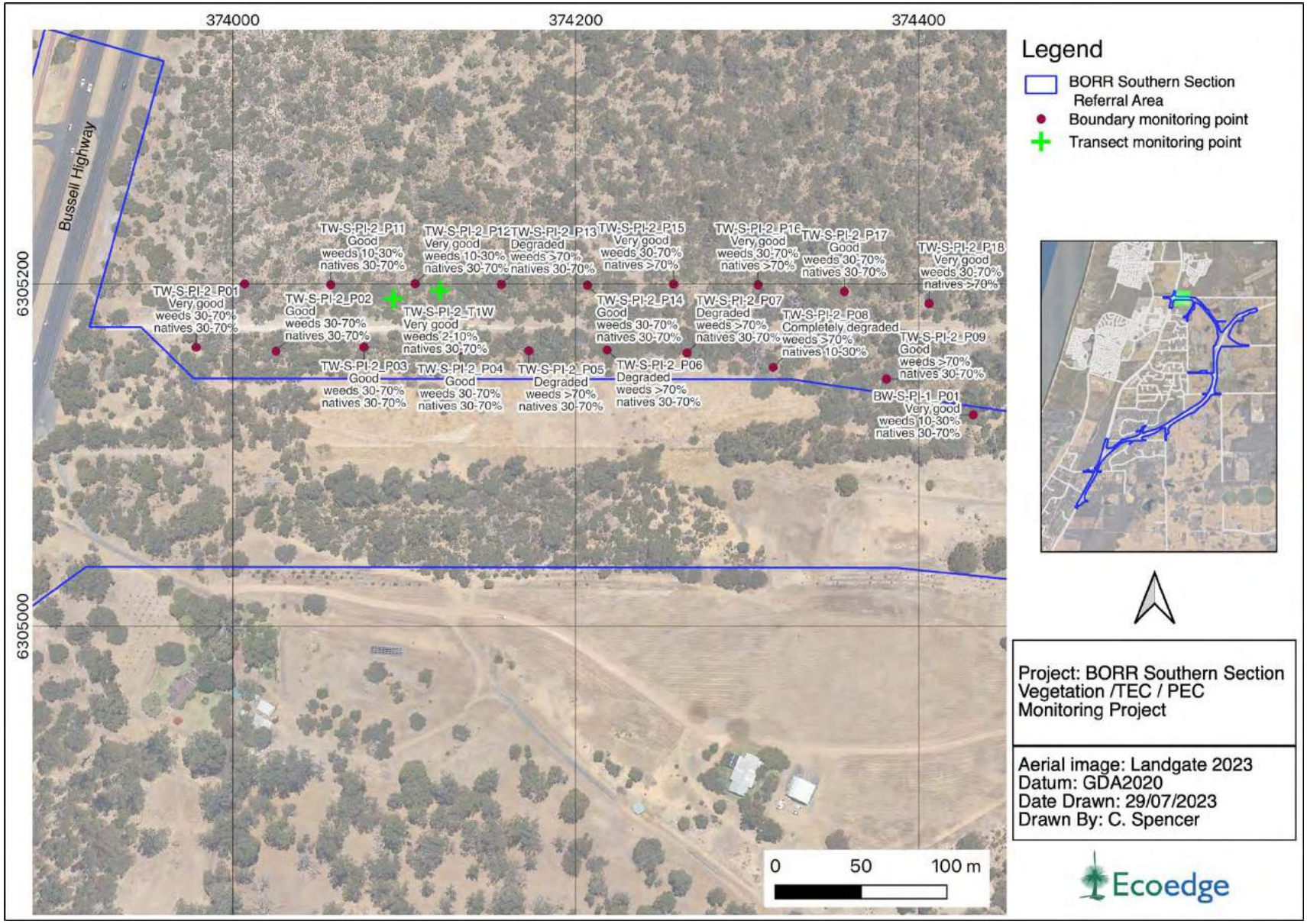


Figure 6. 2023 potential impact site TW-S-PI-2 vegetation condition, weed and native cover.

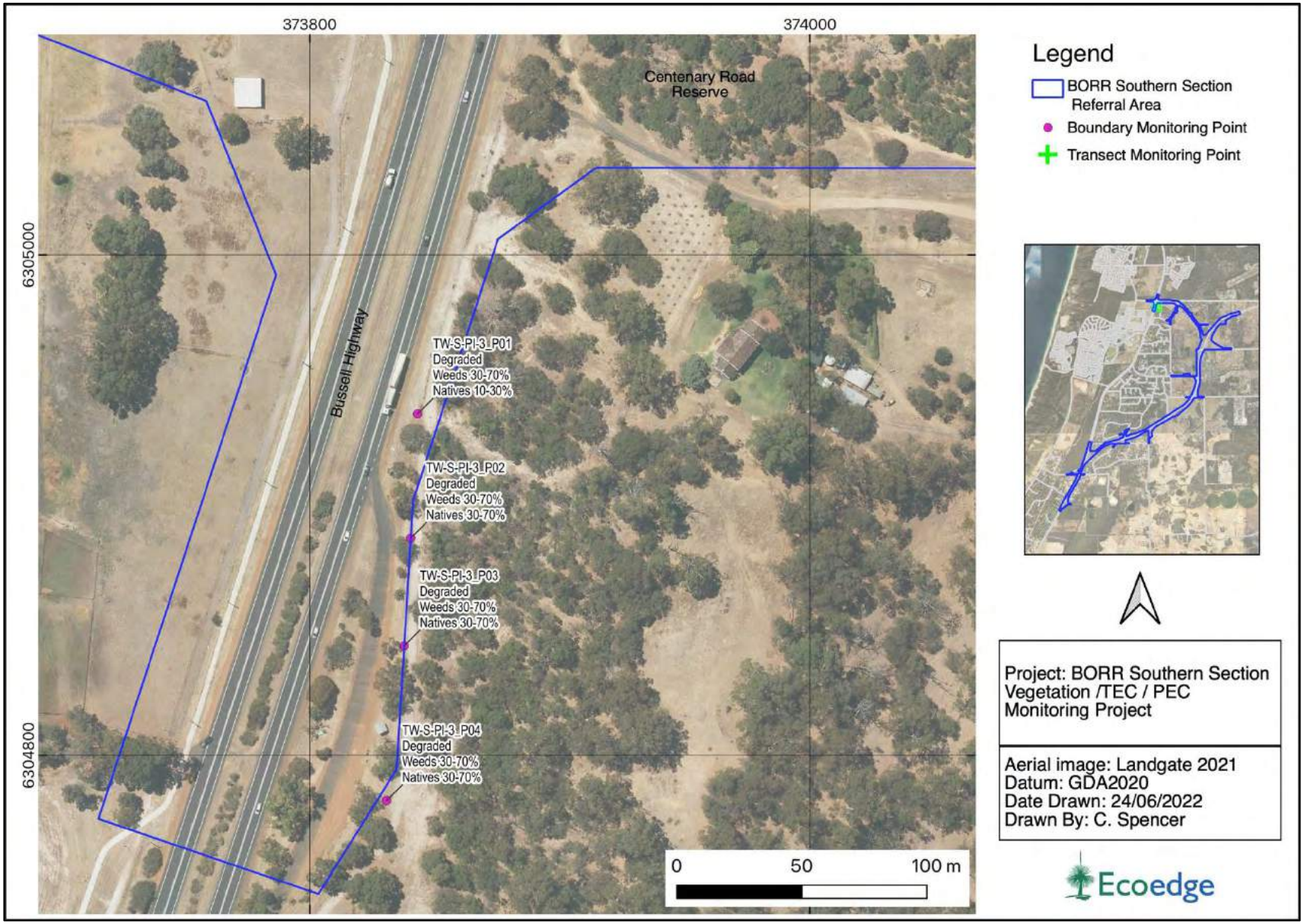


Figure 7. Baseline potential impact site TW-S-PI-3 vegetation condition, weed and native cover.

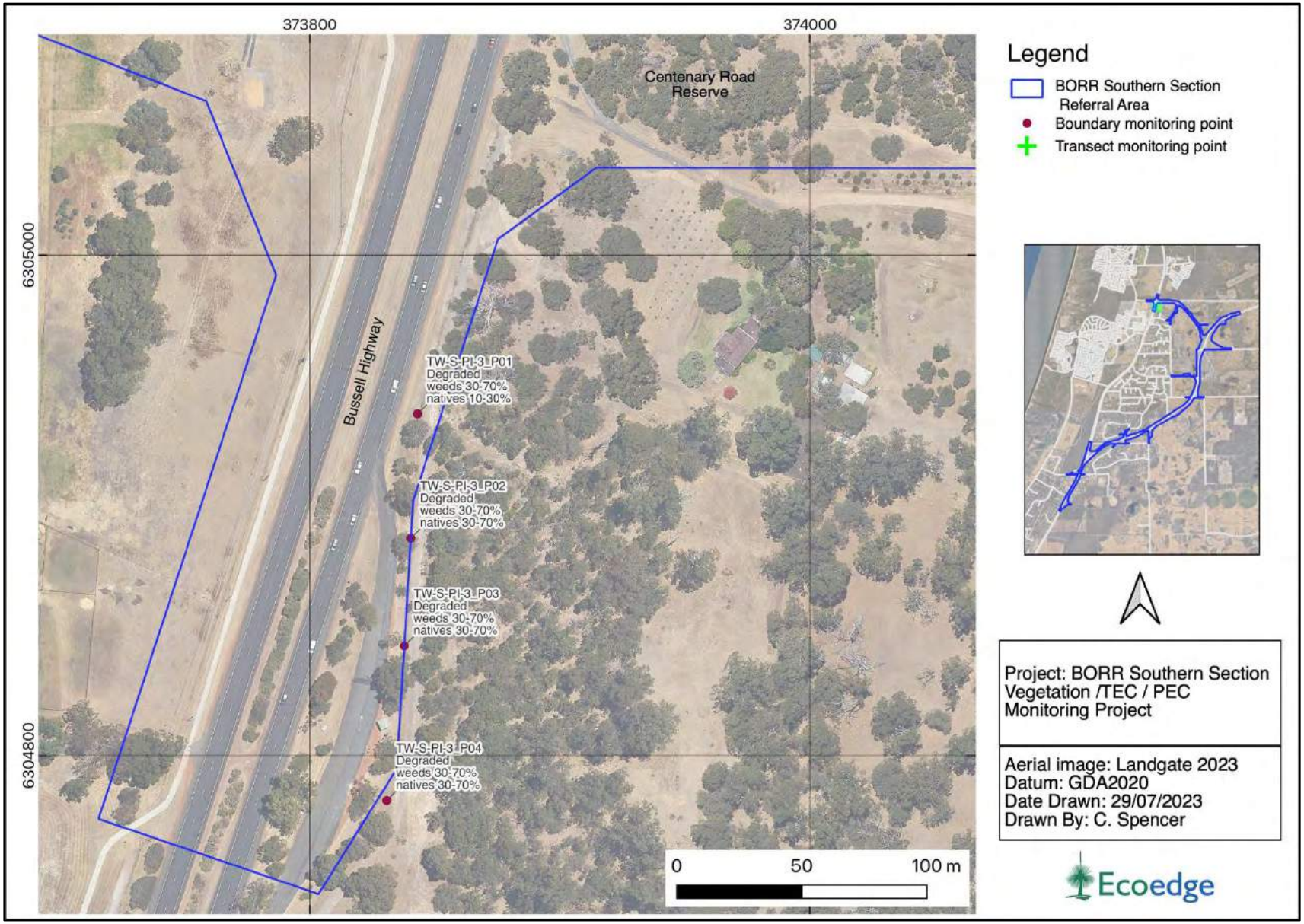


Figure 8.2023 potential impact site TW-S-PI-3 vegetation condition, weed and native cover.

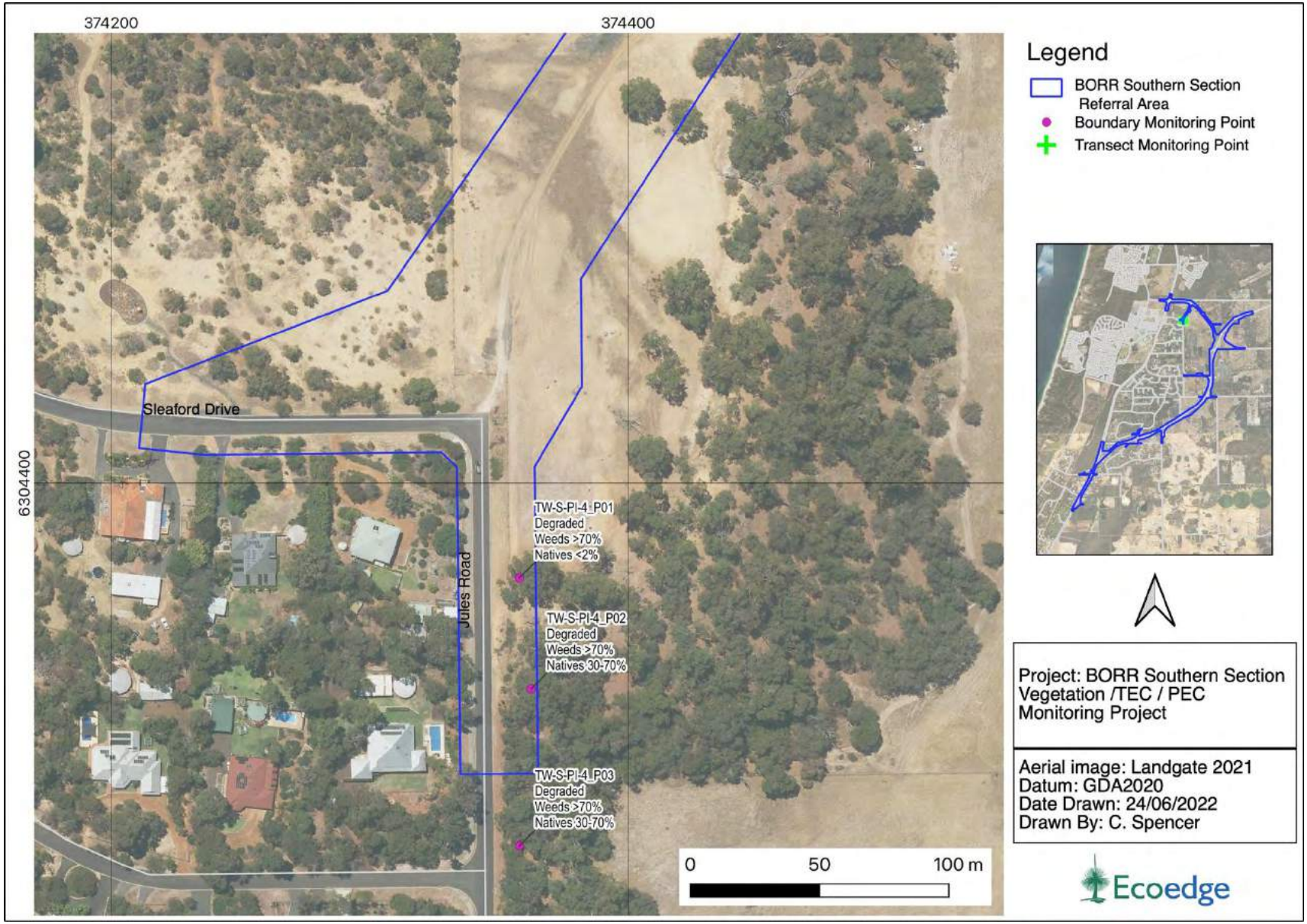


Figure 9. Baseline potential impact site TW-S-PI-4 vegetation condition, weed and native cover.

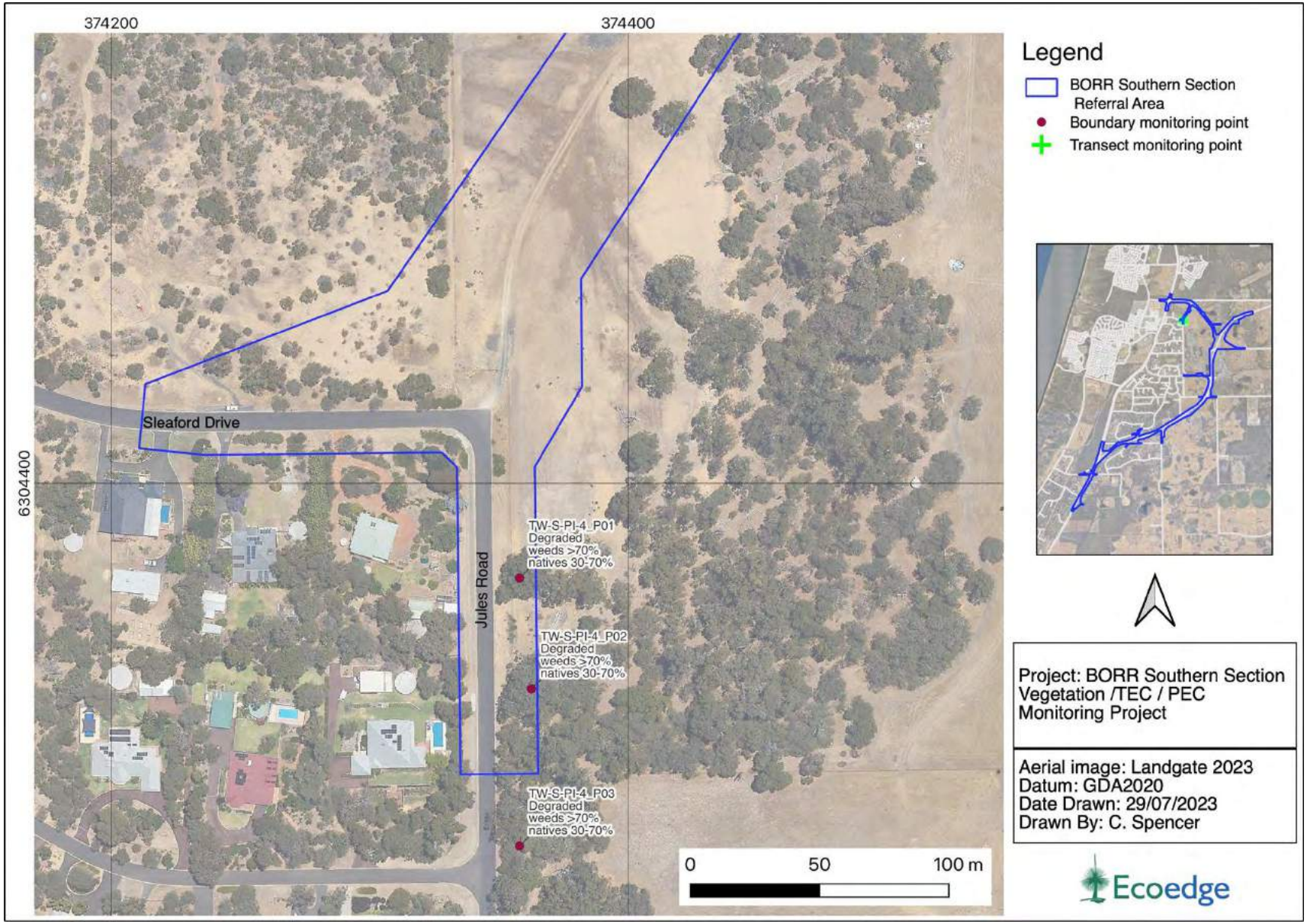


Figure 10. 2023 potential impact site TW-S-PI-4 vegetation condition, weed and native cover.

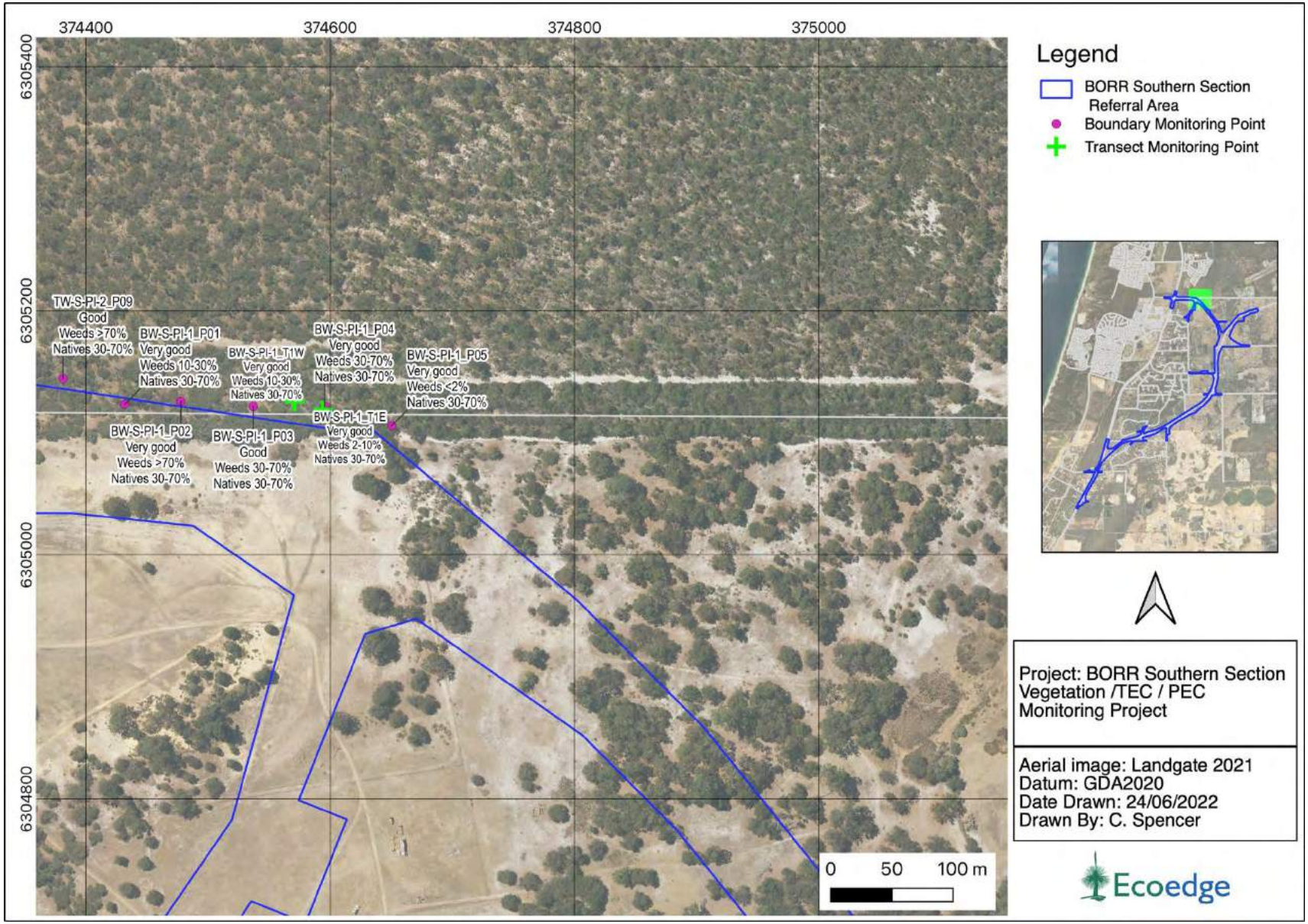


Figure 11. Baseline potential impact site BW-S-PI-1 vegetation condition, weed and native cover.

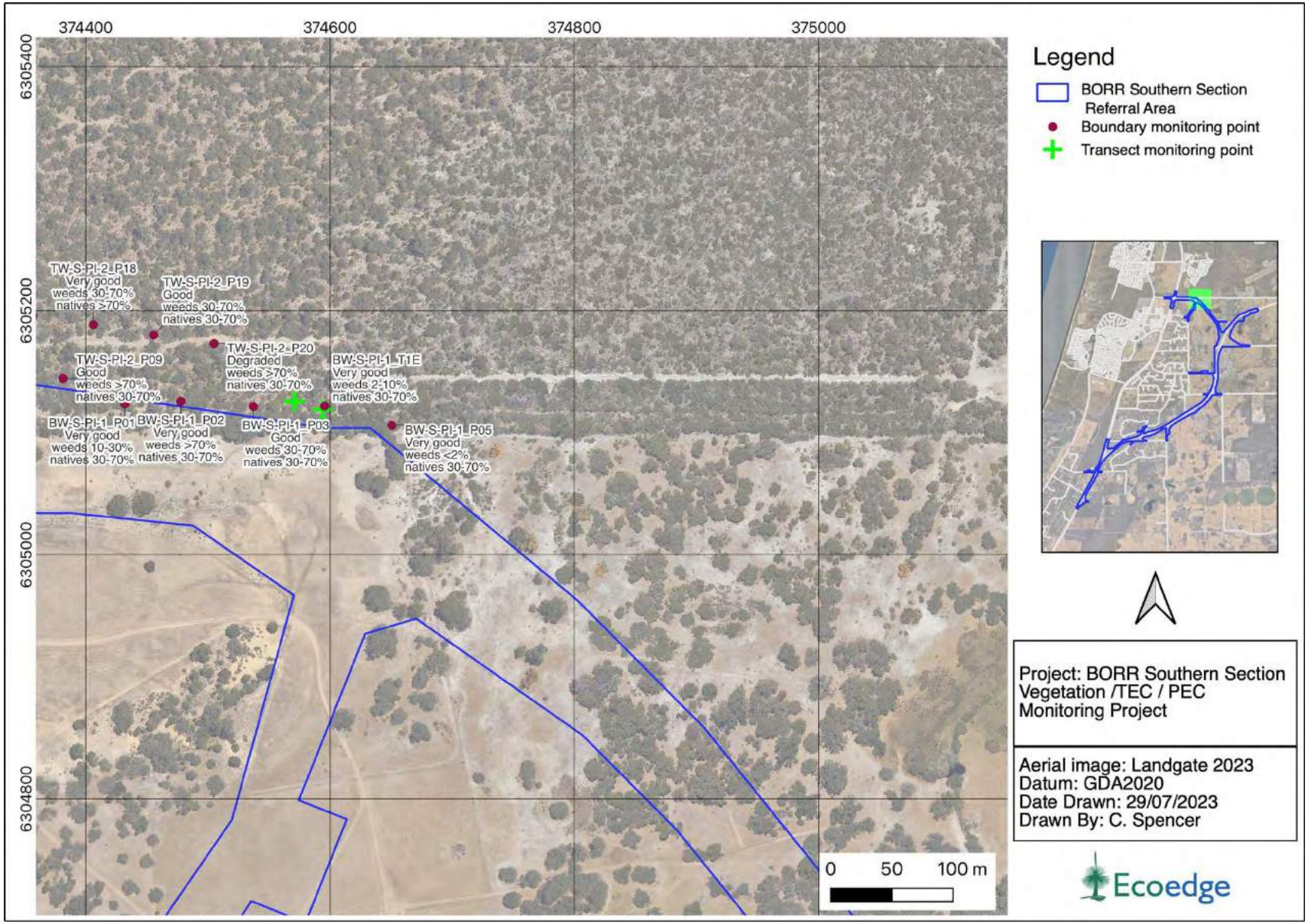


Figure 12. 2023 potential impact site BW-S-PI-1 vegetation condition, weed and native cover.

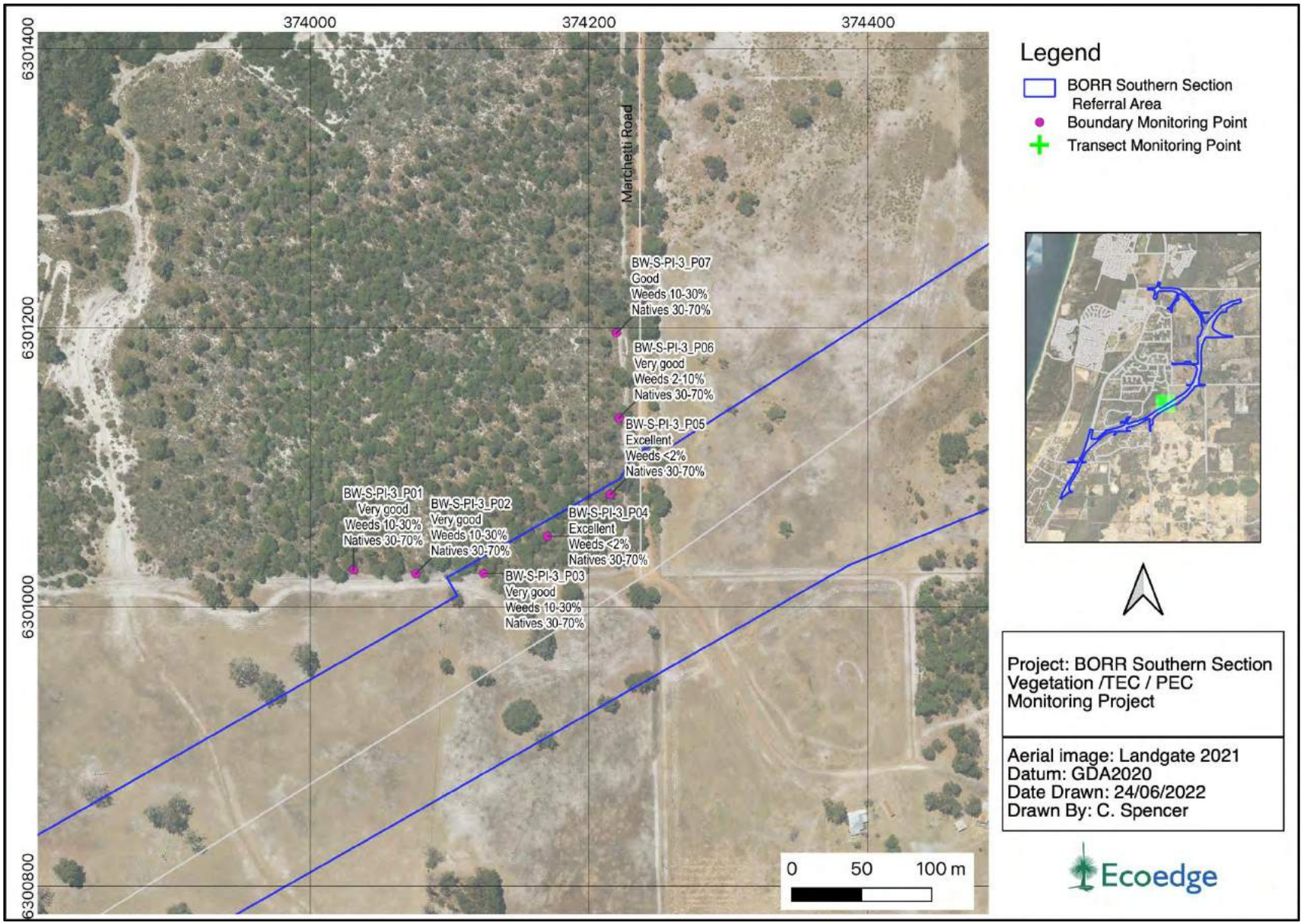


Figure 13. Baseline potential impact site BW-S-PI-3 vegetation condition, weed and native cover.

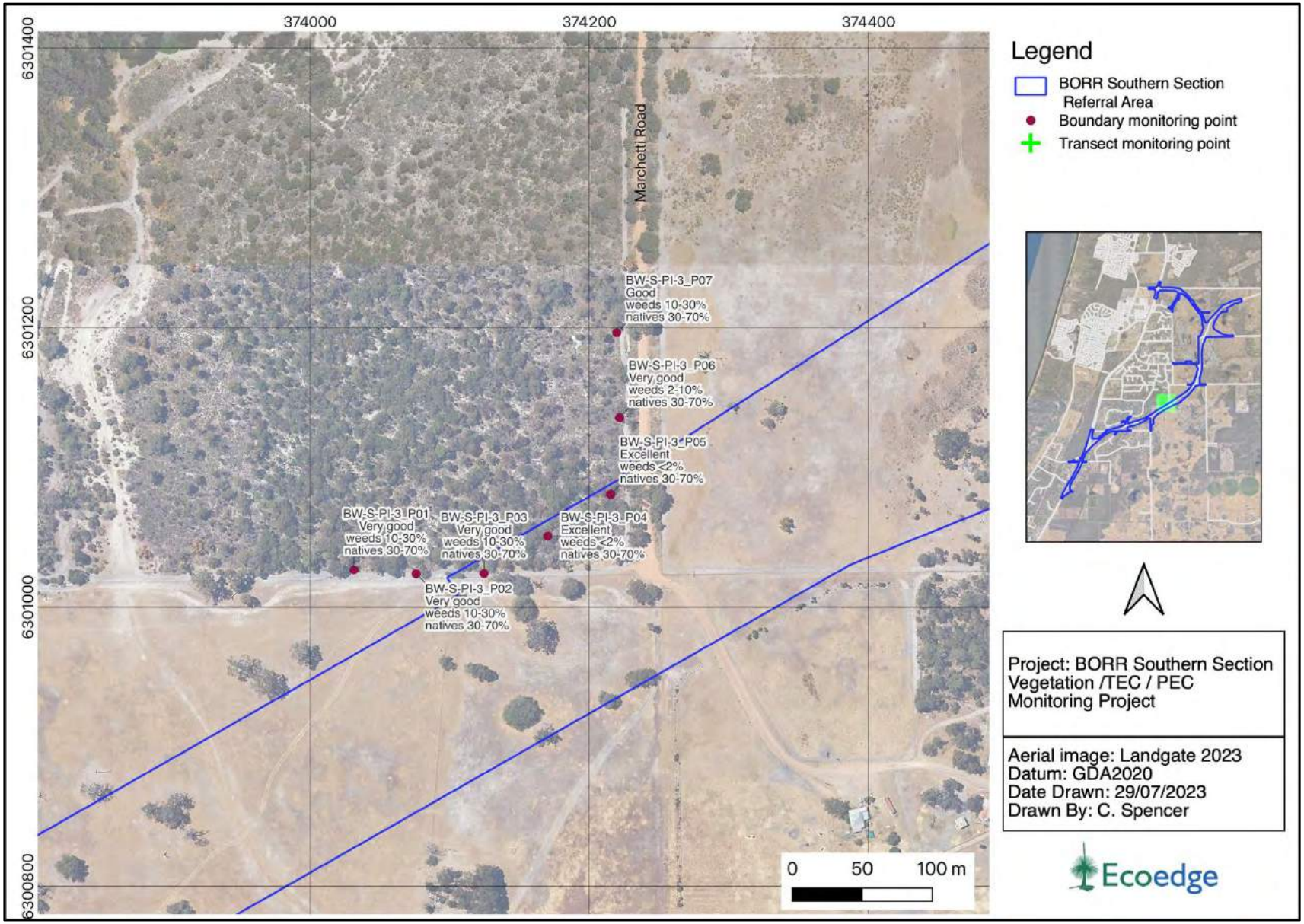


Figure 14. 2023 potential impact site BW-S-PI-3 vegetation condition, weed and native cover

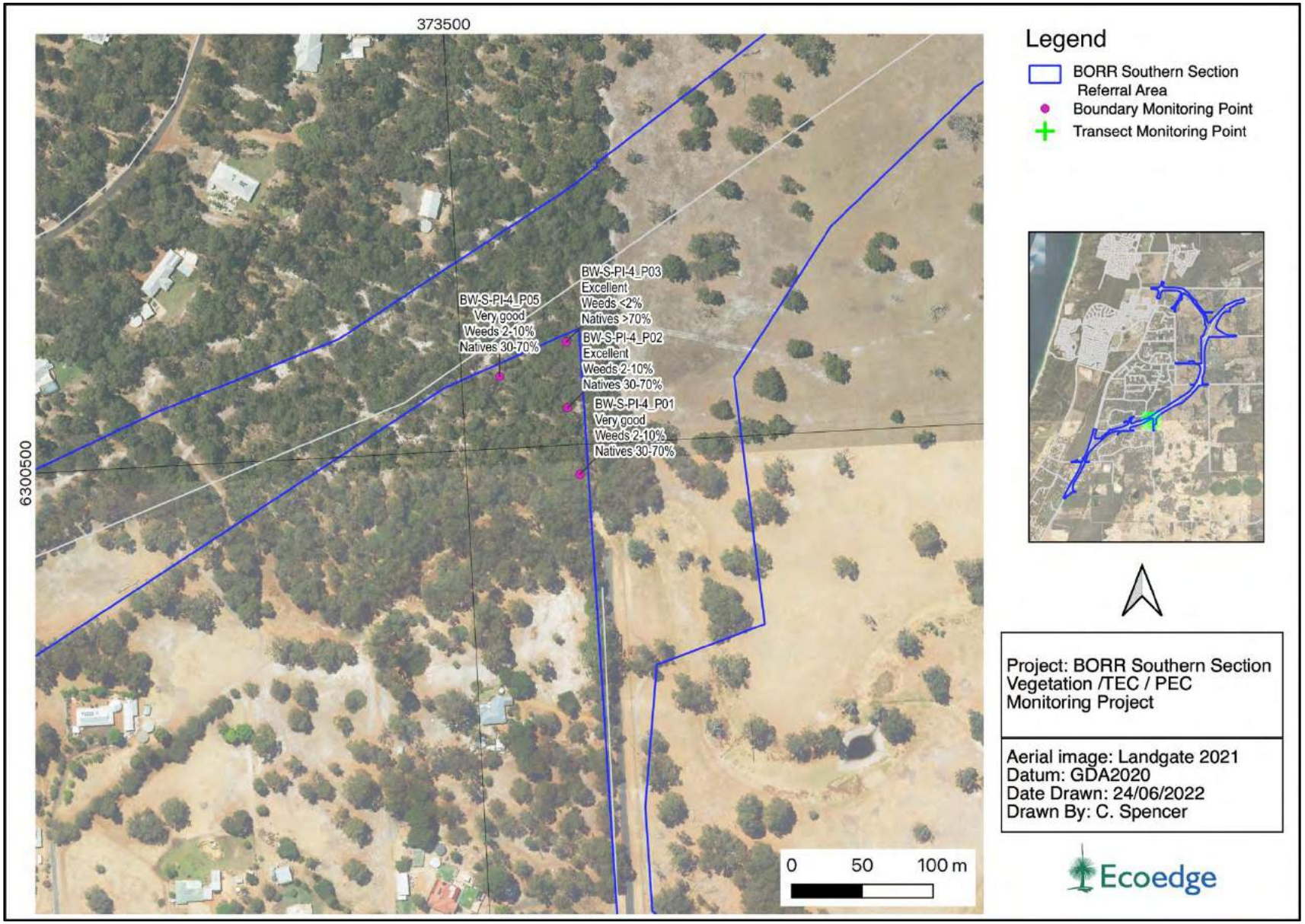


Figure 15. Baseline potential impact site BW-S-PI-4 vegetation condition, weed and native cover.

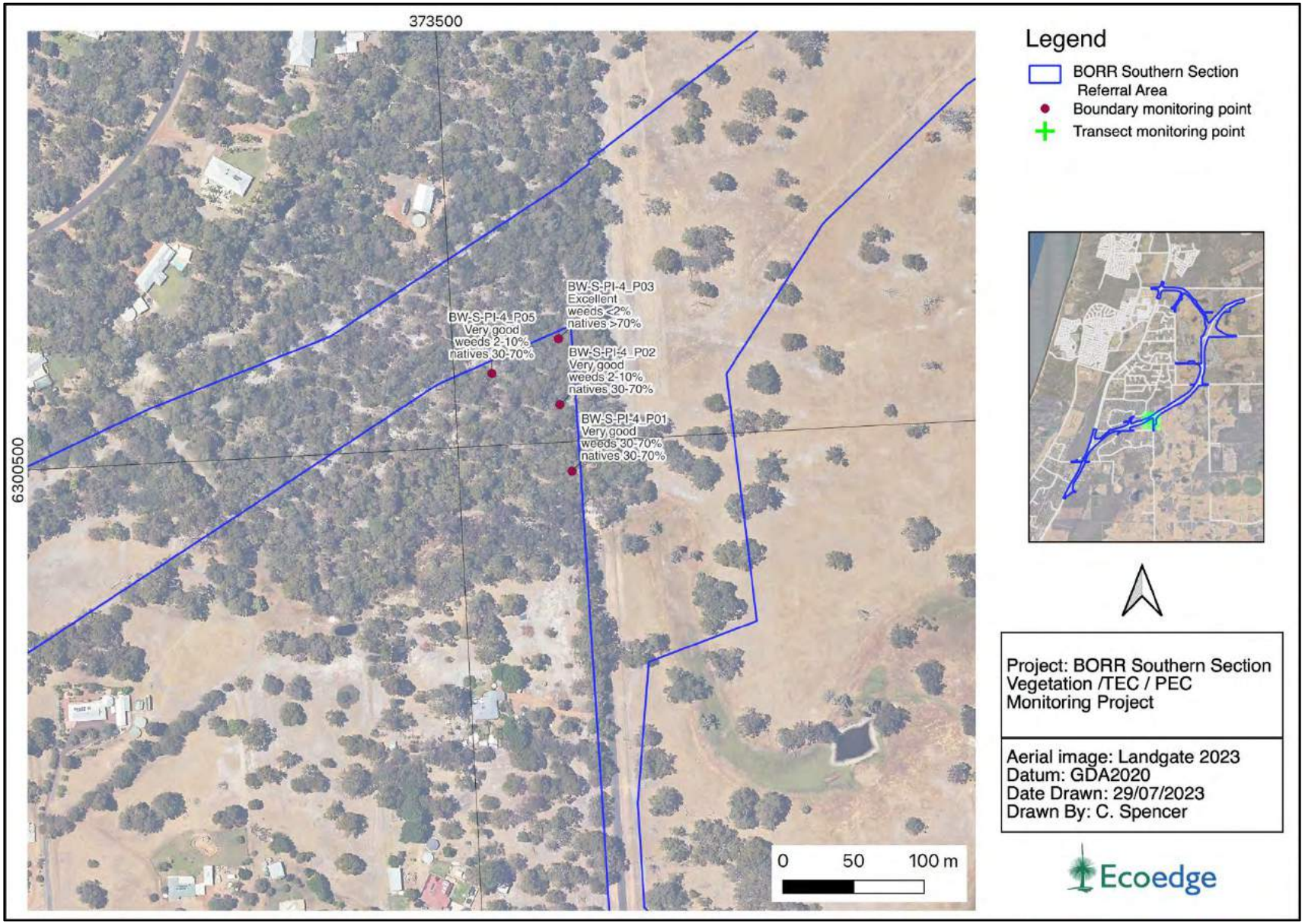


Figure 16. 2023 potential impact site BW-S-PI-4 vegetation condition, weed and native cover.

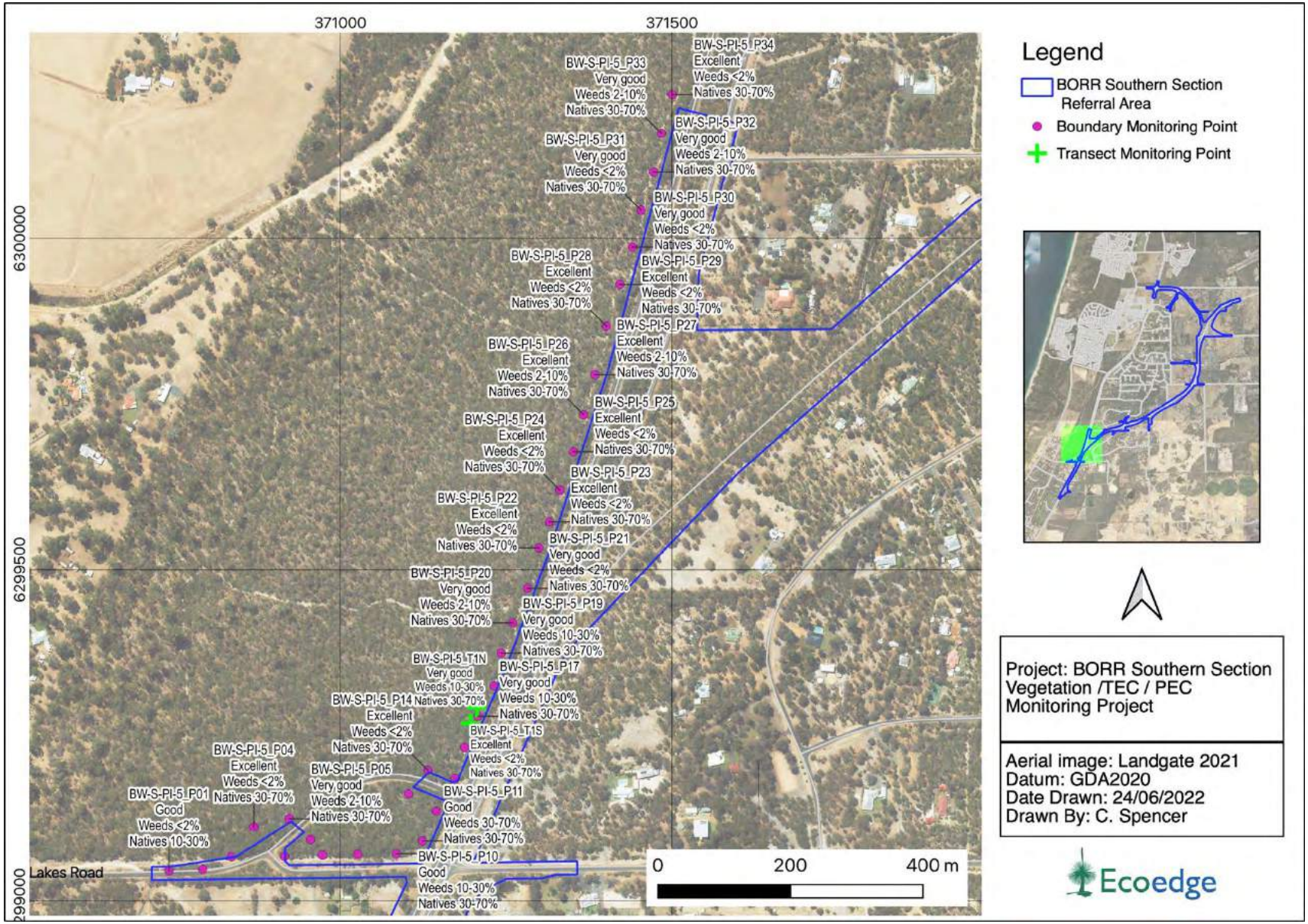


Figure 17. Baseline potential impact site BW-S-PI-5 vegetation condition, weed and native cover.

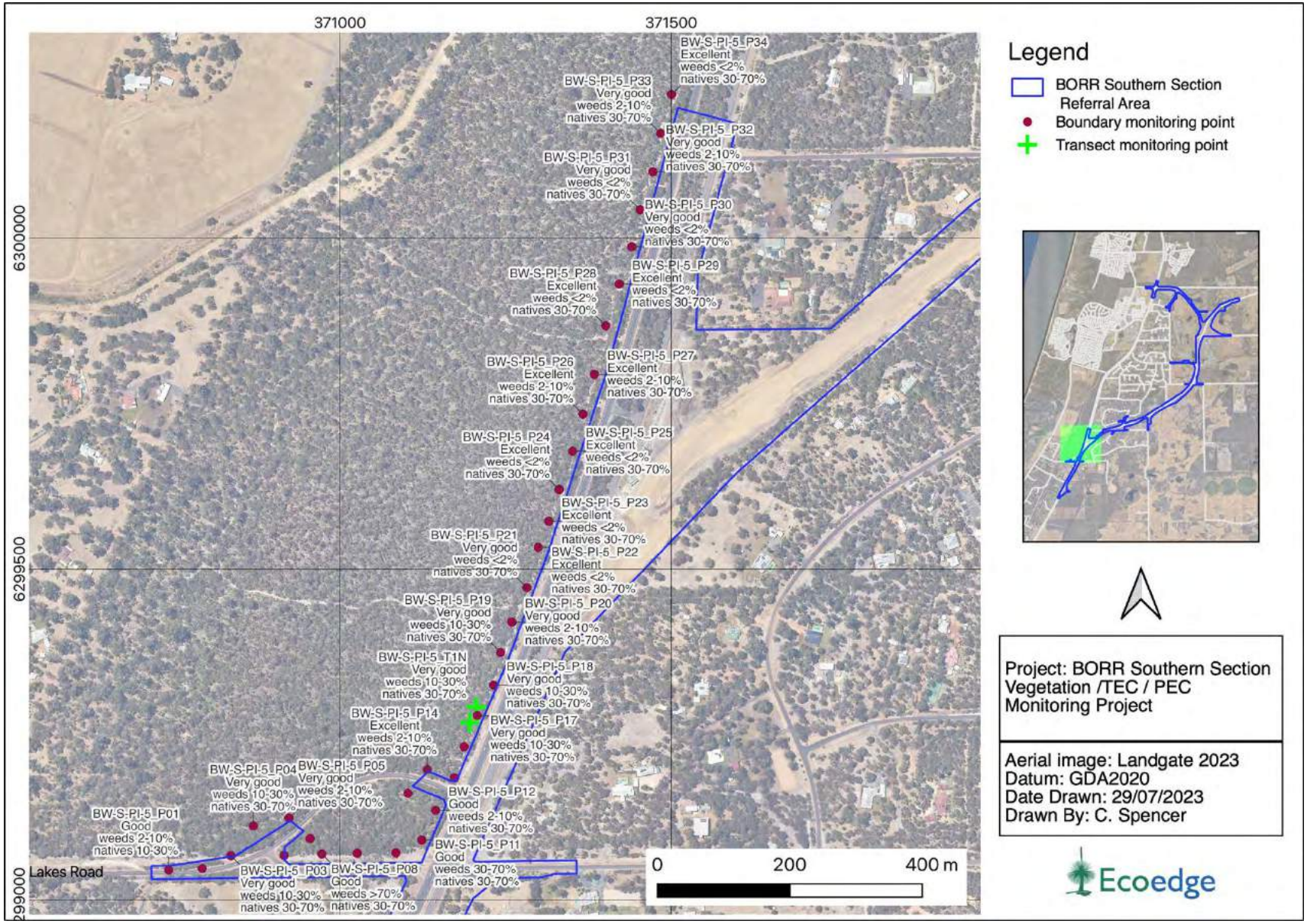


Figure 18. 2023 potential impact site BW-S-PI-5 vegetation condition, weed and native cover.

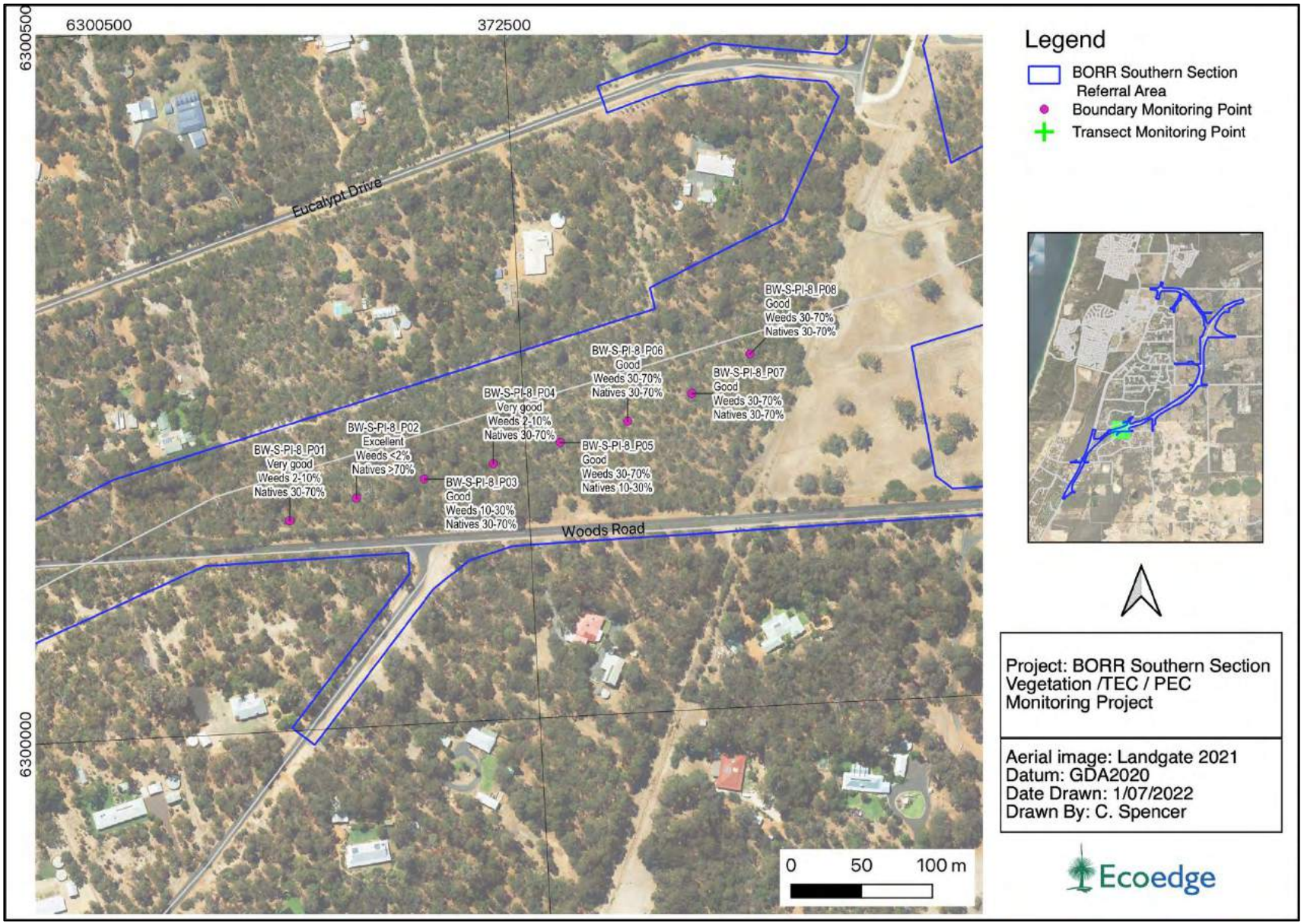


Figure 19. Baseline potential impact site BW-S-PI-8 vegetation condition, weed and native cover.

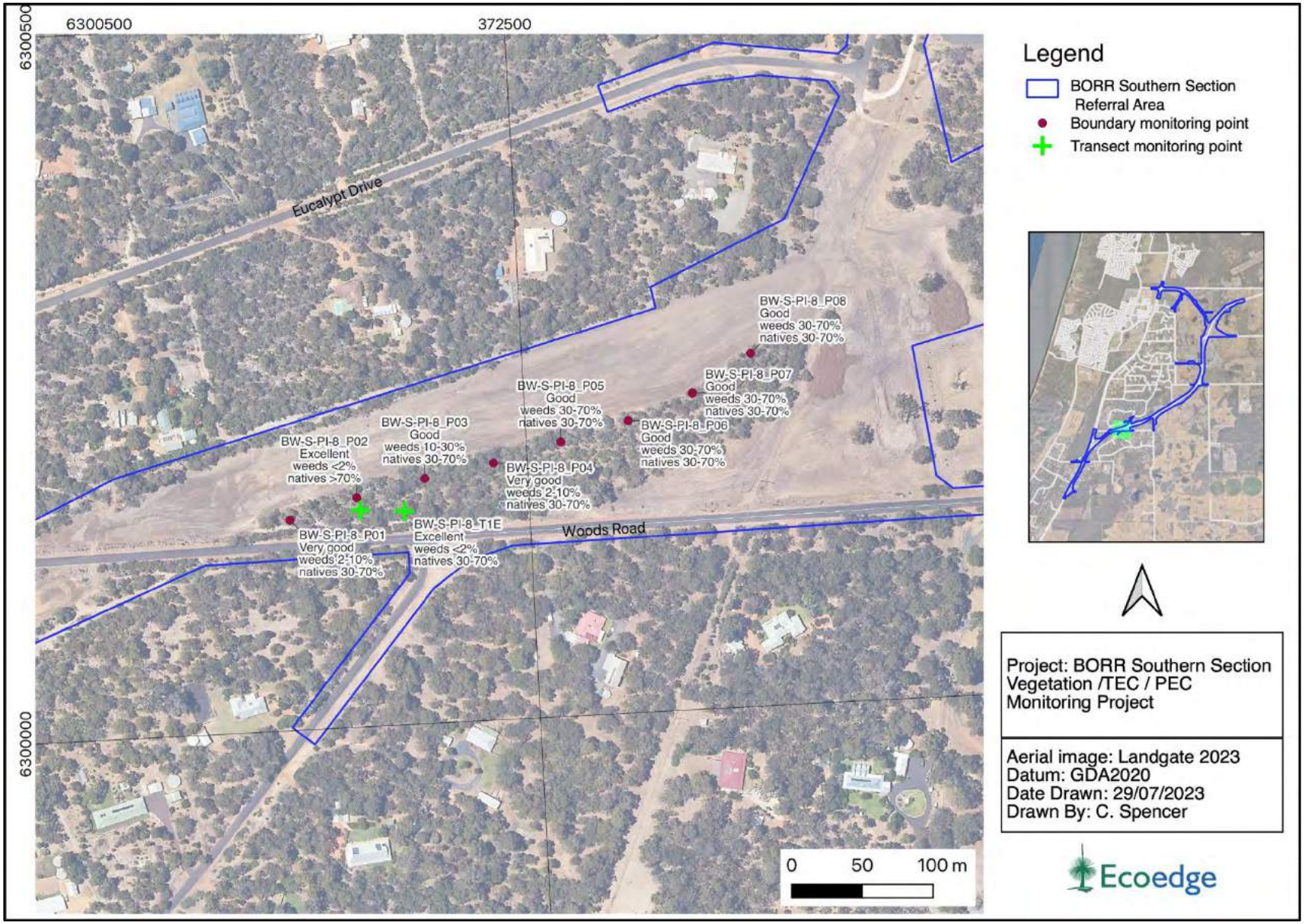


Figure 20. 2023 potential impact site BW-S-PI-8 vegetation condition, weed and native cover

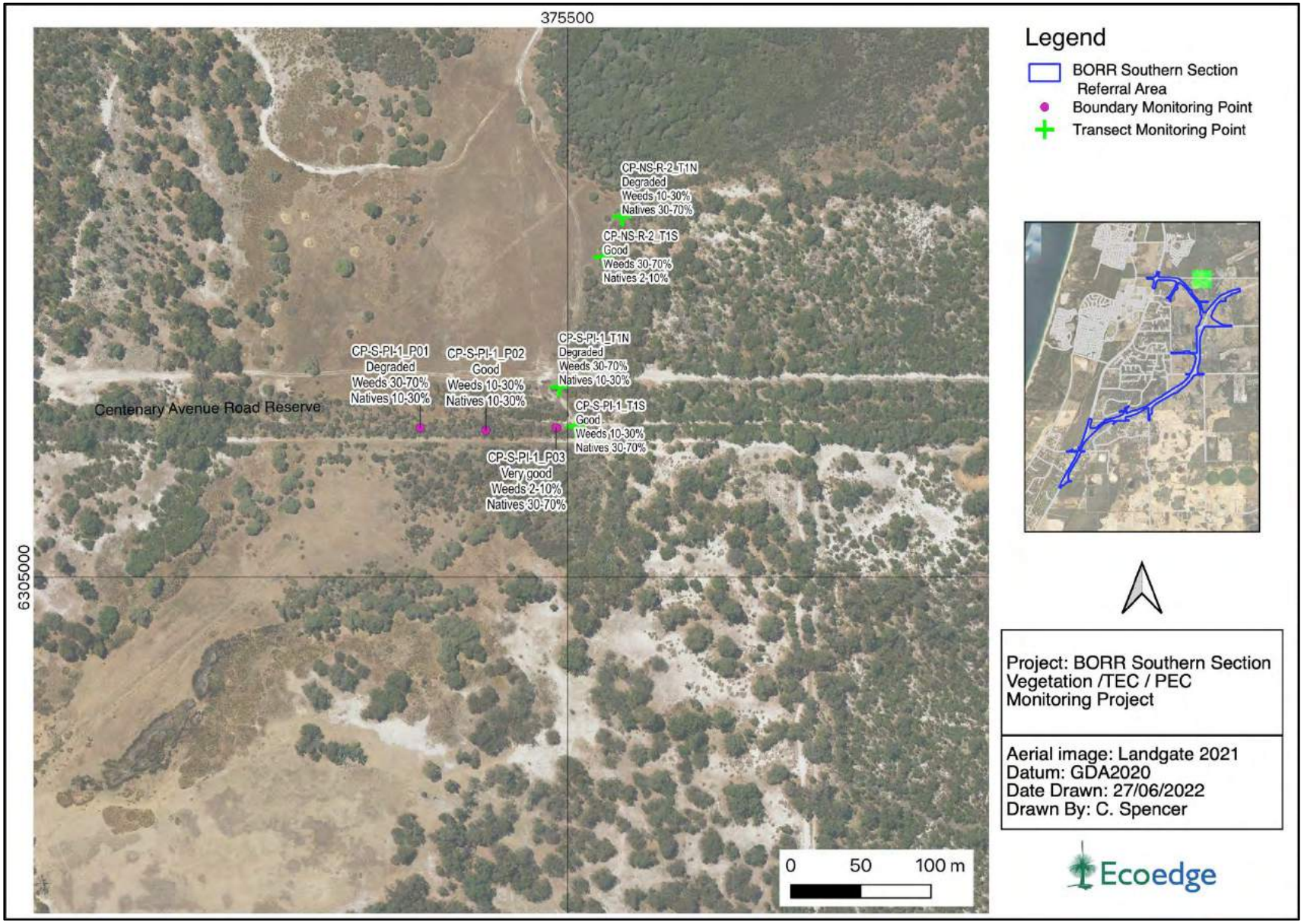


Figure 21. Baseline potential impact sites CP-S-PI-1 and reference site CP-NS-R-2 vegetation condition, weed and native cover.

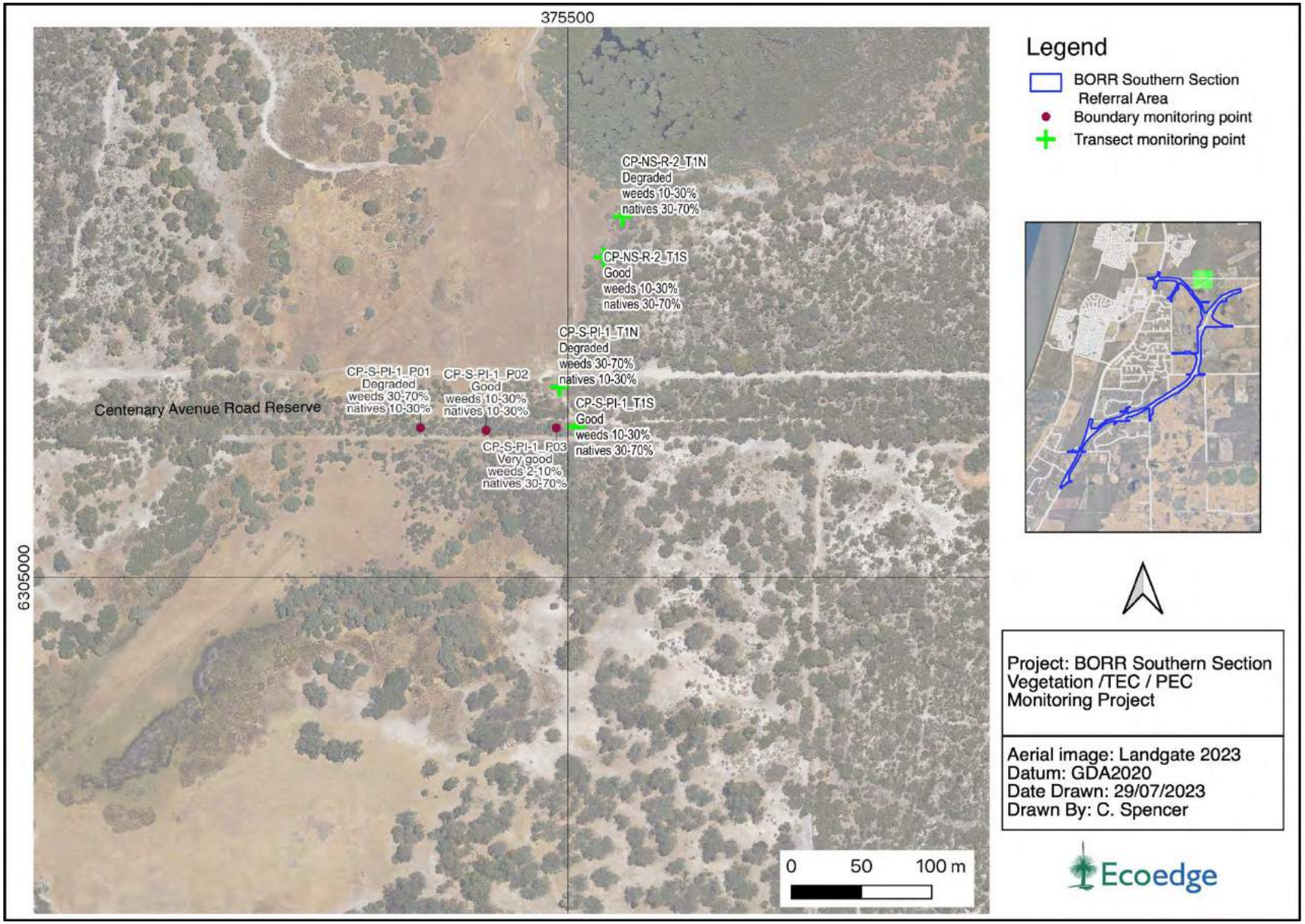


Figure 22. 2023 potential impact site CP-S-PI-1 and reference site CP-NS-R-2 vegetation condition, weed and native cover.

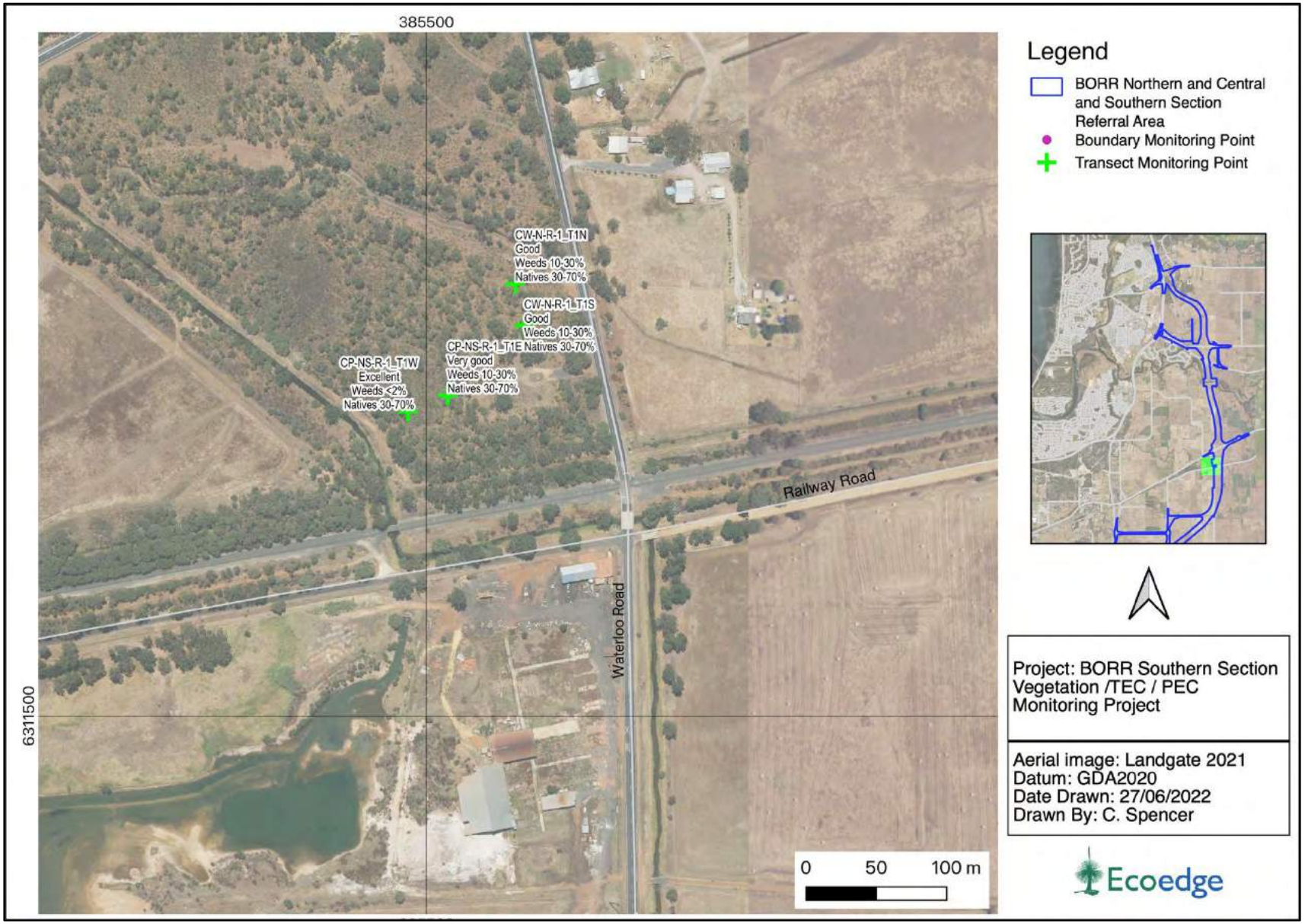


Figure 23 Baseline reference site CP-NS-R-1 vegetation condition, weed and native cover.

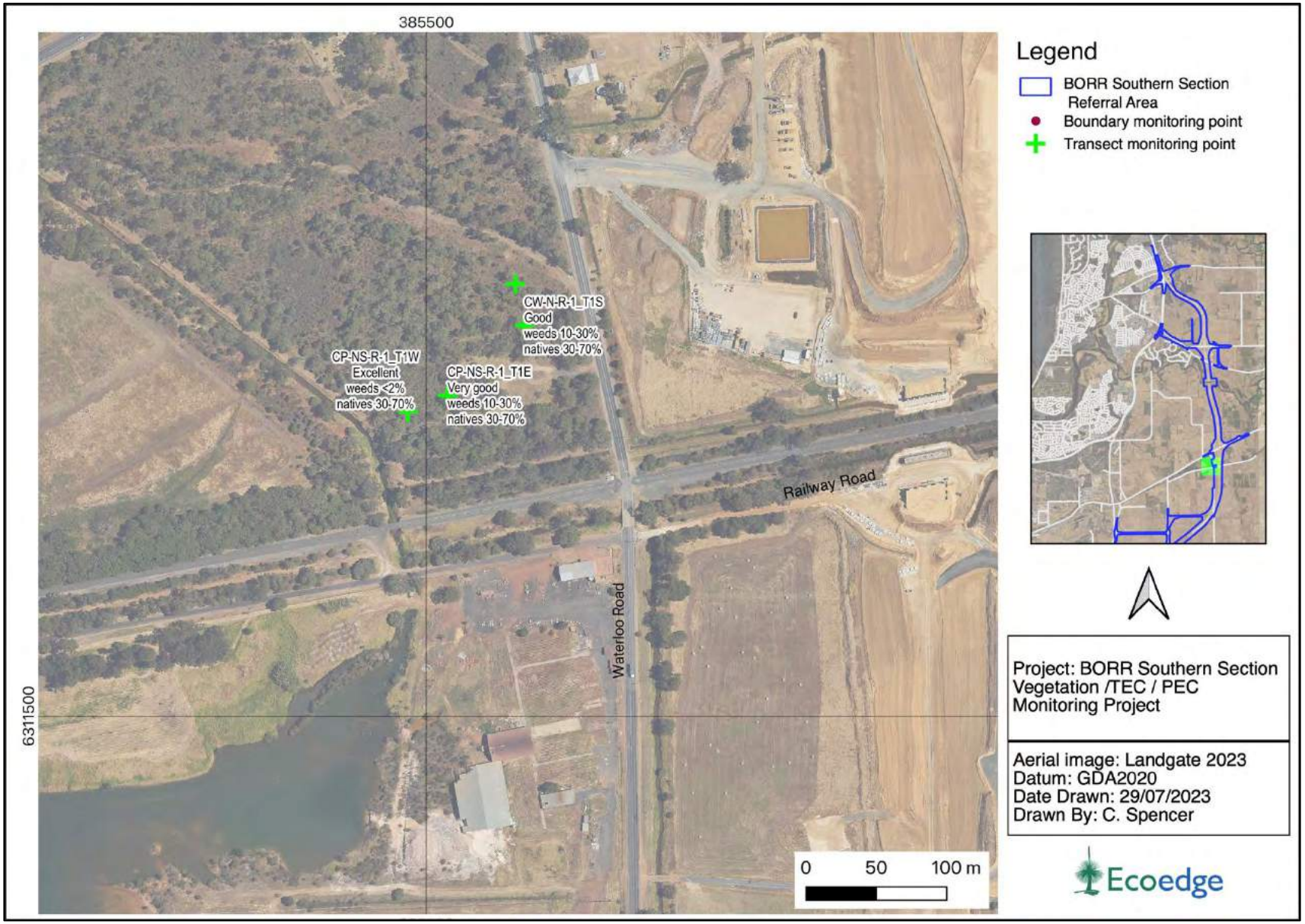


Figure 24 2023 reference site CP-NS-R-1 vegetation condition, weed and native cover.

Appendix 2. Index to all photographs taken during the monitoring survey.

Boundary and transect end point photographs

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BTW-S-I-3_T1E	26/05/2022 9:25	628ed7194be8e47fc6d9d078
BTW-S-I-3_T1E	26/05/2022 9:24	628ed6e34be8e47fc6d9d072
BTW-S-I-3_T1E	26/05/2022 9:24	628ed6b94be8e47fc6d9d06f
BTW-S-I-3_T1E	26/05/2022 9:22	628ed66f4be8e47fc5af0fd4
BTW-S-I-3_T1E	26/05/2022 9:21	628ed6234be8e47fc5af0fcb
BTW-S-I-3_T1E	26/05/2022 9:19	628ed5be4be8e47fc6d9d063
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BTW-S-I-3_T1E	11/06/2021 12:03	60c2e09a7f1ccc3590000009
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BTW-S-I-3_T1E	26/10/2020 15:31	5f967b3b7f1ccc23e200000b
BTW-S-I-3_T1E	26/10/2020 15:27	5f967a4c7f1ccc23e2000005
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BW-S-PI-1_P01	26/05/2020 10:07	5ecc79e97f1cccda86000007
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BW-S-PI-5_P15	23/10/2020 10:41	5f9242ea7f1ccc57b8000004
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BW-S-PI-5_P21	25/05/2022 12:49	628db5714be8e47fc6d9d010
BW-S-PI-5_P21	14/10/2021 8:27	616779634be8e4203d3cb90d
BW-S-PI-5_P21	23/10/2020 11:36	5f924fce7f1ccc57b8000016
BW-S-PI-5_P21	22/05/2020 12:34	5ec7566d7f1cccfa0d000008
BW-S-PI-5_P21	20/11/2019 10:58	5dd4abce7f1ccca2bf00000a
BW-S-PI-5_P22	20/10/2022 9:36	6350a6214be8e47fc5af174f
BW-S-PI-5_P22	25/05/2022 12:47	628db4f24be8e47fc6d9d00d
BW-S-PI-5_P22	14/10/2021 8:26	6167794f4be8e4203d3cb90b
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BW-S-PI-5_P22	22/05/2020 12:38	5ec757427f1cccfa0d00000b
BW-S-PI-5_P22	20/11/2019 11:03	5dd4ad1b7f1ccc3da8000002
BW-S-PI-5_P23	20/10/2022 9:33	6350a5854be8e47fc6d9d78d
BW-S-PI-5_P23	25/05/2022 12:38	628db2ab4be8e47fc5af0f69
BW-S-PI-5_P23	14/10/2021 8:29	616779f54be8e4203d3cb910
BW-S-PI-5_P23	23/10/2020 13:14	5f9266a87f1ccc57b800001c
BW-S-PI-5_P23	22/05/2020 12:43	5ec758727f1cccfa0d00000e
BW-S-PI-5_P23	20/11/2019 11:07	5dd4ade27f1ccc3da8000006
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BW-S-PI-5_P24	25/05/2022 12:34	628db1de4be8e47fc6d9d00a
BW-S-PI-5_P24	14/10/2021 8:36	61677b804be8e4203d3cb921
BW-S-PI-5_P24	23/10/2020 13:18	5f9267a27f1ccc57b800001f
BW-S-PI-5_P24	22/05/2020 12:48	5ec7598f7f1cccfa0d000011
BW-S-PI-5_P24	20/11/2019 11:10	5dd4aeb97f1ccc3da800000a
BW-S-PI-5_P25	25/05/2022 12:29	628db0a74be8e47fc5af0f66
BW-S-PI-5_P25	14/10/2021 9:03	616781d84be8e4203d3cb955
BW-S-PI-5_P25	23/10/2020 13:23	5f9268d17f1ccc57b8000022
BW-S-PI-5_P25	22/05/2020 12:52	5ec75aa67f1ccca8e4000004
BW-S-PI-5_P25	20/11/2019 11:13	5dd4af6d7f1ccc3da800000e
BW-S-PI-5_P26	20/10/2022 9:24	6350a3524be8e47fc6d9d787
BW-S-PI-5_P26	25/05/2022 12:23	628daf5d4be8e47fc6d9d007
BW-S-PI-5_P26	14/10/2021 8:45	61677dc04be8e4203d3cb936
BW-S-PI-5_P26	23/10/2020 13:27	5f9269c67f1ccc57b8000025
BW-S-PI-5_P26	22/05/2020 12:56	5ec75b727f1ccca8e4000016
BW-S-PI-5_P26	20/11/2019 11:17	5dd4b03c7f1ccc7137000002
BW-S-PI-5_P27	20/10/2022 9:16	6350a17a4be8e47fc6d9d784
BW-S-PI-5_P27	20/10/2022 9:15	6350a1434be8e47fc6d9d781
BW-S-PI-5_P27	25/05/2022 12:18	628dae294be8e47fc6d9d003
BW-S-PI-5_P27	25/05/2022 12:03	628daaa34be8e47fc6d9cffd
BW-S-PI-5_P27	14/10/2021 9:15	6167849c4be8e4203d3cb96d
BW-S-PI-5_P27	23/10/2020 13:35	5f926b927f1ccc57b8000028
BW-S-PI-5_P27	22/05/2020 12:52	5ec75aa47f1cccc384000004
BW-S-PI-5_P27	20/11/2019 11:41	5dd4b5cd7f1ccc7137000006
BW-S-PI-5_P28	20/10/2022 9:12	6350a08a4be8e47fc5af1749

Name [Site]	Date and time	Photo ID
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BW-S-PI-5_P28	23/10/2020 13:38	5f926c6b7f1ccc57b800002b
BW-S-PI-5_P28	22/05/2020 12:53	5ec75abd7f1ccca8e4000007
BW-S-PI-5_P28	22/05/2020 12:52	5ec75a747f1cccfa0d000017
BW-S-PI-5_P28	20/11/2019 12:56	5dd4c7647f1ccc713700000a
BW-S-PI-5_P29	20/10/2022 9:10	63509ff94be8e47fc5af1746
BW-S-PI-5_P29	25/05/2022 11:58	628da95d4be8e47fc6d9cffa
BW-S-PI-5_P29	14/10/2021 9:21	616785fd4be8e4203d3cb975
BW-S-PI-5_P29	23/10/2020 13:42	5f926d397f1ccc57b800002e
BW-S-PI-5_P29	22/05/2020 12:52	5ec75a867f1cccc384000001
BW-S-PI-5_P29	20/11/2019 12:59	5dd4c84e7f1ccc713700000e
BW-S-PI-5_P30	20/10/2022 9:07	63509f5d4be8e47fc5af1743
BW-S-PI-5_P30	25/05/2022 11:53	628da83b4be8e47fc6d9cff4
BW-S-PI-5_P30	14/10/2021 9:33	616788cb4be8e4203d3cb98d
BW-S-PI-5_P30	23/10/2020 13:45	5f926e047f1ccc57b8000031
BW-S-PI-5_P30	22/05/2020 12:55	5ec75b377f1ccca8e4000010
BW-S-PI-5_P30	22/05/2020 12:54	5ec75afb7f1cccc384000007
BW-S-PI-5_P30	22/05/2020 12:53	5ec75acf7f1ccca8e400000a
BW-S-PI-5_P30	22/05/2020 12:51	5ec75a697f1cccfa0d000014
BW-S-PI-5_P30	20/11/2019 13:18	5dd4cca97f1ccc7137000012
BW-S-PI-5_P31	20/10/2022 9:00	63509dc24be8e47fc5af1740
BW-S-PI-5_P31	25/05/2022 11:51	628da7b64be8e47fc5af0f57
BW-S-PI-5_P31	14/10/2021 9:50	61678cf64be8e4203d3cb9ad
BW-S-PI-5_P31	23/10/2020 13:50	5f926f277f1ccc57b8000034
BW-S-PI-5_P31	22/05/2020 12:52	5ec75a857f1ccc6f0c000001
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BW-S-PI-5_P32	20/10/2022 8:56	63509ccb4be8e47fc6d9d77e
BW-S-PI-5_P32	25/05/2022 11:49	628da7334be8e47fc5af0f54
BW-S-PI-5_P32	14/10/2021 10:02	61678fba4be8e4203d3cb9bf
BW-S-PI-5_P32	23/10/2020 13:54	5f92702e7f1ccc57b8000037
BW-S-PI-5_P32	22/05/2020 12:55	5ec75b3f7f1ccca8e4000013
BW-S-PI-5_P32	22/05/2020 12:54	5ec75afd7f1ccca8e400000d
BW-S-PI-5_P32	22/05/2020 12:52	5ec75a867f1ccca8e4000001
BW-S-PI-5_P32	20/11/2019 13:35	5dd4d0a07f1ccc713700001a
BW-S-PI-5_P33	23/10/2020 14:00	5f92717d7f1ccc57b800003a
BW-S-PI-5_P33	20/11/2019 13:46	5dd4d3447f1ccc713700001e
BW-S-PI-5_P34	23/10/2020 14:06	5f9272cd7f1ccc57b800003d
BW-S-PI-5_P34	20/11/2019 13:57	5dd4d5da7f1ccc56be000002
BW-S-PI-5_P35	22/11/2020 13:39	5fb9f9ac7f1ccc9f2d000001
BW-S-PI-5_P35	20/11/2019 14:07	5dd4d8227f1ccc56be000006
BW-S-PI-5_T1N	20/10/2022 9:50	6350a9754be8e47fc6d9d79c
BW-S-PI-5_T1N	17/10/2022 15:20	634d02324be8e47fc5af15da
BW-S-PI-5_T1N	25/05/2022 13:03	628db8b04be8e47fc6d9d019
BW-S-PI-5_T1N	14/10/2020 16:29	5f86b7027f1ccc8a9d00000f
BW-S-PI-5_T1N	22/05/2020 11:27	5ec746ab7f1cccbde0000028

Name [Site]	Date and time	Photo ID
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BW-S-PI-5_T1S	17/10/2022 15:55	634d0a8c4be8e47fc6d9d609
BW-S-PI-5_T1S	25/05/2022 13:07	628db97d4be8e47fc6d9d01c
BW-S-PI-5_T1S	14/10/2021 13:01	6167b9904be8e4203d3cba19
BW-S-PI-5_T1S	14/10/2020 15:35	5f86aa4c7f1ccc8a9d00000c
BW-S-PI-5_T1S	14/10/2020 15:21	5f86a6f37f1ccc8a9d000008
BW-S-PI-5_T1S	22/05/2020 11:25	5ec746287f1cccbde0000025
BW-S-PI-5_T1S	20/11/2019 15:11	5dd4e7137f1ccc12cb000006
BW-S-PI-8	20/10/2022 9:54	6350aa5e4be8e47fc6d9d7a5
BW-S-PI-8	20/10/2022 9:22	6350a2b84be8e47fc5af174c
BW-S-PI-8_p01	20/10/2022 12:39	6350d11f4be8e47fc5af177c
BW-S-PI-8_p01	29/07/2022 8:59	62e330eb4be8e47fc5af12a7
BW-S-PI-8_p01	20/06/2022 10:12	62afd78d4be8e47fc6d9d196
BW-S-PI-8_p02	20/10/2022 12:38	6350d0a84be8e47fc6d9d7c6
BW-S-PI-8_p02	29/07/2022 8:55	62e32ff94be8e47fc5af12a4
BW-S-PI-8_p02	20/06/2022 10:03	62afd5804be8e47fc6d9d192
BW-S-PI-8_p03	20/10/2022 12:36	6350d0384be8e47fc5af1779
BW-S-PI-8_p03	29/07/2022 8:51	62e32f234be8e47fc5af12a1
BW-S-PI-8_p03	20/06/2022 9:59	62afd46d4be8e47fc5af10ea
BW-S-PI-8_p04	20/10/2022 12:32	6350cf5a4be8e47fc6d9d7c3
BW-S-PI-8_p04	29/07/2022 8:41	62e32c9d4be8e47fc6d9d318
BW-S-PI-8_p04	20/06/2022 9:53	62afd32e4be8e47fc5af10e7
BW-S-PI-8_p05	20/10/2022 12:28	6350ce7f4be8e47fc6d9d7c0
BW-S-PI-8_p05	29/07/2022 8:38	62e32bfb4be8e47fc5af129e
BW-S-PI-8_p05	20/06/2022 9:47	62afd1b14be8e47fc6d9d18c
BW-S-PI-8_p06	20/10/2022 12:26	6350cdd94be8e47fc6d9d7bd
BW-S-PI-8_p06	29/07/2022 8:35	62e32b344be8e47fc6d9d315
BW-S-PI-8_p06	20/06/2022 9:41	62afd04e4be8e47fc6d9d188
BW-S-PI-8_p07	20/10/2022 12:13	6350cad54be8e47fc6d9d7ba
BW-S-PI-8_p07	29/07/2022 9:21	62e3362c4be8e47fc6d9d31b
BW-S-PI-8_p07	29/07/2022 8:25	62e329064be8e47fc5af1298
BW-S-PI-8_p07	20/06/2022 9:19	62afcb324be8e47fc5af10df
BW-S-PI-8_p08	20/10/2022 12:21	6350ccdb4be8e47fc5af1776
BW-S-PI-8_p08	29/07/2022 8:33	62e32ad04be8e47fc5af129b
BW-S-PI-8_p08	20/06/2022 9:32	62afce164be8e47fc5af10e3
BW-s-pi-8_T1E	20/10/2022 12:55	6350d4cc4be8e47fc6d9d7c9
BW-s-pi-8_T1w	20/10/2022 13:15	6350d9784be8e47fc6d9d7cd
BW-S-R-1_T1E	13/10/2022 12:03	63478e254be8e47fc6d9d593
BW-S-R-1_T1E	26/05/2022 8:28	628ec9ca4be8e47fc5af0fc5
BW-S-R-1_T1E	13/10/2021 8:24	6166273e4be8e4203d3cb636
BW-S-R-1_T1E	13/10/2021 7:58	6166210e4be8e4203d3cb61f
BW-S-R-1_T1E	13/10/2021 7:55	6166206c4be8e4203d3cb616
BW-S-R-1_T1E	12/10/2021 15:03	6165333e4be8e4203d3cb608
BW-S-R-1_T1E	22/05/2020 9:06	5ec7259a7f1ccc4b1a000004

Name [Site]	Date and time	Photo ID
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BW-S-R-1_T1E	22/05/2020 9:02	5ec7249c7f1ccc466b000004
BW-S-R-1_T1E	22/11/2019 13:57	5dd778b87f1ccc82ad00005a
BW-S-R-1_T1W	13/10/2022 13:50	6347a71a4be8e47fc5af153c
BW-S-R-1_T1W	13/10/2022 13:49	6347a7004be8e47fc6d9d596
BW-S-R-1_T1W	26/05/2022 8:28	628ec9954be8e47fc5af0fc2
BW-S-R-1_T1W	13/10/2021 8:24	616627394be8e4203d3cb634
BW-S-R-1_T1W	13/10/2021 7:58	6166210c4be8e4203d3cb61d
BW-S-R-1_T1W	13/10/2021 7:55	6166205e4be8e4203d3cb612
BW-S-R-1_T1W	12/10/2021 15:02	616533224be8e4203d3cb603
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BW-S-R-1_T1W	22/11/2019 14:00	5dd779697f1ccc82ad00005e
BW-S-R-1_T2N	13/10/2022 14:26	6347af844be8e47fc6d9d599
BW-S-R-1_T2N	26/05/2022 8:41	628eccbd4be8e47fc6d9d05d
BW-S-R-1_T2N	22/05/2020 9:31	5ec72b607f1ccc4b1a00000e
BW-S-R-1_T2N	3/12/2019 7:36	5de5a00c7f1ccc501400001c
BW-S-R-1_T2S	13/10/2022 14:27	6347afdd4be8e47fc5af153f
BW-S-R-1_T2S	26/05/2022 8:43	628ecd444be8e47fc6d9d060
BW-S-R-1_T2S	13/10/2021 8:38	61662a844be8e4203d3cb650
BW-S-R-1_T2S	13/10/2021 8:23	616626e74be8e4203d3cb630
BW-S-R-1_T2S	13/10/2021 7:57	616621024be8e4203d3cb619
BW-S-R-1_T2S	13/10/2021 7:55	616620614be8e4203d3cb614
BW-S-R-1_T2S	22/05/2020 9:28	5ec72ab77f1ccc4b1a00000a
BW-S-R-1_T2S	3/12/2019 7:38	5de5a05a7f1ccc5014000020
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BW-S-R-1_T3E	14/10/2022 8:33	6348ae524be8e47fc5af1565
BW-S-R-1_T3E	14/10/2022 8:32	6348ae284be8e47fc5af1562
BW-S-R-1_T3E	14/10/2022 8:31	6348adf44be8e47fc5af155f
BW-S-R-1_T3E	14/10/2022 8:30	6348adb94be8e47fc6d9d5af
BW-S-R-1_T3E	14/10/2022 8:30	6348adab4be8e47fc5af1559
BW-S-R-1_T3E	14/10/2022 8:29	6348ad844be8e47fc5af1556
BW-S-R-1_T3E	14/10/2022 8:29	6348ad6d4be8e47fc6d9d5ac
BW-S-R-1_T3E	14/10/2022 8:28	6348ad164be8e47fc6d9d5a9
BW-S-R-1_T3E	14/10/2022 8:27	6348ad034be8e47fc5af1550
BW-S-R-1_T3E	14/10/2022 8:27	6348acf24be8e47fc5af154d
BW-S-R-1_T3E	14/10/2022 8:26	6348aca04be8e47fc6d9d5a6
BW-S-R-1_T3E	14/10/2022 8:25	6348ac874be8e47fc5af154a
BW-S-R-1_T3E	14/10/2022 8:25	6348ac754be8e47fc5af1547
BW-S-R-1_T3E	14/10/2022 8:24	6348ac4e4be8e47fc6d9d5a0
BW-S-R-1_T3E	14/10/2022 8:23	6348abf54be8e47fc6d9d59d
BW-S-R-1_T3E	25/05/2022 15:48	628ddf4b4be8e47fc6d9d05a
BW-S-R-1_T3E	26/10/2020 9:58	5f962d3d7f1ccc707400000a
BW-S-R-1_T3E	22/05/2020 9:41	5ec72daf7f1ccc8804000001
BW-S-R-1_T3E	3/12/2019 9:05	5de5b4d17f1ccc5014000030

Name [Site]	Date and time	Photo ID
BW-S-R-1_T3W	13/10/2022 14:52	6347b5934be8e47fc5af1544
BW-S-R-1_T3W	25/05/2022 15:49	628ddf9b4be8e47fc5af0fbf
BW-S-R-1_T3W	26/10/2020 8:30	5f9618b37f1ccc7e1500000b
BW-S-R-1_T3W	3/12/2019 9:08	5de5b58a7f1ccc5014000034
CP-NS-R-1_T1E	28/09/2022 11:31	6333bfff4be8e47fc6d9d4b9
CP-NS-R-1_T1E	24/05/2022 11:33	628c521d4be8e47fc6d9cf8e
CP-NS-R-1_T1E	24/05/2022 11:33	628c520d4be8e47fc5af0eed
CP-NS-R-1_T1E	12/10/2020 13:50	5f83eeb97f1ccce8ed00002f
CP-NS-R-1_T1E	20/05/2020 8:36	5ec47b757f1ccc1e33000002
CP-NS-R-1_T1E	6/11/2019 13:06	5dc254da7f1ccc1d4e00000c
CP-NS-R-1_T1W	28/09/2022 11:32	6333c0524be8e47fc5af1437
CP-NS-R-1_T1W	24/05/2022 11:37	628c530a4be8e47fc6d9cf91
CP-NS-R-1_T1W	12/10/2020 15:10	5f84015f7f1ccc1a8a000004
CP-NS-R-1_T1W	20/05/2020 8:37	5ec47be57f1ccc1e33000005
CP-NS-R-1_T1W	6/11/2019 13:03	5dc254367f1ccc1d4e000008
CP-NS-R-2_T1N	19/10/2022 11:25	634f6e134be8e47fc6d9d6fb
CP-NS-R-2_T1N	26/05/2022 9:35	628ed97d4be8e47fc6d9d099
CP-NS-R-2_T1N	15/10/2021 10:07	6168e2734be8e4203d3cbb0f
CP-NS-R-2_T1N	20/05/2020 14:44	5ec4d1de7f1ccc25c5000029
CP-NS-R-2_T1N	5/11/2019 8:53	5dc0c7f17f1ccc95d000001d
CP-NS-R-2_T1S	19/10/2022 11:16	634f6c1c4be8e47fc6d9d6f8
CP-NS-R-2_T1S	19/10/2022 10:57	634f67844be8e47fc5af16c2
CP-NS-R-2_T1S	26/05/2022 9:37	628ed9de4be8e47fc6d9d09c
CP-NS-R-2_T1S	20/05/2020 14:42	5ec4d13b7f1ccc25c5000026
CP-NS-R-2_T1S	5/11/2019 8:54	5dc0c85d7f1ccc95d0000021
CP-NS-R-2_T2N	19/10/2022 12:02	634f76d04be8e47fc5af16c8
CP-NS-R-2_T2N	26/05/2022 9:53	628edda94be8e47fc5af0fe9
CP-NS-R-2_T2N	15/10/2021 10:39	6168e9ea4be8e4203d3cbb16
CP-NS-R-2_T2N	26/09/2020 8:47	5f6e8f887f1cccf40a000002
CP-NS-R-2_T2S	19/10/2022 11:57	634f75924be8e47fc5af16c5
CP-NS-R-2_T2S	26/05/2022 9:44	628edb8a4be8e47fc6d9d09f
CP-NS-R-2_T2S	26/09/2020 8:48	5f6e8fe67f1cccf40a000006
CP-S-PI-1_P01	19/10/2022 10:48	634f658e4be8e47fc5af16bc
CP-S-PI-1_P01	26/05/2022 9:24	628ed6e34be8e47fc6d9d073
CP-S-PI-1_P01	15/10/2021 8:17	6168c8954be8e4203d3cbaed
CP-S-PI-1_P01	21/10/2020 10:47	5f8fa1357f1ccca22b000013
CP-S-PI-1_P01	20/05/2020 15:12	5ec4d8577f1ccc0b9800000a
CP-S-PI-1_P01	19/11/2019 14:41	5dd38ea47f1ccc483e000005
CP-S-PI-1_P02	19/10/2022 10:51	634f66214be8e47fc5af16bf
CP-S-PI-1_P02	26/05/2022 9:27	628ed7794be8e47fc6d9d08a
CP-S-PI-1_P02	15/10/2021 8:27	6168cadb4be8e4203d3cbaff
CP-S-PI-1_P02	21/10/2020 10:57	5f8fa3a27f1ccc098c000005
CP-S-PI-1_P02	21/10/2020 10:57	5f8fa37d7f1ccc098c000001
CP-S-PI-1_P02	20/05/2020 15:09	5ec4d7a87f1ccc0b98000007
CP-S-PI-1_P02	19/11/2019 14:47	5dd3900c7f1ccc483e00000e

Name [Site]	Date and time	Photo ID
CP-S-PI-1_P03	19/10/2022 10:58	634f67bf4be8e47fc6d9d6f5
CP-S-PI-1_P03	26/05/2022 9:34	628ed9184be8e47fc5af0fe6
CP-S-PI-1_P03	15/10/2021 8:30	6168cbb14be8e4203d3cbb07
CP-S-PI-1_P03	21/10/2020 11:34	5f8fac5a7f1ccc098c000008
CP-S-PI-1_P03	20/05/2020 15:06	5ec4d6e67f1ccc0b98000004
CP-S-PI-1_P03	20/05/2020 15:05	5ec4d6ca7f1ccc0b98000001
CP-S-PI-1_P03	19/11/2019 14:54	5dd391a47f1ccc84c7000003
TW-S-3_P03	19/10/2022 15:41	634faa214be8e47fc6d9d76c
TW-S-3_P03	26/05/2022 11:36	628ef5d24be8e47fc5af1038
TW-S-3_P03	21/10/2020 12:20	5f8fb71f7f1ccc6147000004
TW-S-3_P03	26/05/2020 13:58	5eccafee7f1ccc361400002b
TW-s-pi-2_11	19/10/2022 14:04	634f93684be8e47fc5af16fc
TW-s-pi-2_12	19/10/2022 14:23	634f97ff4be8e47fc6d9d74d
TW-s-pi-2_12	19/10/2022 14:13	634f95724be8e47fc5af1703
Tw-s-pi-2_13	19/10/2022 14:24	634f98174be8e47fc5af1708
TW-s-pi-2_14	19/10/2022 14:32	634f99e74be8e47fc6d9d751
TW-s-pi-2_15	19/10/2022 14:39	634f9baa4be8e47fc5af170b
TW-s-pi-2_16	19/10/2022 15:13	634fa37d4be8e47fc6d9d766
TW-s-pi-2_16	19/10/2022 15:09	634fa2964be8e47fc6d9d760
TW-s-pi-2_16	19/10/2022 15:01	634fa0e64be8e47fc6d9d75a
TW-s-pi-2_16	19/10/2022 15:00	634fa07d4be8e47fc6d9d757
TW-s-pi-2_16	19/10/2022 14:58	634f9ffd4be8e47fc5af1710
Tw-s-pi-2_17	19/10/2022 14:59	634fa03a4be8e47fc5af1713
TW-s-pi-2_18	19/10/2022 15:12	634fa3654be8e47fc6d9d763
TW-s-pi-2_18	19/10/2022 15:08	634fa2824be8e47fc6d9d75d
TW-s-pi-2_19	19/10/2022 15:10	634fa2fa4be8e47fc5af1718
TW-s-pi-2_20	19/10/2022 15:16	634fa4304be8e47fc5af171c
TW-S-PI-2_P1	19/10/2022 13:45	634f8ef24be8e47fc5af16f5
TW-S-PI-2_P1	26/05/2022 11:00	628eed3d4be8e47fc5af1034
TW-S-PI-2_P1	14/10/2021 13:29	6167c04b4be8e4203d3cba2f
TW-S-PI-2_P1	21/10/2020 8:44	5f8f84797f1ccc23a3000001
TW-S-PI-2_P1	31/07/2020 7:50	5f235cc67f1cccaf9b000006
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TW-S-PI-2_P2	19/10/2022 13:43	634f8e644be8e47fc6d9d746
TW-S-PI-2_P2	26/05/2022 10:57	628eec9f4be8e47fc5af1031
TW-S-PI-2_P2	14/10/2021 13:32	6167c0f04be8e4203d3cba33
TW-S-PI-2_P2	21/10/2020 9:01	5f8f884c7f1ccc23a3000004
TW-S-PI-2_P2	31/07/2020 7:57	5f235e5e7f1cccaf9b00000a
TW-S-PI-2_P3	19/10/2022 13:40	634f8ddc4be8e47fc6d9d743
TW-S-PI-2_P3	26/05/2022 10:54	628eebd54be8e47fc5af102e
TW-S-PI-2_P3	14/10/2021 13:39	6167c2994be8e4203d3cba42
TW-S-PI-2_P3	21/10/2020 9:02	5f8f88ac7f1ccc23a300000a
TW-S-PI-2_P3	21/10/2020 9:02	5f8f88977f1ccc23a3000007
TW-S-PI-2_P3	31/07/2020 8:03	5f235fce7f1cccaf9b00000e
TW-S-PI-2_P4	19/10/2022 13:37	634f8d0d4be8e47fc5af16f2

Name [Site]	Date and time	Photo ID
TW-S-PI-2_P4	26/05/2022 10:45	628ee9b24be8e47fc6d9d0df
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TW-S-PI-2_P4	21/10/2020 9:07	5f8f89ec7f1ccc23a3000010
TW-S-PI-2_P4	21/10/2020 9:07	5f8f89dd7f1ccc23a300000d
TW-S-PI-2_P4	31/07/2020 8:09	5f2361407f1cccaf9b000012
TW-S-PI-2_P5	19/10/2022 13:35	634f8c9d4be8e47fc5af16ec
TW-S-PI-2_P5	26/05/2022 10:42	628ee9094be8e47fc5af1013
TW-S-PI-2_P5	14/10/2021 13:49	6167c4f04be8e4203d3cba51
TW-S-PI-2_P5	31/07/2020 8:19	5f2363857f1cccaf9b00001c
TW-S-PI-2_P6	19/10/2022 13:32	634f8c094be8e47fc6d9d722
TW-S-PI-2_P6	26/05/2022 10:40	628ee8914be8e47fc6d9d0c4
TW-S-PI-2_P6	21/10/2020 9:13	5f8f8b4c7f1ccc23a3000013
TW-S-PI-2_P6	31/07/2020 8:28	5f23659a7f1cccaf9b000024
TW-S-PI-2_P7	19/10/2022 13:32	634f8be54be8e47fc6d9d716
TW-S-PI-2_P7	26/05/2022 10:39	628ee8464be8e47fc6d9d0af
TW-S-PI-2_P7	21/10/2020 9:19	5f8f8cb07f1ccc23a3000016
TW-S-PI-2_P7	31/07/2020 8:33	5f2366c47f1cccaf9b000031
TW-S-PI-2_P8	19/10/2022 13:31	634f8bc04be8e47fc6d9d70a
TW-S-PI-2_P8	26/05/2022 10:38	628ee83b4be8e47fc5af0ff2
TW-S-PI-2_P8	14/10/2021 13:57	6167c6b04be8e4203d3cba61
TW-S-PI-2_P8	21/10/2020 9:26	5f8f8e457f1ccc23a3000019
TW-S-PI-2_P8	31/07/2020 8:42	5f2368fa7f1cccaf9b000035
TW-S-PI-2_P9	19/10/2022 13:33	634f8c204be8e47fc6d9d725
TW-S-PI-2_P9	19/10/2022 13:32	634f8c054be8e47fc6d9d71c
TW-S-PI-2_P9	19/10/2022 13:32	634f8bd04be8e47fc5af16d4
TW-S-PI-2_P9	19/10/2022 13:28	634f8aed4be8e47fc6d9d704
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TW-S-PI-2_P9	26/05/2022 10:43	628ee93f4be8e47fc5af1019
TW-S-PI-2_P9	26/05/2022 10:42	628ee90d4be8e47fc5af1016
TW-S-PI-2_P9	26/05/2022 10:41	628ee8ea4be8e47fc6d9d0cd
TW-S-PI-2_P9	26/05/2022 10:41	628ee8bc4be8e47fc5af1007
TW-S-PI-2_P9	26/05/2022 10:40	628ee8854be8e47fc5af0ffe
TW-S-PI-2_P9	26/05/2022 10:39	628ee8694be8e47fc5af0ff8
TW-S-PI-2_P9	26/05/2022 10:39	628ee84e4be8e47fc5af0ff5
TW-S-PI-2_P9	26/05/2022 10:38	628ee80a4be8e47fc6d9d0a9
TW-S-PI-2_P9	31/07/2020 9:02	5f236d9b7f1cccec9d000005
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TW-S-PI-2_T1E	26/05/2022 10:49	628eeaa44be8e47fc6d9d0e5
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TW-S-PI-2_T1E	26/05/2020 9:45	5ecc74c07f1ccc22ac000001
TW-S-PI-2_T1E	19/11/2019 12:21	5dd36dc97f1cccf0cb00000f
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TW-S-PI-2_T1W	14/10/2021 16:12	6167e6514be8e4203d3cba97

Name [Site]	Date and time	Photo ID
TW-S-PI-2_T1W	26/10/2020 10:51	5f96399b7f1ccc7074000013
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TW-S-PI-2_T1W	19/11/2019 10:43	5dd356de7f1cccf0cb00000b
TW-S-PI-3_P01	19/10/2022 15:44	634faac84be8e47fc5af1722
TW-S-PI-3_P01	26/05/2022 11:34	628ef5444be8e47fc6d9d0ee
TW-S-PI-3_P01	14/10/2021 16:17	6167e79a4be8e4203d3cbaa5
TW-S-PI-3_P01	21/10/2020 12:19	5f8fb6d57f1ccca032000007
TW-S-PI-3_P01	26/05/2020 13:48	5eccad987f1ccc361400001d
TW-S-PI-3_P02	19/10/2022 15:42	634faa5c4be8e47fc5af171f
TW-S-PI-3_P02	26/05/2022 11:33	628ef4ec4be8e47fc6d9d0eb
TW-S-PI-3_P02	14/10/2021 16:17	6167e7b04be8e4203d3cbaa8
TW-S-PI-3_P02	21/10/2020 12:19	5f8fb6c77f1ccca032000004
TW-S-PI-3_P02	26/05/2020 13:54	5eccaf077f1ccc3614000027
TW-S-PI-3_P04	19/10/2022 15:39	634fa9a94be8e47fc6d9d769
TW-S-PI-3_P04	26/05/2022 11:39	628ef6794be8e47fc6d9d0f1
TW-S-PI-3_P04	15/10/2021 7:22	6168bba44be8e4203d3cbad5
TW-S-PI-3_P04	21/10/2020 12:23	5f8fb7c17f1ccc6147000011
TW-S-PI-3_P04	21/10/2020 12:23	5f8fb7ab7f1ccc614700000e
TW-S-PI-3_P04	26/05/2020 14:03	5eccb1317f1ccc361400002f
TW-S-PI-4_P01	19/10/2022 16:06	634fb0174be8e47fc6d9d76f
TW-S-PI-4_P01	25/05/2022 15:43	628dde3e4be8e47fc6d9d057
TW-S-PI-4_P01	19/10/2020 8:13	5f8cda227f1ccc7d99000007
TW-S-PI-4_P01	26/05/2020 11:11	5ecc88f77f1ccc23d5000001
TW-S-PI-4_P01a	19/10/2022 16:06	634fb01e4be8e47fc6d9d772
TW-S-PI-4_P01a	25/05/2022 15:44	628dde444be8e47fc5af0fbc
TW-S-PI-4_P01a	25/05/2022 15:43	628dde394be8e47fc5af0fb9
TW-S-PI-4_P02	19/10/2022 16:30	634fb5ad4be8e47fc5af173a
TW-S-PI-4_P02	19/10/2022 16:30	634fb58b4be8e47fc5af1734
TW-S-PI-4_P02	19/10/2022 16:28	634fb5434be8e47fc5af172e
TW-S-PI-4_P02	19/10/2022 16:24	634fb4234be8e47fc5af172b
TW-S-PI-4_P02	19/10/2022 16:21	634fb3a04be8e47fc6d9d775
TW-S-PI-4_P02	19/10/2022 16:21	634fb3914be8e47fc5af1725
TW-S-PI-4_P02	25/05/2022 15:43	628dde3b4be8e47fc6d9d054
TW-S-PI-4_P02	14/10/2021 8:01	616773714be8e4203d3cb8d3
TW-S-PI-4_P02	14/10/2021 7:47	6167701d4be8e4203d3cb8b5
TW-S-PI-4_P02	20/10/2020 9:10	5f8e39067f1ccc39b3000011
TW-S-PI-4_P02	20/10/2020 9:09	5f8e38bd7f1ccc39b300000e
TW-S-PI-4_P02	20/10/2020 9:07	5f8e386a7f1ccc39b3000008
TW-S-PI-4_P02	20/10/2020 9:07	5f8e38557f1ccc39b3000005
TW-S-PI-4_P02	20/10/2020 9:07	5f8e38387f1ccc39b3000001
TW-S-PI-4_P02	20/10/2020 9:04	5f8e37b07f1ccc4ccc000007
TW-S-PI-4_P02	19/10/2020 13:39	5f8d26847f1cccc75a000022
TW-S-PI-4_P02	19/10/2020 13:33	5f8d25447f1cccc75a00001c
TW-S-PI-4_P02	19/10/2020 13:33	5f8d25357f1cccc75a000019
TW-S-PI-4_P02	19/10/2020 13:31	5f8d24b77f1cccc75a000016

Name [Site]	Date and time	Photo ID
TW-S-PI-4_P02	19/10/2020 13:31	5f8d24a97f1cccc75a000013
TW-S-PI-4_P02	19/10/2020 13:30	5f8d24747f1cccc75a000010

Appendix 3. Boundary photopoint comparative data for vegetation condition, crown extent density, weed cover and native cover from spring / summer 2019 to autumn 2023.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-1_P01	11/21/2019	Very good		2-10%		Vegetation condition originally assessed as Good. This was retrospectively reassessed to be Very Good based on a cumulative assessment of the site in autumn 2020.
BW-S-PI-1_P01	5/26/2020	Very good		2-10%	30-70%	
BW-S-PI-1_P01	10/28/2020	Very Good	4	10-30%	30-70%	Weed cover increased.
BW-S-PI-1_P01	10/14/2021	Very Good	4	10-30%	30-70%	
BW-S-PI-1_P01	5/26/2022	Very good	4	10-30%	30-70%	
BW-S-PI-1_P01	10/19/2022	Very good	4	10-30%	30-70%	
BW-S-PI-1_P01	5/25/2023	Very good	4	10-30%	30-70%	
BW-S-PI-1_P02	11/21/2019	Very good		2-10%		Vegetation condition originally assessed as Good. This was retrospectively reassessed to be Very Good based on a cumulative assessment of the site in autumn 2020.
BW-S-PI-1_P02	5/26/2020	Very good		2-10%	30-70%	
BW-S-PI-1_P02	10/28/2020	Very Good	4	>70%	30-70%	Weed cover increased.
BW-S-PI-1_P02	10/14/2021	Very Good	4	>70%	30-70%	
BW-S-PI-1_P02	5/26/2022	Very good	4	>70%	30-70%	Marri crowns thinning
BW-S-PI-1_P02	10/19/2022	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead,
BW-S-PI-1_P02	5/25/2023	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead,
BW-S-PI-1_P03	11/21/2019	Good		<2%		
BW-S-PI-1_P03	5/26/2020	Good		<2%	30-70%	
BW-S-PI-1_P03	10/28/2020	Good	4	30-70%	30-70%	Weed cover increased.
BW-S-PI-1_P03	10/14/2021	Good	4	30-70%	30-70%	
BW-S-PI-1_P03	5/26/2022	Good	4	30-70%	30-70%	
BW-S-PI-1_P03	10/19/2022	Good	4	30-70%	30-70%	Acacia iteaphylla invading
BW-S-PI-1_P03	5/25/2023	Good	4	30-70%	30-70%	Acacia iteaphylla invading
BW-S-PI-1_P04	11/21/2019	Very good		<2%		
BW-S-PI-1_P04	5/26/2020	Very good		<2%	30-70%	
BW-S-PI-1_P04	10/28/2020	Very good	4	30-70%	30-70%	Weed cover increased.
BW-S-PI-1_P04	10/14/2021	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	5/26/2022	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	10/19/2022	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	5/25/2023	Very good	4	30-70%	30-70%	Recently cleared hard up against monitoring boundary.
BW-S-PI-1_P05	11/21/2019	Very good		<2%		Vegetation condition originally assessed as Good. This was retrospectively reassessed to be Very Good based on a cumulative assessment of the site in autumn 2020.
BW-S-PI-1_P05	5/26/2020	Very good		<2%	30-70%	
BW-S-PI-1_P05	10/28/2020	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	10/14/2021	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	5/26/2022	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	10/19/2022	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	5/25/2023	Very good	5	<2%	30-70%	
BW-S-PI-3_P01	11/21/2019	Very good		<2%		
BW-S-PI-3_P01	5/20/2020	Very good		<2%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-3_P01	9/9/2020	Very good		<2%	30-70%	
BW-S-PI-3_P01	10/13/2021	Very good	5	10-30%	30-70%	Weed cover increased.Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	5/25/2022	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	10/17/2022	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	5/24/2023	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P02	11/21/2019	Very good		<2%		Possible historically cleared? Of trees
BW-S-PI-3_P02	5/20/2020	Very good		<2%	30-70%	Possible historically cleared? Of trees
BW-S-PI-3_P02	10/28/2020	Very good	4	2-10%	30-70%	Weed cover increased.
BW-S-PI-3_P02	10/13/2021	Very good	4	10-30%	30-70%	Weed cover increased.
BW-S-PI-3_P02	5/25/2022	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P02	10/17/2022	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P02	5/24/2023	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P03	11/21/2019	Very good		<2%		
BW-S-PI-3_P03	5/20/2020	Very good		<2%	30-70%	
BW-S-PI-3_P03	10/28/2020	Very good	5	10-30%	30-70%	Weed cover increased.
BW-S-PI-3_P03	10/13/2021	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	5/25/2022	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	10/17/2022	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	5/24/2023	Very good	5	10-30%	30-70%	
BW-S-PI-3_P04	11/21/2019	Excellent		<2%		
BW-S-PI-3_P04	5/20/2020	Excellent		<2%	30-70%	
BW-S-PI-3_P04	10/28/2020	Excellent	5	<2%	30-70%	
BW-S-PI-3_P04	10/13/2021	Excellent	5	<2%	30-70%	
BW-S-PI-3_P04	5/25/2022	Excellent	5	<2%	30-70%	Dead kunzea has fallen in previous storms.
BW-S-PI-3_P04	10/17/2022	Excellent	5	<2%	30-70%	Dead kunzea has fallen in previous storms.
BW-S-PI-3_P04	5/24/2023	Excellent	5	<2%	30-70%	Dead Kunzea has fallen in previous storms.
BW-S-PI-3_P05	11/21/2019	Excellent		<2%		
BW-S-PI-3_P05	5/20/2020	Excellent		<2%	30-70%	
BW-S-PI-3_P05	10/28/2020	Excellent	5	<2%	30-70%	
BW-S-PI-3_P05	10/13/2021	Excellent	5	<2%	30-70%	
BW-S-PI-3_P05	5/25/2022	Excellent	5	<2%	30-70%	Trees have died due to fire/ dieback
BW-S-PI-3_P05	10/17/2022	Excellent	5	<2%	30-70%	Trees have died due to fire/ dieback. Remaining trees are healthy and have the 5 health rating.
BW-S-PI-3_P05	5/24/2023	Excellent	5	<2%	30-70%	Trees have died due to fire/ dieback. Remaining trees are healthy and have the 5 health rating.
BW-S-PI-3_P06	11/21/2019	Very good		<2%		
BW-S-PI-3_P06	5/20/2020	Very good		<2%	30-70%	
BW-S-PI-3_P06	10/28/2020	Very good	4	2-10%	30-70%	Weed cover increased.Jarrah is thin
BW-S-PI-3_P06	10/13/2021	Very good	4	2-10%	30-70%	
BW-S-PI-3_P06	5/25/2022	Very good	4	2-10%	30-70%	Fire impacts are between 1-10 years
BW-S-PI-3_P06	10/17/2022	Very good	4	2-10%	30-70%	Fire impacts are between 1-10 years, regrowth evident.
BW-S-PI-3_P06	5/24/2023	Very good	3	2-10%	30-70%	Fire impacts are between 1-10 years, regrowth evident. Canopy of jarrah trees is very thin. Dieback appears active with recent death of Macrozamia
BW-S-PI-3_P07	11/21/2019	Good		2-10%		
BW-S-PI-3_P07	5/20/2020	Good		2-10%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-3_P07	10/28/2020	Good	5	10-30%	30-70%	Weed cover increased.
BW-S-PI-3_P07	10/13/2021	Good	5	10-30%	30-70%	
BW-S-PI-3_P07	5/25/2022	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire
BW-S-PI-3_P07	10/17/2022	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating.
BW-S-PI-3_P07	5/24/2023	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating.
BW-S-PI-4_P01	5/26/2020	Very good		<2%	30-70%	
BW-S-PI-4_P01	10/28/2020	Very good	5	2-10%	30-70%	Weed cover increased.
BW-S-PI-4_P01	10/13/2021	Very good	5	2-10%	30-70%	
BW-S-PI-4_P01	5/25/2022	Very good	5	2-10%	30-70%	Acacia longifolia also present
BW-S-PI-4_P01	10/17/2022	Very good	5	30-70%	30-70%	Acacia longifolia also present , marri blight is still active, Weed cover increased.
BW-S-PI-4_P01	5/26/2023	Very good	5	30-70%	30-70%	Acacia longifolia also present , marri blight is still active, weeds increasing.
BW-S-PI-4_P02	5/26/2020	Excellent		<2%	30-70%	
BW-S-PI-4_P02	10/28/2020	Excellent	5	2-10%	30-70%	Weed cover increased.
BW-S-PI-4_P02	10/13/2021	Excellent	5	2-10%	30-70%	
BW-S-PI-4_P02	5/25/2022	Excellent	5	2-10%	30-70%	Note Acacia longifolia becoming established.
BW-S-PI-4_P02	10/17/2022	Excellent	5	2-10%	30-70%	Note Acacia longifolia becoming established. Presence of more aggressive weeds lowering veg condition
BW-S-PI-4_P02	5/26/2023	Excellent	5	2-10%	30-70%	Note Acacia longifolia becoming established. Presence of more aggressive weeds lowering veg condition
BW-S-PI-4_P03	5/26/2020	Excellent		<2%	>70%	
BW-S-PI-4_P03	10/28/2020	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	10/13/2021	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	5/25/2022	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	10/17/2022	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	5/26/2023	Excellent	5	<2%	>70%	
BW-S-PI-4_P04	5/26/2020	Excellent		<2%	30-70%	
BW-S-PI-4_P05	5/26/2020	Very good		<2%	30-70%	
BW-S-PI-4_P05	10/28/2020	Very good	4	<2%	30-70%	
BW-S-PI-4_P05	10/13/2021	Very good	4	2-10%	30-70%	Weed cover increased. Briza has increased at the site
BW-S-PI-4_P05	5/25/2022	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	10/17/2022	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	5/26/2023	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-5_P01	11/20/2019	Good		<2%		
BW-S-PI-5_P01	5/22/2020	Good		<2%	10-30%	
BW-S-PI-5_P01	10/23/2020	Good	4	<2%	10-30%	
BW-S-PI-5_P01	10/14/2021	Good	4	<2%	10-30%	
BW-S-PI-5_P01	5/25/2022	Good	4	<2%	10-30%	New *Acacia iteaphylla* infestation
BW-S-PI-5_P01	10/20/2022	Good	5	2-10%	10-30%	Weed cover increased.
BW-S-PI-5_P01	5/25/2023	Good	5	2-10%	10-30%	
BW-S-PI-5_P02	11/20/2019	Good		<2%		
BW-S-PI-5_P02	5/22/2020	Good		<2%	10-30%	
BW-S-PI-5_P02	10/23/2020	Good	5	2-10%	10-30%	Weed cover increased.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P02	10/14/2021	Good	5	10-30%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	5/25/2022	Good	5	30-70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	10/20/2022	Good	5	>70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	5/25/2023	Good	5	>70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P03	11/20/2019	Very good		<2%		
BW-S-PI-5_P03	5/22/2020	Very good		<2%	30-70%	
BW-S-PI-5_P03	10/23/2020	Very good	4	10-30%	30-70%	
BW-S-PI-5_P03	10/14/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P03	5/25/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P03	10/20/2022	Very good	4	10-30%	30-70%	Veg structure and diversity intact
BW-S-PI-5_P03	5/25/2023	Very good	4	10-30%	30-70%	Veg structure and diversity intact
BW-S-PI-5_P04	7/30/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P04	9/9/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P04	10/14/2021	Excellent	5	<2%	30-70%	Increase in native herbs
BW-S-PI-5_P04	5/25/2022	Excellent	5	<2%	30-70%	Increase in native herbs
BW-S-PI-5_P04	10/20/2022	Excellent	5	10-30%	30-70%	Weed cover increased.Site has a high concentration of Briza maxima. Vegetation condition decreased.
BW-S-PI-5_P04	5/25/2023	Excellent	4	10-30%	30-70%	Site has a high concentration of Briza maxima , crowns of jarrah and banksia are thin.
BW-S-PI-5_P05	7/30/2020	Very good		2-10%	30-70%	
BW-S-PI-5_P05	10/23/2020	Very good	3	2-10%	30-70%	
BW-S-PI-5_P05	10/14/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P05	5/25/2022	Very good	4	2-10%	30-70%	Crowns are reasonably healthy
BW-S-PI-5_P05	10/20/2022	Very good	4	2-10%	30-70%	Crowns are reasonably healthy
BW-S-PI-5_P05	5/25/2023	Very good	4	2-10%	30-70%	Crowns are reasonably healthy
BW-S-PI-5_P06	7/30/2020	Good		30-70%	30-70%	
BW-S-PI-5_P06	10/23/2020	Good	4	30-70%	30-70%	
BW-S-PI-5_P06	10/14/2021	Good	4	30-70%	30-70%	
BW-S-PI-5_P06	5/25/2022	Good	4	30-70%	30-70%	
BW-S-PI-5_P06	10/20/2022	Good	5	>70%	30-70%	Weed cover increased.
BW-S-PI-5_P06	5/25/2023	Good	5	>70%	30-70%	
BW-S-PI-5_P07	11/20/2019	Good		30-70%		Adjacent power line
BW-S-PI-5_P07	5/22/2020	Good		30-70%		Adjacent power line
BW-S-PI-5_P07	10/23/2020	Good	4	30-70%	30-70%	Adjacent power line
BW-S-PI-5_P07	10/14/2021	Good	5	30-70%	30-70%	Tree health is really good
BW-S-PI-5_P07	5/25/2022	Good	5	30-70%	30-70%	Tree health is really good
BW-S-PI-5_P07	10/20/2022	Good	5	>70%	30-70%	Tree health is really good. Weed cover increased. Oxalis glabra and O. Pes-caprae increasing, along with Briza maxima
BW-S-PI-5_P07	5/25/2023	Good	5	>70%	30-70%	Tree health is really good , Oxalis glabra and O. Pes-caprae increasing, along with Briza maxima
BW-S-PI-5_P08	11/20/2019	Good		2-10%		
BW-S-PI-5_P08	5/22/2020	Good		2-10%	30-70%	
BW-S-PI-5_P08	10/23/2020	Good	4	10-30%	30-70%	Weed cover increased.
BW-S-PI-5_P08	10/14/2021	Good	4	30-70%	30-70%	Understory shrubs Ap, and M thy very reduced
BW-S-PI-5_P08	5/25/2022	Good	4	30-70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P08	10/20/2022	Good	4	>70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good.
BW-S-PI-5_P08	5/25/2023	Good	4	>70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good. Dipogon appears to have been controlled.
BW-S-PI-5_P09	11/20/2019	Good		2-10%		
BW-S-PI-5_P09	5/22/2020	Good		2-10%	30-70%	
BW-S-PI-5_P09	10/23/2020	Good	4	10-30%	30-70%	
BW-S-PI-5_P09	10/14/2021	Good	4	30-70%	30-70%	Weeds have increased
BW-S-PI-5_P09	5/25/2022	Good	4	30-70%	30-70%	Weeds have increased
BW-S-PI-5_P09	10/20/2022	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact,
BW-S-PI-5_P09	5/25/2023	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact,
BW-S-PI-5_P10	11/20/2019	Good		<2%		Geraldton wax along power line
BW-S-PI-5_P10	5/22/2020	Good		<2%	30-70%	Geraldton wax along power line
BW-S-PI-5_P10	10/23/2020	Good	4	2-10%	30-70%	Geraldton wax along power line
BW-S-PI-5_P10	10/14/2021	Good	4	2-10%	30-70%	Rubbish has been cleaned up
BW-S-PI-5_P10	5/25/2022	Good	4	10-30%	30-70%	Weed cover increased at site. Near access track.
BW-S-PI-5_P10	10/20/2022	Good	5	10-30%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing.
BW-S-PI-5_P10	5/25/2023	Good	5	10-30%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing.
BW-S-PI-5_P11	11/20/2019	Good		30-70%		
BW-S-PI-5_P11	5/22/2020	Good		30-70%	30-70%	
BW-S-PI-5_P11	10/23/2020	Good	4	30-70%	30-70%	
BW-S-PI-5_P11	10/14/2021	Good	4	30-70%	30-70%	Rubbish cleaned up
BW-S-PI-5_P11	5/25/2022	Good	4	30-70%	30-70%	
BW-S-PI-5_P11	10/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-5_P11	5/25/2023	Good	5	30-70%	30-70%	
BW-S-PI-5_P12	11/20/2019	Good		2-10%		
BW-S-PI-5_P12	5/22/2020	Good		2-10%	30-70%	
BW-S-PI-5_P12	10/23/2020	Good	4	2-10%	30-70%	
BW-S-PI-5_P12	10/14/2021	Good	4	2-10%	30-70%	Litter cleaned up
BW-S-PI-5_P12	5/25/2022	Good	4	2-10%	30-70%	
BW-S-PI-5_P12	10/20/2022	Good	5	2-10%	30-70%	Canopy crown is healthy
BW-S-PI-5_P12	5/25/2023	Good	5	2-10%	30-70%	Canopy crown is healthy
BW-S-PI-5_P13	7/30/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P13	10/23/2020	Excellent	3	<2%	30-70%	
BW-S-PI-5_P13	10/14/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P13	5/25/2022	Excellent	3	<2%	30-70%	Crowns of most trees are thin
BW-S-PI-5_P13	10/20/2022	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good
BW-S-PI-5_P13	5/25/2023	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good
BW-S-PI-5_P14	7/30/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P14	10/23/2020	Excellent	4	<2%	30-70%	
BW-S-PI-5_P14	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P14	5/25/2022	Excellent	4	<2%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P14	10/20/2022	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing
BW-S-PI-5_P14	5/25/2023	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing
BW-S-PI-5_P15	11/20/2019	Good		10-30%		
BW-S-PI-5_P15	5/22/2020	Good		10-30%	10-30%	
BW-S-PI-5_P15	10/23/2020	Good	4	10-30%	10-30%	
BW-S-PI-5_P15	10/14/2021	Good	5	10-30%	10-30%	Crown extent density increased to 5
BW-S-PI-5_P15	5/25/2022	Good	5	10-30%	10-30%	Rubbish dumped at gate
BW-S-PI-5_P15	10/20/2022	Good	5	30-70%	10-30%	Rubbish dumped at gate , weed cover has increased substantially.
BW-S-PI-5_P15	5/25/2023	Good	5	30-70%	10-30%	Close to recently cleared areas.
BW-S-PI-5_P16	11/20/2019	Very good		30-70%		
BW-S-PI-5_P16	9/9/2020	Very good		30-70%	30-70%	
BW-S-PI-5_P16	10/14/2021	Very good	4	30-70%	30-70%	No photo mon point for this fulcrum point. New photo mon point established
BW-S-PI-5_P16	10/20/2022	Very good	4	30-70%	30-70%	No photo mon point for this fulcrum point. New photo mon point established, Weed cover increasing.
BW-S-PI-5_P16	5/25/2022	Very good	4	30-70%	30-70%	No photo mon point for this fulcrum point. New photo mon point established
BW-S-PI-5_P16	5/25/2023	Very good	4	30-70%	30-70%	No photo mon point for this fulcrum point. New photo mon point established, Weed cover increasing. Crowns look reasonably healthy.
BW-S-PI-5_P17	11/20/2019	Very good		10-30%		
BW-S-PI-5_P17	5/22/2020	Very good		10-30%	30-70%	
BW-S-PI-5_P17	10/23/2020	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	10/14/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	5/25/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	10/20/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	5/25/2023	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	11/20/2019	Very good		10-30%		
BW-S-PI-5_P18	5/22/2020	Very good		10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P18	10/23/2020	Very good	3	10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P18	10/14/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	5/25/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	10/20/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	5/25/2023	Very good	4	10-30%	30-70%	Large Marri very stressed.
BW-S-PI-5_P19	11/20/2019	Very good		2-10%		
BW-S-PI-5_P19	5/22/2020	Very good		2-10%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P19	10/23/2020	Very good	3	10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P19	10/14/2021	Very good	3	10-30%	30-70%	
BW-S-PI-5_P19	5/25/2022	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	10/20/2022	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	5/25/2023	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P20	11/20/2019	Very good		2-10%		
BW-S-PI-5_P20	5/22/2020	Very good		2-10%	30-70%	
BW-S-PI-5_P20	10/23/2020	Very good	3	2-10%	30-70%	
BW-S-PI-5_P20	10/14/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P20	5/25/2022	Very good	3	2-10%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P20	10/20/2022	Very good	4	2-10%	30-70%	Canopy health has improved
BW-S-PI-5_P20	5/25/2023	Very good	4	2-10%	30-70%	Canopy health has improved , still a 4 rating
BW-S-PI-5_P21	11/20/2019	Very good		<2%		
BW-S-PI-5_P21	5/22/2020	Very good		<2%	30-70%	
BW-S-PI-5_P21	10/23/2020	Very good	3	<2%	30-70%	
BW-S-PI-5_P21	10/14/2021	Very good	3	<2%	30-70%	
BW-S-PI-5_P21	5/25/2022	Very good	3	<2%	30-70%	Crowns are thin
BW-S-PI-5_P21	10/20/2022	Very good	4	<2%	30-70%	Canopy health has improved
BW-S-PI-5_P21		Very good	4	<2%	30-70%	Canopy health has improved
BW-S-PI-5_P22	11/20/2019	Excellent		<2%		
BW-S-PI-5_P22	5/22/2020	Excellent		<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P22	10/23/2020	Excellent	4	<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P22	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P22	5/25/2022	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Jarrah stressed
BW-S-PI-5_P22	10/20/2022	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Jarrah stressed
BW-S-PI-5_P22	5/25/2023	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Small Jarrah saplings stressed
BW-S-PI-5_P23	11/20/2019	Excellent		<2%		
BW-S-PI-5_P23	5/22/2020	Excellent		<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P23	10/23/2020	Excellent	4	<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P23	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23	10/20/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23	5/25/2023	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23		Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	11/20/2019	Excellent		<2%		
BW-S-PI-5_P24	5/22/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P24	10/23/2020	Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	5/25/2022	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P24	10/20/2022	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P24	5/25/2023	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P25	11/20/2019	Excellent		<2%		
BW-S-PI-5_P25	5/22/2020	Excellent		<2%	30-70%	Was incorrectly labeled P21
BW-S-PI-5_P25	10/23/2020	Excellent	3	<2%	30-70%	Was incorrectly labeled P21
BW-S-PI-5_P25	10/14/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P25	5/25/2022	Excellent	3	<2%	30-70%	Jarrah trees very stressed with thinning crowns
BW-S-PI-5_P25	10/20/2022	Excellent	4	<2%	30-70%	Jarrah trees have improved in condition.
BW-S-PI-5_P25	5/25/2023	Excellent	4	<2%	30-70%	Jarrah trees have improved in condition.
BW-S-PI-5_P26	11/20/2019	Excellent		<2%		
BW-S-PI-5_P26	5/22/2020	Excellent		<2%	30-70%	Possible storm damage in past
BW-S-PI-5_P26	10/23/2020	Excellent	3	2-10%	30-70%	Weed cover increased.
BW-S-PI-5_P26	10/14/2021	Excellent	3	2-10%	30-70%	
BW-S-PI-5_P26	5/25/2022	Excellent	4	2-10%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P26	5/25/2023	Excellent	4	2-10%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health. Trees still at 4 rating
BW-S-PI-5_P26		Excellent	4	2-10%	30-70%	
BW-S-PI-5_P27	11/20/2019	Excellent		<2%		Possible storm damage in past
BW-S-PI-5_P27	5/22/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P27	10/23/2020	Excellent	3	2-10%	30-70%	
BW-S-PI-5_P27	10/14/2021	Excellent	3	2-10%	30-70%	
BW-S-PI-5_P27	5/25/2022	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	10/20/2022	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	5/25/2023	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P28	11/20/2019	Excellent		<2%		
BW-S-PI-5_P28	6/25/2020	Excellent		<2%		
BW-S-PI-5_P28	9/9/2020	Excellent		<2%		
BW-S-PI-5_P28	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P28	5/25/2022	Excellent	4	<2%	30-70%	Banksia canopies look healthy. Other tree crowns are thinning.
BW-S-PI-5_P28	10/20/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_P28	5/25/2023	Excellent	4	<2%	30-70%	Banksia healthy. Marri showing continued stress, hence 4 rating.
BW-S-PI-5_P29	11/20/2019	Excellent		<2%		
BW-S-PI-5_P29	5/22/2020	Excellent		<2%	30-70%	Note recent death of Banksia attenuata due to die back
BW-S-PI-5_P29	10/23/2020	Excellent	4	<2%	30-70%	Note recent death of two Banksia attenuata due to die back
BW-S-PI-5_P29	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P29	5/25/2022	Excellent	4	<2%	30-70%	Canopies of large trees are thin
BW-S-PI-5_P29	10/20/2022	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. Xanthorrhoea brunonis fronds yellowing.
BW-S-PI-5_P29	5/25/2023	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. Xanthorrhoea brunonis fronds yellowing. Xanthorrhoea still alive,
BW-S-PI-5_P30	11/20/2019	Very good		<2%		
BW-S-PI-5_P30	5/22/2020	Very good		<2%	30-70%	
BW-S-PI-5_P30	10/23/2020	Very good	4	<2%	30-70%	
BW-S-PI-5_P30	10/14/2021	Very good	4	<2%	30-70%	
BW-S-PI-5_P30	5/25/2022	Very good	4	<2%	30-70%	Dead Banksia trees have fallen.
BW-S-PI-5_P30	10/20/2022	Very good	4	<2%	30-70%	Dead Banksia trees have fallen.
BW-S-PI-5_P30	5/25/2023	Very good	4	<2%	30-70%	Dead Banksia trees have fallen. Dieback does not appear to be very active, no recent death.
BW-S-PI-5_P31	11/20/2019	Very good		2-10%		
BW-S-PI-5_P31	5/22/2020	Very good		<2%	30-70%	Weeds not evident at this time
BW-S-PI-5_P31	10/23/2020	Very good	4	<2%	30-70%	Weeds not evident at this time
BW-S-PI-5_P31	10/14/2021	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	5/25/2022	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	10/20/2022	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	5/25/2023	Very good	4	<2%	30-70%	
BW-S-PI-5_P32	11/20/2019	Very good		2-10%		
BW-S-PI-5_P32	5/22/2020	Very good		<2%	30-70%	Access issues previously reported have passed

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P32	10/23/2020	Very good	4	2-10%	30-70%	Access issues previously reported have passed
BW-S-PI-5_P32	10/14/2021	Very good	4	2-10%	30-70%	
BW-S-PI-5_P32	5/25/2022	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	10/20/2022	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	5/25/2023	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P33	11/20/2019	Very good		2-10%		
BW-S-PI-5_P33	5/22/2020	Very good		<2%	30-70%	Autumn view presents less weeds
BW-S-PI-5_P33	10/23/2020	Very good	3	2-10%	30-70%	Autumn view presents less weeds
BW-S-PI-5_P33	10/14/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	5/25/2022	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	10/20/2022	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	5/25/2023	Very good	3	2-10%	30-70%	
BW-S-PI-5_P34	11/20/2019	Excellent		2-10%		
BW-S-PI-5_P34	5/22/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P34	10/23/2020	Excellent	3	<2%	30-70%	
BW-S-PI-5_P34	10/14/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P34	5/25/2022	Excellent	4	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5
BW-S-PI-5_P34	10/20/2022	Excellent	5	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5, Briza maxima is increasing in the area west of monitoring area. Substantial increases in the monitoring area will result in a lowering of veg condition.
BW-S-PI-5_P34	5/25/2023	Excellent	5	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5, Briza maxima is increasing in the area west of monitoring area. Substantial increases in the monitoring area will result in a lowering of veg condition.
BW-S-PI-8_P01	6/20/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P01	10/20/2022	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed
BW-S-PI-8_P01	5/26/2023	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed , still stressed. Cleared within 10m of site.
BW-S-PI-8_P02	6/20/2022	Excellent	5	<2%	>70%	
BW-S-PI-8_P02	10/20/2022	Excellent	5	<2%	>70%	
BW-S-PI-8_P02	5/26/2023	Excellent	5	<2%	>70%	Site looks healthy
BW-S-PI-8_P03	6/20/2022	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves away from road
BW-S-PI-8_P03	10/20/2022	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves away from referral area.
BW-S-PI-8_P03	5/26/2023	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves towards the project area.
BW-S-PI-8_P04	6/20/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P04	10/20/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P04	5/26/2023	Very good	5	2-10%	30-70%	
BW-S-PI-8_P05	6/20/2022	Good	5	30-70%	10-30%	
BW-S-PI-8_P05	10/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P05	5/26/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	6/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	10/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	5/26/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P07	6/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P07	10/20/2022	Good	5	30-70%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-8_P07	5/26/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	6/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	10/20/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	5/26/2023	Good	5	30-70%	30-70%	
CP-S-PI-1_P01	11/19/2019	Degraded		10-30%		
CP-S-PI-1_P01	5/20/2020	Degraded		10-30%	10-30%	
CP-S-PI-1_P01	10/28/2020	Degraded	5	30-70%	10-30%	10 Cm inundated fire break
CP-S-PI-1_P01	10/15/2021	Degraded	5	30-70%	10-30%	Sheep foot plugs in clay
CP-S-PI-1_P01	5/26/2022	Degraded	5	30-70%	10-30%	Fire track inundated, as expected in clay pan after rain
CP-S-PI-1_P01	10/19/2022	Degraded	5	30-70%	10-30%	Fire track inundated, as expected in clay pan after rain
CP-S-PI-1_P01	5/25/2023	Degraded	5	30-70%	10-30%	Fire track slightly inundated. Dry autumn
CP-S-PI-1_P02	11/19/2019	Good		2-10%		Farm
CP-S-PI-1_P02	5/20/2020	Good		2-10%	10-30%	Farm
CPS-S-PI-1_P02	10/28/2020	Good	5	10-30%	10-30%	Site fully inundated, 20x20m. 10cm
CP-S-PI-1_P02	10/15/2021	Good	5	10-30%	10-30%	
CP-S-PI-1_P02	5/26/2022	Good	5	10-30%	10-30%	No native annuals germinated yet
CP-S-PI-1_P02	10/19/2022	Good	5	10-30%	10-30%	Track inundated as expected for this time of year.
CP-S-PI-1_P02	5/25/2023	Good	5	10-30%	10-30%	Track dry
CP-S-PI-1_P03	11/19/2019	Very good		2-10%		
CP-S-PI-1_P03	5/20/2020	Very good		2-10%	30-70%	Adjacent to fire access track
CP-S-PI-1_P03	10/28/2020	Very good	5	2-10%	30-70%	Adjacent to fire access track
CP-S-PI-1_P03	10/15/2021	Very good	5	2-10%	30-70%	
CP-S-PI-1_P03	5/26/2022	Very good	5	2-10%	30-70%	
CP-S-PI-1_P03	10/19/2022	Very good	5	2-10%	30-70%	
CP-S-PI-1_P03	5/25/2023	Very good	5	2-10%	30-70%	Dry autumn, no water.
TW-S-PI-2_P01	7/31/2020	Very good		10-30%	30-70%	
TW-S-PI-2_P01	10/28/2020	Very good	5	30-70%	30-70%	Site is in the border of being good
TW-S-PI-2_P01	10/14/2021	Very good	5	30-70%	30-70%	
TW-S-PI-2_P01	5/26/2022	Very good	5	30-70%	30-70%	
TW-S-PI-2_P01	10/19/2022	Very good	5	30-70%	30-70%	Weeds are invading the condition of the site is declining
TW-S-PI-2_P01	5/25/2023	Very good	5	30-70%	30-70%	Weeds are invading the condition of the site is declining. Autumn dry no annual weeds.
TW-S-PI-2_P02	7/31/2020	Good		10-30%	30-70%	
TW-S-PI-2_P02	10/28/2020	Good	5	30-70%	30-70%	Weed cover increased significantly
TW-S-PI-2_P02	10/14/2021	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	5/26/2022	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	10/19/2022	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	5/25/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P03	7/31/2020	Good		10-30%	30-70%	
TW-S-PI-2_P03	10/28/2020	Good	5	10-30%	30-70%	
TW-S-PI-2_P03	10/14/2021	Good	5	10-30%	30-70%	
TW-S-PI-2_P03	5/26/2022	Good	54	10-30%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating
TW-S-PI-2_P03	10/19/2022	Good	4	30-70%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-2_P03	5/25/2023	Good	4	30-70%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating
TW-S-PI-2_P04	7/31/2020	Good		10-30%	30-70%	
TW-S-PI-2_P04	10/28/2020	Good	4	30-70%	30-70%	Banksia and agonis have some thinning of the canopy.
TW-S-PI-2_P04	10/14/2021	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	5/26/2022	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	10/19/2022	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	5/25/2023	Good	4	30-70%	30-70%	
TW-S-PI-2_P05	7/31/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P05	9/9/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P05	10/14/2021	Degraded	4	10-30%	30-70%	
TW-S-PI-2_P05	5/26/2022	Degraded	4	10-30%	30-70%	
TW-S-PI-2_P05	10/19/2022	Degraded	4	>70%	30-70%	Weed cover increased
TW-S-PI-2_P05	5/25/2023	Degraded	4	>70%	30-70%	
TW-S-PI-2_P06	7/31/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P06	10/28/2020	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	10/14/2021	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	5/26/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	10/19/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	5/25/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	7/31/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P07	10/28/2020	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	10/14/2021	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	5/26/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	10/19/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	5/25/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P08	7/31/2020	Completely degraded		>70%	2-10%	
TW-S-PI-2_P08	10/28/2020	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	10/14/2021	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	5/26/2022	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	10/19/2022	Completely degraded	4	>70%	10-30%	Small tuart tree is very stressed
TW-S-PI-2_P08	5/25/2023	Completely degraded	4	>70%	10-30%	Small tuart tree is very stressed, still stressed.
TW-S-PI-2_P09	7/31/2020	Good		10-30%	30-70%	
TW-S-PI-2_P09	10/28/2020	Good	4	>70%	30-70%	
TW-S-PI-2_P09	10/14/2021	Good	4	>70%	30-70%	
TW-S-PI-2_P09	5/26/2022	Good	4	>70%	30-70%	
TW-S-PI-2_P09	10/19/2022	Good	4	>70%	30-70%	
TW-S-PI-2_P09	5/25/2023	Good	4	>70%	30-70%	
TW-S-PI-2_P10	7/31/2020	Good		10-30%	30-70%	
TW-S-PI-2_P10	10/19/2022		4	10-30%	30-70%	Possible impacts from pc. But old impact site.
TW-S-PI-2_P10	5/25/2023		4	10-30%	30-70%	Possible impacts from pc. But old impact site.
TW-S-PI-2_P11	10/19/2022	Good	4	10-30%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-2_P11	5/25/2023	Good	4	10-30%	30-70%	
TW-S-PI-2_P12	10/19/2022	Very good	5	10-30%	30-70%	
TW-S-PI-2_P12	5/25/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_P13	10/19/2022	Degraded	5	>70%	30-70%	Veg structure impacted , low scope for regeneration
TW-S-PI-2_P13	5/25/2023	Degraded	5	>70%	30-70%	Veg structure impacted , low scope for regeneration
TW-S-PI-2_P14	10/19/2022	Good	5	30-70%	30-70%	
TW-S-PI-2_P14	5/25/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P15	10/19/2022	Very good	4	30-70%	>70%	Weeds are small, competing with smaller herbs.
TW-S-PI-2_P15	5/25/2023	Very good	4	30-70%	>70%	Few autumn weeds.
TW-S-PI-2_P16	10/19/2022	Very good	5	30-70%	>70%	
TW-S-PI-2_P16	5/25/2023	Very good	5	30-70%	>70%	All Macrozamia riedlei plants are stressed with outer leaves dead.
TW-S-PI-2_P17	10/19/2022	Good	4	30-70%	30-70%	
TW-S-PI-2_P17	5/25/2023	Good	4	30-70%	30-70%	Outer leaves of Macrozamia dead, but plants look healthy
TW-S-PI-2_P18	10/19/2022	Very good	4	30-70%	>70%	
TW-S-PI-2_P18	5/25/2023	Very good	4	30-70%	>70%	
TW-S-PI-2_P19	10/19/2022	Good	5	30-70%	30-70%	Dieing Agonis flexuosa north of site
TW-S-PI-2_P19	5/25/2023	Good	5	30-70%	30-70%	Dying Agonis flexuosa north of site, half is dead.
TW-S-PI-2_P20	10/19/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P20	5/25/2023	Degraded	5	>70%	30-70%	
TW-S-PI-3_P01	5/26/2020	Degraded		30-70%	10-30%	
TW-S-PI-3_P01	10/28/2020	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	10/14/2021	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	5/26/2022	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	10/19/2022	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	5/22/2023	Degraded	5	30-70%	10-30%	A new fence is being constructed on opposite side of the fire access track.
TW-S-PI-3_P02	5/26/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P02	10/28/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	10/14/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	5/26/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	10/19/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	5/22/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	5/26/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P03	10/28/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	10/14/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	5/26/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	10/19/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	5/22/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	5/26/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P04	10/28/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	10/14/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	5/26/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	10/19/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	5/22/2023	Degraded	5	30-70%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-4_P01	5/26/2020	Degraded		30-70%	30-70%	Historical grazing
TW-S-PI-4_P01	10/19/2020	Degraded	5	>70%	30-70%	Historical grazing
TW-S-PI-4_P01	10/13/2021	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	5/25/2022	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	10/19/2022	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	5/22/2023	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P02	5/26/2020	Degraded		2-10%	30-70%	Historic clearing
TW-S-PI-4_P02	9/9/2020	Degraded		2-10%	30-70%	Historic clearing
TW-S-PI-4_P02	10/13/2021	Degraded	5	>70%	30-70%	Farm site.
TW-S-PI-4_P02	5/25/2022	Degraded	5	>70%	30-70%	Farm site.
TW-S-PI-4_P02	10/19/2022	Degraded	5	>70%	30-70%	Farm site.
TW-S-PI-4_P02	5/22/2023	Degraded	5	>70%	30-70%	Fire access track recently graded
TW-S-PI-4_P03	10/19/2020	Degraded	5	>70%	30-70%	Historically cleared
TW-S-PI-4_P03	10/13/2021	Degraded	5	>70%	30-70%	
TW-S-PI-4_P03	5/25/2022	Degraded	5	>70%	30-70%	
TW-S-PI-4_P03	10/19/2022	Degraded	5	>70%	30-70%	
TW-S-PI-4_P03	5/22/2023	Degraded	5	>70%	30-70%	

Appendix 4. Transect boundary photopoint comparative data for vegetation condition, crown extent density, weed cover and native cover spring 2019 to Autumn 2023.

Current photocode	Date	Condition	Crown extent density	Weed cover	Native cover	Comments
BTW-S-R-1_T1E	12/3/2019	Very good				
BTW-S-R-1_T1E	5/22/2020	Very good		<2%	30-70%	Historic drought affects evident
BTW-S-R-1_T1E	10/26/2020	Very good	4	<2%	30-70%	
BTW-S-R-1_T1E	10/12/2021	Very good	4	2-10%	30-70%	Weed cover increased
BTW-S-R-1_T1E	5/25/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	10/13/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	5/22/2023	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	12/3/2019	Very good				
BTW-S-R-1_T1W	5/22/2020	Very good		<2%	30-70%	
BTW-S-R-1_T1W	10/26/2020	Very good	4	<2%	30-70%	
BTW-S-R-1_T1W	10/12/2021	Very good	4	2-10%	30-70%	Weed cover increased
BTW-S-R-1_T1W	5/25/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	10/13/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	5/22/2023	Very good	4	2-10%	30-70%	Note Leucopogon racemulosa is a common shrub now in the middle story.
BTW-S-R-2_T1N	11/22/2019	Excellent				
BTW-S-R-2_T1N	5/22/2020	Excellent		<2%	30-70%	
BTW-S-R-2_T1N	10/26/2020	Excellent	4	10-30%	30-70%	Weed cover increased
BTW-S-R-2_T1N	10/20/2021	Excellent	4	10-30%	30-70%	
BTW-S-R-2_T1N	5/26/2022	Excellent	4	10-30%	30-70%	
BTW-S-R-2_T1N	10/19/2022	Excellent	5	10-30%	30-70%	Vegetation health has improved, Briza maxima increasing.
BTW-S-R-2_T1N	5/25/2023	Excellent	4	10-30%	30-70%	Some Jarrah and peppermint trees showing signs of stress. Lowering overall health of trees. Perhaps due to dry summer
BTW-S-R-2_T1S	11/22/2019	Very good				
BTW-S-R-2_T1S	5/22/2020	Very good		2-10%	30-70%	Large Jarrah drought affected
BTW-S-R-2_T1S	10/26/2020	Very good	4	10-30%	30-70%	Weed cover increased. Large Jarrah drought affected
BTW-S-R-2_T1S	10/20/2021	Very good	4	10-30%	30-70%	
BTW-S-R-2_T1S	5/26/2022	Very good	4	10-30%	30-70%	
BTW-S-R-2_T1S	10/19/2022	Very good	4	10-30%	30-70%	
BTW-S-R-2_T1S	5/25/2023	Very good	4	10-30%	30-70%	Trees are generally stressed across the site with a level of dieback in most trees. Due to drought?
BW-S-PI-1_T1E	11/19/2019	Very good				
BW-S-PI-1_T1E	5/26/2020	Very good		<2%	30-70%	
BW-S-PI-1_T1E	2/8/2021	Very good	3	<2%	30-70%	
BW-S-PI-1_T1E	10/14/2021	Very good	4	2-10%	30-70%	Weed cover increased. Some improvement in the condition of the trees
BW-S-PI-1_T1E	5/26/2022	Very good	4	2-10%	30-70%	Jarrah and Marri tree crowns are thin
BW-S-PI-1_T1E		Very good	4	2-10%	30-70%	Some improvement in the condition of the trees
BW-S-PI-1_T1E	5/25/2023	Very good	4	2-10%	30-70%	Dieback appears limited to jarrah

Current photocode	Date	Condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-1_T1W	11/19/2019	Very good				Marri blight present in most Marri trees. Moderate infected
BW-S-PI-1_T1W	5/26/2020	Very good		<2%	30-70%	Marri blight does not seem to be impacting trees so badly
BW-S-PI-1_T1W	10/26/2020	Very good	4	2-10%	30-70%	Weed cover increased Jarrah and Banksia attenuata thinning
BW-S-PI-1_T1W	10/14/2021	Very good	4	10-30%	30-70%	Weed cover increased
BW-S-PI-1_T1W	5/26/2022	Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W		Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W	5/25/2023	Very good	4	10-30%	30-70%	
BW-S-PI-5_T1N	11/20/2019	Very good				
BW-S-PI-5_T1N	5/22/2020	Very good		<2%	30-70%	
BW-S-PI-5_T1N	10/14/2020	Very good	3	30-70%	30-70%	Weed cover increased
BW-S-PI-5_T1N	10/14/2021	Very good	4	10-30%	30-70%	Weed cover has reduced
BW-S-PI-5_T1N	5/25/2022	Very good	4	10-30%	30-70%	Weed cover has reduced
BW-S-PI-5_T1N	10/17/2022	Very good	5	10-30%	30-70%	
BW-S-PI-5_T1N	5/26/2023	Very good	5	10-30%	30-70%	
BW-S-PI-5_T1S	11/20/2019	Excellent				
BW-S-PI-5_T1S	5/22/2020	Excellent		<2%	30-70%	Historic drought deaths Jarrah
BW-S-PI-5_T1S	10/14/2020	Excellent	4	<2%	30-70%	Historic drought deaths Jarrah
BW-S-PI-5_T1S	10/14/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	5/25/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	10/17/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	5/26/2023	Excellent	4	<2%	30-70%	Trees still partially stressed.
BW-S-PI-8_T1E	10/20/2022	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1E	5/26/2023	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1W	10/20/2022	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1W	5/26/2023	Excellent	5	<2%	30-70%	
BW-S-R-1_T1E	11/22/2019	Very good				
BW-S-R-1_T1E	5/22/2020	Very good		<2%	30-70%	
BW-S-R-1_T1E	10/22/2020	Very good	5	<2%	30-70%	
BW-S-R-1_T1E	10/12/2021	Very good	5	<2%	30-70%	
BW-S-R-1_T1E	5/26/2022	Very good	4	<2%	30-70%	Dieback has killed a number of banksia trees. The jarrah trees are stressed and have a thin crown.
BW-S-R-1_T1E	10/13/2022	Very good	5	<2%	30-70%	
BW-S-R-1_T1E	5/22/2023	Very good	4	<2%	30-70%	Large banksia attenuata has fallen across the transect impacting a small jarrah tree. All banksia attenuata in area is now dead.
BW-S-R-1_T1W	11/22/2019	Very good				
BW-S-R-1_T1W	5/22/2020	Very good		<2%	30-70%	
BW-S-R-1_T1W	10/22/2020	Very good	4	<2%	30-70%	
BW-S-R-1_T1W	10/12/2021	Very good	4	<2%	30-70%	
BW-S-R-1_T1W	5/26/2022	Very good	4	<2%	30-70%	Lots of storm detritus
BW-S-R-1_T1W	10/13/2022	Very good	4	<2%	30-70%	
BW-S-R-1_T1W	5/22/2023	Very good	4	<2%	30-70%	West end of site not as impacted by dieback. Note absence of Calytrix flavescens and Bossiaea eriocarpa and Gompholobium tomentosum in the under story.

Current photocode	Date	Condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-R-1_T2N	12/3/2019	Excellent				
BW-S-R-1_T2N	5/22/2020	Excellent		<2%	30-70%	Storm damage evident in site with fallen shrubs
BW-S-R-1_T2N	10/22/2020	Excellent	3	<2%	30-70%	Storm damage evident in site with fallen shrubs , jarrah trees stressed
BW-S-R-1_T2N	10/12/2021	Excellent	3	<2%	30-70%	
BW-S-R-1_T2N	5/26/2022	Excellent	4	<2%	30-70%	Vegetation looks healthy, but large jarrah is stressed.
BW-S-R-1_T2N	10/13/2022	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain.
BW-S-R-1_T2N	5/22/2023	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain. Condition hasn't deteriorated. However x brunonis appears stressed.
BW-S-R-1_T2S	12/3/2019	Excellent				
BW-S-R-1_T2S	5/22/2020	Excellent		<2%	>70%	
BW-S-R-1_T2S		Excellent		<2%	>70%	
BW-S-R-1_T2S	10/12/2021	Excellent		<2%	>70%	
BW-S-R-1_T2S	5/26/2022	Excellent	4	<2%	>70%	
BW-S-R-1_T2S	10/13/2022	Excellent	5	<2%	>70%	
BW-S-R-1_T2S	5/22/2023	Excellent	5	<2%	>70%	Note Styphelia racemulosa is a dominant shrub in the under story
TW-S-PI-2_T1E	11/19/2019	Very good				
TW-S-PI-2_T1E	5/26/2020	Very good		<2%	30-70%	
TW-S-PI-2_T1E	10/26/2020	Very good	5	2-10%	30-70%	Weed cover has increased.
TW-S-PI-2_T1E	10/14/2021	Very good	5	10-30%	30-70%	Weed cover has increased.
TW-S-PI-2_T1E	5/26/2022	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	10/19/2022	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	5/25/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1W	11/19/2019	Very good				
TW-S-PI-2_T1W	5/26/2020	Very good		<2%	30-70%	
TW-S-PI-2_T1W	10/26/2020	Very good	5	2-10%	30-70%	Weed cover has increased.
TW-S-PI-2_T1W	10/14/2021	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	5/26/2022	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	10/19/2022	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	5/25/2023	Very good	5	2-10%	30-70%	

Appendix 5. Vegetation condition scale (EPA, 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 6. Recording sheet template

BORR Drainage Monitoring Program.
Quarterly visual inspection Sheet

Site name	Date	Field personnel

Flooding/inundation

If flooding/inundation is present, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC that is flooded/inundated.
Considering the degree of impact (or lack of impact), make a recommendation for when the subsequent assessment should occur (quarterly as is the standard or within a shorter timeframe)

Standing water present (Y/N)	
Estimated area of standing water (m^2)	
% of TEC / PEC occurrence impacted by standing water	
TEC/PEC vegetation affected (Y/N) If yes, describe effect.	
List main species affected	
Photograph and waypoint taken (Y)	
Plant health assessment conducted (Y/N)	

Erosion

If TEC/PEC vegetation is impacted by active erosion, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC suspected to be impacted.

Active erosion present (Y/N)	
Estimated area of active erosion (m^2)	
Photograph and waypoint taken (Y)	
TEC/PEC vegetation affected (Y/N) If yes, describe effect. Complete plant health assessment if required.	
Plant health assessment conducted (Y/N)	

Drying

If a drying effect is suspected, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC suspected to be impacted.
Considering the degree of impact (or lack of impact), make a recommendation for when the subsequent assessment should occur (quarterly as is the standard or within a shorter timeframe)

Drying effect present or suspected (Y/N)	
% of TEC / PEC occurrence impacted	
Describe effect	
List main species affected	
Photograph and waypoint taken (Y)	
Plant health assessment conducted (Y/N)	

Appendix 7. An example of drainage monitoring report.

BW-S-PI-5 (da22)

Created	2022-05-25 04:40:54 UTC by Colin Spencer
Updated	2023-05-26 04:02:44 UTC by Debbie Brace
Location	-33.43518552373483, 115.61582766484061
Site name	BW-S-PI-5
Point name	BW-S-PI-5 (da22)
Recorder	Debbie Brace
Date	2023-05-25
Issue Y/N	No
Issue	Drying effects
Photos	
General comments	No issues

South West Gateway Alliance
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South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Appendix I

M4.4-4.6 Report – Black Cockatoo Artificial Nest Hollows

Australian Black Cockatoo Specia

Report: Installation of four Artificial Hollows Ducane Reserve W.A

Main Roads
Western Australia

5 June 2023

Australian Black Cockatoo Specialists

CONTENTS

All images source: Rick Dawson

INTRODUCTION

Australian **B**lack **C**ockatoo **S**pecialists (ABCS) are pleased to submit this report to the Department of Main Roads Western Australia (MRWA) regarding the installation of four artificial hollows (ANH) in Ducane Reserve on Friday 2 June 2023, as an initial offset for the Bunbury Outer Ring Road (BORR) project.

APPROVAL AND LICENSES DBCA

As agreed ABCS liaised with Department of Biodiversity Conservation and Attractions (DBCA) regarding the installation of the four ANH and obtained an authority to 'ACCESS TO LAND FOR A DESIGNATED ACTIVITY' (Pursuant to Regulation 101 of the Biodiversity Conservation Regulations 2018). DBCA gave approval for ANH to be installed on nominated trees D3, D8, D9 and D12.

INSTALLATION METHOD

On Friday 2 June 2023, assisted by Dr Peter Mawson four ANH were installed in Ducane Reserve using a ladder (No access for EWP), and in accordance with requirements of latest guideline for ANH by the WA Department of Parks and Wildlife publications is *DBCA '(2023). Fauna Notes – Artificial hollows for black cockatoos'* which has replaced ***DPAW Fauna Note 'How to design and place artificial hollows for Carnaby's cockatoo 2015'***

On closer inspection of D3 it was observed that it had extensive fire scaring on the lower trunk. As a result, I spoke with Kim Williams DBCA at approximately 9am that day, and obtained approval for the ANH (DR01) to be installed on D4.

Each hollow was 375 mm internal diameter (430mm external), 1.2m in height, and installed 8m above ground to reduce the chance of 'Nest Robbing', and allow maintenace by ladder. The hollows were attached to the tree by chain and fixed by 4 points. A sacrificial post was placed in each hollow along with a minimum of 20lts of premium quality hardwood woodchips. All hollows used by ABCS are made to last at 50 years, except for substrate and sacrificial post, which will need to be change periodically. The hollow is attached to the tree so that when it grows the hollow will rise with the tree and not place the fixings under stress.

The four ANH were numbered on the base DR01 to DR04 and installed in locations close to the perimeter access track in the eastern area of the reserve as approved by DBCA.

At approximately 12:30pm in the west and southwest ends of the reserve >40 Baudin's Cockatoos (*Zanda baudinii*) were observed and photographed feeding on Marri and Banksia, and drinking in the water trough in the adjacent property. Also in the north-western end of the reserve >20 Forest Red-tail Black cockatoos (*Calyptorhynchus banksia)* naso where observed and photographed feeding on Marri. See Annex 5

All hollows were placed on Jarrah (*Eucalyptus.*marginata) within Ducane Reserve. Research has shown that by placing the ANH in a manner that the foliage provides shade can considerably reduce the heat in the hollow. Each hollow was placed with this in mind with a minimum of a shade rating of 3. Shade over the hollow was rated from 5-1, with 5 full shade and 1 full sun.

RECOMMENDATIONS

That this year's nesting survey is conducted **in late to mid-October and December 2023**, to enable data to be taken from nestlings (if present) to provide valuable information on the health of the birds using the area.

If prescribed burning is to take place in Ducane then the four trees that have ANH on them must have the understory cleared from around the trees to ensure that ANH's are not affected and the canopy remains intact to provide shade.

CONTACT INFORMATION

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Position:	Principal Consultant
Phone:	0448 170 670
Email:	dawsonrick60@gmail.com

Rick Dawson
Director
Australian Black Cockatoo Specialists
5 June 2023

APPENDIX 1 – ARTIFICIAL HOLLOW DETAILS

Artificial Hollow DR01

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	*Eucalyptus.* marginata	1082	DR01	376990	6299787	Wando	SE	8010	375	1200	930	4

Artificial Hollow DR02

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	*Eucalyptus.* marginata	1091	DR02	377887	6300210	Wando	N	8060	375	1200	940	5

Artificial Hollow DR03

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	*Eucalyptus* marginata	1076	DR03	377890	6300237	Wando	S	8000	375	1200	930	3

Artificial Hollow DR04

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	*Eucalyptus.* marginata	1075	DR04	376921	6300760	Wando	ESE	8020	375	1200	930	4

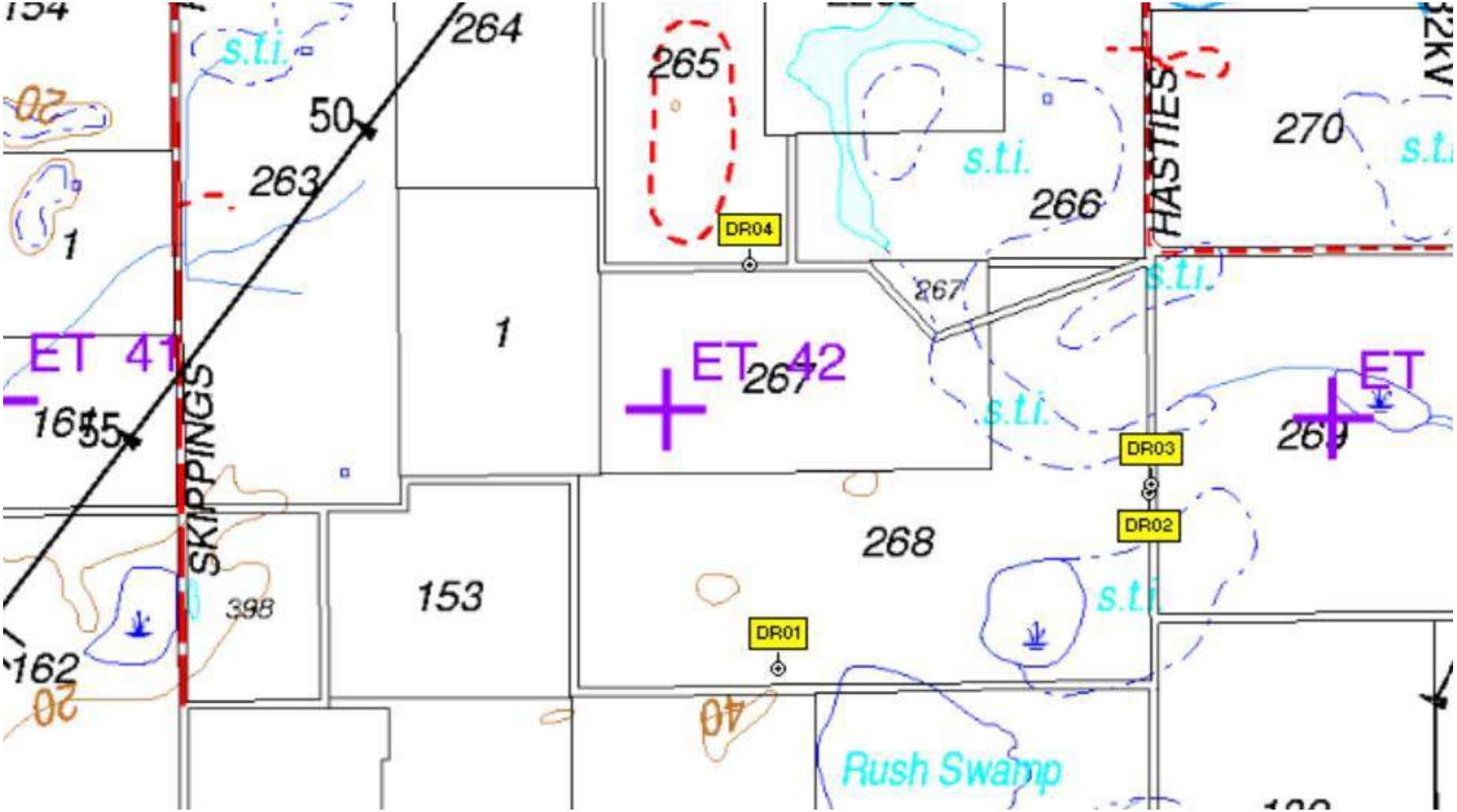
Appendix 2 – Installation method

Wood Chips, ladder and Sacrificial post.

Upper Fixings

Lower fixings placed in a manner to ensure the hollow can grow up with the tree

APPENDIX 3 – MAP OF HOLLOW INSTALLATIONS.



APPENDIX 4 – DETAILS OF EACH ANH

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	*Eucalyptus.* marginata	1082	DR01	376990	6299787	Wando	SE	8010	375	1200	930	4
Ducane	*Eucalyptus.* marginata	1091	DR02	377887	6300210	Wando	N	8060	375	1200	940	5
Ducane	*Eucalyptus.* marginata	1076	DR03	377890	6300237	Wando	S	8000	375	1200	930	3
Ducane	*Eucalyptus.* marginata	1075	DR04	376921	6300760	Wando	ESE	8020	375	1200	930	4

APPENDIX 5 – BLACK COCKATOOS IN DUCANE RESERVE

Appendix J

M5.3 Environmental Performance Report – Construction Fauna Management Plan

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M5-3

Environmental Performance Report

Construction Fauna Management Plan

(2022 - 2023)

Main Roads WA

Revision 0

30-Aug-23

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	19-Jul-23	SWGA Review	A.G.	E.R.		A.H.
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C	29-Aug-23	Main Roads Review	A.G.	E.R.		A.H.
0	30-Aug-23	Issued	E.R	Main Roads		M.S.
Current revision		**0**				

Contents

Figures

Tables

1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted that in relation to Terrestrial Fauna, the key values likely to be impacted by the proposal are the local and regional population levels of conservation significant terrestrial fauna. The residual impacts to these values are predominately from clearing of breeding and foraging habitat, habitat fragmentation and changes to hydrological regimes of aquatic habitat.

1.2 MS 1191 Condition 5

In relation to the potential for direct and indirect impacts to Terrestrial Fauna, the EPA recommended a number of conditions including Condition 5, and Ministerial Statement 1191, therefore, includes the following conditions in relation to Terrestrial Fauna:

Condition 5-1

The proponent shall implement the proposal to achieve the following environmental objective:

(1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.

Condition 5-2

The proponent shall prepare a Construction Fauna Management Plan and

submit to the CEO prior to ground-disturbing activities. This Plan shall:

(1) specify the passive relocation management actions to be implemented prior to and during clearing;

(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;

(3) specify monitoring that:

(a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan;

(b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the Biodiversity Conservation Act 2016;

(c) evaluates the suitability, adequacy and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3;

(d) evaluates impacts to residential western ringtail possum individuals at receival sites; and

(e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).

(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;

(5) specify management actions; management targets; monitoring locations, methodologies, indicators and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and

(6) *be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the Biodiversity Conservation Act 2016.*

2 Environmental Performance Report

2.1 Purpose and scope

This Environmental Performance Report (EPR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with Condition 5-3 set out in Ministerial Statement 1191 (MS 1191).

Condition 5-3 of MS 1191 requires an annual environmental performance report to be submitted to the Chief Executive Officer (CEO) of the Environmental Protection Authority (EPA) as part of the Compliance Assessment Report (CAR).

Condition 5-3

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the Construction Faun Management Plan required in condition 5-2;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 5-1(1) were achieved;

(3) report whether that the outcomes in condition 5-1(1) were achieved; and

(4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1).

An Environmental Performance Report (EPR) has been prepared to address Conditions 5-1(1), 5-2 and 5-3 of MS 1191 during the reporting period (refer attached report prepared by Biota Environmental Sciences, July 2023).

This EPR incorporates a 12-month audit period from 31 May 2022 to 30 May 2023. This is the first EPR associated with Condition 5-3 to be submitted under Ministerial Statement 1191.

2.2 Compliance with MS 1191Conditions 5-1, 5-2 and 5-3

Compliance with Conditions 5-1, 5-2 and 5-3 is addressed in Table 1.

Table 1. Compliance status with regard to MS 1191 Conditions 5-1, 5-2 and 5-3.

MS 1191 Condition	Condition	Status	Evidence / Compliance
5-1	*The proponent shall implement the proposal to achieve the following environmental objective:* *(1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.*	Compliant	This CAR.
5-2	*The proponent shall prepare a Construction Fauna Management Plan and submit to the CEO prior to ground-disturbing activities. This Plan shall:* *(1) specify the passive relocation management actions to be implemented prior to and during clearing;* *(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;* *(3) specify monitoring that:* *(a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan;*	Compliant	Construction Fauna Management Plan (approved 22 July 2022).

MS 1191 Condition	Condition	Status	Evidence / Compliance
	(b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the Biodiversity Conservation Act 2016; *(c) evaluates the suitability, adequacy and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3;* *(d) evaluates impacts to residential western ringtail possum individuals at receival sites; and* *(e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).* *(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;* *(5) specify management actions; management targets; monitoring locations, methodologies, indicators and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and* *(6) be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the Biodiversity Conservation Act 2016.*		

MS 1191 Condition	Condition	Status	Evidence / Compliance
5.3 (1)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(1) outline the monitoring that was undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2*	Compliant	The Construction Fauna Management Plan identified the following monitoring: • Pre-clearing WRP and BTP surveys • Recording of conservation significant fauna encounters that occur during clearing • Post-clearing WRP and BTP surveys of the receival and reference sites as part of on-going bi-monthly surveys • Mark-resight study using PIT tags of WRP within the Development Envelope and receival sites • Telemetry study using GPS collars on up to fifty WRP and monitoring these animals for up to 3 months • A genetic relatedness study of WRP with a minimum of 20 and up to 50 a samples DNA sequenced. Please refer to this CAR. Please refer also to attached EPR report (Biota Environmental Science, 2023).
5.3 (2)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 5-1(1) were achieved;*	Compliant	Please refer to this CAR. Please refer also to attached EPR report (Biota Environmental Science, 2023) with regard to the bi-monthly, and telemetry and mark-resight surveys. It should be noted that the genetic relatedness study was ongoing during the reporting period with collection of genetic samples continuing in association with the second stage of clearing. Genetic samples from all 153 animals collected during the current reporting period will be collated along with 11 additional samples collected after 31 May 2023, and formally analysed during the 2023/2024 reporting period.
5-3(3)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(3) report whether that the outcomes in condition 5-1(1) were achieved; and*	Compliant	The objectives of Condition 5-1 is that *during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.* Given the work undertaken to minimise and manage project attributable impacts, with one clearing related WRP mortality being recorded during the entire clearing program, it is considered that the management measures in place have achieved

MS 1191 Condition	Condition	Status	Evidence / Compliance
			the objective. Ongoing monitoring will continue to measure whether this objective is being achieved.
5-3(4)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1)*	Compliant	Please refer to this CAR.

2.3 Clearing metrics in relation to Terrestrial Fauna during the reporting period

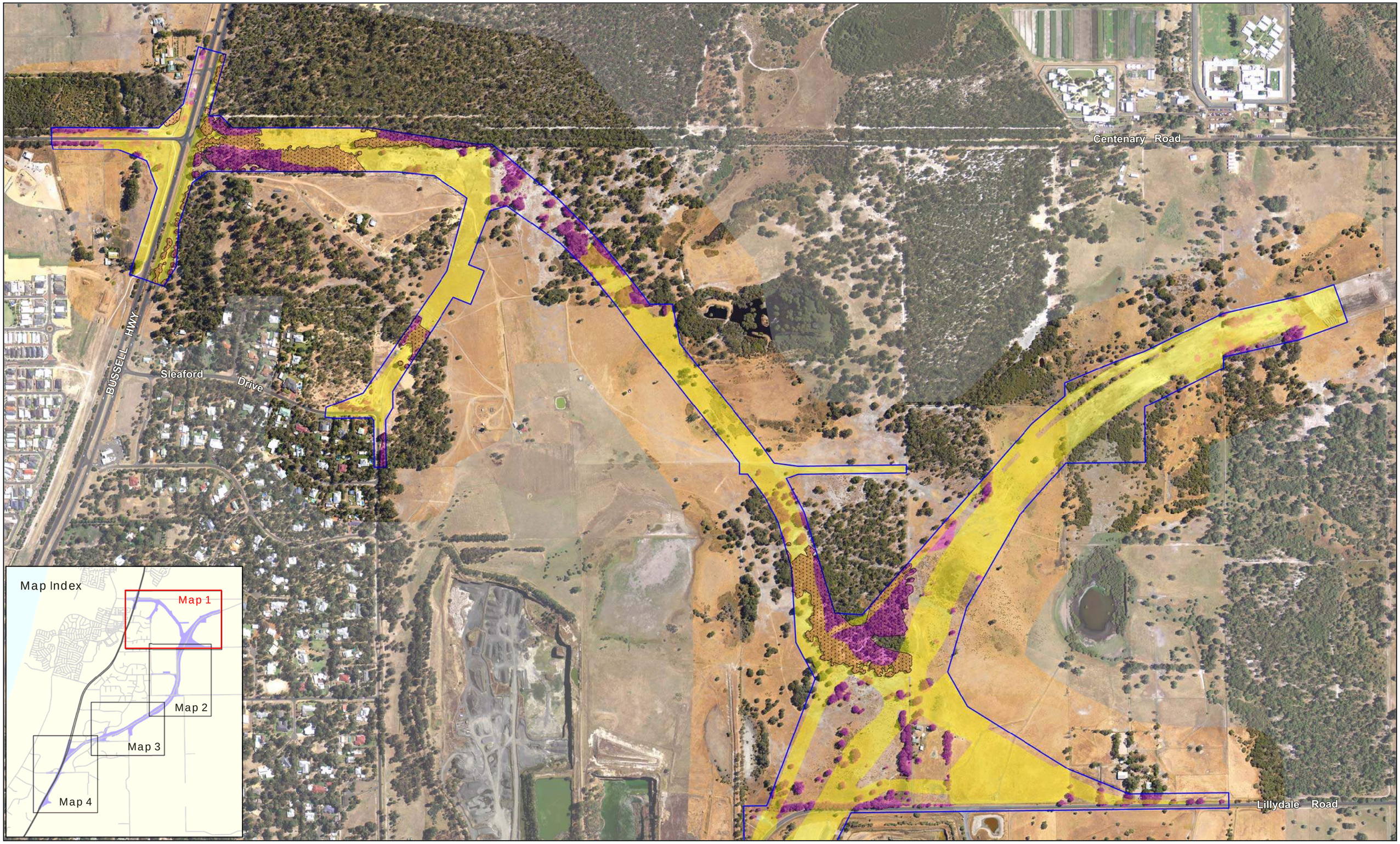
Construction of the Proposal (BORR Southern Section) commenced on 1 August 2022.

Clearing and disturbance in relation to Terrestrial Fauna, specifically Western ringtail possum (WRP) habitat and Brush-tailed phascogale (BPh) habitat during the reporting period is summarised in Table 1 and Figure 1.

Table 2. Ground disturbance and clearing in relation to Terrestrial Fauna (Western ringtail possum habitat and South-western brush-tailed phascogale habitat) during the reporting period (May 2022 – 2023).

Environmental Aspect	Area specified in Ministerial Statement 1191	Area cleared during this reporting period (and total cleared)
Western ringtail possum habitat (WRP)	60.9 ha	24.39 ha
Brush-tailed phascogale habitat (BPh)	39.2 ha	18.09 ha

Figure 1. Ground disturbance and clearing extents during the reporting period in relation to Terrestrial Fauna (Western ringtail possum habitat and South-western brush-tailed phascogale habitat).



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023
- Western Ringtail Possum habitat
- Brush-tailed Phscogale habitat

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Western Ringtial Possum habitat

Brush-tailed Phascogale habitat

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,500 @ A3

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents (current as of 31 May 2023)

Western Ringtail Possum habitat

Brush-tailed Phascogale habitat

N

0 400

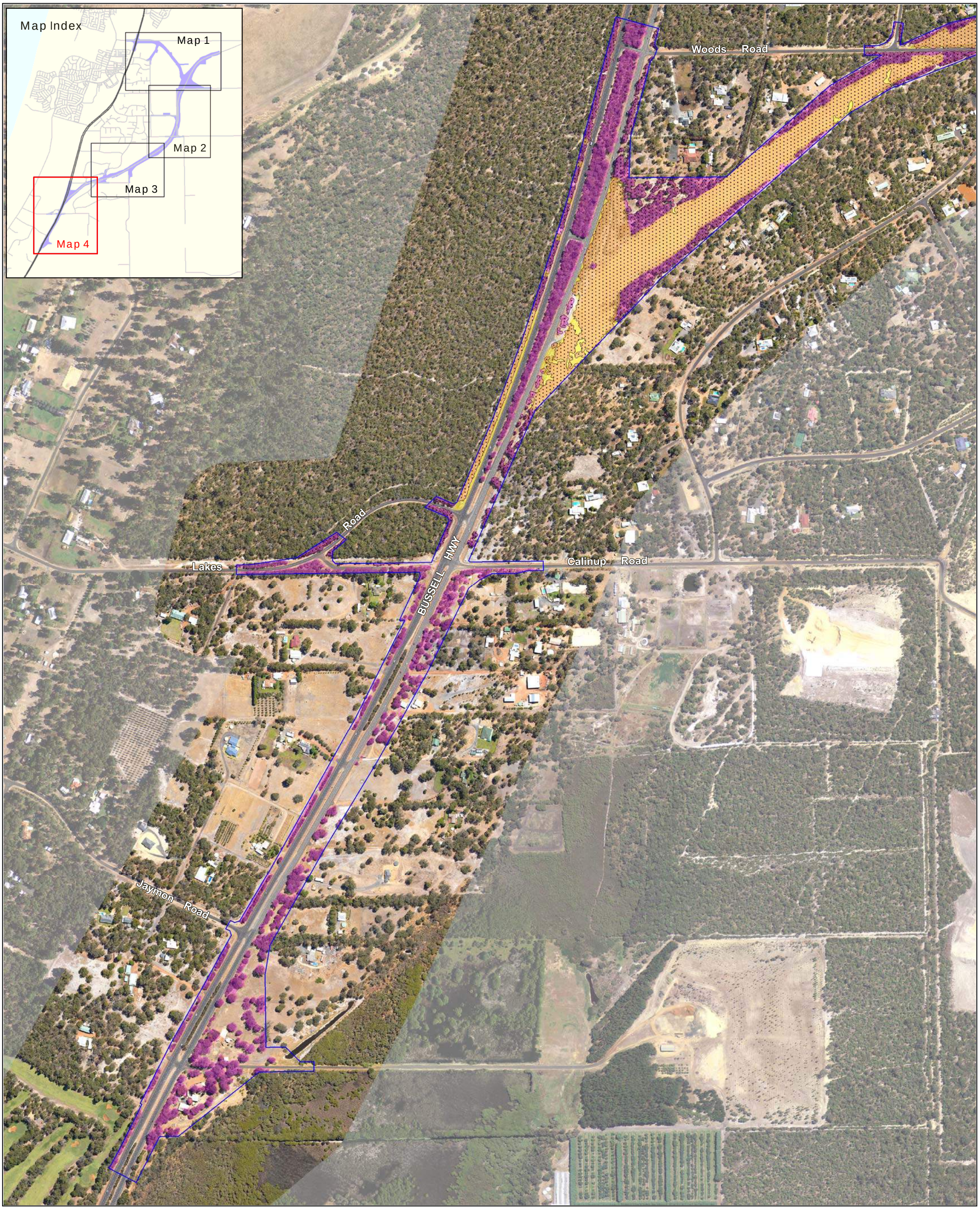
metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 4 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents (current as of 31 May 2023)
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

metres

BORR South Imagery 14 March 2023

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1765	Date: 8 Aug 2023	Revised:	Projection: MGA Z50 (GDA2020)	Scale: 1:7,000 @ A3

South West Gateway Alliance

Report

Environmental Performance Report (Biota Environmental Sciences, 2023)

Biota Environmental Sciences

Biota (n): The living creatures of an area; the flora and fauna together

30 August 2023

Ernie Stead-Richardson
Environmental Manager Construction
South West Gateway Alliance
Via Email

Dear Ernie

Bunbury Outer Ring Road (Southern Section): Annual EPR Monitoring Report May 31 2022 to 30 May 2023.

Biota Environmental Sciences have contributed to several scopes of work related to the Bunbury Outer Ring Road (BORR) Southern Section, required under Ministerial Approval 1191. These scopes largely relate to Western Ringtail Possum (WRP) monitoring activities documented in the Construction Fauna Management Plan (CFMP) and Habitat Fragmentation Management Plan (HFMP). The scopes include: bi-monthly surveys, telemetry studies, mark-resight studies, a genetic relatedness study and WRP habitat condition surveys.

Compliance Assessment Reporting (CAR) is a requirement for the BORR (Southern Section) under the Ministerial Approval 1191 with the first reporting period coinciding with the period 31st May 2022 to 30th May 2023. Though construction did not commence until August 2022, some activities required under the CFMP (e.g. the telemetry study) had relatively long lead times and so commenced prior to construction. Other studies represented a continuation of monitoring that was first commenced in late 2019.

This document reports on the aspects of WRP monitoring required under the CFMP that were undertaken by Biota Environmental Sciences.

With regard to the scope of works issued to Biota these are specifically:

- Pre-clearing WRP and Brush-tailed Phascogale (BTP) survey of the Development Envelope, receival sites and reference sites (reported elsewhere);
- Post-clearing WRP and BTP surveys of the receival and reference sites as part of the on-going bi-monthly survey;
- Mark-resight study using PIT tags of WRP within the Development Envelope and receival sites;
- Telemetry study using GPS collars on up to fifty WRP and monitoring these animals for up to 3 months; and
- A genetic relatedness study of WRP with an expected fifty (50) samples DNA sequenced.
- WRP habitat condition surveys via assessment of 3D aerial imagery.

Bi-monthly surveys

Bi-monthly (every two months) surveys have been completed throughout the reporting period (31 May 2022 – 30 May 2023) (Table 1) and have included habitat within the development envelop, the receiving habitat and Reserve 23,000 (the BORR S reference site). The bi-monthly surveys commenced in August 2019 and the almost three years of continuous data provide a robust baseline for population size and natural fluctuations within the survey footprint. Methods adopted for these surveys are provided in Appendix A.

Access was denied by the landowner to the area between Lillydale Road and Bussell Highway during the reporting period and as a result no bi-monthly surveys were conducted in this area for August 2022, October 2022 and February 2023.

Table 1. BORR South bi-monthly survey dates during current reporting period.

Phase	Survey Date
June 2022	20th June – 25th June 2022
August 2022	23rd August – 25th August 2022
October 2022	3rd October – 5th October 2022
December 2022	5th December – 9th December
February 2023	20th February – 23rd February 2023
April 2023	11th April – 12th April and 27th April – 28th April 2023

The BORR S reference site (Reserve 23,000) is considered sufficiently large to provide a demographic snapshot of the entire monitoring period (commencing November 2019). Approximately 5 ha of Reserve 23,000 representing 3.4 % of the total area (146 ha) was burnt following a lightning strike on the 3/01/2023 and should be considered when investigating the bi-monthly counts for this Reserve.

Except for the 2019 counts, the peaks and troughs are broadly comparable across years. The peaks associated with the emergence of young from the pouch typically evident in the October and December counts but with an occasional April peak (Figure 1). Troughs are evident in the winter counts (Figure 1).

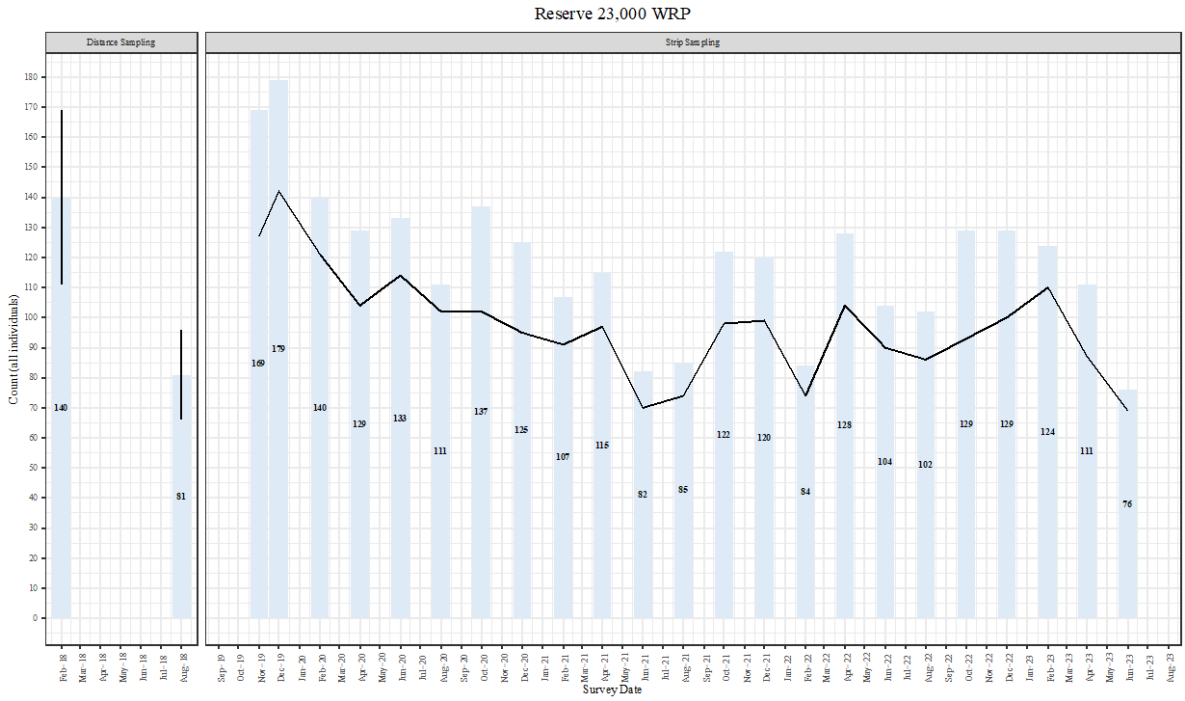


Figure 1. Results of counts of Western Ringtail Possums in Reserve 23,000 using distance sampling in the first panel (blue bars represent total number of individuals, black vertical bars are standard error estimates) and strip sampling in the second panel (blue bars represent total number of individuals, black line representing the total number of detections).

Mark-resight study

For the current reporting period, the transponder mark-recapture / resight study is mostly superseded by the comprehensiveness of the GPS collaring study (see below). This is because the fate of collared animals (n= 108) has been studied intensively prior to, during and post-clearing and within the clearing area as well as the receiving habitat (where access was permitted). We have estimated that the total number of WRP captured represents approximately 90 % of the total number of individuals available for capture in the accessible parts of the receiving habitat and throughout the clearing footprint.

Telemetry study

During the reporting period a total of 153 WRP were captured as part of the telemetry study (for methods see Appendix B and raw data see Appendix C), these included animals from both the development footprint and the receiving habitat and across both phases of clearing: phase 1 – Bussell Highway to Yalinda Drive; and phase 2 – Yalinda Drive to Jilly Road and "Banksia Hill".

Phase 1 Clearing: Bussell Highway to Yalinda Drive

During phase 1 of clearing, a total of 76 animals were captured between 30th May 2022 and 3rd August 2022 of which 52 animals were collared. The remaining 24 animals caught were too small to collar. Duration of collaring for each animal where relocation data were recorded is given in Figure 2. Clearing progressed over 11 days between the 2nd and 26th of August (Figure 2 and Appendix D)

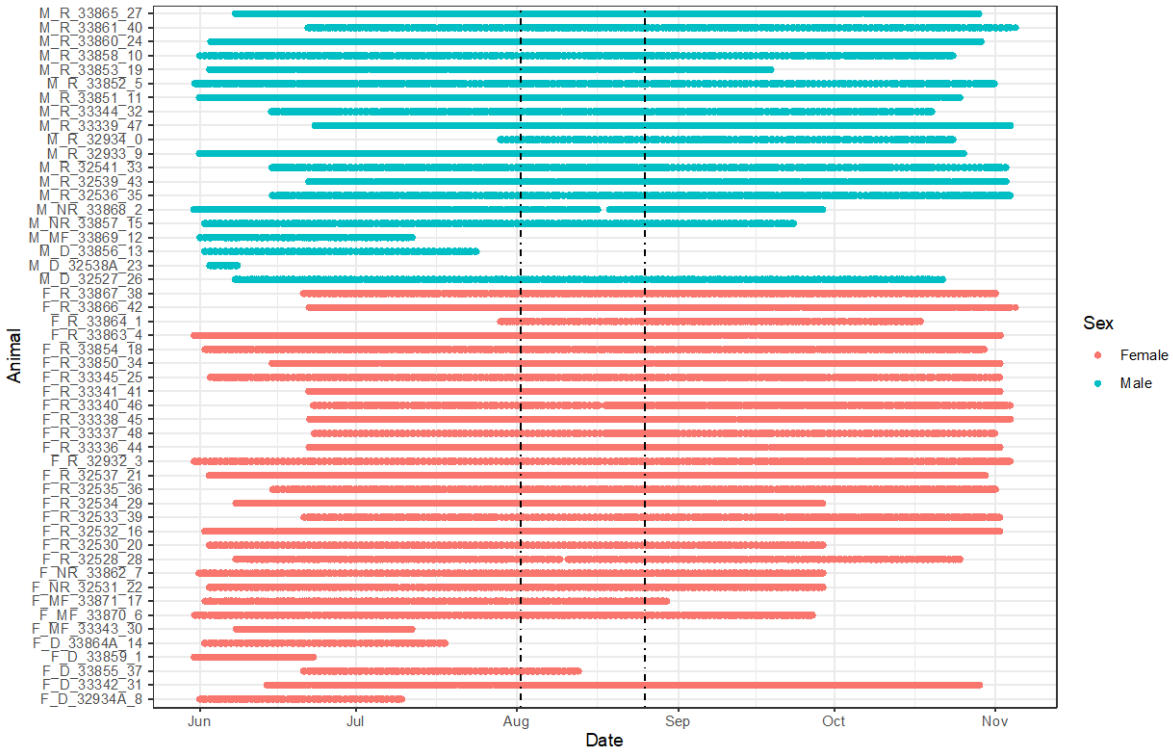


Figure 2. Duration over which WRP wore GPS collars during phase 1 of clearing within the Gelorup corridor (Bussell Highway to Yalinda Drive). Clearing activities were completed between 2nd and 26th August 2022 as denoted by hashed vertical lines (F= female, M= male, D = animal died or presumed to have died, MF = collar malfunctioned, NR = collar not recovered, R= collar recovered).

During the current reporting period, the collection of GPS relocation data associated with phase 1 clearing was finalised. Collars were retrieved and the animal's condition assessed and reported under our animal ethics obligations. The relocation data associated with phase 1 clearing have been analysed but not formally reported. The results suggest that modelled home ranges (based on relocation data collected for approximately six weeks either side of clearing) that were positioned outside of the clearing footprint remained

largely unchanged (Appendix E). Home ranges of females that were partially cleared generally retracted back to those areas that remained uncleared. Home ranges of males that were partially cleared repositioned to overlap with female home ranges post clearing.

Phase 2 Clearing: Yalinda Drive to Jilly Road

Six weeks ahead of the anticipated start (late March 2023) of the Gelorup corridor phase 2 clearing (Yalinda Drive to Jilly Road) and up to the end of the current reporting period (31 May 2023), a total of 77 WRP were captured within the DE and receiving habitat (of phase 2) (Appendix C). Of the 77 WRP, 50 were collared with GPS units (Figure 3) and five with VHF only collars, the remaining 22 animals were either too small to collar or released without a collar. Phase 2 clearing did not commence in March as anticipated, and the duty cycle of the collars was reduced to one GPS fix per day to help preserve battery life. The Phase 2 clearing commenced on 3rd April 2023 and continued through to 30th August 2023.

Collection of GPS relocation data association with phase 2 clearing was ongoing during the reporting period. The duty cycle was restored to seven recordings per 24-hour period after completion of clearing for the central track and for the bridge footings at Five Mile Creek.

Figure 3. Duration over which WRP wore GPS collars during phase 2 of clearing within the Gelorup corridor (Bussell Highway to Yalinda Drive) up to May 31st 2023 (F= female, M= male, D = animal died or presumed to have died, RT= collar recovered).

Pre-clearing Radio Telemetry

Whilst the primary purpose of the GPS collaring study was to document changes in modelled home ranges before and after clearing, being able to locate collared animals immediately prior to clearing activities helped reduce the risk of accidental WRP death. The recorded daytime refuges (dens, dreys and other locations) of collared animals were plotted onto maps showing the animals home range and clearing footprint these were updated daily. The location of all collared animals at the clearing front were identified in the field and trees flagged and locations shown to fauna spotters of the clearing team.

Mortality Events

Across the entire collaring study to the end of the reporting period, a total of 21 collars (21%) have been retrieved from animals that had died (Table 2). Twelve (60%) mortality events occurred when no clearing was being undertaken. Two mortality events occurred during phase 1 clearing and seven mortality events occurred during the phase 2 clearing. Four mortality events were recorded coincident with clearing activities, two in each of the phases of clearing. A destroyed collar belonging to a male (956000012885932) was recovered from Bussell Highway on the 11th of August. A female (F_D_33855) was injured during clearing on the 23rd of August 2022. During the clearing window of the construction of a central access track, the collars from two males (M_D_33854_A_36 and M_D_32541_51) were collected at 'Banksia Hill'.

One mortality event (F_D_33855) has been directly linked to the project's clearing activities.

In seven cases evidence of Fox DNA was recovered from collars (Table 3).

Table 2. Mortality events of collared Western Ringtail Possums during the reporting period.

Animal Identifier	Sex	Approximate date or mortality	Notes
956000014468016, M_D_32538A	Male	Jun 6, 2022	Fox DNA recovered
953010003843044, F_D_33859	Female	Jun 17, 2022	No recovered DNA
956000013287340, F_D_32934A	Female	Jul 8, 2022	Fox DNA recovered
956000013284721, F_D_33864A	Female	Jul 18, 2022	No recovered DNA
956000013278514, M_D_33856	Male	Jul 23, 2022	No Result
956000012885932*	Male	Approx. Aug 5, 2022	Killed on road
956000014465074, F_D_33855	Female	Aug 23, 2022	Tree felling
956000012887430, M_D_32527	Male	Oct 21, 2022	No Result
956000012887188, F_D_33342	Female	Oct 28, 2022	No Result
956000016553768, M_D_33864	Male	Jan 21, 2023	Fox DNA recovered
956000016552200, F_D_32537	Female	Mar 05, 2023	Fox DNA recovered
956000016554090, F_D_32532	Female	Mar 09, 2023	No recovered DNA
956000016558586, M_D_33856	Male	Mar 14, 2023	No recovered DNA
956000016623238, F_D_34485	Female	Apr 1, 2023	Fox DNA recovered
956000016551115, F_D_33337	Female	Apr 9 2023	No recovered DNA
956000016561739, F_D_33855	Female	Apr 14, 2023	Fox DNA recovered
956000013284822, M_D_34367	Male	Apr 15, 2023	Fox DNA recovered
956000016552062, M_D_32541	Male	Apr 29, 2023	No recovered DNA
956000016555813, M_D_33854_A	Male	Apr 30, 2023	No recovered DNA
956000013267396, M_D_34359	Male	May 15, 2023	No recovered DNA
956000012883500, M_D_34361	Male	May 19, 2023	No recovered DNA

* This individual wore a collar for approximately 14 days but no data was collected and hence it is not included in summary Figure 2 above (Orange = clearing period, Blue = directly related to clearing activities, Red = adjacent to clearing activities and Green = not related to clearing activities).

Genetic relatedness study

The genetic relatedness study was ongoing during the reporting period with collection of genetic samples continuing in association with Stage 2 clearing. Genetic samples from all 153 animals collected during the current reporting period will be collated along with 11 additional samples collected after May 31st 2023 and formally analysed during the 2023/2024 reporting period.

WRP Habitat Condition Survey.
Aerial 3D-imagery of the development envelope, receiving habitat and the reference site was captured prior to commencement of clearing (July 2022), and again in February 2023. The following datasets will be utilised for further analyses:

- 25cm SpecTerra multispectral imagery (4-band) with co-registered 6 cm high resolution RGB imagery.
- Digital Surface Models (DSM) and Digital Terrain Models (DTM).
- Delineation and segmentation of canopy polygons with height, area and Plant Cell Density (PCD) / Normalised Difference Vegetation Index attributes.

Examples of the resultant imagery are provided as Appendix F.

Other Studies
We confirmed that DNA extracted from freshly collected scats can be assigned to known individuals and that DNA can remain viable in many instances for around two weeks. The report of this study is included as Appendix G.

Yours sincerely,

Biota Environmental Sciences Pty Ltd

Roy Teale
Director/Zoologist

Appendix A: Standard Western Ringtail Possum Survey Methods

To document WRP seasonal population variation and to guide management actions, censuses within the BORR South Study Area and the BORR South Referral Boundary have been undertaken at two-monthly (bimonthly) intervals since August 2019. Counts within the BORR South Reference Site (Reserve 23,000) commenced in early November 2019 and were then timed to match those undertaken in the BORR South Study Area (i.e., from December 2019 and then bimonthly). To simplify reporting, the BORR South Study Area and Referral Boundary have been divided into Patches (see Appendix B).

A strip-sampling approach using 20 m wide strips, was adopted in each of the survey areas. This was preferred over using distance sampling for a number of reasons, mainly that many habitat remnants were too small to implement robust distance sampling. However, the width of the strip was guided by the detection function developed from the regional distance sampling program (based on thousands of detections) which indicated a probability of detection of 95% within 10 m either side of an observer (and even higher in the more open habitat characteristic of the BORR study sites). To obtain accurate and repeatable counts of the number of possums utilizing the BORR South Study Area and Referral Boundary, each section of habitat (including the Reserve 23000 Reference Site) was divided into 20 m strips.

These strips were pre-loaded onto map imagery and displayed on tablets (UniStrong UT 10) with a GPS accuracy typically to within 1.5 m. Each strip was surveyed by an appropriately experienced zoologist walking centrally through the strip at a slow steady pace (typically less than 1 km/hr), using a high-powered head torch (Led Lenser XEO 19R model) to detect animals. In open pasture with scattered trees, searching individual paddock trees was undertaken in favour of searching strips. In addition to the Western Ringtail Possum, observations of the Common Brushtail Possum and Brush-tailed Phascogale were also recorded.

Appendix B Collaring Study

The collaring project is designed as a longitudinal study, where the home range of WRP individuals is modelled from GPS re-locations obtained prior to, during and after clearing.

Main objectives

- Estimate home range size for WRP before, during and after clearing in the Gelorup section of BORR South.
- Determine the extent to which shepherded WRP remain in modified home ranges or re-establish new home ranges within adjacent habitat.
- Determine the extent to which new home ranges overlap with pre-existing home ranges.
- Determine whether genetic relatedness influences the likelihood of WRP successfully sharing home ranges.
- Determine whether rope bridges. artificial water sources and dens can be used to shepherd WRP into adjacent home ranges before and during clearing.
- Determine whether artificial den sites, rope connections and water sources and dens continue to be utilised post-clearing, and whether they allow WRP to coexist at higher densities in the receiving habitat.

Methods

WRP were hand-captured using the hook-fitted pole techniques outlined in Jones et al (1994) and in accordance with animal ethics AEC NO. 21-1-05. Following capture, possums were weighed, sexed, scanned for microchips, and given a visual health assessment. All individuals were marked with a microchip if none was already present. Female's pouches were examined to determine their reproductive status, and the size of any pouch young. WRP which were visually healthy, weighed >900g, and not carrying large pouch young were fitted with Lotek® Litetrack-30 RF whip-antenna collars (Lotek, Havelock North, New Zealand), and then released at point of capture. Collars weighed 35g; no more than 3.9% of total body weight for any individual. Follow-up visual assessments were conducted the night post-release, and throughout the study.

GPS data was remotely downloaded from the collars throughout the study using a Lotek® PinPoint Commander unit (Lotek, Havelock North, New Zealand) attached to a three-prong Yagi antenna (Advanced Telemetry Solutions Australia, Gold Coast, Australia). This data was used to assess each individual's movement and check for signs of mortality progressively throughout the course of the clearing.

VHF Collars

The VHF collars are the same model as the GPS units described above (Litetrack collars, manufactured by Lotek), but are VHF-only. They are also lighter, at 22g, and have been used to track lighter (>600 g) WRP during clearing activities. A 22g collar on 600g animal represents <4% of body weight (3.66%). The collars are intended for short-term use, allowing us to locate smaller WRP during clearing activities, and was fitted with a drop-off mechanism. The drop-off mechanism was either light foam or elastic and designed in consultation with DBCA Senior Research Scientist Mark Cowan.

References

Jones, B.A.; How, R.A. and Kitchener, D.J. (1994). A Field Study of *Pseudocheirus occidentalis* (Marsupialia: Petauridae). II. Population studies. Wildlife Research 21: 189-201.

Appendix C Data on all capture WRP

Appendix C. Western Ringtail Possums caught, microchipped, and collared in Gelorup; 2022-2023.

Clearing Area	Microchip	Collar ID	Ear Tag	Sex	Initial Capture						Second Capture				Third Capture				Fourth Capture				Home Range Centre		Last Recorded		
					Date	Mass	Latitude	Longitude	Maternal Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Latitude	Longitude	Date	Health Status	Relatives
8a	956000014484362	-	-	F	20/06/22	590	-33.436054	115.616893	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-33.433465	115.620970	11/08/22	A	-
8a	956000012885932	32538	-	M	27/07/22	1100	-33.435407	115.617156	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11/08/22	DR	-
8a	956000012887154	32534	-	F	07/06/22	1000	-33.435620	115.617638	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
8a	956000014456657	-	-	M	04/11/22	920	-33.435335	115.617869	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	04/11/22	A	-
8a	956000012883475	33849	-	F	03/08/22	1140	-33.435218	115.618224	PY	A	02/11/22	-	YAH	RM	-	-	-	-	-	-	-	-	-	-	02/11/22	A	-
8a	956000012887480	-	-	F	16/08/22	790	-33.433350	115.620438	PY	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17/08/22	A	-
8a	953010003843044	32534, 33859	-	F	05/03/20	950	-33.433263	115.619549	D	A	20/07/20	1110	PY	RM	30/05/22	1050	M	A	-	-	-	-	-	-	29/06/22	DF	-
8a	956000013287576	33868	-	M	30/05/22	1100	-33.432901	115.621282	-	A	16/08/22	1085	-	C	-	-	-	-	-	-	-	-	-	-	28/09/22	A	-
8a	956000013285306	-	-	F	30/05/22	740	-33.431707	115.622112	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30/05/22	A	-
8a	956000013289942	33860	-	M	02/06/22	1130	-33.432310	115.622875	-	A	03/11/22	1245	-	RM	-	-	-	-	-	-	-	-	-	-	03/11/22	A	PF of 956000013289286
8a	956000013289286	-	-	M	02/06/22	270	-33.432288	115.622855	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13/06/22	A	C of 956000014456451 PC of 956000013289942
8a	956000014456451	33345	-	F	02/06/22	1160	-33.432262	115.622861	YAH	A	01/11/22	1185	D	RM	-	-	-	-	-	-	-	-	-33.432187	115.623020	01/11/22	A	M of 956000013289286
8a	956000016556562	-	-	M	23/02/23	505	-33.431438	115.622669	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23/02/23	A	-
8a	956000013286309	-	-	F	30/05/22	820	-33.431684	115.623175	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30/05/22	A	-
8a	956000012883557	32536	-	M	14/06/22	1100	-33.431641	115.623741	-	A	03/11/22	1065	-	RM	-	-	-	-	-	-	-	-	-	-	03/11/22	A	PF of 956000013290304
8a	956000013290304	-	-	F	02/06/22	680	-33.431559	115.623796	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21/06/22	A	PC of 956000012883557 PC of 956000012888113
8a	956000012888113	33850	-	F	14/06/22	1080	-33.431587	115.623917	PY	A	01/11/22	1105	D	RM	-	-	-	-	-	-	-	-	-33.431746	115.624121	01/11/22	A	PM of 956000013290304
8a	956000013278848	32932	-	F	30/05/22	1090	-33.431211	115.623488	D	A	03/11/22	1025	SE	RM	-	-	-	-	-	-	-	-	-33.431336	115.623413	03/11/22	A	-
8a	956000012887342	33867	-	F	20/06/22	1120	-33.431049	115.623984	D	A	31/10/22	965	YAH	RM	-	-	-	-	-	-	-	-	-	-	31/10/22	A	M of 956000014481020
8a	956000014481020	-	-	F	31/10/22	420	-33.430667	115.624366	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31/10/22	A	C of 956000012887342
8a	956000013278920	33851	-	M	31/05/22	980	-33.430725	115.624844	-	A	01/11/22	1035	-	RM	-	-	-	-	-	-	-	-	-	-	01/11/22	A	-
8a	956000014465074	33855	-	F	20/06/22	950	-33.430731	115.625054	PY	A	22/08/22	1005	PY	RM	-	-	-	-	-	-	-	-	-33.430771	115.624853	22/08/22	DC	-
8a	956000014469008	32533	-	F	20/06/22	900	-33.430717	115.625914	D	A	01/11/22	965	YAH	RM	-	-	-	-	-	-	-	-	-33.433468	115.618609	01/11/22	A	-
8a	956000012884335	-	-	F	14/06/22	250	-33.431841	115.625296	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14/06/22	A	-
8a	956000012884966	32539	-	M	21/06/22	1140	-33.431254	115.625477	-	A	02/11/22	1105	-	RM	-	-	-	-	-	-	-	-	-	-	02/11/22	A	-
8a	956000012885478	33866	-	F	21/06/22	1175	-33.431043	115.626274	PY	A	04/11/22	1105	PY & YAH	RM	-	-	-	-	-	-	-	-	-	-	04/11/22	A	-
8a	956000013278514	33856	-	M	01/06/22	1025	-33.430252	115.622951	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	07/11/22	DF	-
8a	956000012884930	-	-	F	20/06/22	610	-33.430459	115.624273	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/07/22	A	-
8a	956000012889934	33340	-	F	22/06/22	940	-33.430525	115.625032	PY	A	16/08/22	1015	PY	C	03/11/22	905	PY	RM	-	-	-	-	-33.430434	115.624842	03/11/22	A	-
8a	956000013284721	33864	-	F	01/06/22	1100	-33.430400	115.625584	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/08/22	AD	-
8a	956000012887806	-	-	F	02/06/22	790	-33.430195	115.625992	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/06/22	A	C of 956000013286647
8a	956000013286647	32631	-	F	02/06/22	1240	-33.430186	115.626004	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-33.430101	115.626024	28/09/22	A	M of 956000012887806
8a	956000013284638	32528	-	F	07/06/22	900	-33.429997	115.626308	V	A	31/10/22	905	YAH	RM	-	-	-	-	-	-	-	-	-33.430231	115.62653	31/10/22	A	-
8a	956000013284785	33869	-	M	31/05/22	1040	-33.430351	115.626796	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	07/09/22	A	-
8a	956000012887332	-	-	F	02/11/22	820	-33.430505	115.627269	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/11/22	A	-
8a	956000014455266	-	-	F	30/05/22	780	-33.430315	115.627314	V	N	27/07/22	820	-	N	-	-	-	-	-	-	-	-	-	-	25/08/22	A	-
8a	956000012884009	-	-	F	01/11/22	440	-33.429727	115.626154	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01/11/22	A	C of 956000013290344
8a	956000013290344	32532	-	F	01/06/22	1070	-33.429700	115.626732	D	A	01/11/22	1045	YAH	RM	-	-	-	-	-	-	-	-	-33.429631	115.626289	01/11/22	A	M of 956000012884009

Clearing Area	Microchip	Collar ID	Ear Tag	Sex	Initial Capture						Second Capture				Third Capture				Fourth Capture				Home Range Centre		Last Recorded		Relatives
					Date	Mass	Latitude	Longitude	Maternal Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Latitude	Longitude	Date	Health Status	
8a	956000014468016	32538	-	M	02/06/22	900	-33.429734	115.626662	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	08/06/22	DF	-
8a	956000013290316	33857	-	M	01/06/22	1080	-33.429681	115.626748	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28/09/22	A	-
8a	956000013286144 003201863514811	32537	-	F	02/06/22	1100	-33.429664	115.626957	YAH	A	03/11/22	985	SE	RM	-	-	-	-	-	-	-	-	-33.429380	115.627348	03/11/22	A	M of 956000013289930
8a	956000013289930	-	-	F	31/05/22	680	-33.429284	115.626872	V	N	03/11/22	970	PY	N	-	-	-	-	-	-	-	-	-	-	03/11/22	A	C of 956000013286144 PC of 956000013287809
8a	956000013287809	32933	-	M	31/05/22	980	-33.429253	115.626856	-	A	01/11/22	985	-	RM	-	-	-	-	-	-	-	-	-	-	01/11/22	A	PF of 956000013289930
8a	956000013290110	-	-	M	02/06/22	800	-33.429119	115.626937	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/06/22	A	-
8a	956000013290120	-	-	M	02/06/22	380	-33.428445	115.627491	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/06/22	A	C of 956000013287340
8a	956000013287340	32934	-	F	31/05/22	960	-33.428457	115.627600	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-33.428495	115.627542	11/07/22	DF	M of 956000013290120
8a	956000013289752	33854	-	F	01/06/22	1020	-33.428319	115.627845	YAH	A	03/11/22	1005	-	RM	-	-	-	-	-	-	-	-	-33.428539	115.628179	03/11/22	A	-
8a	956000013290013	33858	-	M	31/05/22	1050	-33.429694	115.628176	-	A	03/11/22	-	-	RM	-	-	-	-	-	-	-	-	-	-	03/11/22	A	-
8a	956000012885357	-	-	F	13/06/22	760	-33.430075	115.628387	V	N	20/07/23	1170	PY	N	-	-	-	-	-	-	-	-	-	-	20/07/23	A	-
8a	956000014454745	33852	-	M	30/05/22	1000	-33.429757	115.628670	-	A	02/11/22	1035	-	RM	20/07/23	1010	-	N	-	-	-	-	-	-	20/07/23	A	-
8a	956000012884725	33864	-	F	27/07/22	1230	-33.429490	115.629029	PY	A	01/11/22	1005	-	RM	-	-	-	-	-	-	-	-	-	-	01/11/22	A	-
8a	956000013284636	33863	-	F	30/05/22	1140	-33.430252	115.628817	D	A	11/08/22	1195	PY	C	01/11/22	1045	-	RM	-	-	-	-	-	-	01/11/22	A	-
8a	956000012888172	33343	-	F	07/06/22	900	-33.430658	115.629004	V	A	25/07/23	1015	PY & YAH	RM	-	-	-	-	-	-	-	-	-33.430868	115.628847	25/07/23	A	-
8a	956000012885149	33337	-	F	22/06/22	1120	-33.430047	115.629456	PY	A	31/10/22	1035	YAH	RM	-	-	-	-	-	-	-	-	-33.430128	115.629150	31/10/22	A	M of 956000014470157
8a	956000014470157	-	-	M	31/10/22	645	-33.430092	115.629598	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31/10/22	A	C of 956000012885149
8a	956000013287587	33870	-	F	30/05/22	1110	-33.429598	115.629655	D	A	04/10/22	-	YAH	RM	-	-	-	-	-	-	-	-	-33.430121	115.62987	4/10/22	A	-
8a	956000012886779	32934	-	M	27/07/22	1130	-33.429818	115.630149	-	A	31/10/22	1335	-	RM	-	-	-	-	-	-	-	-	-	-	31/10/22	A	-
8a	956000012887188	33342	-	F	13/06/22	1140	-33.429272	115.630536	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31/10/22	AD	-
8a	956000012889385	33336	-	F	21/06/22	950	-33.428083	115.628903	D	A	01/11/22	1085	PY	RM	-	-	-	-	-	-	-	-	-33.428164	115.629162	01/11/22	A	-
8a	956000013256802	-	-	M	01/06/22	850	-33.428111	115.629033	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01/06/22	A	-
8a	956000012889243	33341	-	F	21/06/22	1200	-33.428306	115.629140	PY	A	01/11/22	1065	E	RM	-	-	-	-	-	-	-	-	-33.428497	115.628953	01/11/22	A	-
8a	956000012887053	-	-	M	07/06/22	500	-33.428942	115.629859	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29/06/22	A	-
8a	956000012888573	-	-	M	20/07/23	1060	-33.428266	115.629572	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20/07/23	A	-
8a	956000012887430	32527	-	M	07/06/22	1120	-33.427927	115.629644	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31/10/22	AD	-
8a	956000014455431	33338	-	F	22/06/22	1320	-33.428106	115.629836	M	A	03/11/22	1245	-	RM	05/07/23	1270	PY & YAH	N	-	-	-	-	-33.428006	115.630042	05/07/23	A	M of 956000016552009
8a	956000016552009	-	-	M	05/07/23	720	-33.428059	115.630254	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	05/07/23	A	C of 956000014455431
8a	956000012888438	33339	-	M	22/06/22	1250	-33.428145	115.629867	-	A	03/11/22	1205	-	RM	-	-	-	-	-	-	-	-	-	-	03/11/22	A	-
8a	956000012887569	-	-	M	08/06/22	790	-33.428113	115.629959	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13/06/22	A	-
8a	956000012889605	-	-	F	05/08/22	790	//////////	//////////	D	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	05/08/22	A	-
8a	956000013289036	33871	-	F	01/06/22	1125	-33.427967	115.630131	D	A	03/08/22	-	YAH	RM	20/07/23	1220	PY & YAH	N	-	-	-	-	-	-	20/07/23	A	M of 956000014455663
8a	956000014455663	-	-	F	03/08/22	-	-33.428013	115.630438	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03/08/22	A	C of 956000013289036
8a	956000012887954	-	-	M	08/06/22	760	-33.427882	115.630481	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14/06/22	A	-
8a	956000012885355	32541	-	M	14/06/22	1120	-33.428255	115.630742	-	A	03/11/22	1225	-	RM	29/06/23	1050	-	N	-	-	-	-	-	-	05/07/23	A	-
8a	956000012885634	32535	-	F	14/05/22	1100	-33.427894	115.630891	PY	A	01/11/22	1105	YAH	RM	27/06/23	1160	PY & YAH	N	-	-	-	-	-33.428083	115.630967	27/06/23	A	M of 956000016556050
8a	956000016556050	-	-	F	27/06/23	790	-33.427935	115.630880	M	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27/06/23	A	C of 956000012885634
8a	956000014454325	33853	-	M	02/06/22	1020	-33.427145	115.629992	-	A	03/11/22	985	-	RM	-	-	-	-	-	-	-	-	-	-	03/11/22	A	-
8a	956000012884409	32530	-	F	02/06/22	960	-33.427239	115.630035	M	A	16/01/23	1025	YAH	RM	-	-	-	-	-	-	-	-	-33.427126	115.630133	16/01/23	A	-
8a	956000012888259	33861	-	M	21/06/22	920	-33.427560	115.631031	-	A	04/11/22	1085	-	RM	-	-	-	-	-	-	-	-	-	-	04/11/22	A	-

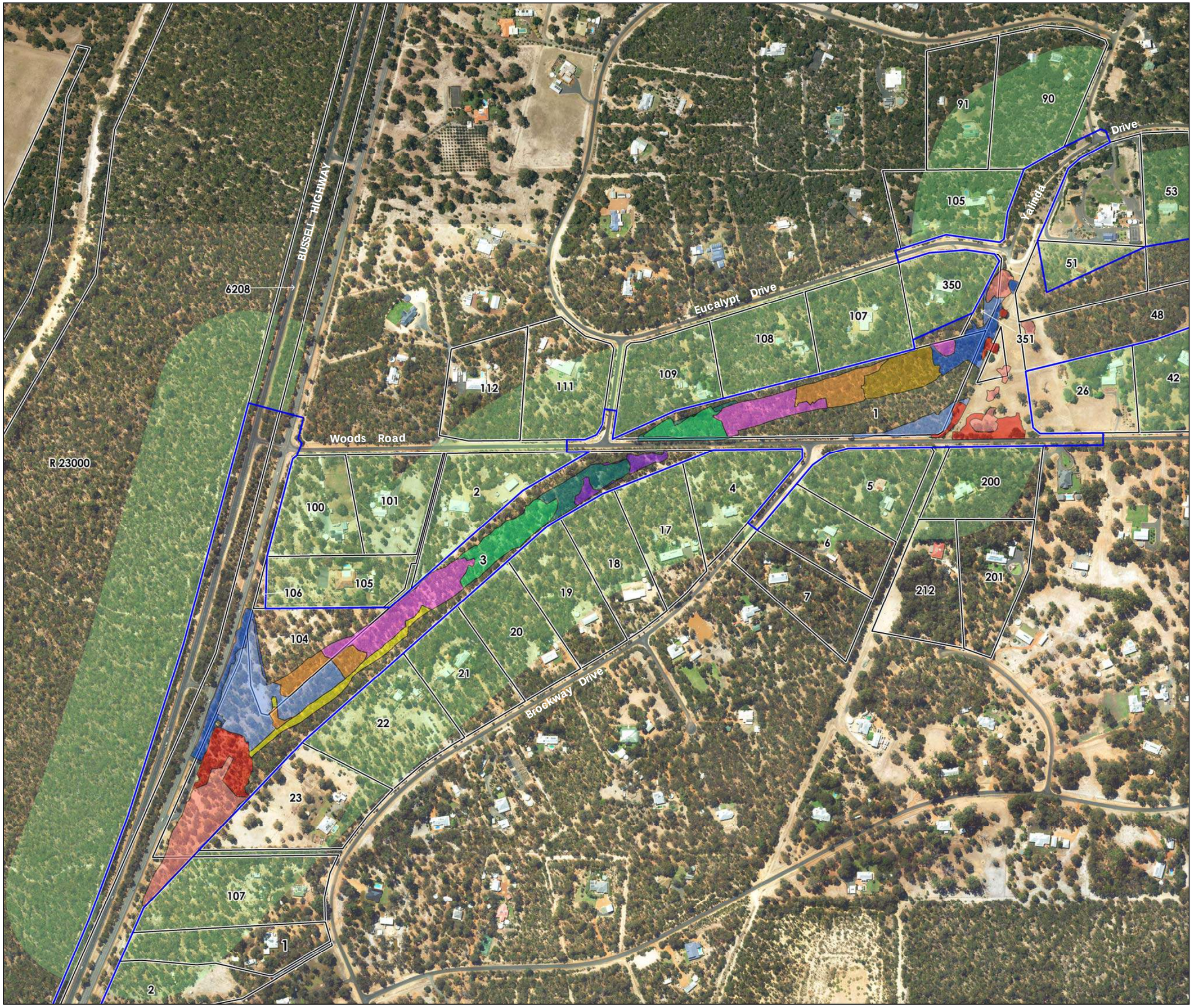
Clearing Area	Microchip	Collar ID	Ear Tag	Sex	Initial Capture						Second Capture				Third Capture				Fourth Capture				Home Range Centre		Last Recorded		Relatives
					Date	Mass	Latitude	Longitude	Maternal Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Latitude	Longitude	Date	Health Status	
8a	956000013255831	33862	-	F	31/05/22	1180	-33.427264	115.631108	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	09/01/23	A	-
8a	956000012885640	33865	-	M	07/06/22	1160	-33.427435	115.631314	-	A	02/11/22	1105	-	RM	-	-	-	-	-	-	-	-	-	-	02/11/22	A	-
8a	956000012886938	-	-	M	02/08/22	730	-33.430166	115.630824	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/08/22	A	-
7/8a	956000012888086	-	-	F	09/01/23	575	-33.427807	115.631321	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/01/23	A	-
7/8a	956000012888481	33344, 33858	-	M	14/06/22	920	-33.427760	115.631342	-	A	31/10/22	945	-	RM	11/01/23	940	-	A	-	-	-	-	-	-	26/06/23	A	-
7	956000016551907	33871	-	F	13/01/23	900	-33.428153	115.631658	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19/07/23	A	-
7	956000016553231	-	-	M	28/02/23	820	-33.428266	115.631558	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28/02/23	A	-
7	956000016555123	150.651, 150.632, 150.651	-	F	22/06/23	860	-33.428595	115.631617	M	A	04/07/23	870	-	A	06/07/23	860	-	RP	-	-	-	-	-	-	03/08//23	AD	-
7	956000016554090	32532	-	F	17/01/23	900	-33.429165	115.631643	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16/03/23	DP	-
7	956000016551085	34362	-	F	11/01/23	1090	-33.428736	115.632383	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26/07/23	A	PM of 956000016562011
7	956000016562011	150.740	-	M	11/01/23	760	-33.428708	115.632366	-	N	26/06/23	-	-	A	-	-	-	-	-	-	-	-	-	-	02/07/23	A	PC of 956000016551085
7	956000016553146	-	-	M	19/01/23	840	-33.428727	115.632326	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19/01/23	A	-
7	956000012883500	34361	-	M	09/01/23	950	-33.428486	115.632997	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/05/23	DF	-
7	956000016553285	33867	-	F	12/01/23	1000	-33.428674	115.633230	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016561681	32535	-	M	12/01/23	1080	-33.428840	115.633270	-	A	06/07/23	1125	-	RM	-	-	-	-	-	-	-	-	-	-	06/07/23	A	-
7	956000016551876	150.842, 150.860	52	M	27/02/23	760	-33.428646	115.633457	-	A	29/06/23	940	-	A	-	-	-	-	-	-	-	-	-	-	03/08/23	DF	-
7	956000016556816	33344, 32537	-	F	10/01/23	1050	-33.428710	115.633793	D	A	03/07/23	1165	PY	RP	-	-	-	-	-	-	-	-	-	-	23/07/23	A	-
7	956000013285425	-	-	M	09/01/23	780	-33.428593	115.633870	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17/01/23	A	PC of 956000013267396 PC of 956000013284183
7	956000013267396	34359	-	M	09/01/23	1040	-33.428580	115.633872	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/05/23	DO	PF of 956000013285425 PF of 956000013283776
7	956000013284183	34368	-	F	09/01/23	1000	-33.428575	115.633873	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22/05/23	A	PM of 956000013285425
7	956000016556034	150.690	-	M	04/07/23	1000	-33.428264	115.633913	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11/07/23	AD	-
7	956000016628778	34364	-	M	11/01/23	900	-33.428722	115.634396	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	PF of 956000013283776 PC of 956000016555381
7	956000016555381	32934, 32544	-	F	11/01/23	1100	-33.428696	115.634442	PY & YAH	A	27/06/23	1185	-	RP	-	-	-	-	-	-	-	-	-	-	25/07/23	A	PM of 956000016628778 PM of 956000013283776
7	956000013283776	-	-	F	09/01/23	720	-33.428673	115.634491	V	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11/01/23	A	PC of 956000016628778 PC of 956000016555381 PC of 956000013267396
7	956000012886712	34366	-	F	09/01/23	1080	-33.427834	115.634036	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19/06/23	DO	-
7	956000013284752	150.860, 34359	-	M	09/01/23	700	-33.427820	115.634030	-	A	05/07/23	920	-	A	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016552839	33859	53	F	28/02/23	910	-33.427579	115.633931	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21/07/23	A	-
7	956000012884779	-	-	M	11/07/23	1000	-33.427355	115.634196	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11/07/23	A	-
7	956000014481923	33339	47	M	23/02/23	940	-33.427321	115.634207	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02/07/23	DF	-
7	956000016551615	-	-	F	12/01/23	740	-33.427116	115.634434	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/01/23	A	-
7	956000016562841	-	-	M	12/01/23	530	-33.428386	115.635430	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18/01/23	A	-
7	956000016551480	33866	-	M	11/01/23	1090	-33.428686	115.635742	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/05/23	A	-
7	956000012889459	-	-	F	16/01/23	740	-33.428224	115.636304	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16/01/23	A	C of 956000016554441

Clearing Area	Microchip	Collar ID	Ear Tag	Sex	Initial Capture						Second Capture				Third Capture				Fourth Capture				Home Range Centre		Last Recorded		Relatives
					Date	Mass	Latitude	Longitude	Maternal Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Latitude	Longitude	Date	Health Status	
7	956000016554441	32538	-	F	16/01/23	1020	-33.428262	115.636346	YAH	A	24/07/23	1085	PY & YAH	RM	-	-	-	-	-	-	-	-	-	-	24/07/23	A	M of 956000012889459
7	956000012885906	32533	-	F	10/07/23	1090	-33.427968	115.635572	M	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23/07/23	A	M of 956000012888966
7	956000012888966	-	-	F	10/07/23	945	-33.427912	115.635524	D	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23/07/23	A	C of 956000012885906
7	956000016557010	-	-	M	17/01/23	800	-33.427492	115.635511	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18/01/23	A	-
7	956000016561739	33855	-	F	19/01/23	1060	-33.427684	115.635799	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14/04/23	DF	-
7	956000012889022	150.801	-	-	27/06/23	750	-33.427707	115.635861	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14/07/23	AD	-
7	956000016552654	-	-	M	17/01/23	800	-33.427112	115.635953	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17/01/23	A	-
7	956000016554196	34361	-	F	01/06/23	1000	-33.427280	115.636148	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	07/07/23	A	-
7	956000016557617	33853	-	M	12/01/23	880	-33.427265	115.636159	-	N	26/04/23	980	-	A	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016555798	33342, 33338	-	M	16/01/23	975	-33.427579	115.636202	-	A	29/06/23	1075	-	RP	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016551620	33861, 33339	-	F	19/01/23	1060	-33.427502	115.636559	PY & YOB	A	10/07/23	1125	PY	RP	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000013284822	34367	-	M	09/01/23	950	-33.427239	115.636664	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16/04/23	DF	-
7	956000016559048	-	-	F	11/01/23	820	-33.426943	115.637096	D	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11/01/23	A	-
7	956000016554436	32541	-	F	01/06/23	1030	-33.427105	115.637184	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016553668	33863, 33337	-	F	11/01/23	1180	-33.427229	115.637788	PY	A	11/07/23	1085	PY	RP	-	-	-	-	-	-	-	-	-	-	23/07/23	A	-
7	956000016553548	32933	20	F	11/01/23	940	-33.427435	115.637953	D	A	24/07/23	1025	PY	C	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016553891	33849, 33856	-	M	11/01/23	910	-33.427451	115.637980	-	A	11/07/23	905	-	RP	18/07/23	1000	-	C	-	-	-	-	-	-	25/07/23	A	-
7	956000013252019	34363, 150.651	06	F	09/01/23	1150	-33.427154	115.638043	D	A	24/07/23	1165	M	RP	-	-	-	-	-	-	-	-	-	-	27/07/23	A	-
7	956000016555509	-	-	M	05/07/23	1100	-33.426777	115.637851	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	05/07/23	A	-
7	956000013287476	34360	-	F	09/01/23	1000	-33.426845	115.637949	D	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20/06/23	A	-
7	956000016553242	-	96	F	18/01/23	760	-33.427142	115.638322	-	N	17/07/23	1010	PY	N	-	-	-	-	-	-	-	-	-	-	24/07/23	A	-
7	956000016552020	32533	43	M	16/02/23	1020	-33.427128	115.638743	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22/06/23	DF	-
7	956000016555392	33851	-	M	10/01/23	900	-33.426510	115.638539	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/07/23	A	-
7	956000016553768	33864	-	M	10/01/23	960	-33.426548	115.638569	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22/01/23	DF	-
7	956000012887127	150.672	-	M	11/07/23	750	-33.426639	115.638870	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17/07/23	AD	-
7	956000016628915	33341, 150.801	09	F	10/01/23	920	-33.426555	115.639123	PY	A	19/07/23	895	PY	RP	-	-	-	-	-	-	-	-	-	-	27/07/23	A	-
7	956000016558057	33865	-	M	10/01/23	1080	-33.426446	115.639178	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13/07/23	A	-
7	956000016554771	-	-	M	28/02/23	200	-33.426121	115.639584	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28/02/23	A	-
7	956000016553609	-	-	M	10/01/23	740	-33.426500	115.639771	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10/01/23	A	-
7	956000016557352	-	-	F	18/01/23	840	-33.426610	115.640127	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18/01/23	A	-
7	956000012887775	150.632	-	F	01/06/23	730	-33.426499	115.640288	V	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27/07/23	A	-
7	956000014480444	-	95	M	24/07/23	930	-33.426418	115.640374	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/07/23	A	-
7	956000012888297	33336	-	F	29/06/23	1130	-33.426250	115.640196	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016558908	34485	-	F	11/07/23	900	-33.426116	115.640108	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	956000016552127	34365	-	M	10/01/23	960	-33.425739	115.640248	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13/07/23	A	-
7	956000013290043	32540	-	F	10/01/23	1020	-33.425448	115.640400	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/09/23	A	-
7	956000016557081	32528	-	F	18/01/23	1080	-33.427784	115.637831	E	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14/07/23	A	-
7	956000016551229	33870	-	M	12/01/23	1100	-33.427787	115.638191	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13/07/23	A	-
7	956000016556638	32536	-	F	12/01/23	980	-33.427786	115.638219	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27/07/23	A	-
7	956000016554205	-	-	M	18/01/23	820	-33.427502	115.638608	-	N	16/02/23	810	-	N	-	-	-	-	-	-	-	-	-	-	16/02/23	A	-
7	956000016553614	-	-	M	12/01/23	700	-33.427654	115.638718	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/01/23	A	PC of 956000016561908
7	956000016561908	34486	23	F	12/01/23	940	-33.427650	115.638720	YAH	A	24/07/23	995	D	C	-	-	-	-	-	-	-	-	-	-	24/07/23	A	PM of 956000016553614

Clearing Area	Microchip	Collar ID	Ear Tag	Sex	Initial Capture						Second Capture				Third Capture				Fourth Capture				Home Range Centre		Last Recorded		Relatives
					Date	Mass	Latitude	Longitude	Maternal Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Date	Mass	Mat. Status	Collar Status	Latitude	Longitude	Date	Health Status	
7	956000016562477	32932	-	M	18/01/23	1100	-33.427642	115.638829	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27/07/23	A	-
7	956000016552425	33860	-	F	12/01/23	1100	-33.427380	115.639011	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24/07/23	A	-
7	956000016554717	-	-	M	12/01/23	810	-33.426968	115.639359	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/01/23	A	-
7	956000016552065	33340, 150.690	-	F	16/01/23	1020	-33.426978	115.639405	D	A	18/07/23	1045	M	RP	-	-	-	-	-	-	-	-	-	-	25/07/23	A	-
7	953010003843013*	32535, 32541, 32539, 33854	44	F	03/03/20	930	-33.427485	115.640045	V	A	20/07/20	1050	PY	RP	03/11/20	1005	YAH	RM	16/02/23	1000	D	A	-	-	27/07/23	A	-
					01/06/23	1015	-33.427354	115.639928	D	RP	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
7	956000014483298	-	-	F	16/02/23	350	-33.427235	115.639666	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16/02/23	A	C of 956000016623238
7	956000016623238	34485	45	F	16/02/23	980	-33.427235	115.639693	YAH	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30/05/23	DF	M of 956000014483298
7	956000016555713	33850	-	F	16/01/23	1000	-33.427275	115.640205	PY & YAH	A	25/07/23	1085	YAH	RM	-	-	-	-	-	-	-	-	-	-	25/07/23	A	M of 956000012886678
7	956000012886678	-	-	M	25/07/23	150	-33.427686	115.640387	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25/07/23	A	C of 956000016555713
6	956000016556712	33852	-	F	17/01/23	1055	-33.419721	115.650709	E	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26/07/23	A	-
6	956000016551115	33337	-	F	18/01/23	900	-33.419883	115.652006	V	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	07/04/23	DF	-
6	956000016558586	33856	48	M	23/02/23	1000	-33.419658	115.652670	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16/03/23	DF	-
6	956000016555911	-	-	F	27/02/23	270	-33.419608	115.652928	V	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27/02/23	A	-
6	956000016555813	33854	-	M	17/01/23	1235	-33.420145	115.652618	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29/04/23	DF	-
6	956000016559502	33345	-	F	28/02/23	1080	-33.420211	115.653038	PY	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19/07/23	A	-
6	956000016552062	32541	-	M	27/02/23	980	-33.420502	115.652802	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28/04/23	DF	-
6	956000016552200	32537	-	F	17/01/23	920	-33.420688	115.652635	M	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03/05/23	DF	-
6	956000016562631	150.632	49	F	23/02/23	780	-33.420637	115.652835	V	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21/03/23	AD	-
6	956000012885706	150.782	50	M	17/01/23	740	-33.420139	115.652943	-	N	23/02/23	820	-	A	-	-	-	-	-	-	-	-	-	-	21/03/23	AD	-

Clearing Area: Animal lived in this clearing area, or its associated receiving habitat.
Microchip: One individual has two microchips. After applying our microchip, we discovered it had a second microchip of unknown origin.
*953010003843013 has been captured >4 times. Records from its fifth capture onwards are recorded in the second row. It's 2023 home range centre is provided.
Collar Number/s: If multiple, presented in order they were applied. Five-digit codes are Lotek Litetrack RF-30 GPS+VHF collars. Codes with decimal points are Lotek Litetrack 30 VHF-only drop-off collars.
Sex: M = Male, F = Female.
Mass: in grams (g). Excludes the weight of any collars attached.
Maternal (Mat.) Status: V = Virginal, D = Dry Pouch, SE = Stained Empty Pouch, M = Moist Pouch, E = Enlarged Teat, PY = Pouch Young, YOB = Young on Back, YAH = Young at Heel
Collar Status: A = Applied, C = Continuing, RP = Replaced, RM = Removed, N = Not applied
Health Status: A = Alive, AD = Alive (Dropped Collar), DF = Deceased (Fox), DR = Deceased (Roadkill), DC = Deceased (Clearing), DP = Deceased (Poor Condition), DO = Deceased (Other/Unknown)
Home Range Centre: Geographic centre of 95% isopleth.
Relatives: M = Mother, C = Child, PF = Possible Father, PM = Possible Mother, PC = Possible Child. All are based off field observations only

Appendix D: Progressive Clearing During Phase 1 Bussell Highway to Yalinda Drive



Location Map

LEGEND

- BORR South development envelope
- WRP receiving habitat
- Cadastre with lot numbers

Clearing Staging

- 02/08/2022
- 03/08/2022
- 04/08/2022
- 05/08/2022
- 10/08/2022
- 11/08/2022
- 12/08/2022
- 15/08/2022
- 16/08/2022
- 17/08/2022
- 18/08/2022

N

0 300

metres

Author: R Teale | Drawn: P Sawers | Job No.: 1686
Date: 6 Sept 2022 | Revised:
Projection: MGA Z50 (GDA94) | Scale: 1:9,250 @ A3

BORR South Gelorup
Bussell Hwy to Yalinda Dve
Clearing Stages
August 2022

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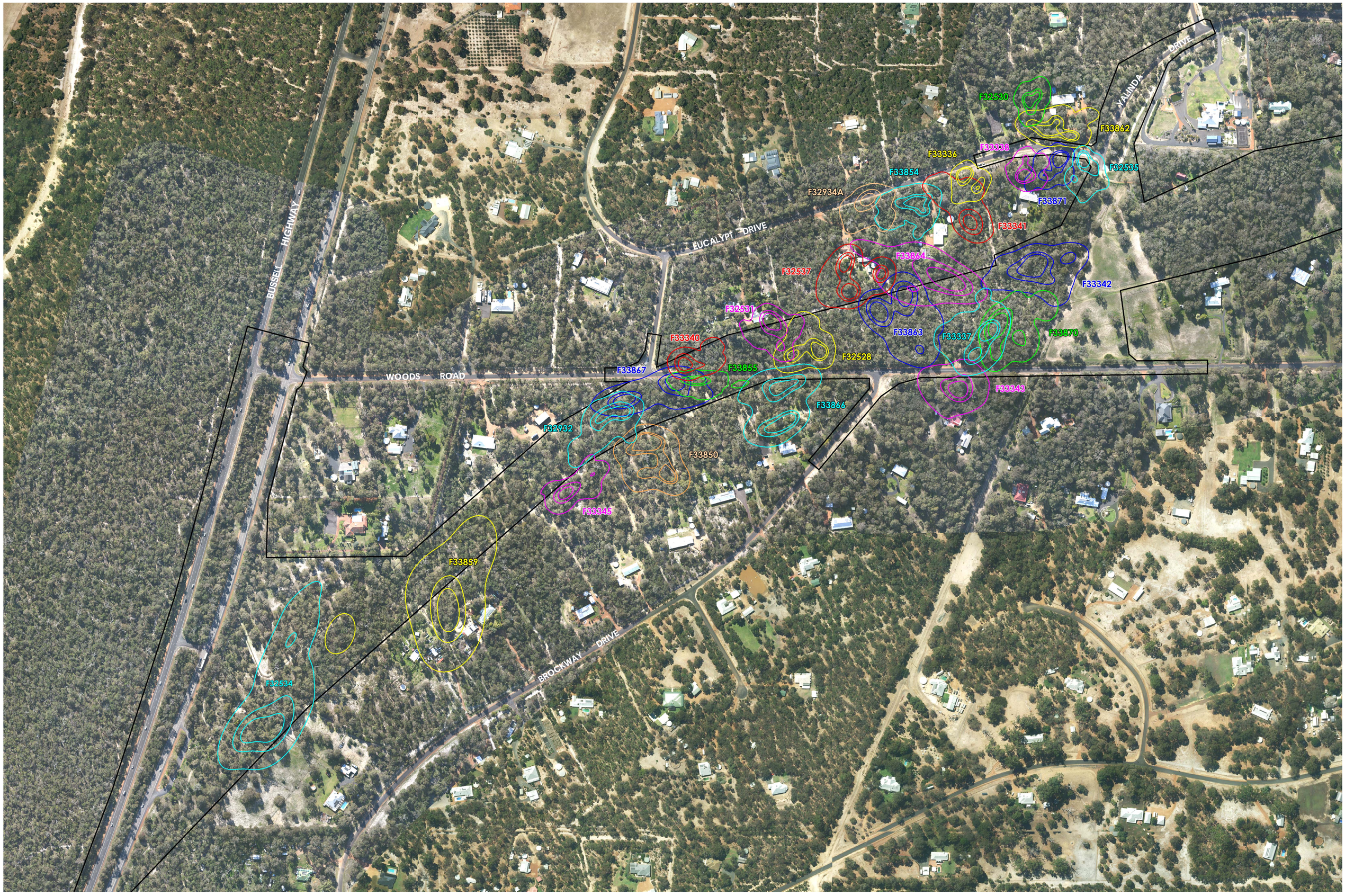
Appendix E: Preliminary Analyses of Relocation Data Pre- and Post-clearing for Phase 1 Bussell Highway to Yalinda Drive.



Bunbury Outer Ring Road

Western Ringtail Possum
Female Home Ranges - Pre Clearance

BORR South Development Envelope

0 200
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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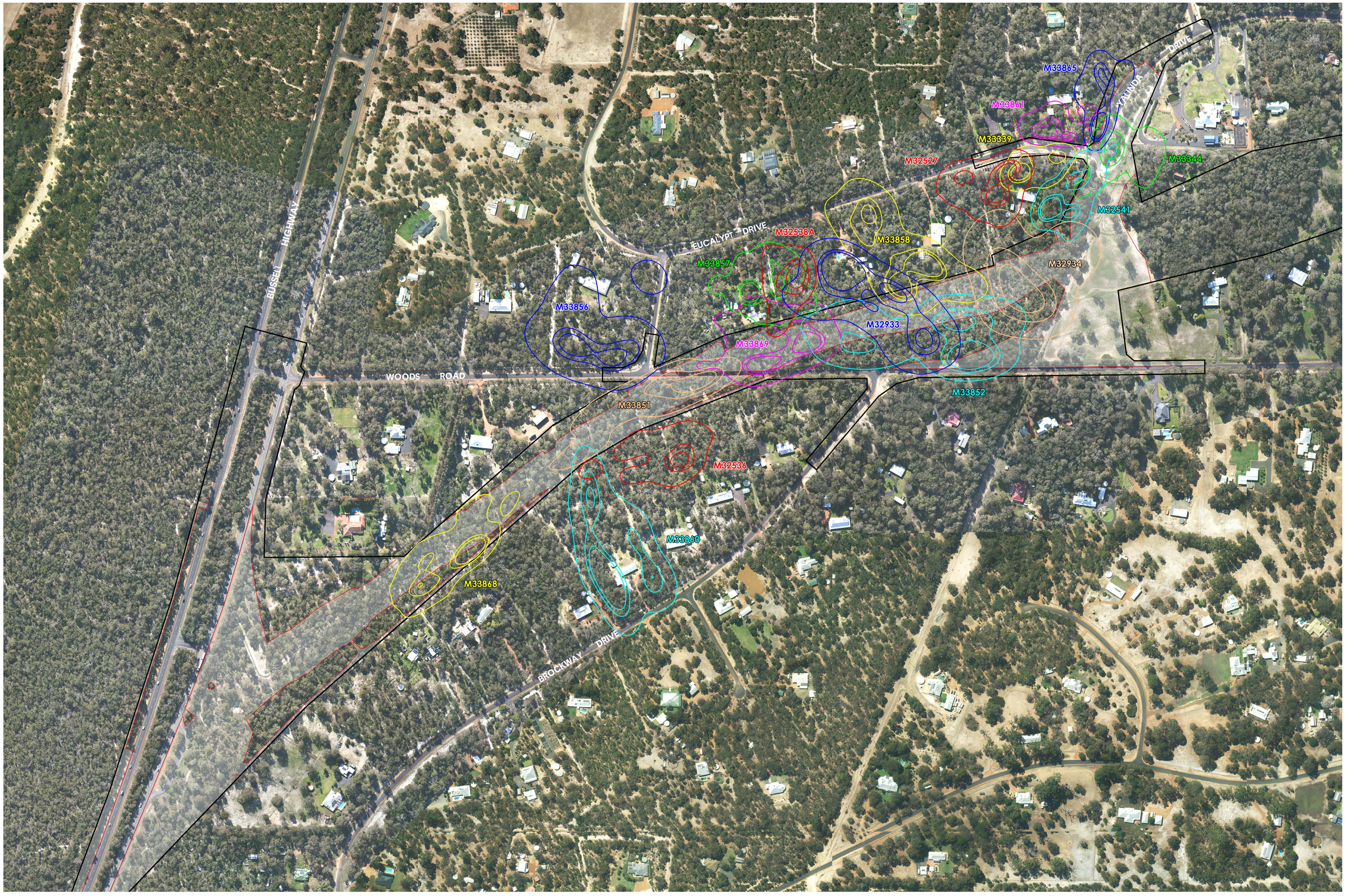

Bunbury Outer Ring Road

Western Ringtail Possum
Male Home Ranges - Pre Clearance

BORR South Development Envelope

Proposed Clearing Area

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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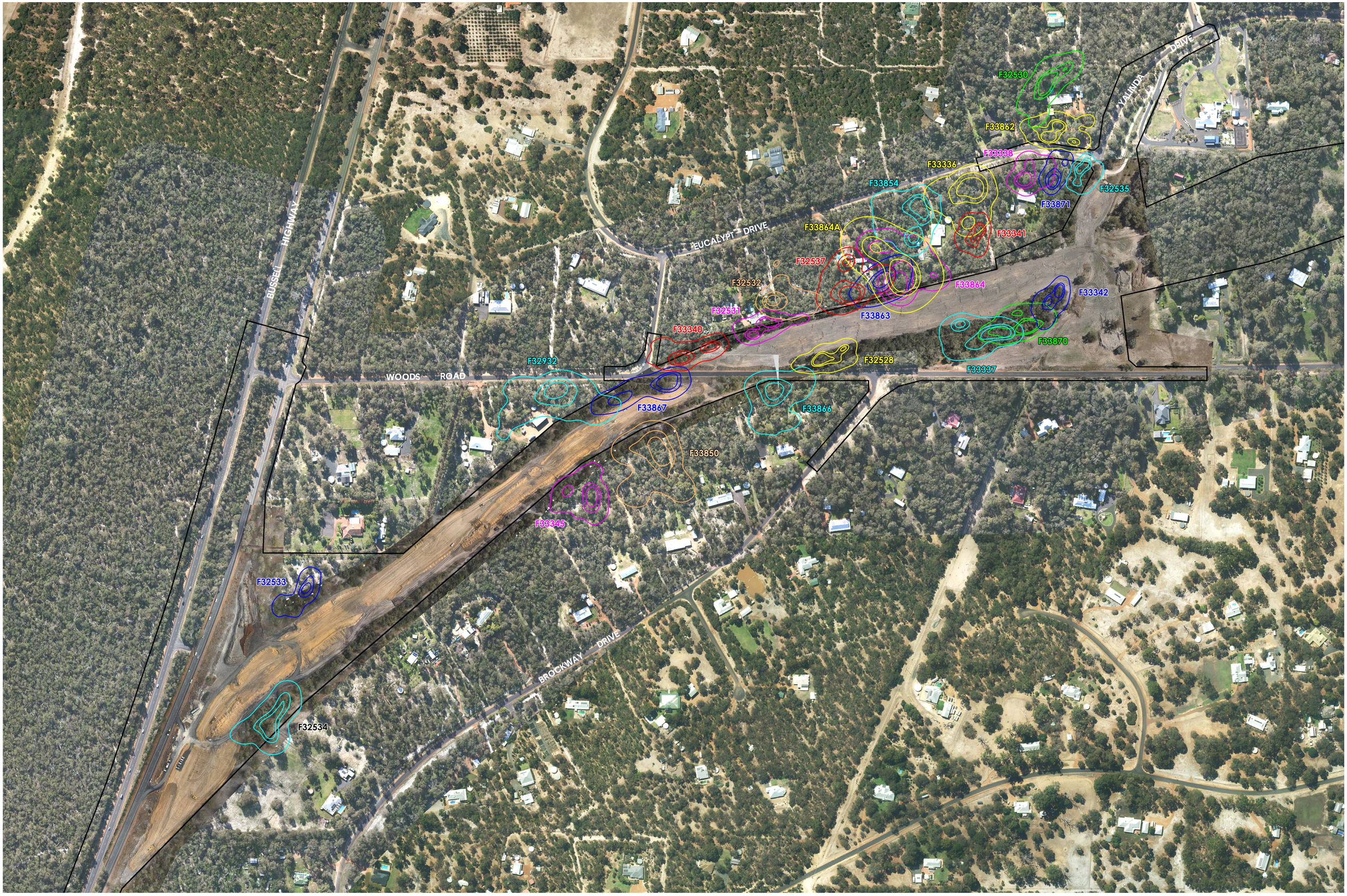

Bunbury Outer Ring Road

Western Ringtail Possum
Female Home Ranges - Post Clearance

BORR South Development Envelope

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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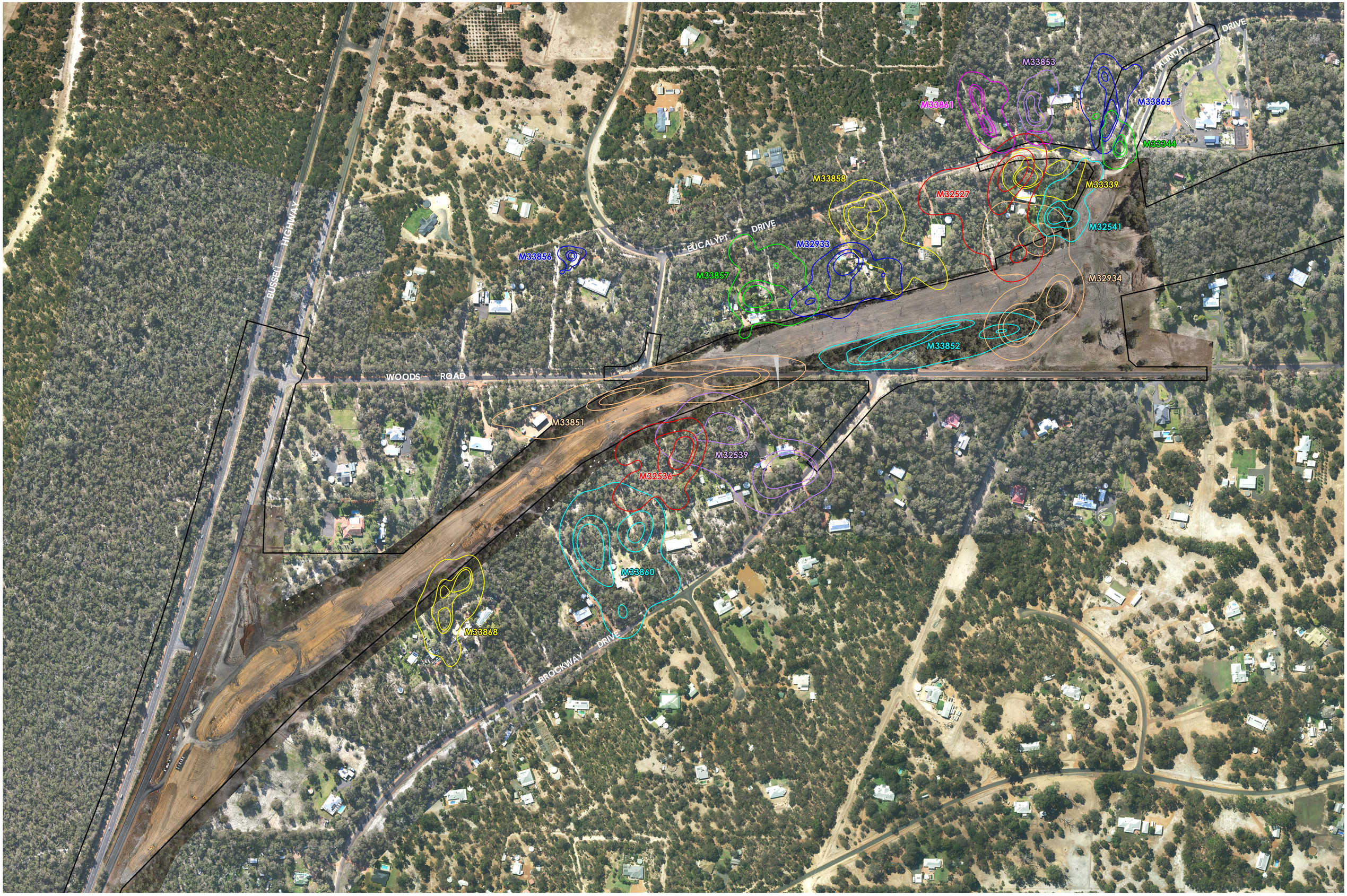

Bunbury Outer Ring Road

Western Ringtail Possum
Male Home Ranges - Post Clearance

BORR South Development Envelope

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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Appendix F: Example of imagery captured for habitat quality assessments.

ENLARGEMENT 1

ENLARGEMENT 2

Tree/Grove canopy

Multispectral July 2023

Multispectral July 2022

Tree/Grove canopy

Multispectral Feb 2023

Tree/Grove canopy

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

AOI - Imagery acquistion 19 July 2022

AOI - Imagery acquisition 28 Feb 2023

N

0 1

kilometres

Imagery source - Specterra Services Pty Ltd

BORR South Habitat Assessment Acquisition of Multispectral & RGB Imagery Generating Tree/Grove Canopy Polygons

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1765 | Date: 24 Aug 2023 | Revised: | Projection: MGA Z50 (GDA2020) | Scale: 1:25,000 @A3

Appendix G: WRP Scats DNA Extraction and Degradation Study.

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12 August 2023

Roy Teale
Zoologist / Director
Biota Environmental Sciences
4/46 Colin St
West Perth WA 6005

Via email

Summary of Western Ringtail Possum (*Pseudocheirus occidentalis*) scat DNA degradation study, assessed by genotyping.

Dear Roy,

Following is an updated summary of the scat DNA degradation study conducted for the Western Ringtail Possums (WRP - *Pseudocheirus occidentalis*).

Objective

Collections of faeces from six individuals were selected based on the number of scat samples available to cover a maximum of 28 exposure days, with eight sample collection days where possible. Three representatives of each gender (male and female) were included to determine whether previously observed differences between sexes were consistent. Faecal specimens were sampled at days 0,1, 3, 5, 7, 14 for all specimens (except RN59 where the day '14' scat could not be located) and days '21' and '28' for two specimens only.

Methodology

Faecal specimens were placed outdoors in a garden bed located in Bayswater to emulate natural conditions *in situ*. One scat (faecal) specimen belonging to each of the six individuals was kept frozen which was treated as day zero. The remaining five to seven scats were left outdoors to undergo DNA degradation conditions to emulate natural conditions and subsequently collected on the assigned exposure days (Days 1, 3, 5, 7, 14, 21 and 28). All scat specimens were frozen directly after collection to preserve the state of DNA degradation for those collection days.

The forty WRP, *Pseudocheirus occidentalis*, scat specimens (5 to 8 scats per individual) were extracted using the QIAGEN QIAamp Fast DNA Stool mini kit (Qiagen, Hilden, Germany). Scat specimens were washed in buffer as per Carpenter *et al.* (2017) with the modification that

scats were incubated in inhibitEX buffer for two hours at room temperature, specimens were eluted as per manufacturers protocols.
The twelve microsatellite loci used in the analysis of tissue specimens were amplified using the QIAGEN Multiplex PCR kit in triplicate. PCR products were analysed on an ABI3730XL Sequencer using Genescan-500 LIZ internal standard and scored using the software GeneMarker version 1.91.

Specimens

Six specimens used for the scat DNA degradation study included samples representing both sexes and a range of source habitats as well as a range of weight classes (see Table 1 for collection details for samples used in the study). The initial scat degradation stuffing included one male (RN44) and one female (RN48). These specimens underwent exposure conditions for days 0, 1, 3, 5, 7, 14, 21 and 28 during the period 12/5/2023 and 9/6/2023. Results indicated a difference between the two individuals, indicating a possible correlation between the success and the gender. This difference in DNA amplification success has been investigated further in this study, with scats from an additional four individuals, including two males (RN41and RN59) and two females (RN39 and RN49). These specimens were collected at days 0, 1, 3, 5, 7 and 14 during the period 23/6/2023 and 7/7/2023. On day '14' the scat sample for specimen RN59 was absent.

Table 1. Faecal (scat) specimen collection details for WRP scat DNA degradation study. Shaded cells represent unsuccessful samples for amplification between day 1 and 5.

ID	WRP Specimen code	Collection Date	Collection time	Habitat	Weight (g)	Age	Sex	Reproductive status
RN44	956000012883557	2022-06-14	20:59	Nuytsia	1100	Adult	Male	-
RN48	956000012885357	2022-06-13	20:57	Peppermint	760	Sub-adult	Female	Virginal
RN39	956000012887154	2022-06-07	21:38	Jarrah	1000	Adult	Female	Pouch Young
RN41	956000012887954	2022-06-08	19:23	Jarrah	760	Sub-adult	Male	-
RN49	956000012887188	2022-06-13	21:21	Banksia	1140	Adult	Female	dry
RN59	956000012884966	2022-06-21	20:54	Jarrah	1140	Adult	Male	-

Results

The scat samples from the six WRP individuals were analysed at five (RN39, RN41, RN49 and RN59) and eight (RN44 and RN48) temporal points, from day 0 to day 28. Four of the six scat specimens (RN48, RN39, RN41 and RN59) amplified a complete genotype (amplification for all 12 loci) after seven days of exposure and a partial genotype after 14 days. Scats from two individuals (RN44 and RN49) failed to produce a useable genotype at the one to five days of exposure. No correlation between the success of amplification and the sex of the possum was detected. Furthermore, there does not appear to be a correlation between the source habitats and the success of the specimens (see Table 1).

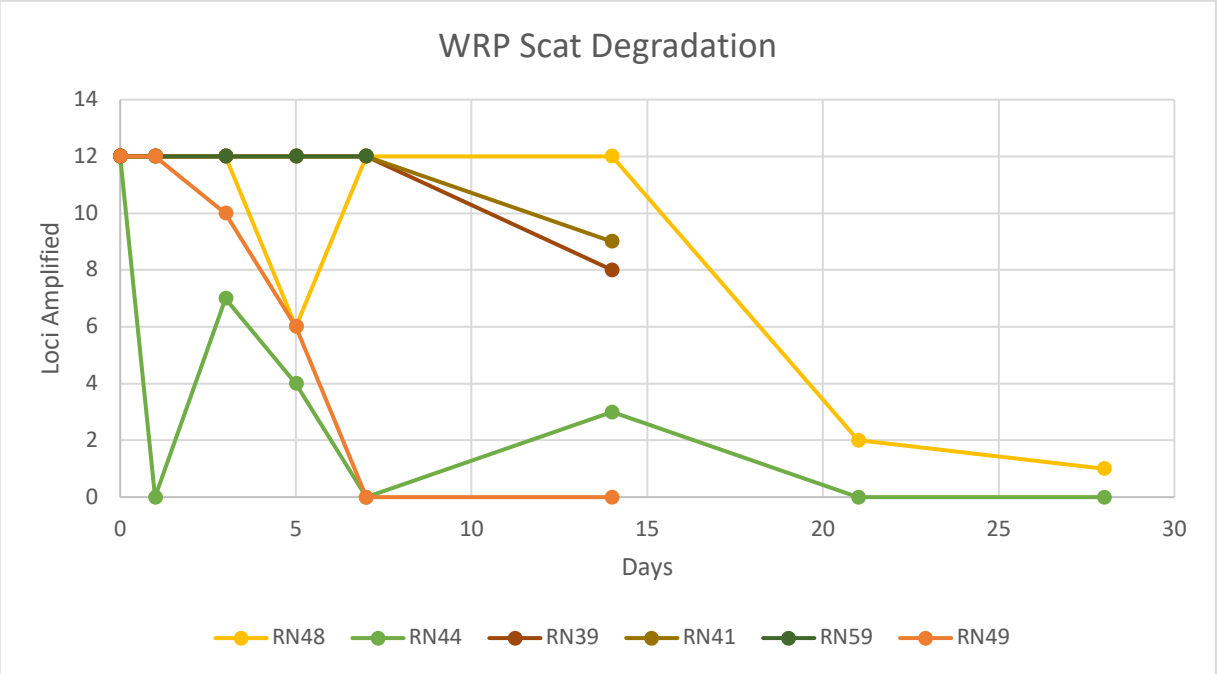

Figure 1. **DNA from scats degradation observed between the six scat samples across six to eight exposure temporal points for the maximum 12 loci.**

The physical appearance of the scats during the exposure study was documented with photographs of the scat specimens at each time point to observe physical changes to the shape, size, and colour of the scat samples (see **Error! Reference source not found.**2, Appendix 1). During the exposure period distinct colour changes were observed, however these did not appear to correlate with genotyping success. Most of the scat specimens also appeared to possess a high number of hair samples.

Summary

Results from this faecal (scat) DNA degradation study suggest that 14-day exposure is the maximum time scats can be exposed under such conditions and still produce a useable genotype for most of specimens. The results show a weak correlation between habitat (potential diet) and success rate. As home-ranges often dissects more than a single habitat type, the habitat (and therefore potential source of diet) at the collection locality would be unlikely to predict success of genotyping. The difference in genotyping success between samples at each time point does not appear to be related to the sex of the individual, nor the habitat at the collection locality. The presence of hairs observed in the scat samples may have an influence on genotyping success. In general, DNA amplification from hair specimens is stronger than from scats. However, due to the failed amplification of the scats specimens RN44 and RN49, despite the presence of hairs, further investigation would be required to determine the possible cause.

References

Carpenter FM, Dziminski MA. (2017). Breaking down scats: degradation of DNA from Greater Bilby (*Macrotis lagotis*) faecal pellets. *Australian Mammalogy*. **39**: 197-204

Thank you once again for collaborating on this project with Helix. We hope we can continue to provide you with useful information, and feel free to contact us if you have any questions or would like to discuss the results in detail.

Yours sincerely,

Yvette Hitchen
Senior Molecular Biologist

Dr Zoë Hamilton
Principal Geneticist / Zoologist

Helix Molecular Solutions Pty Ltd

Table 2. **Faecal (scat) specimens for WRP specimens RN44, RN48, RN39, RN41, RN49 and RN59 for the exposure time period.**
*** Indicates scat was placed out but lost over the 14 days of exposure**

Collection day	RN44 Male	RN48 Female	RN39 Female	RN41 sub-adult Male	RN49 Female	RN59 Male
Day 0						
Day 1						
Day 3						
Day 5						
Day 7						
Day 14						No sample*
Day 21			No sample	No sample	No sample	No sample
Day 28			No sample	No sample	No sample	No sample

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