

ANNUAL COMPLIANCE REPORT 2022

Vasse Diversion Drain

AU213009972.001
Rev 0
29 June 2023

REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Draft A	Draft for client review	MarMcC	SteRol		23/06/2023
Rev 0	Final for issue	MarMcC	SteRol	Steve Rolls	29/06/2023

Approval for issue

S. Rolls

29 June 2023

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1 INTRODUCTION

The Vasse Diversion Drain (VDD) is a 100-year-old infrastructure (drainage) corridor, originally constructed in the 1920s to create more arable land. Now, its primary function is to prevent flooding of the Busselton township and surrounds. The drain diverts flows from the catchments of the Vasse and Sabina rivers, extending approximately 6.3 kilometres (km) from Geography Bay to the Busselton golf course, flowing through agricultural, light industrial, urban land uses and sensitive ecological environments.

The drain did not meet the flood mitigation requirement determined by the Busselton Flood Management Steering Committee and state cabinet; hence Water Corporation has upgraded the VDD to improve flood protection outcomes. The VDD upgrade works included:

- Construction of an overflow structure upstream of the Vasse River Diversion Dam (VRDD), identified as the Vasse River Overflow Structure (VROS)
- Widening and full reconstruction of the VDD levee banks
- Duplication of the existing culverts, increasing flow capacity into the Lower Vasse River (per Department of Water and Environmental Regulation (DWER) specifications)
- Installation of an improved gauging station (per DWER specification and requirements).

The VDD upgrade works were referred to the then Commonwealth Department of Agriculture, Water and the Environment¹ (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in May 2017. The Water Corporation received approval of EPBC 2017/7932 in September 2020 (Appendix A).

A clearing permit application for the VDD upgrade works was prepared in September 2018. Clearing permit (CPS 8191/1) was subsequently approved by DWER in July 2020 (Appendix B). CPS 8191/1 allowed for the clearing of up to 2.16 hectares (ha) of native vegetation within the approved clearing area. Section 40 Ministerial Authorisations for the taking and/or disturbing of Threatened fauna under the state *Biodiversity Conservation Act 2016* (BC Act) were also granted.

1.1 Scope of the report

This Annual Compliance Report (ACR) has been prepared by RPS on behalf of Water Corporation (the Permit Holder) to address the annual reporting requirements under the clearing permit (CPS 8191/1) and EPBC Act (EPBC 2017/7932) approvals.

The civil construction works for the VDD upgrade commenced in November 2020 and were completed by the end of June 2021. No native vegetation clearing occurred in 2022 under the approved clearing permit (CPS 8191/1).

This annual compliance report addresses the required reporting period for the approved clearing permit (CPS 8191/1) from 1 January to 31 December 2022. In March 2022, Water Corporation requested approval from the DAWE to align the EPBC 2017/7932 compliance reporting dates with those of the approved clearing permit. Permission was granted to align EPBC 2017/7932 compliance reporting with the approved clearing permit on 8 April 2022 (Appendix C). Therefore, this annual compliance report addresses the EPBC Act (EPBC 2017/7932) approval compliance reporting requirements from 1 January to 31 December 2022.

Condition 19 (a) of the approved clearing permit (CPS 8191/1) states:

- a. The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:
 - i. Of records required under condition 18 of this Permit; and
 - j. Concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the proceeding calendar year.

¹ Known as the Department of Climate Change, Energy, and the Environmental and Water (DCCEEW) from 1 July 2022.

Condition 16 of the EPBC Act (EPBC 2017/7932) approval states:

16. The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must:
 - a. publish each compliance report on the website within 60 business days following the relevant 12 month period;
 - b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication;
 - c. keep all compliance reports publicly available on the website until this approval expires;
 - d. exclude or redact sensitive ecological data from compliance reports published on the website; and
 - e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication.

1.2 Methodology

In preparing this ACR, RPS:

- Reviewed the approved clearing permit (CPS 8191/1) and the EPBC Act (EPBC 2017/7932) approval to confirm the scope of the report
- Reviewed the record-keeping and reporting requirements for the approved clearing permit (CPS 8191/1) and the conditions of approval for the EPBC Act (EPBC 2017/7932) approval to assess environmental performance
- Verified the environmental performance using the available evidence
- Assigned a compliance rating for each record-keeping and reporting requirement of approved clearing permit (CPS 8191/1); and the conditions of approval for the EPBC Act (EPBC 2017/7932) approval.

A site inspection was beyond the scope of the brief.

1.3 Structure of report

This ACR has been structured in the following order to specifically address the reporting requirements of the approved clearing permit (CPS 8191/1) and the conditions of approval for EPBC Act (EPBC 2017/7932):

- CPS 8191/1: Condition 18: Record Keeping
 - Condition 18a (i), (ii), (iii), (iv), (v) and (vi) is presented in Table 1
 - Condition 18a (v) specific to flora management under conditions 9 and 10 is detailed in Table 2
 - Condition 18a (vi) specific to fauna management – Carter's freshwater mussel under conditions 11 and 12 is detailed in Table 3
 - Condition 18a (vi) specific to fauna management – Western Ringtail Possum under conditions 13, 14 and 15 is detailed in Table 4
 - Conditions 18b is presented in Table 5
- EPBC 2017/7932: Condition 16: Annual Compliance Reporting
 - Part A: Conditions specific to the action (Conditions 1 – 10) are presented in Table 6
 - Part B: Standard administrative conditions (Conditions 11 – 22) are presented in Table 7.

1.4 Compliance assessment framework

The environmental performance against the reporting requirements of the approved clearing permit (CPS 8191/1) and the conditions of approval for the EPBC Act (EPBC 2017/7932) approval has been assessed using the available evidence to determine a compliance rating.

1.4.1 Compliance information sources

This ACR has been underpinned by various information sources (available evidence) prepared to support the planning and implementation of the VDD upgrade works, including:

- Subject matter specific information sources
- Regulator liaison.

1.4.1.1 Subject matter specific information

Subject matter specific information has been generated for the VDD upgrade works to specifically address fauna management (Western Ringtail Possum) and revegetation and rehabilitation requirements identified in the approved clearing permit (CPS 8191/1) and EPBC Act (EPBC 2017/7932) approval. These subject matter specific information sources have been collated in respect to the particular matters as follows:

- Western Ringtail Possum information is provided in Appendix D
- Revegetation and rehabilitation information is provided in Appendix E.

1.4.1.2 Regulator liaison

Liaison by Water Corporation with DWER and DAWE regarding the reporting information or results required to be provided to the regulators under the clearing permit (CPS 8191/1) and EPBC Act (EPBC 2017/7932) approvals include:

- Email: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report (29 June 2022)
- Email: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report - published on website (30 June 2022).

A copy of this correspondence is provided in Appendix F.

1.4.2 Compliance rating determination

Compliance ratings have been allocated to each condition according to the following set of measures:

- Achieved: Available evidence identifies the condition has been met
- Partially achieved: Available evidence demonstrates the condition has been partially met
- Not achieved: Available evidence shows that the condition has not been met
- Not applicable: Available evidence shows the condition is no longer applicable
- Implementation ongoing: Available evidence shows that the implementation of the condition remains ongoing.

2 CLEARING PERMIT: CPS 8191/1

2.1 Condition 18a: Recording-keeping

Table 1: Environmental performance against record-keeping and reporting requirements for CPS 8191/1 condition 18a

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1: 18 (a) (i)	The boundaries of clearing undertaken on each date, recorded using a Global Positioning System GPS unit set to GDA94, expressing the geographical coordinates in eastings and northings or decimal degrees	Previous Annual Compliance Report (RPS 2021)	No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022)	Not applicable
8191/1: 18 (a) (ii)	The size of the area cleared (in hectares)	Previous Annual Compliance Report (RPS 2021)	Clearing works were completed between October and November 2020 and reported on as part of a previous Annual Compliance Report 2020 (RPS 2021)	Not applicable
8191/1: 18 (a) (iii)	Actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 7 of this Permit			
8191/1: 18 (a) (iv)	Actions taken to minimise the risk of the introduction and spread of weeds and dieback in accordance with condition 8 of this Permit	Previous Annual Compliance Report (RPS 2021)	Clearing for maintenance purposes in the VDD base occurred during the current reporting period. However, the clearing works were conducted under a valid clearing exception², and not under the CPS 8191/1.	Not applicable
8191/1: 18 (a) (v)	Details required in accordance with flora management conditions 9 and 10 of this Permit	Refer to Table 2		Condition 9 – Not applicable Condition 10 – Not applicable
8191/1: 18 (a) (vi)	Details required in accordance with fauna management conditions 11, 12, 13, 14 and 15 of this Permit	- Refer to Table 3 for conditions 11 and 12 - Refer to Refer to Table 4 for conditions 13, 14 and 15		Condition 11 (a) – Not applicable Condition 11 (b) – Not applicable Condition 12 – Not applicable Condition 13 – Not applicable Condition 14 – Implementation ongoing Condition 15 – Implementation ongoing

2.2 Condition 18a (v): Flora management – conditions 9 and 10

Table 2: Environmental performance against record-keeping and reporting requirements for CPS 8191/1 condition 18a (v): conditions 9 and 10

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1: 9 (a)	Prior to undertaking any clearing, the Permit Holder must engage a botanist to conduct a targeted flora survey within suitable habitat(a) within the areas cross-hatched yellow on attached Plan 8191/1a for the presence of <i>Caladenia procera</i>	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 9 (b)	The Permit Holder shall ensure no clearing of any <i>Caladenia procera</i> individuals identified through the surveys required by condition 9(a)	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 9 (c)	The Permit Holder shall ensure that no clearing occurs within ten metres of <i>Caladenia procera</i> individuals identified through the surveys required by condition 9(a), unless the clearing is done in accordance with condition 9(d) of this Permit	Previous Annual Compliance report (RPS 2021))		Not applicable

² Item 15 of Regulation 5 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1: 9 (d)	Where clearing within ten metres of individuals of <i>Caladenia procera</i> is unavoidable, the Permit Holder must: (i) Install clearly demarked temporary fencing around the individuals of <i>Caladenia procera</i> prior to undertaking any clearing and maintain the fencing until the project activities have ceased (ii) Adhere to the Flora Management Plan required under condition 10 which has been approved by the CEO	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	
8191/1: 9 (e)	Within two months of undertaking any clearing authorised under this Permit within the areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide the results of the targeted flora survey, as required by condition 9(a), in a report to the CEO	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 9 (f)	If <i>Caladenia procera</i> are identified within ten metres of the areas cross-hatched yellow on Plan 8191/1a, the targeted flora survey report must include the following: (i) The location of each <i>Caladenia procera</i> identified under condition 9(a), either as the location of individual plants, or where this is not practical, the areal extent of the population and an estimate of the number of plants, recorded using a global positioning system (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in eastings and northings or decimal degrees (ii) Map/s showing the location of any identified population of <i>Caladenia procera</i> cleared and the remaining population (iii) The methodology used to survey the Permit area	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 10	Where clearing within ten metres of individuals of <i>Caladenia procera</i> is unavoidable, the Permit Holder must submit a Flora Management Plan to the CEO for approval, prior to clearing commencing. The management plan must contain the following: (i) Details of the Permit Holder's attempts to avoid and minimise impacts to <i>Caladenia procera</i> (ii) Proposed methods of minimising and mitigating any indirect impacts to <i>Caladenia procera</i>	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable

2.3 Condition 18a (vi): Fauna management conditions 11, 12, 13, 14 and 15

2.3.1 Conditions 11 – other approvals and 12 – Carter's freshwater mussel

Table 3: Environmental performance against record-keeping and reporting requirements for CPS 8191/1 condition 18a (vi): conditions 11 and 12

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1: 11 (a)	Prior to clearing, the Permit Holder must provide to the CEO a copy of the fauna licence(s) obtained under the <i>Biodiversity Conservation Act 2016</i> for the relocation and/or translocation of Carter's freshwater mussel (<i>Westralunio carteri</i>) and the dispersion of western ringtail possum (<i>Pseudocheirus occidentalis</i>) individuals	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 11 (b)	Prior to clearing, the Permit Holder must provide to the CEO a copy of the approved exemption from the Department of Primary Industries and Regional Development under the <i>Fish Resources Management Act 1994</i> and Fish Resources Management Regulations 1995 for the collection of Carter's freshwater mussel for translocation.	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 12 (a)	Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must submit a Carter's freshwater mussel (<i>Westralunio carteri</i>) Management Plan to the CEO for approval. The management plan must contain the following: (i) Removal, transportation and relocation method, and where required, temporary storage method (ii) Location of the relocation site, including a field assessment confirming the suitability of the relocation site (iii) Stocking densities (iv) The success rate monitoring plan	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable

2.3.2 Condition 13, 14 and 15 – western ringtail possum

Table 4: Environmental performance against record-keeping and reporting requirements for CPS 8191/1 condition 18a (vi): conditions 13, 14 and 15

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1: 13 (a)	In relation to the area cross-hatched yellow on attached Plans 8191/1a and 8191/1b, the Permit Holder must engage a fauna specialist to inspect that area, including all trees and tree hollows present, within 24 hours prior to, and for the duration of clearing, for the presence of western ringtail possum(s) (<i>Pseudocheirus occidentalis</i>)	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 13 (b)	Clearing must cease in any area where fauna referred to in condition 13(a) above are identified until the western ringtail possum(s) has moved out of the development area to adjoining suitable habitat(b)			
8191/1: 13 (c)	Where fauna is identified under condition 13(a) of this Permit, the Permit Holder must provide the following records to the CEO as soon as practicable: (i) The number of individuals identified (ii) The date each individual was identified (iii) The location where each individual was identified recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in eastings and northings or decimal degrees (iv) The number of individuals displaced (v) the relevant qualifications of the fauna specialist undertaking the displacement (vi) The date each individual was displaced (vii) The method of dispersal (viii) The date each individual was dispersed (ix) The location where each individual dispersed to, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in eastings and northings or decimal degrees (x) Details pertaining to the circumstances of any death of, or injury sustained by, an individual	Previous Annual Compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
8191/1: 14	Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must at a minimum install six rope bridges within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements: (i) The end of each rope bridge must be connected to at least two mature trees, or two different locations in the canopy of a single mature tree, at a height of at least three metres above ground level (ii) The rope bridges must be placed in areas that provide canopy connectivity for western ringtail possum movement across the local area, i.e. across roadways and other gaps in the canopy (iii) Be monitored annually and maintained for a period of at least ten years (iv) Within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a and 8191/1b, the Permit Holder must provide to the CEO, the locations where each rope bridge was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in eastings and northings or decimal degrees	- Subject matter specific information - Revegetation and rehabilitation information (Appendix E) - Vasse Diversion Drain Upgrade Revegetation – Water Corporation Post Activity Reports #17 - Western Ringtail Possum information (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021) - Tranen reported that possum infrastructure maintenance was undertaken on 9 December 2022. This involved adjustments to the rope bridges by tightening them up to their original lengths, as the natural fibres stretch over time (M. Bamford, personal communication, 20 June 2023). - Bamford Consulting Ecologists have been commissioned to conduct ongoing monitoring of the rope bridges for ten years: (Bamford Consulting Ecologists 2022 and 2023): - Bamford Consulting Ecologists undertook possum monitoring for Year One in January 2022 and for Year Two in December 2022. - Motion sensitive cameras were positioned to monitor rope bridge usage. One night-time camera session was held in January 2022 (Year One) and one night-time camera sessions were held in December 2022 (Year Two). In addition, observations and opportunistic searches for scat underneath the rope bridges were undertaken during other monitoring events to search for evidence of use - Many western ringtail possums and some brushtail possums were recorded using the rope bridges in January and December 2022, indicating the design is successful and are suitable to keep possums off the ground and improve connectivity	Implementation ongoing
8191/1: 15	Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must, at a minimum, install 12 nest boxes within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements:	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Implementation ongoing

Condition no.	Condition	Evidence	Discussion	Compliance rating
	(i) Be designed and placed in accordance with the specifications detailed in the Project Revegetation Plan required by condition 17(a) (ii) Be placed at least three metres above ground level in a mature tree facing the shadiest side of the tree (iii) Be monitored annually and maintained for a period of at least ten years (iv) Within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide to the CEO, the locations where each nest box was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees	One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) ○ Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	• Bamford Consulting Ecologists have been commissioned to conduct ongoing monitoring of the installed shelters for ten years (Bamford Consulting Ecologists 2022 and 2023): – There were 80 artificial shelters checked by Bamford Consulting Ecologists on one occasion in January 2022 for Year One, and 78 artificial shelters were checked on one occasion in December 2022 for Year Two. This included 16 relocated natural dreys in Year One and Year Two. The number of viable relocated natural dreys has reduced from the original 24 relocated natural dreys installed prior to January 2021 to 16 relocated natural dreys. This is because many of them had fallen down or become unusable. One relocated natural drey was replaced in December 2022 with a dome with coconut fibre shelter (ID S22a). – There was a small number of new natural dreys observed in the study area in January 2022 and 33 new natural dreys were observed in the study area in December 2022, which have been added to future monitoring events. – Bamford Consulting Ecologists (2023) found that the population has remaining stable following the initial disturbance. – The relocated natural dreys were considered important initially, however became disused as possums built new natural dreys or adopted artificial dreys. None of the relocated natural dreys were in use during the 2022 monitoring periods of Year One and Year Two. – The artificial shelters were used consistently during Year One and Year Two. In January 2022, 18% of possums located were using artificial shelters, and in December 2022, 27% of possums located were using artificial shelters. The availability of additional shelter is likely to have supported the population of possums following displacement and may have contributed to the sustained increase in numbers of possums at the ends of the breeding seasons by providing additional shelter for newly independent juveniles.	

2.4 Condition 18b: Record-keeping

Table 5: Environmental performance against record-keeping and reporting requirements for CPS 8191/1 condition 18b

Condition no.	Condition	Evidence	Discussion	Compliance rating
8191/1 18 (b) “The Permit Holder must maintain the following records in relation to revegetation activities undertaken pursuant to conditions 16 and 17 of this Permit:”				
8191/1: 18 (b) (i)	The date(s) each area was revegetated	• Subject matter specific information – Revegetation and rehabilitation information (Appendix E) ○ Vasse Diversion Drain Upgrade Revegetation – Water Corporation Post Activity Report #15	• Revegetation works were undertaken by Tranen on the following dates: – 7 June – 13 July 2022: Installed seedlings in the Quindalup Dune (infill), Queen Elizabeth Avenue (QE Ave) Swale, Central Priority Ecological Community (PEC) (infill) and Eastern PEC zones. Planting included augering / ripping and fertiliser table supply and installation of 6,000 tree guards in selected areas.	Implementation ongoing
8191/1: 18 (b) (ii)	The location of each area revegetated recorded using a GPS unit set to GDA94, expressing the geographical coordinates in eastings and northings or decimal degrees	• Subject matter specific information – Revegetation and rehabilitation information (Appendix E) ○ Revegetation Plan (Tranen 2020) ○ Vasse Diversion Drain Upgrade Revegetation – Water Corporation Post Activity Report #15	Areas within the Quindalup Dune, QE Ave Swale, Central PEC and Eastern PEC zones were revegetated between 5 June to 13 July 2022. The revegetation zones are illustrated in Appendix 2 of the Revegetation Plan (Tranen 2020). Shapefiles for these revegetation zones can be provided to DWER in GDA94 format (if required).	Implementation ongoing
8191/1: 18 (b) (iii)	At least two photographs of each area revegetated taken on an annual basis at the same location each year	• Subject matter specific information – Revegetation and rehabilitation information (Appendix E) ○ Vasse Diversion Drain Upgrade Revegetation – Water Corporation Post Activity Reports #16 ○ Vasse Diversion Drain Upgrade Revegetation Spring 2022 Vegetation Monitoring Report (Tranen 2023)	Photo monitoring was undertaken by Tranen on 1 – 4 November 2022 at 34 quadrats across the revegetation zones, as shown in Appendix 6 of the Spring 2022 Vegetation Monitoring Report (Tranen 2023). At least two photo monitoring quadrats for each zone revegetated have been established. A photo was captured for each quadrat as follows: • Zone 1 – Quindalup Dune (Q1–Q4) • Zone 2 – VDD Embankments (Q5–Q8) • Zone 3 – Queen Elizabeth Avenue Swale (Q9–Q11) • Zone 4 – Upland PEC: – Zone 4.2 – Western PEC (Q12, Q14) – Zone 4.3 – Central PEC (Q18–Q20) – Zone 4.4 – Eastern PEC (Q21–Q31) • Zone 5 – Drainage PEC – Zone 5.1 – Western Basin PEC (Q32)	Implementation ongoing
8191/1: 18 (b) (iv)	A description of the revegetation activities undertaken each year for each area revegetated	• Subject matter specific information – Revegetation and rehabilitation information (Appendix E)	Post activity reports have been prepared by Tranen identifying the rehabilitation actions undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022). Activities undertaken for the whole project and at specific revegetation zones are summarised in the table below.	Implementation ongoing

Condition no.	Condition	Evidence	Discussion	Compliance rating												
		○ Vasse Diversion Drain Upgrade Revegetation – Water Corporation Post Activity Reports #12 to #17	<table><tr><th>Location</th><th>Rehabilitation activities in 2022</th></tr><tr><td>Whole of project</td><td> • Weed control along a number of revegetation areas • Seedling delivery • Field monitoring • Tree guard installation in selected areas • Analysis of monitoring data and preparation of 2021 and 2022 reports • Plant orders for 2023 • Revegetation sign installation </td></tr><tr><td>Zone 1 – Quindalup Dune</td><td> • Weed control • Watering mature trees and seedlings • Planting seedlings </td></tr><tr><td>Zone 2 – VDD Embankments</td><td> • Slashing VDD levees </td></tr><tr><td>Zone 3 – QE Ave Swale</td><td> • Coir mesh installation • Weed control • Planting seedlings </td></tr><tr><td>Zone 4 – Upland PEC</td><td> • Mulch procurement and site preparation • Mulch spreading • Weed control • Watering mature trees and seedlings • Tree guard maintenance and removal • Planting seedlings • Fencing installation </td></tr></table>	Location	Rehabilitation activities in 2022	Whole of project	• Weed control along a number of revegetation areas • Seedling delivery • Field monitoring • Tree guard installation in selected areas • Analysis of monitoring data and preparation of 2021 and 2022 reports • Plant orders for 2023 • Revegetation sign installation	Zone 1 – Quindalup Dune	• Weed control • Watering mature trees and seedlings • Planting seedlings	Zone 2 – VDD Embankments	• Slashing VDD levees	Zone 3 – QE Ave Swale	• Coir mesh installation • Weed control • Planting seedlings	Zone 4 – Upland PEC	• Mulch procurement and site preparation • Mulch spreading • Weed control • Watering mature trees and seedlings • Tree guard maintenance and removal • Planting seedlings • Fencing installation	
			Location	Rehabilitation activities in 2022												
			Whole of project	• Weed control along a number of revegetation areas • Seedling delivery • Field monitoring • Tree guard installation in selected areas • Analysis of monitoring data and preparation of 2021 and 2022 reports • Plant orders for 2023 • Revegetation sign installation												
			Zone 1 – Quindalup Dune	• Weed control • Watering mature trees and seedlings • Planting seedlings												
			Zone 2 – VDD Embankments	• Slashing VDD levees												
Zone 3 – QE Ave Swale	• Coir mesh installation • Weed control • Planting seedlings															
Zone 4 – Upland PEC	• Mulch procurement and site preparation • Mulch spreading • Weed control • Watering mature trees and seedlings • Tree guard maintenance and removal • Planting seedlings • Fencing installation															
8191/1: 18 (b) (v)	A description of the tree density and native understorey vegetation cover for each area revegetated recorded on an annual basis	• Subject matter specific information – Revegetation and rehabilitation information (Appendix E) ○ Revegetation Plan (Tranen 2020) ○ Vasse Diversion Drain Upgrade Revegetation Spring 2022 Vegetation Monitoring Report (Tranen 2023)	Condition 17 of the clearing permit approval (CPS 8191/1) requires that Water Corporation achieve established completion criteria for revegetation and rehabilitation within the ten year monitoring period. These completion criteria were incorporated into the Revegetation Plan (Tranen 2020), assessed in spring 2020 (baseline), in spring 2021 (Year One) when the ten year monitoring program commenced and in autumn and spring 2022 (Year Two) (Tranen 2023). Tranen (2023) visited 34 quadrats across all key revegetation zones on 1 – 4 November 2022. A summary of the results against each completion criterion is provided below: • Native vegetation cover – The average native vegetation cover across all quadrats was 27% in spring, which was up from 15% cover in autumn. For the quadrats where revegetation works have commenced (Q1–Q12, Q14, Q18–Q32), showed an increase in cover, with the Quindalup Dune and VDD Embankment zones recording the most significant increases since autumn 2022 (30% and 26% respectively). The primary indicator of cover increase is the rate of increase, which has been close to doubling each successive monitoring event since spring 2021. At this rate of growth, the criterion is projected to be met within the next year. However, the rate of increase will also moderate and the rate will likely reduce in subsequent years as it approaches full cover. – The results did not include existing mature canopy cover, as this can provide a skewed representation of rehabilitation success in the early stages of establishment. • Weeds – Average weed cover across all quadrats was 10%, which is the same as was recorded in autumn 2022. Weed cover remaining effectively unchanged from autumn to spring is a very positive outcome and a result of on-going concerted weed control efforts. – Both declared weeds, arum lily (<i>Zantedeschia aethiopica</i>) and bridal creeper (<i>Asparagus asparagoides</i>), were recorded in spring 2022. Overall abundance of <i>Zantedeschia aethiopica</i> is reasonably low, although with a concentrated distribution located within the Possum Corridor and some limited distribution in the Eastern PEC. Overall abundance of <i>Asparagus asparagoides</i> is limited to some scattered individuals in the Western PEC and Possum Corridor zones. • Bare ground cover – Bare ground cover varies significantly across the quadrats, with an overall average cover of 17%, which is down from 21% recorded in autumn 2022. The decrease in bare ground is primarily a result of the increase in native vegetation cover and natural litter accumulation across the site more generally • Species richness – Overall species richness increased from 48 species in autumn to 61 species in spring 2022. Quindalup Dune recorded no change in species richness, while both Geographe Coastal Wetland System and PEC vegetation communities increased significantly (from 0 to 16 species and 38 to 50 species respectively).	Implementation ongoing												

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Condition no.	Condition	Evidence	Discussion	Compliance rating
			- Vegetation condition - Overall 98% of the total area was assessed as being in good condition or above, up from 67% in autumn 2022 - Only some areas of site were reclassified due to improvement in overall vegetation condition (Queen Elizabeth Avenue Swale and Eastern PEC), primarily due to new areas of direct planting works being undertaken The completion criterion for <i>Conospermum caeruleum</i> var. <i>Busselton</i> was not assessed in autumn and spring 2022, as the species was in production at nurseries and was not ready to be planted in 2022 (Tranen 2023). Once the species is planted, this criterion will be assessed in future monitoring reports	

3 EPBC ACT 2017/7932

3.1 Condition 16: Annual compliance reporting

3.1.1 EPBC 2017/7932: Part A – conditions specific to the action

Table 6: Summary of environmental performance of Vasse Diversion Drain upgrade works with EPBC 2017/7932: Part A – Conditions specific to the action

Condition no.	Condition	Evidence	Discussion	Compliance rating
1.	To minimise impacts to EPBC Act listed species, the approval holder must:			
a.	Clear no more than 2.16 hectares (ha) of western ringtail possum habitat within the project area (hatched yellow in Attachment A and Attachment B)	Previous annual compliance report (RPS 2021)	- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - Clearing works were completed between October and November 2020 and reported on as part of a previous annual compliance report (RPS 2021)	Not applicable
b.	Comply with and implement the conditions of the clearing permit CPS 8191/1 or as varied from time to time	This annual compliance report	Refer to Table 1, Table 2, Table 3, Table 4 and Table 5	Implementation ongoing
c.	Notify the Department in writing of any variations of the conditions of clearing permit CPS 8191/1 within ten business days of such a change being approved by the state government	No variation to the conditions of clearing permit (CPS 8191/1) occurred		Not applicable
2.	To avoid and mitigate impacts to the Western Ringtail Possum, the approval holder must:			
a.	Implement condition 14 of the clearing permit CPS 8191/1 by installing a minimum of six rope bridges. The installation of the rope bridges must be in accordance with advice from a suitably qualified ecologist	- Subject matter specific information - Western Ringtail Possum information (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	Refer to Table 4, 8191/1: 14	Implementation ongoing
b.	Implement condition 15 of the clearing permit CPS 8191/1 by installing a minimum of 12 nest boxes suitable for western ringtail possum. If the action results in the removal of more than six dreys, the approval holder must install two nest boxes for each additional drey being removed. Installation of the nest boxes must be in accordance with advice from a suitably qualified ecologist	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- Refer to Table 4, 8191/1: 15 - There were 88 artificial shelters installed prior to January 2021, which exceeded the 2:1 ratio requirement for the removal of 41 natural dreys. - During the 2022 monitoring periods of Year One and Year Two, Bamford Consulting Ecologists checked 80 and 78 artificial shelters, inclusive of 16 relocated natural dreys (Bamford Consulting Ecologists 2022 and 2023). The number of viable relocated natural dreys has reduced from the original 24 relocated natural dreys installed prior to January 2021 to 16 relocated natural dreys. This is because many of them had fallen down or become unusable. One relocated natural drey was replaced in December 2022 with a dome with coconut fibre (ID S22a). - The number of remaining installed artificial shelters recorded in December 2022 was less than the 2:1 ratio requirement of artificial shelters installed to natural dreys removed (i.e. at least 82 artificial shelters are required). Only 78 of the 88 originally installed artificial shelters were present. The 10 artificial shelters that were no longer present included: 8 relocated natural dreys which had fallen down, become unusable or could not be located. One of these was replaced in December 2022 with a dome with coconut fibre (ID S22a). 2 domes with coconut fibre, one of which had collapsed and the other had been damaged due to drain maintenance. 1 installed hollow - The implementation of the Condition 2. b. is ongoing as the installed artificial shelters will be monitored and maintained for at least ten years. Steps undertaken to replace the unusable or lost artificial shelters to meet the 2:1 ratio requirement will be addressed in the 2023 compliance report.	Implementation ongoing

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Condition no.	Condition	Evidence	Discussion	Compliance rating
c.	Reposition rope bridges and nest boxes in accordance with advice from a suitably qualified ecologist if they are not being utilised by western ringtail possum within six months of installation	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- Bamford Consulting Ecologists conducted a survey in January 2021 to make a preliminary assessment of the shelters and the possum population following displacement. They also checked the shelters on one occasion in January 2022 for Year One, and on one occasion in December 2022 for Year Two out of a ten year monitoring program. - No recommendations were made to reposition the rope bridges in either report (Bamford Consulting Ecologists 2022 and 2023) - No recommendations were made to reposition the shelters (Bamford Consulting Ecologists 2022 and 2023)	Not applicable
3.	The approval holder must maintain the following records and provide them to the Department within two months of the installation or repositioning of rope bridges and nesting boxes:			
a.	The date(s) and the location where the rope bridges and nest boxes for western ringtail possum (conditioned under 2 and the clearing permit CPS 8191/1) were installed or repositioned	Previous annual compliance report (RPS 2021)	- Refer to Table 6, 2.b and c - Location, date installed, and photographs of rope bridges confirmed part of a previous annual compliance report (RPS 2021)	Achieved
b.	An in-situ photograph of each rope bridge and nest box installed or repositioned	- Previous annual compliance report (RPS 2021) - Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- Refer to Table 6, 3.a - No repositioning of ropes bridges or nest boxes was undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022)	Achieved
c.	Evidence that a suitably qualified ecologist has approved the design and placement of each rope bridge and nest box	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- There were 88 artificial shelters installed prior to January 2021, inclusive of 24 relocated natural dreys, which have been monitored by Bamford Consulting Ecologists (2023). - Bamford Consulting Ecologists conducted a survey in January 2021 to make a preliminary assessment of the shelters and the possum population following displacement. They also checked the shelters on one occasion in January 2022 for Year One, and on one occasions in December 2022 for Year Two out of a ten year monitoring program. - No recommendations were made to reposition the rope bridges in either report (Bamford Consulting Ecologists 2022 and 2023) - No recommendations were made to reposition the shelters (Bamford Consulting Ecologists 2022 and 2023)	Implementation ongoing
d.	Provide the Department with an annual monitoring and maintenance report for the installed and repositioned rope bridges and nest boxes for at least ten years from the date of approval	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	The annual monitoring report by Bamford Consulting Ecologists (2023) is attached to this compliance report under Appendix D. It is anticipated that this annual compliance report will be sent to the DCCEEW, prior to being published on Water Corporation's project website	Implementation ongoing
4.	The approval holder must notify the Department within two business days if any western ringtail possum is killed as a result of the action	- Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	No western ringtail possum was killed as a result of the VDD upgrade works	Not applicable
5.	To minimise impacts to the Caribunup King Spider Orchid, the approval holder:			
a.	Must implement condition 9 of the clearing permit CPS 8191/1. The targeted flora survey as required by condition 9 (a) of the clearing permit CPS 8191/1, must be conducted between September and October 2020	Previous annual compliance report (RPS 2021)	Refer to Table 2, 8191/1: 9 (a-f)	Not applicable
b.	Must not clear any Caribunup King Spider Orchid individuals identified through the targeted flora survey required by condition 5a	Previous annual compliance report (RPS 2021)	Refer to Table 2, 8191/1: 9 (b)	Not applicable

Condition no.	Condition	Evidence	Discussion	Compliance rating
c.	Develop and implement a translocation proposal for all Caribunup King Spider Orchid individuals identified through the targeted flora survey required under condition 5a located within the clearing area. This translocation proposal must be endorsed in writing by a suitably qualified biologist as appropriate to ensure the successful survival of the translocated individuals without posing a risk to the receiving area(s) prior to implementation of the proposal. The translocation proposal must be implemented once endorsed by a suitably qualified biologist as appropriate	Previous annual compliance report (RPS 2021)	Refer to Table 2, 8191/1: 9 (b)	Not applicable
d.	Documentary evidence of the endorsement of the translocation proposal and implementation of the translocation proposal must be provided to the Department within 14 business days of the endorsement	Previous annual compliance report (RPS 2021)	Refer to Table 2, 8191/1: 9 (b)	Not applicable
6.	Within two months of conducting a targeted flora survey for Caribunup King Spider Orchid and as required by condition 5a, the approval holder must provide the Department the results of the targeted flora survey which must contain the following information	Previous annual compliance report (RPS 2021)	The Targeted <i>Caladenia procera</i> Flora Survey report was provided to DWER on 6 October 2020, prior to commencement of clearing on 28 October 2020	Not applicable
a.	The date(s) targeted flora survey was conducted and the methodology used	Previous annual compliance report (RPS 2021)	Refer Table 6, 5.	Not applicable
b.	A photograph of each individual of Caribunup King Spider Orchid identified during the targeted flora survey and map/s showing their location	Previous annual compliance report (RPS 2021)	Refer Table 6, 5.	Not applicable
7.	Prior to the commencement of the action, the approval holder must implement the weed management and soil hygiene management measures as mentioned in the Construction Environmental Management Framework provided to the Department on 2 July 2020	Previous annual compliance report (RPS 2021)	Refer to Table 1, 8191/1: 18 (a) iv	Achieved
8.	The approval holder must implement the fauna management plan provided to the Department on 10 September 2020	• Subject matter specific information – Western Ringtail Possum (Appendix D) ○ Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) ○ Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	• Bamford Consulting Ecologists has been commissioned to conduct ongoing monitoring of the installed shelters for ten years (Bamford Consulting Ecologists 2022 and 2023): – There were 80 artificial shelters checked by Bamford Consulting Ecologists on one occasion in January 2022 for Year One, and 78 artificial shelters were checked on one occasion in December 2022 for Year Two. This included 16 relocated natural dreys in Year One and Year Two. The number of viable relocated natural dreys has reduced from the original 24 relocated natural dreys installed prior to January 2021 to 16 relocated natural dreys. This is because many of them had fallen down or become unusable. One relocated natural drey was replaced in December 2022 with a dome with coconut fibre shelter (ID S22a). – There was a small number of new natural dreys observed in the study area in January 2022 and 33 new natural dreys were observed in the study area in December 2022, which have been added to future monitoring events. – Bamford Consulting Ecologists (2023) found that the population has remaining stable following the initial disturbance. – The relocated natural dreys were considered important initially, however became disused as possums built new natural dreys or adopted artificial dreys. None of the relocated natural dreys were in use during the 2022 monitoring for Year One and Year Two. – The artificial shelters were used consistently during Year One and Year Two. In January 2022, 18% of possums located were using artificial shelters, and in December 2022, 27% of possums located were using artificial shelters. The availability of additional shelter is likely to have supported the population of possums following displacement and may have contributed to the sustained increase in numbers of possums at the ends of the breeding seasons by providing additional shelter for newly independent juveniles.	Implementation ongoing

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Condition no.	Condition	Evidence	Discussion	Compliance rating
9.	The approval holder must implement a flora management plan as required by condition 10 of the clearing permit CPS 8191/1	Previous annual compliance report (RPS 2021)	8191/1: 18 (a) (v)	Achieved
10.	To compensate for the residual significant impacts on the Western Ringtail Possum, the approval holder must implement condition 17 of the clearing permit CPS 8191/1	- Subject matter specific information - Revegetation and rehabilitation information (Appendix E)	Refer to Table 5	Implementation ongoing

3.1.2 EPBC 2017/7932; Part B – standard administrative conditions

Table 7: Summary of environmental performance of Vasse Diversion Drain upgrade works with EPBC 2017/7932: Part B – Standard administrative conditions

Condition no.	Condition	Evidence	Discussion	Compliance rating
11.	The approval holder must notify the Department in writing of the date of commencement of the action within 10 business days after the date of commencement of the action	Previous annual compliance report (RPS 2021)	DAWE was advised in writing by Water Corporation of the intended commencement date (26 October 2020) on 6 October 2020	Not applicable
12.	The approval holder must maintain accurate and complete compliance records	- This annual compliance report - Previous annual compliance reports (RPS 2021 and 2022)	This annual compliance report and the two previous annual compliance reports (RPS 2021 and 2022) provides evidence that Water Corporation has maintained accurate and complete compliance records	Implementation ongoing
13.	If the Department makes a request in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request	Not applicable	DCCEEW has not requested in writing for the Water Corporation to provide electronic copies of compliance to the DCCEEW	Not applicable
14.	The approval holder must:			
a.	Submit plans electronically to the Department for approval by the Minister	Previous annual compliance report (RPS 2021)	All plans were previously submitted to DAWE for approval. No new plans were prepared during the current reporting period (i.e. between 1 January 2022 and 31 December 2022)	Not applicable
b.	Publish each plan on the website within 20 business days of the date the plan is approved by the Minister or of the date a revised action management plan is submitted to the Minister or the Department, unless otherwise agreed to in writing by the Minister	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	The plans for the VDD upgrade works available on Water Corporation's project website	Not applicable
c.	Exclude or sensitive ecological data from plans published on the website or provided to a member of the public	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	Sensitive ecological data within the VDD upgrade includes: - Confirmed locations of <i>Caladenia procera</i> - GPS locations of <i>Caladenia procera</i> provide in Dixon 2020 were blocked out in the report provided on the website - Identified locations of western ringtail possum and the location of fauna shelters - Figures and GPS locations showing fauna shelter or possum locations were blocked out in the Bamford Consulting Ecologists 2021 report provided on the website	Not applicable
d.	Keep plans published on the website until the end date of this approval	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	The plans for the VDD upgrade works are available on Water Corporation's project website	Implementation ongoing
15.	The approval holder must ensure that any monitoring data (including sensitive ecological data), surveys, maps, and other spatial and metadata required under condition 5 of this approval, is prepared in accordance with the Department's Guidelines for biological survey and mapped data (2018) and submitted electronically to the Department	- Previous annual compliance report (RPS 2021) - Subject matter specific information - Western Ringtail Possum (Appendix D) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) - Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023).	- All plans previously submitted to DAWE for approval were reported on as part of a previous annual compliance report (RPS 2021) - No new plans were prepared during the current reporting period (i.e. between 1 January 2022 and 31 December 2022) - The two reports, Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021–January 2022 (Bamford Consulting Ecologists 2022) and Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year Two, January 2022 – February 2023 (Bamford Consulting Ecologists 2023), are provided in Appendix D) of this compliance report.	Achieved
16.	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must:			

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Condition no.	Condition	Evidence	Discussion	Compliance rating
a.	Publish each compliance report on the website within 60 business days following the relevant 12 month period	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	- The previous two annual compliance reports (RPS 2021 and 2022) are available on Water Corporation's project website - This annual compliance report addresses the required reporting period from 1 January 2022 to 31 December 2022 for the approved clearing permit (CPS 8191/1) and EPBC Act (EPBC 2017/7932) It is anticipated this annual compliance report will be published on the Water Corporation's VDD Upgrade website https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	Implementation ongoing
b.	Notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication	Not applicable	This annual compliance report is pending website publication	Not applicable
c.	Keep all compliance reports publicly available on the website until this approval expires	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	See Table 7, 16a	Implementation ongoing
d.	Exclude or redact sensitive ecological data from compliance reports published on the website	Water Corporation VDD upgrade works project website: https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Vasse-diversion-drain-upgrade	- The 2021 Annual Compliance Report (RPS 2022) that is available on the Water Corporation's project website has redacted sensitive ecological data within the VDD upgrade - Text, figures and GPS locations showing fauna shelter or possum locations provided in the Management of the Western Ringtail Possum and other Vertebrates during Clearing along the Vasse Diversion Drain, Busselton: October 2020- January 2021 (Bamford Consulting Ecologists 2021) report have been redacted from Appendix E of the 2021 Annual Compliance Report (RPS 2023). - Text, figures and GPS locations showing fauna shelter or possum locations provided in the Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021 – January 2022 (Bamford Consulting Ecologists 2022) report have been redacted from Appendix E of the 2021 Annual Compliance Report (RPS 2023). - Prior to publication of this compliance report on the Water Corporation's project website, it is anticipated that sensitive ecological information will be redacted from the Bamford Consulting Ecologists (2022 and 2023) reports in Appendix D.	Achieved
e.	Where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within five business days of publication	- Regulator liaison (Appendix F) - Email: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report (29 June 2022) - Email: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report - published on website (30 June 2022)	- The full 2021 Annual Compliance Report (RPS 2022) was sent to the DAWE on 29 June 2022. Water Corporation advised that the compliance report was available on the project website on 30 June 2022. - This annual compliance report is pending website publication	Achieved
17.	The approval holder must notify the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable, and no later than two business days after becoming aware of the incident or non-compliance. The notification must specify:			
a.	Any condition which is or may be in breach	- Water Corporation liaison - Email: RE: CD00116 Busselton VDD Upgrade - Annual Compliance Report 2022 (12 May 2023)	Water Corporation advised that there have been no reported incidents or non-compliances with the conditions or associated management plans during the current reporting period (i.e. between 1 January 2022 and 31 December 2022)	Not applicable
b.	A short description of the incident and/or non-compliance			
c.	The location (including co-ordinates), date, and time of the incident and/or non-compliance. In the event the exact information cannot be provided, provide the best information available			
18.	The approval holder must provide to the Department the details of any incident or non-compliance with the conditions or commitments made in plans as soon as practicable and no later than 10 business days after becoming aware of the incident or non-compliance, specifying:			
a.	Any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future	Not applicable	Refer Table 7, 17	Not applicable
b.	The potential impacts of the incident or non-compliance			
c.	The method and timing of any remedial action that will be undertaken by the approval holder			
19.	The approval holder must ensure that independent audits of compliance with the conditions are conducted as requested in writing by the Minister	Not applicable	No independent audits of compliance with the conditions have been requested in writing by the Minister	Not applicable

REPORT

Condition no.	Condition	Evidence	Discussion	Compliance rating
20.	For each independent audit, the approval holder must:			
a.	Provide the name and qualifications of the independent auditor and the draft audit criteria to the Department	Not applicable	Refer Table 7, 19	Not applicable
b.	Only commence the independent audit once the audit criteria have been approved in writing by the Department			
c.	Submit an audit report to the Department within the time frame specified in the approved audit criteria			
21.	The approval holder must publish the audit report on the website within ten business days of receiving the Department's approval of the audit report and keep the audit report published on the website until the end date of this approval	Not applicable	Refer Table 7, 19	Not applicable
22.	Within 30 days after the completion of the action, the approval holder must notify the Department in writing and provide completion data	Not applicable	Completion of the action means all specified activities associated with the action have permanently ceased. The VDD upgrade works were completed on schedule in July 2021, however management and monitoring activities associated with the action are ongoing	Not applicable

4 DISCUSSION

The environmental performance assessment against the record-keeping and reporting requirements for CPS 8191/1 (Condition 19 (a)) (i.e. Tables 1–5) found:

- No clearing works were undertaken during the current reporting period (i.e. between 1 January 2022 and 31 December 2022), hence Conditions 9, 10, 11, 12 (a), 13, 18 (a) (i) – (v) were not applicable
- Bamford Consulting Ecologists (2022 and 2023) undertook the second event of the ten-year monitoring program of the rope bridges and artificial shelters for Year One in January 2022 and for Year Two in December 2022. They found that
 - The overall population of possums have remained stable throughout 2022
 - There were 80 artificial shelters checked by Bamford Consulting Ecologists on one occasion in January 2022 for Year One, and 78 artificial shelters were checked on one occasion in December 2022 for Year Two. This included 16 relocated natural dreys in Year One and Year Two. The number of viable relocated natural dreys has reduced from the original 24 relocated natural dreys installed prior to January 2021 to 16 relocated natural dreys. This is because many of them had fallen down or become unusable. One relocated natural drey was replaced in December 2022 with a dome with coconut fibre shelter (ID S22a)
 - There was a small number of new natural dreys observed in the study area in January 2022 and 33 new natural dreys were observed in the study area in December 2022, which have been added to future monitoring events
 - The relocated natural dreys were considered important initially, however became disused as possums built new natural dreys or adopted artificial dreys. None of the relocated natural dreys were in use during the 2022 monitoring periods of Year One and Year Two
 - The artificial shelters were used consistently during Year One and Year Two. In January 2022, 18% of possums located were using artificial shelters, and in December 2022, 27% of possums located were using artificial shelters. The availability of additional shelter is likely to have supported the population of possums following displacement and may have contributed to the sustained increase in numbers of possums at the ends of the breeding seasons by providing additional shelter for newly independent juveniles
- Revegetation works were undertaken by Tranen from 7 June to 13 July 2022 within the Quindalup Dune (infill), QE Ave Swale, Central PEC (infill) and Eastern PEC zones. In 2022, 40,371 plants (seedlings and mature trees), 39,371 fertiliser tablets and 5,260 guards have been installed
- Tranen (2023) visited 34 quadrats across all key revegetation zones on 1 – 4 November 2022 for the second assessment since the ten-year program commenced. They captured photos at each quadrat, and assessed the native vegetation cover, weed cover, presence of declared weeds, bare ground cover, species richness and vegetation condition. They did not address the completion criterion for *Conospermum caeruleum* var. *Busselton* as it was not ready to be planted yet
- Water Corporation's environmental performance addressed the requirements of all of the clearing permit conditions, with implementation ongoing to address Conditions 14, 15 and 18.

The environmental performance assessment against conditions of approval for the EPBC Act (EPBC 2017/7932) approval (Condition 16) (i.e. Tables 6–7) found:

- Bamford Consulting Ecologists undertook a survey in January 2021 to make a preliminary assessment of the shelters and the possum population following displacement. They also checked the shelters on one occasion in January 2022 for Year One, and on one occasion in December 2022 for Year Two out of a ten year monitoring program. These reports did not make any recommendations to reposition the rope bridges or nest boxes
- The number of remaining installed artificial shelters recorded in December 2022 was less than the 2:1 ratio requirement of artificial shelters installed to natural dreys removed (i.e. at least 82 artificial shelters are required). Only 78 of the 88 originally installed artificial shelters were present in December 2022. The implementation of the Condition 2. b. is ongoing as the installed artificial shelters will be monitored and maintained for at least ten years. Steps undertaken to replace the unusable or lost artificial shelters to meet the 2:1 ratio requirement will be addressed in the 2023 compliance report

REPORT

- The annual monitoring report by Bamford Consulting Ecologists (2023) is attached to this compliance report under Appendix D. It is anticipated that this Annual Compliance Report will be sent to the DCCEEW, prior to being published on Water Corporation's project website
- No Western Ringtail Possum was killed as a result of the VDD upgrade works
- Water Corporation's environmental performance addressed the requirements of all but one of the EPBC Act approval conditions that were applicable to the reporting period, with implementation ongoing to address Conditions 1. b., 2. a. and b., 3. c. and d., 8., 10., 12., 14. d., 16. a. and c
 - Prior to publication of this compliance report on the Water Corporation's project website, it is anticipated that sensitive ecological information will be redacted from the Bamford Consulting Ecologists (2022 and 2023) reports in Appendix D.

5 REFERENCES

- Bamford Consulting Ecologists. 2022. Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton: Year One, January 2021–January 2022. Report prepared for the Water Corporation.
- Bamford Consulting Ecologists. 2023. Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton Year Two, January 2022 – February 2023. Report prepared for the Water Corporation.
- RPS. 2021. Annual compliance report, Vasse Diversion Drain. Report prepared for Water Corporation.
- RPS. 2022. Annual compliance report, Vasse Diversion Drain. Report prepared for Water Corporation.
- Tranen. 2020. Vasse Diversion Drain Upgrade Revegetation Plan. Report prepared for Water Corporation.
- Tranen. 2023. Vasse Diversion Drain Upgrade Revegetation Spring 2022 Vegetation Monitoring Report. Report prepared for Water Corporation.

Appendix A: **EPBC Act (2017/7932) approval**



APPROVAL

Vasse Diversion Drain Upgrade, Busselton, Western Australia (EPBC 2017/7932)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. Note that section 134(1A) of the **EPBC Act** applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	Water Corporation WA
ACN or ABN of approval holder	ABN: 28003434917
Action	To upgrade the Vasse diversion drain within the City of Busselton approximately 220 km south of Perth, WA (EPBC 2017/7932) subject to the variation of the action accepted by the Minister under section 156B of the EPBC Act on Wednesday, 18 July 2018.

Approval decision

My decision on whether or not to approve the taking of the action for the purposes of the controlling provision for the action is as follows.

Controlling Provisions

Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve

Period for which the approval has effect

This approval has effect until 28 July 2035

Decision-maker

Name and position	Kylie Calhoun Assistant Secretary Environment Assessments West (WA, SA, NT) Branch Department of Agriculture, Water and the Environment
Signature	
Date of decision	24 September 2020

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

1. To minimise impacts to **EPBC Act listed species**, the approval holder must:
 - a. **clear** no more than 2.16 hectares (ha) of **Western Ringtail Possum habitat** within the **project area** (hatched yellow in Attachment A and Attachment B);
 - b. comply with and implement the conditions of the **clearing permit CPS 8191/1** or as varied from time to time; and
 - c. notify the **Department** in writing of any variations of the conditions of **clearing permit CPS 8191/1** within 10 business days of such a change being approved by the **State Government**.
2. To avoid and mitigate impacts to the **Western Ringtail Possum**, the approval holder must:
 - a. implement condition 14 of the **clearing permit CPS 8191/1** by installing a minimum of six rope bridges. The installation of the rope bridges must be in accordance with advice from a **suitably qualified ecologist**;
 - b. implement condition 15 of the **clearing permit CPS 8191/1** by installing a minimum of 12 nest boxes suitable for **Western Ringtail Possum**. If the **action** results in the removal of more than six **dreys**, the **approval holder** must install two nest boxes for each additional **drey** being removed. Installation of the nest boxes must be in accordance with advice from a **suitably qualified ecologist**; and
 - c. reposition rope bridges and nest boxes in accordance with advice from a **suitably qualified ecologist** if they are not being utilised by **Western Ringtail Possum** within six months of installation.
3. The approval holder must maintain the following records and provide them to the **Department** within two months of the installation or repositioning of rope bridges and nesting boxes:
 - a. the date(s) and the **location** where the rope bridges and nest boxes for **Western Ringtail Possum** (conditioned under 2 and the **clearing permit CPS 8191/1**) were installed or repositioned;
 - b. an in-situ photograph of each rope bridge and nest box installed or repositioned;
 - c. evidence that a **suitably qualified ecologist** has approved the design and placement of each rope bridge and nest box; and
 - d. provide the **Department** with an annual monitoring and maintenance report for the installed and repositioned rope bridges and nest boxes for at least ten years from the date of approval.
4. The approval holder must notify the **Department** within two **business days** if any **Western Ringtail Possum** is killed as a result of the **action**.
5. To minimise impacts to the **Carbunup King Spider Orchid**, the approval holder:
 - a. must implement condition 9 of the **clearing permit CPS 8191/1**. The **targeted flora survey** as required by condition 9 (a) of the **clearing permit CPS 8191/1**, must be conducted between September and October 2020;
 - b. must not **clear** any **Carbunup King Spider Orchid** individuals identified through the **targeted flora survey** required by condition 5a; and
 - c. develop and implement a **translocation proposal** for all **Carbunup King Spider Orchid** individuals identified through the **targeted flora survey** required under condition 5a located within the **clearing area**. This **translocation proposal** must be endorsed in writing by a **suitably qualified biologist** as appropriate to ensure the successful survival of the translocated individuals without posing a risk to the receiving area(s) prior to implementation

of the proposal. The **translocation proposal** must be implemented once endorsed by a **suitably qualified biologist** as appropriate.

- d. documentary evidence of the endorsement of the **translocation proposal** and implementation of the **translocation proposal** must be provided to the **Department** within 14 business days of the endorsement.
6. Within two months of conducting a **targeted flora survey** for **Carbunup King Spider Orchid** and as required by condition 5a, the approval holder must provide the **Department** the results of the **targeted flora survey** which must contain the following information:
 - a. the date(s) **targeted flora survey** was conducted and the methodology used; and
 - b. a photograph of each individual of **Carbunup King Spider Orchid** identified during the **targeted flora survey** and map/s showing their **location**.
7. Prior to the **commencement of the action**, the approval holder must implement the weed management and soil hygiene management measures as mentioned in the **Construction Environmental Management Framework** provided to the **Department** on 2 July 2020.
8. The approval holder must implement the **fauna management plan** provided to the **Department** on 10 September 2020.
9. The approval holder must implement a **flora management plan** as required by condition 10 of the **clearing permit CPS 8191/1**.
10. To compensate for the **residual significant impacts** on the **Western Ringtail Possum**, the approval holder must implement condition 17 of the **clearing permit CPS 8191/1**.

Part B – Standard administrative conditions

Notification of date of commencement of the action

11. The approval holder must notify the **Department** in writing of the date of **commencement of the action** within 10 **business days** after the date of **commencement of the action**.

Compliance records

12. The approval holder must maintain accurate and complete **compliance records**.
13. If the **Department** makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request.

Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department's** website or through the general media.

Preparation and publication of plans

14. The approval holder must:
 - a. submit **plans** electronically to the **Department** for approval by the **Minister**;
 - b. publish each **plan** on the **website** within 20 **business days** of the date the **plan** is approved by the **Minister** or of the date a revised action management plan is submitted to the **Minister** or the **Department**, unless otherwise agreed to in writing by the **Minister**;
 - c. exclude or redact **sensitive ecological data** from **plans** published on the **website** or provided to a member of the public; and
 - d. keep **plans** published on the **website** until the end date of this approval.

15. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under condition 5 of this approval, is prepared in accordance with the **Department's Guidelines for biological survey and mapped data** (2018) and submitted electronically to the **Department**.

Annual compliance reporting

16. The approval holder must prepare a **compliance report** for each 12 month period following the date of **commencement of the action**, or otherwise in accordance with an annual date that has been agreed to in writing by the **Minister**. The approval holder must:
- publish each **compliance report** on the **website** within 60 **business days** following the relevant 12 month period;
 - notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication;
 - keep all **compliance reports** publicly available on the **website** until this approval expires;
 - exclude or redact **sensitive ecological data** from **compliance reports** published on the **website**; and
 - where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within 5 **business days** of publication.

Note: **Compliance reports** may be published on the **Department's** website.

Reporting non-compliance

17. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:
- any condition which is or may be in breach;
 - a short description of the **incident** and/or non-compliance; and
 - the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.
18. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:
- any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;
 - the potential impacts of the **incident** or non-compliance; and
 - the method and timing of any remedial action that will be undertaken by the approval holder.

Independent audit

19. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.
20. For each **independent audit**, the approval holder must:
- provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**;

- b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and
 - c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.
21. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Completion of the action

22. Within 30 days after the **completion of the action**, the approval holder must notify the **Department** in writing and provide **completion data**.

Part C - Definitions

In these conditions, except where contrary intention is expressed, the following definitions are used:

Approval holder means Western Australian Water Corporation.

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Carbunup King Spider Orchid means the **EPBC Act** listed critically endangered *Caladenia procera*.

Clear/Clearing means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of vegetation (but not including weeds – see the *Australian weeds strategy 2017 to 2027* for further guidance, or for the purpose of translocation under condition 5c).

Cleared area/s means an area/s (in hectares) within the **project area** where loss or long-term modification of habitat has occurred.

Clearing area means the area (in hectares) where loss or long term modification of habitat will occur within the **project area**.

Clearing permit CPS 8191/1 means the clearing permit granted on 3 July 2020 under section 51E of the *Environmental Protection Act 1986* (WA), and any subsequent versions.

Commencement of the action means the first instance of any specified activity associated with the action including clearing of vegetation and **construction** of any infrastructure. **Commencement of the action** does not include minor physical disturbance necessary to:

- i. undertake pre-clearance surveys or monitoring programs;
- ii. install signage and /or temporary fencing to prevent unapproved use of the project area;
- iii. protect environmental and property assets from fire, weeds and pests, including **construction** of fencing, and maintenance of existing surface access tracks;
- iv. install temporary site facilities for persons undertaking pre-commencement activities so long as these are located where they have no impact on the **protected matters**.

Completion data means an environmental report and spatial data clearly detailing how the conditions of this approval have been met. The **Department's** preferred spatial data format is **shapefile**.

Completion data should include, but not be limited to, information detailing the date and location of **clearing**; the actual total **cleared area/s** within the **project area** (in hectares); the total area and type of **Western Ringtail Possum** habitat **cleared** within the **project area** (in hectares); and the total area and type of **Western Ringtail Possum** habitat within **retention area/s** (in hectares). **Completion data** must also include information on the location of rope bridges and nest hollows installed under the conditions of this approval.

Completion of the action means all specified activities associated with the action have permanently ceased.

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance reports means written reports:

- i. providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and the **plans**;
- ii. consistent with the **Department's Annual Compliance Report Guidelines (2014)**;
- iii. include a **shapefile** of any clearance of any **protected matters**, or their habitat, undertaken within the relevant 12 month period; and
- iv. annexing a schedule of all **plans** prepared and in existence in relation to the conditions during the relevant 12 month period.

Construction means the erection of a building or structure that is or is to be fixed to the ground and wholly or partially fabricated on-site; the alteration, maintenance, repair or demolition of any building or structure; preliminary site preparation work which involves breaking of the ground (including pile driving); the laying of pipes and other prefabricated materials in the ground, and any associated excavation work; but excluding the installation of temporary fences and signage.

Construction Environmental Management Framework means the document provided by Western Australian Water Corporation to the **Department** on 2 July 2020.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

Drey means a nest for the **Western Ringtail Possum** typically formed from a mass of twigs.

Dieback and weed management methods mean various methodologies applied to control dieback of Western Australian native vegetation from *Phytophthora* species and multiple **weeds**.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

EPBC Act listed species Threatened fauna and flora listed under Section 178 of the **EPBC Act**.

Fauna management plan means a management **plan** for fauna species including **Western Ringtail Possum** occurring within the **project area** prepared by Western Australian Water Corporation.

Flora management plan means a management **plan** for flora species including **Carbunup King Spider Orchid** occurring within the **project area** prepared by Western Australian Water Corporation.

Incident means any event which has the potential to, or does, impact on one or more **protected matter(s)**.

Independent audit: means an audit conducted by an independent and **suitably qualified person** as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines (2019)*.

Life of the approval means the period for which this approval has effect.

Location means the exact position recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA 1994), expressing the geographical co-ordinates in decimal degrees.

Monitoring data means the data required to be recorded under the conditions of this approval.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

Plan(s) means any of the documents required to be prepared, approved by the **Minister**, and/or implemented by the approval holder and published on the **website** in accordance with these conditions (includes action management plans and/or strategies).

Project area means all of the areas approved to clear overlain with yellow in Attachment A and Attachment B and areas subject to conditions overlain with yellow and blue in Attachment C.

Protected matter means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.

Residual significant impacts mean the residual impacts on the protected matters that are still likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account.

Sensitive ecological data means data as defined in the Australian Government Department of the Environment (2016) *Sensitive Ecological Data – Access and Management Policy V1.0*.

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain '.shp', '.shx', '.dbf' files and a '.prj' file that specifies the projection/geographic co-ordinate system used. Shapefiles must also include an '.xml' metadata file that describes the shapefile for discovery and identification purposes.

State Government means the Government of Western Australia.

Suitably qualified biologist means a person who has professional qualifications and at least three years of work experience surveying for **Carbunup King Spider Orchid** and can give authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods and/or literature. If the person does not have appropriate professional qualifications, the person must have at least five years of work experience related to the subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods and/or literature.

Suitably qualified ecologist means a person who has professional qualifications and at least three years of work experience surveying for **Western Ringtail Possum** and can give authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods and/or literature. If the person does not have appropriate professional qualifications, the person must have at least five years of work experience related to the subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods and/or literature.

Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Targeted flora survey means a field-based investigation, including a review of established literature, of the biodiversity of flora and vegetation of the permit area, focusing on habitat suitable for **Carbunup King Spider Orchid** and carried out during the optimal time to identify the species, which is during the flowering period between September and October. Where target flora are identified in the or in close proximity to the permit area, the survey must also include a minimum of a 10 metre radius of the surrounding areas to place the permit area into a local context.

Translocation proposal means a written plan that details the deliberate, human-mediated movement of **Carbunup King Spider Orchid** from one area, with a release in another for the purpose of establishing, re-establishing or augmenting a population.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

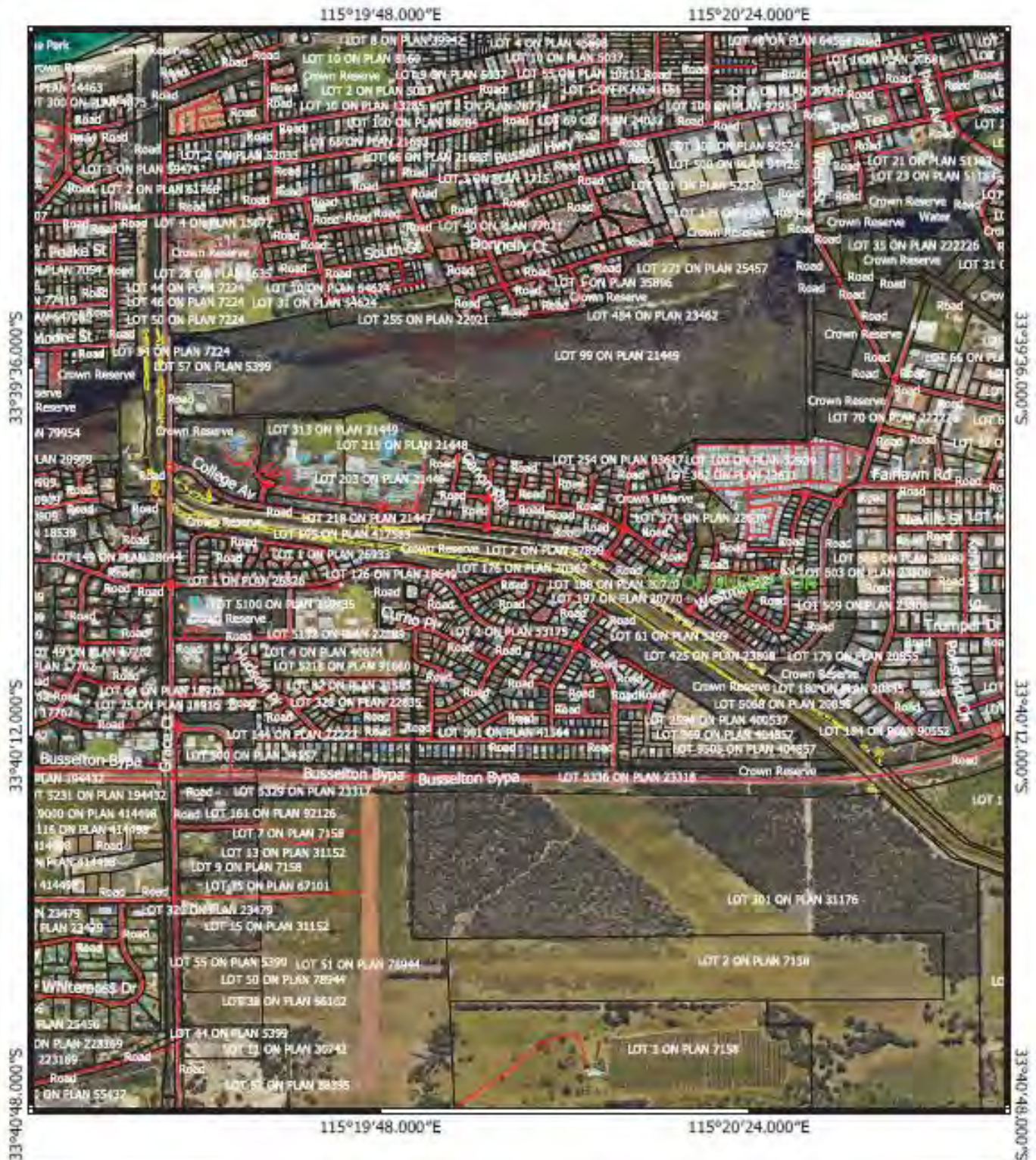
Weed/s means any plant species included in the Australian Government Weeds of National Significance or any other species defined as a weed in **clearing permit CPS 8191/1**.

Western Ringtail Possum means the **EPBC Act** listed critically endangered species *Pseudocheirus occidentalis*.

Western Ringtail Possum habitat means any areas where **Western Ringtail Possum** occurs naturally.

ATTACHMENTS

Attachment A



Attachment B



Attachment C



Appendix B: **Approved Clearing Permit (CPS 8191/1)**



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 8191/1
Permit Holder:	Water Corporation
Duration of Permit:	From 28 July 2020 to 28 July 2035

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

1. Purpose for which clearing may be done

Clearing for the purpose of upgrading the Vasse Diversion Drain, including the reconstruction of the Vasse Diversion Dam and duplication of the culverts.

2. Land on which clearing is to be done

Lot 866 on Diagram 4170 (Crown reserve 16061), West Busselton
Lot 80 on Deposited Plan 70429, Bovell
Lot 61 on Plan 5399, West Busselton
Lot 59 on Plan 5399, West Busselton
Lot 58 on Plan 5399, Bovell
Lot 57 on Plan 5399 (Crown reserve 16061), West Busselton
Lot 56 on Plan 9868, Bovell
Lot 56 on Plan 9868, West Busselton
Lot 56 on Plan 5399, Bovell
Lot 55 on Plan 9868, West Busselton
Lot 553 on Plan 23463 (Crown reserve 48018), West Busselton
Lot 5337 on Plan 23318, Bovell
Lot 5210 on Plan 22191 (Crown reserve 45170), West Busselton
Lot 5209 on Plan 22630 (Crown reserve 45170), West Busselton
Lot 5190 on Deposited Plan 220139 (Crown reserve 41460), West Busselton
Lot 5136 on Diagram 42478 (Crown reserve 45588), Bovell
Lot 5068 on Plan 20855 (Crown reserve 44380), Busselton
Lot 5067 on Plan 20770 (Crown reserve 43250), West Busselton
Lot 5067 on Plan 20362 (Crown reserve 43250), West Busselton
Lot 505 on Deposited Plan 417589, West Busselton
Lot 501 on Deposited Plan 417589, West Busselton
Lot 4989 on Plan 18644 (Crown reserve 43250), West Busselton
Lot 4607 on Diagram 40995, West Busselton
Lot 4348 on Diagram 27395 (Crown reserve 26555), West Busselton
Lot 2594 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton
Lot 2593 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton
Lot 1 on Diagram 39001, West Busselton

Lot 100 on Diagram 9165, Bovell
Unallocated Crown Land (PIN 11993547), Bovell
Water Feature (PIN 11725451), Bovell
Road Reserve - 1172836, West Busselton
Road Reserve - 11440716, West Busselton
Road Reserve - 1183896, West Busselton
Deposited Plan 37514 - Easement J140752 (5067)
Deposited Plan 37514 - Easement J140752 (5209)
Deposited Plan 37514 - Easement J140752 (5210)

3. Area of clearing

The Permit Holder must not clear more than 2.16 hectares of native vegetation within the area hatched yellow on attached Plan 8191/1a and 8191/1b.

4. Period in which clearing is authorised

The Permit Holder shall not clear any native vegetation after 28 July 2025.

5. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

6. Type of clearing authorised

This Permit authorises the Permit Holder to clear native vegetation for the *project activities* described in condition 1 of this Permit to the extent that the Permit Holder has the power to carry out works involving clearing for those *project activities* under the *Water Corporation Act 1995* or any other written law.

7. Avoid, minimise and reduce the impacts and extent of clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- (a) avoid the clearing of native vegetation;
- (b) minimise the amount of native vegetation to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

8. Dieback and weed management

When undertaking any clearing authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

9. Flora management – *Caladenia procera*

- (a) Prior to undertaking any clearing, the Permit Holder must engage a *botanist* to conduct a *targeted flora survey* within *suitable habitat(a)* within the areas cross-hatched yellow on attached Plan 8191/1a for the presence of *Caladenia procera*;
- (b) The Permit Holder shall ensure no clearing of any *Caladenia procera* individuals identified through the surveys required by condition 9(a);
- (c) The Permit Holder shall ensure that no clearing occurs within 10 metres of *Caladenia procera* individuals identified through the surveys required by condition 9(a), unless the clearing is done in accordance with condition 9(d) of this Permit;
- (d) Where clearing within 10 metres of individuals of *Caladenia procera* is unavoidable, the Permit Holder must:

- (i) install clearly demarked temporary fencing around the individuals of *Caladenia procera* prior to undertaking any clearing and maintain the fencing until the *project activities* have ceased; and
 - (ii) Adhere to the Flora Management Plan required under condition 10 which has been approved by the *CEO*.
- (e) Within two months of undertaking any clearing authorised under this Permit within the areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide the results of the *targeted flora survey*, as required by condition 9(a), in a report to the *CEO*; and
- (f) If *Caladenia procera* are identified within 10 metres of the areas cross-hatched yellow on Plan 8191/1a, the *targeted flora survey* report must include the following:
 - (i) the location of each *Caladenia procera* identified under condition 9(a), either as the location of individual plants, or where this is not practical, the areal extent of the population and an estimate of the number of plants, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (ii) map/s showing the location of any identified population of *Caladenia procera* cleared and the remaining population; and
 - (iii) the methodology used to survey the Permit area.

10. Flora Management Plan

Where clearing within 10 metres of individuals of *Caladenia procera* is unavoidable, the Permit Holder must submit a Flora Management Plan to the *CEO* for approval, prior to clearing commencing. The management plan must contain the following:

- (i) Details of the Permit Holder's attempts to avoid and minimise impacts to *Caladenia procera*; and
- (ii) Proposed methods of minimising and mitigating any indirect impacts to *Caladenia procera*.

11. Fauna management – other approvals

Prior to clearing, the Permit Holder must provide to the *CEO*:

- (a) a copy of the fauna licence(s) obtained under the *Biodiversity Conservation Act 2016* for the *relocation* and/or *translocation* of Carter's freshwater mussel (*Westralunio carteri*) and the dispersion of western ringtail possum (*Pseudocheirus occidentalis*) individuals; and
- (b) a copy of the approved exemption from the Department of Primary Industries and Regional Development under the *Fish Resources Management Act 1994* and *Fish Resources Management Regulations 1995* for the collection of Carter's freshwater mussel for translocation.

12. Fauna management – Carter's freshwater mussel

- (a) Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must submit a Carter's freshwater mussel (*Westralunio carteri*) Management Plan to the *CEO* for approval. The management plan must contain the following:
 - (i) Removal, transportation and *relocation* method, and where required, temporary storage method;
 - (ii) Location of the *relocation* site, including a field assessment confirming the suitability of the *relocation* site;
 - (iii) Stocking densities; and
 - (iv) The success rate monitoring plan.

13. Fauna management – western ringtail possum

- (a) In relation to the area cross-hatched yellow on attached Plans 8191/1a and 8191/1b, the Permit Holder must engage a *fauna specialist* to inspect that area, including all trees and tree hollows present, within 24 hours prior to, and for the duration of clearing, for the presence of western ringtail possum(s) (*Pseudocheirus occidentalis*).
- (b) Clearing must cease in any area where fauna referred to in condition 13(a) above are identified until the western ringtail possum(s) has moved out of the development area to adjoining *suitable habitat*(b).
- (c) Where fauna is identified under condition 13(a) of this Permit, the Permit Holder must provide the following records to the *CEO* as soon as practicable:

- (i) the number of individuals identified;
- (ii) the date each individual was identified;
- (iii) the location where each individual was identified recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (iv) the number of individuals displaced;
- (v) the relevant qualifications of the *fauna specialist* undertaking the displacement;
- (vi) the date each individual was displaced;
- (vii) the method of dispersal;
- (viii) the date each individual was dispersed;
- (ix) the location where each individual dispersed to, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees; and
- (x) details pertaining to the circumstances of any death of, or injury sustained by, an individual.

14. Fauna management – western ringtail possum rope bridges

Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must at a minimum install six rope bridges within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements:

- (i) the end of each rope bridge must be connected to at least two mature trees, or two different locations in the canopy of a single mature tree, at a height of at least three metres above ground level;
- (ii) the rope bridges must be placed in areas that provide canopy connectivity for western ringtail possum movement across the local area, i.e. across roadways and other gaps in the canopy;
- (iii) be monitored annually and maintained for a period of at least ten years; and
- (iv) Within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a and 8191/1b, the Permit Holder must provide to the *CEO*, the locations where each rope bridge was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees.

15. Fauna management – western ringtail possum nest boxes

Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must, at a minimum, install 12 nest boxes within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements:

- (i) be designed and placed in accordance with the specifications detailed in the Project Revegetation Plan required by condition 17(a);
- (ii) be placed at least three metres above ground level in a mature tree facing the shadiest side of the tree;
- (iii) be monitored annually and maintained for a period of at least ten years; and
- (iv) within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide to the *CEO*, the locations where each nest box was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees.

16. Revegetation and rehabilitation – mitigation

- (a) Within 12 months of the commencement of clearing, the Permit Holder must undertake revegetation within 0.55 hectares of the area hatched red on attached Plan 8191/1d in accordance with condition 17 of this permit.

17. Offset – revegetation and rehabilitation

- (a) Within 3 months of clearing commencing, the Permit Holder must submit a Project Revegetation Plan to the *CEO* for approval for the *revegetation* of 10.34 hectares of land within the areas cross-hatched red on Plan 8191/1e, which shall be developed in accordance with *A Guide to Preparing Revegetation Plans for Clearing Permits* (Department of Water and Environmental Regulation (DWER) 2018).
- (b) The Project Revegetation Plan must be prepared by an *environmental specialist*.
- (c) The Project Revegetation Plan must include the following:
 - (i) *site preparation*;
 - (ii) deliberate planting of native vegetation that will provide *suitable habitat(b)* for western ringtail possum;
 - (iii) deliberate planting of species associated with the *Eucalyptus rudis* (flooded gum), *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton)' priority ecological community (PEC) in areas as outlined in the Project Revegetation Plan;
 - (iv) deliberate planting of up to 300 seedlings of *Conospermum caeruleum* var. Busselton;
 - (v) planting of *local provenance* native understorey species at an *optimal time* so as to achieve the *completion criteria* specified in condition 17(a)(xii) below;
 - (vi) a biannual weed control program within the area hatched red on Plan 8191/1e to achieve the *completion criteria* outline under condition 17(a)(xii), criterion 2;
 - (vii) establishment of a total of 34, 5 x 5 metre monitoring *quadrats* within the area hatched red on Plan 8191/1e;
 - (viii) maintenance of sufficient fencing to protect revegetation areas adjacent to areas most impacted by public access as outlined in the Project Revegetation Plan;
 - (ix) implementation of hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;
 - (x) installation of signage to educate reserve users of the revegetation activities being undertaken;
 - (xi) achieve the below *completion criteria* within the ten year monitoring period for the area hatched red on Plan 8191/1e;

Criterion	Aspect	Scale	Completion criteria description	Monitoring frequency
1	Per cent <i>weed</i> cover	Average of <i>quadrat</i> data and site traverse	<15 per cent weed cover across all sites	Bi-annually in the first 2 years, and annually for the next 8 years
2	Declared <i>weeds</i>	Site traverse	Absence of declared weeds	Bi-annually in the first 2 years, and annually for the next 8 years
3	Per cent bare ground	Average of <i>quadrat</i> data and site traverse	Per cent of bare ground to be no greater than that recorded in the <i>pre clearing surveys</i> .	Bi-annually in the first 2 years, and annually for the next 8 years
4	Vegetation condition	Site traverse	The condition of the vegetation to be in a good to very good condition on average across the revegetation area (Keighery 1994).	Bi-annually in the first 2 years, and annually for the next 8 years
5	Native vegetation cover/density	Average of <i>quadrat</i> data and site traverse	>70 per cent native cover	Bi-annually in the first 2 years, and annually for the next 8 years
6	Species richness	Average of <i>quadrat</i> data	>70 per cent of species planted represented across all sites respectively (PEC sites, Geographe coastal wetland	Bi-annually in the first 2 years, and annually for the next 8 years

			system sites and Quindalup dune sites) as outlined in the species list provided in the Project Revegetation Plan	
7	<i>Conospermum caeruleum</i> var. Busselton	Site traverse and direct survival observation	>50 per cent survival rate to be achieved	Bi-annually in the first 2 years, and annually for the next 8 years

(xii) remedial actions to be undertaken if *completion criteria* are not met; and

(xiii) management commitments that will be achieved.

(d) The Permit Holder shall implement the Project Revegetation Plan as approved by the *CEO*.

18. Record keeping

The Permit Holder must maintain the following records:

- (a) In relation to the clearing of native vegetation authorised under this Permit:
 - (i) the boundaries of clearing undertaken on each date, recorded using a Global Positioning System GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (ii) the size of the area cleared (in hectares);
 - (iii) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 7 of this Permit;
 - (iv) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 8 of this Permit;
 - (v) details required in accordance with flora management conditions 9 and 10 of this Permit; and
 - (vi) details required in accordance with fauna management conditions 11, 12, 13, 14 and 15 of this Permit.
- (b) In relation to revegetation activities undertaken pursuant to conditions 16 and 17 of this Permit:
 - (i) the date(s) each area was revegetated;
 - (ii) the location of each area revegetated recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iii) at least two photographs of each area revegetated taken on an annual basis at the same location each year;
 - (iv) a description of the revegetation activities undertaken each year for each area revegetated; and
 - (v) a description of the tree density and native understorey vegetation cover for each area revegetated recorded on an annual basis.

19. Reporting

- (a) The Permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:
 - (i) of records required under condition 18 of this Permit; and
 - (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit has been undertaken, a written report confirming that no clearing under this Permit has been undertaken, must be provided to the *CEO* on or before 30 June of each year.
- (c) Prior to 30 March 2030, the Permit Holder must provide to the *CEO* a written report of records required under condition 18 of this Permit where these records have not already been provided under condition 19(a) of this Permit.

Definitions

The following meanings are given to terms used in this Permit:

botanist means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of two (2) years work experience in Western Australian flora identification and undertaking flora surveys native to the bioregion being inspected or surveyed, or who is approved by the CEO as a suitable environmental specialist for the bioregion, and who holds a valid flora licence issued under the *Biodiversity Conservation Act 2016*;

CEO means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

completion criteria (quantitative) means a measurable outcome based on a suitable reference site, used to determine revegetation/rehabilitation success;

dieback means the effect of *Phytophthora* species on native vegetation;

environmental specialist means a person who holds a tertiary qualification in environmental science or equivalent, and has a minimum of 2 years work experience relevant to the type of environmental advice that an environmental specialist is required to provide under this permit, or who is approved by the CEO as a suitable environmental specialist;

fill means material used to increase the ground level, or fill a hollow;

local provenance means native vegetation seeds and propagating material from natural sources within 100 kilometres where practical, based on a species specific assessment and availability of sufficient propagation material and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared.

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

optimal time means the most suitable period for undertaking direct seeding and planting based on species availability, as set out in the Project Revegetation Plan;

pre clearing surveys means those surveys undertaken by the applicant prior to the permit being granted, which informed the assessment of the clearing permit application;

quadrat means a sample plot established for the purpose of data collection and monitoring vegetation characteristics, for example species composition, structure, density and condition;

rehabilitate/ed/ion/ing means actively managing an area containing native vegetation in order to improve the ecological function of that area;

relocation means moving an individual animal (or family group) from one location within its home range to another location within the same home range for the purpose of resolving a human-wildlife conflict;

revegetate/ed/ion/ing means the re-establishment of a cover of local provenance native vegetation in an area using methods such as natural regeneration, direct seeding and/or planting, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

reference site means a site used to provide baseline data for planning a revegetation project. Measurements from fixed reference points or plots where biodiversity components are measured are used to set measurable completion criteria for revegetation projects. Reference sites are to be in at least very good condition (Keighery 1994);

revegetation plan means a plan prepared by the Permit Holder, or an appropriate *environmental specialist* delegated by the Permit Holder, for the *revegetation* of a site in accordance with a Permit condition;

site preparation means management of existing site topsoil and preparation of the finished soil surface, for example by ripping or tilling the soil surface and resspreading site topsoil and chipped native vegetation.

suitable habitat(a) means habitat known to support Caribunup king spider orchid (*Caladenia procera*) within the known current distribution of the species, typically characterised by jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) and peppermint (*Agonis flexuosa*) woodland on alluvial sandy-clay loam flats, with Mangles kangaroo paw (*Anigozanthos manglesii*) amongst dense heath and sedges or low dense shrubs. Other associated species include *Acacia stenoptera* and *Pimelea sylvestris*.

suitable habitat(b) means habitat known to support western ringtail possums (*Pseudocheirus occidentalis*) within the known current distribution of the species, typically characterised by abundant foliage, presence of suitable nesting structures such as tree hollows, as well as high canopy cover and continuity. Known habitat includes peppermint (*Agonis flexuosa*) dominated woodlands, jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) forests, riparian vegetation with a canopy of Bullich (*Eucalyptus megacarpa*) or flooded gum (*Eucalyptus rudis*), karri (*Eucalyptus diversicolor*) forests, sheoak (*Allocasuarina fraseriana*) dominated woodlands, and other stands of myrtaceous trees growing near swamps, watercourses or floodplains;

targeted flora survey means a field-based investigation, including a review of established literature, of the biodiversity of flora and vegetation of the permit area, focusing on habitat suitable for *Caladenia procera* and carried out during the optimal time to identify the species, which is during the flowering period between September and October. Where target flora are identified in the or in close proximity to the permit area, the survey must also include a minimum of a 10 metre radius of the surrounding areas to place the permit area into local context;

translocation means deliberate, human-mediated movement of living organisms from one area, with release in another for the purpose of establishing, re-establishing or augmenting a population. Movement includes between wild locations and populations, from a captive facility or ex situ population to a wild location, and/or from the wild to a captive facility for population growth, with an intention to return the individuals or their progeny to the wild;

vegetation condition means the rating given to native vegetation which refers to the impact of disturbance on each of the layers and the ability of the community to regenerate (Keighery 1994);

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or
- (c) not indigenous to the area concerned.

fauna specialist means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of 2 years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the CEO as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the Biodiversity Conservation Act 2016.



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Adrian Wiley
SENIOR MANAGER
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

3 July 2020

Appendix C: Compliance reporting time frame approval



Australian Government

Department of Agriculture, Water and the Environment

Ref: 2017/7932

Mr Sean Nicholson
Senior Environment Advisor
Assets Planning and Delivery
Water Corporation
Locked Mail Bag 2
Osborne Park Delivery Centre
OSBORNE PARK WA 6916

RE: EPBC 2017/7932 - Request to change compliance reporting

Dear Mr Nicholson

Thank you for your correspondence to the Department requesting changes to the compliance reporting for EPBC 2017/7932.

Officers of this Department have reviewed these requests and briefed me. As delegate of the Minister, I agree for the EPBC 2017/7932 compliance reporting dates to be aligned with the state clearing permit. Please note that in accordance with the relevant Annual compliance reporting condition, the Department must be notified by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication.

As you are aware, the Department has an active monitoring program which includes monitoring inspections, desk top document reviews and audits. Please ensure that you maintain accurate records of all activities associated with, or relevant to, the conditions of approval so that they can be made available to the Department on request.

Should you require any further information please contact Bayley Costin, Project Officer, Post Approvals Section, on 02 6274 1118 or by email: post.approval@awe.gov.au.

Yours sincerely

Kim Farrant
Assistant Secretary
Environment Assessments (Vic, Tas) and Post Approvals Branch
Environment Approvals Division

8 April 2022

Appendix D: **Western Ringtail Possum**

Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton

Year One

January 2021 – January 2022



Image 1: Western Ringtail Possum adult with juvenile using rope bridge (J Bamford)

Prepared for: Water Corporation
PO Box 210,
Mandurah, WA, 6210

Prepared by: Amanda Bamford, Joshua Bamford & Jake Bamford
M.J. & A.R. Bamford Consulting Ecologists
23 Plover Way
Kingsley, WA 6026



12th June 2022

Executive Summary

The Water Corporation widened the Vasse Diversion Drain in Busselton in 2020 - 2021 for flood mitigation, and since the conservation significant Western Ringtail Possum occurs in remnant vegetation that was impacted by drain widening, Bamford Consulting Ecologists was commissioned to undertake the displacement of possums prior to clearing along the drain in two areas: a northern area between Queen Elizabeth Avenue and the Busselton Bypass Road, and a southern area near the Golf Course (VROS). BCE was also commissioned to conduct ongoing monitoring of the population and their use of installed shelters and rope bridges over a ten-year period, as a condition of the approval of the drain widening project. This report covers the first year of post-disturbance monitoring (January 2021 – January 2022).

Of the 43ha project area surveyed in 2019 prior to the project's approval, where 206 dreys and at least 66 possums were recorded, only 1.9ha was cleared in 2020. Forty-one dreys and hollows and 36 possums were identified in the impact area prior to clearing. Prior to and during clearing in November 2020, all possums were successfully relocated into adjacent vegetation without mortality or injury. Of the 41 dreys found, 23 were able to be relocated, and a further 63 artificial shelters (dreys and hollows) have been installed, making a total of 87 new shelter locations (a commitment was made to provide 82 additional shelters). Rope bridges were also installed along the north side of the drain adjacent to College Avenue and Scott Street, to increase connectivity and reduce the need for possums to go to the ground to travel between trees, where they are at risk of predation by foxes, cats and dogs.

Since most possums could remain within their home ranges, handling was avoided where possible to minimise stress. In most cases, animals could be displaced into adjacent vegetation without handling them. Trees were checked and animals displaced immediately prior to clearing, to avoid them returning to the clearing area. Eleven possums had to be hand-captured and moved; four were moved without touching them, while contained within or holding onto the top of an artificial or natural drey; two were moved while within hollows; and two were moved by encouraging them to climb onto the net and carrying them to safety while perched on top of the net. The remaining 17 were displaced by gently disturbing them from their dreys and herding them to adjacent, safe trees. Clearing debris was then removed immediately to prevent animals trying to return.

Six monitoring periods were undertaken during Year One; January, March, April / May, August, September 2021, and January 2022. There were 38 possums recorded in the area adjacent to works in January 2021, following the disturbance. The numbers remained remarkably stable, with a minimum of 31 recorded in March 2021, which is consistent with the dispersal of juveniles, and had increased to 45 in January 2022. This increase may be due to the provision of additional shelters, or a result of the wet spring, which may have improved the quality of food plants available to the animals. It seems likely that many of the animals found during monitoring are those who were displaced from the impact area but have stayed within their remaining home ranges.

In January 2021 14 possums were found on branches, not associated with shelters, however by January 2022, although several animals were at the entrances of shelters or outside because of hot weather, all were associated with shelters.

Both Brushtail and Western Ringtail Possums were recorded using rope bridges, indicating that the design is successful. Future monitoring of rope bridges will determine which bridges are used most often, and the extent to which they are contributing to connectivity.

Relocated dreys were used initially then most became disused, except for two, which were still in use in September 2021. One of these was still being maintained in January 2022.

Artificial shelters were used consistently throughout the year. Twelve to 18% of possums located during monitoring periods were using artificial shelters. The lowest usage was during the September monitoring period, when mothers have large joeys, and probably prefer natural dreys which they can 'extend'. Artificial 'short hollows' were the most commonly occupied (80% were used in at least one monitoring period) with plastic filter buckets also being surprisingly popular (60%). Coconut-lined dreys were used until possums harvested the coconut for use elsewhere, after which they were less attractive. Artificial shelters lined with paperbark and coconut appear more attractive and lasted longer than coconut alone, however additional trials will need to be made to confirm this due to the small sample size (only 2 dreys due to the availability of sustainably sourced paperbark)

Unlike the results of monitoring along the Vasse Diversion Drain between Queen Elizabeth Avenue and the Busselton Bypass Road, possums have not been detected in any of the artificial dreys at the VROS since March 2021. It is likely that fragmentation of the area has made it unsuitable for possums, and this is likely to continue unless revegetation occurs in collaboration with the farmers adjacent to the site.

Tranen Revegetation SouthWest is continuing revegetation work, which will provide increased food and connectivity. Once vegetation has established, it should also provide additional locations for natural dreys to be constructed, and possibly result in an increase in the population of possums. Additional dreys and an increase in possum numbers should be detectable within the ten-year monitoring timeframe for the project.

Relocated natural dreys performed an important function immediately following displacement of the possums but will need replacement as they deteriorate to maintain the numbers of additional dreys provided, as committed to as part of approvals for the project. While this is a requirement, the possums are now constructing their own dreys, so it will be interesting to see if increasing the numbers of artificial dreys increases usage of them.

Revegetation should proceed as quickly as practical to ensure the animals continue to have sufficient food resources to support them during lean times. The increased connectivity provided by plantings will also allow possums to move between the population along the drain and the rest of Busselton, improving the species' long-term viability in the area.

Results of the first year of monitoring suggest that the displacement and disturbance due to drain works had not greatly impacted possum numbers, that artificial shelters are helping to

house the population and that rope bridges are of a suitable design to keep possums off the ground and improve connectivity. Future work will help to better assess these initial findings, and effects of revegetation work, which is likely to provide significant positive impact within the next ten years.

INTRODUCTION

The Water Corporation manages a network of drains in the vicinity of Busselton and in October 2020 – April 2021 works were undertaken to widen the Vasse Diversion Drain for flood mitigation. This widening affected some vegetation alongside the drain, but not the full width of this vegetation. An Environmental Impact Assessment conducted by GHD (2017) found that the Western Ringtail Possum *Pseudocheirus occidentalis*, which is a listed conservation significant species (Critically Endangered under both the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Biodiversity Conservation Act 2016*) occurred in vegetation adjacent to the drain. Widening of the drain could affect >0.5ha of what might be primary corridor habitat for the species (*sensu* DEWHA 2009) and based on EPBC Act Policy Statement 3.10 (DEWHA 2009), this would be a significant impact. Therefore, the Department of Biodiversity, Conservation and Attractions requested the Water Corporation provide more information on the distribution and abundance of this species along the drain. Bamford Consulting Ecologists was commissioned to undertake this work in 2019.

The Vasse Drain Diversion Upgrade project was assessed Bilaterally by the DWER Native Vegetation branch under Part V of the EP Act [WA] and by AWE under the EPBC Act 1999 [Cwth] and the project was referred under the *EPBC Act* (Cwth). The project is a ‘*Controlled Action*,’ so all activities must be undertaken in compliance with conditions set in the EPBC 2017/7932 Approval Conditions.

Following surveys of the 43ha project area in March 2019, where 206 dreys and at least 66 possums were recorded, areas were revised and only 2.16ha was identified as the impact area to be cleared in 2020.

A Fauna Management Plan for the Vasse Diversion Drain Upgrade was developed by Bamford Consulting Ecologists as part of the Approvals process and provides a detailed description of commitments and approach, as well as a summary of current research on Western Ringtail Possums and their requirements (Bamford et al., 2020). Implementation of the plan commenced in October 2020, prior to works commencing.

The Water Corporation committed to revegetation to re-establish and improve connectivity of vegetation, and the installation of rope bridges and fauna shelters, including ten years of maintenance and monitoring with the aim that any long-term effect of the works will be a positive one. Bamford Consulting Ecologists was commissioned to undertake relocation and subsequent monitoring of fauna in response to the disturbance and amelioration activities. The agreed approach was to gently displace the animals from the clearing zone but keep them within their home ranges where possible. By avoiding or minimising handling, personnel were able to keep stress to the animals to a minimum. Cowan et al. (2020), links the poor survival of relocated animals to the stress associated with their capture, handling and transport. Studies of Western Ringtail Possums report high mortality of relocated animals (Clarke, 2011, Thompson & Thompson, 2009). Transfer of parasites (Dunlop & Watson, 2022) can also occur when animals are moved out of their home ranges. Since the disturbance

was only to affect a narrow area, displacement, rather than translocation was the preferred option.

Western Ringtail Possums are nocturnal and shelter in tree hollows, or build shelters called ‘dreys’ in which they sleep during the day. Dreys are clumps of twigs and leaves that are generally quite conspicuous and placed in the mid canopy of trees (See Images 8 & 9 in Appendix 1). A possum may have five to eight dreys across a home range of 0.5 – 1.5ha, and home ranges overlap (Jones, 2000).

Clearing works were carried out from October to December 2020 and construction was completed in April 2021. Artificial shelters were installed, Western Ringtail Possums and other fauna were displaced from the clearing areas in October and November 2020, and a survey was carried out in January 2021 to make a preliminary assessment of the shelters and the possum population following displacement. Monitoring of possums and their use of shelters and rope bridges has continued during 2021 – 2022 and this report covers Year One of the study; the period of January 2021 to January 2022.

Over its ten-year period, the monitoring program aims to determine:

- the effects of disturbance on the numbers and distribution of Western Ringtail Possums adjacent to the disturbance areas along the Vasse Diversion Drain.
- Whether artificial shelters are used by possums and can contribute to the maintenance of the population, post disturbance
- Which shelter designs are preferred by Western Ringtail Possums,
- Whether rope bridges will be used by possums and are therefore effective in improving connectivity in a disturbed landscape
- Whether revegetation is being accessed by possums and results in increased habitat for the species during a ten-year period.

This Year One report analyses data collected to date to inform these questions.

METHODS

Description of Project Area

The project area consists of land along two parts of the Vasse Diversion Drain (Figure 1). The northern area lies between the Busselton Bypass Road in the south and Bussell Highway in the north and includes some extra land in small reserves to the south of the drain. Much of the vegetation consists of Peppermint *Agonis flexuosa* forest and woodland, with varying proportions of Marri *Corymbia calophylla*, Flooded Gum *Eucalyptus rudis*, Jarrah *Eucalyptus marginata*, Coojong *Acacia saligna*, Swamp Banksia *Banksia littoralis*, Modong *Melaleuca priessiana* (Saltwater Paperbark *Melaleuca cuticularis* where the drain crosses The Broadwater), Spearwood *Kunzea* sp., and occasional other tree and tall shrub species. The understorey is generally in poor condition. Vegetation is in best condition on the south side of

the drain, between Queen Elizabeth Avenue and the Busselton Bypass Road. Open areas of weedy grasses are present, although these are being managed as part of rehabilitation.

The southern area lies adjacent to the Busselton Golf Course, east of Chapman Hill Rd and includes land on the eastern side of the drain, as well as encompassing a section of the Vasse River. This is the site of the Vasse River Overflow Structure (VROS). The vegetation is generally degraded and in places parkland cleared and grazed, with an open woodland of Peppermint and Flooded Gum, some planted, non-native eucalypts and some riparian woodland along the Vasse River. The trees which provided some connectivity through the site were removed for construction of the VROS, so the remaining vegetation is fragmented (see Figure 1c).

The total area cleared was 1.9ha (see Figure 1 a, b and c), however the project area for this study also includes sites in adjacent bushland and rehabilitation areas into which artificial shelters, relocated dreys and rope bridges have been installed, and will increasingly include the rehabilitation areas as plantings mature and become attractive to possums.

(a)



(b)



(c)



Figure 1 (a,b,c). The project areas. The northern site (a and b) stretches from Busselton Bypass Road in the south to Queen Elizabeth Avenue in the north. Figure 1(c) shows the Vasse River Overflow Structure (VROS) site. Areas that were cleared are hatched yellow.

Approach

This report covers the first year of a ten-year study following the disturbance and relocation of possums due to clearing. All relocation work was carried out in accordance with the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al., 2020) and focussed on minimal disturbance to the animals. During clearing, animals had been displaced as little as possible, ideally within their existing home ranges, while moving them from the impact area. In most cases, this was able to be done without capturing the possums, to minimise disturbance and stress to the animals. Thirty-six possums were displaced from the clearing area during operations. All animals were relocated successfully without injury or mortality. In most cases, the animals were moved no more than 20 metres and in some cases as little as five metres. Details of the displacement techniques employed are given in Bamford et al. (2021).

Since most animals were not handled, they were not individually marked, so assessment of the population is undertaken by recording numbers and locations of animals and dreys. Given the sedentary nature of most of the animals, this is likely to be an accurate measure of the impact due to clearing and means that disturbance of the animals (and confounding of the results by the impacts of handling) has been kept to an absolute minimum.

Rope bridges are monitored using motion sensitive cameras, observation and scat records to search for evidence of use.

Survey methods

Monitoring is undertaken by Amanda (Mandy) Bamford (B.Sc. Hons. Zool.) and Mike Bamford (B.Sc. Hons. Ph.D. Biol.). Mandy and Mike have many years of experience in management of the Western Ringtail Possum (hereafter referred to as possum). The work was carried out under DBCA Permit numbers TFA 2020-0149 and FR28000164, undertaken with reference to the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al, 2020) and informed by observations in Bamford et al (2021). Field assistance was provided by Jake Bamford (B.C.I.) and Joshua Bamford (B.Sc. B.Mus. Hons. M.A.), and Data Management was undertaken by Joshua Bamford.

Possum monitoring was carried out in January, March, April / May, August, and September 2021, and January 2022. Monitoring was carried on fine days once the sun was up to protect camera equipment and minimise disturbance to possums. Previous experience (Bamford pers. obs.) is that possums are often only dozing on overcast days or at first light and are easily disturbed. In bright sunlight they are usually firmly asleep and dreys may be checked without disturbing them. All artificial shelters and relocated natural dreys were checked with binoculars or a pole camera to assess their status and check for possums. Natural dreys, hollows and possums sighted out of dreys adjacent to the cleared area were also recorded opportunistically. Recognising that it was important to minimise disturbance during monitoring, the pole camera was used for the minimal time, and just close enough to check for activity and take a photo, to disturb the animals as briefly as possible. In some natural dreys, it was not possible to access the drey using the pole camera without disturbing the animal, in which case the drey was checked using binoculars.

Handling of Fauna

No fauna requires handling as part of the post disturbance monitoring phase of the project. Checking of dreys is done with minimal disturbance and cameras are unbaited, so do not alter the behaviour of the animals. Bamford Consulting Ecologists operates under Scientific Use Licence U261 2021-2022 and if animals require handling for any reason, personnel use techniques outlined in the Fauna Sampling Manual by Bamford et al. (2013).

Relocated and Artificial Dreys

As outlined in the Fauna Management Plan (Bamford et al., 2020), a range of shelter types was installed in the project area in a variety of locations to augment the shelters available in relocation areas and trial the attractiveness to possums of the different designs. The types included:

Relocated Natural Drey – a drey cut out from a tree before it was cleared and wired up into a tree outside the clearing zone.

Relocated Long Hollow – a long hollow cut from a tree in the clearing zone. There were only two of these so results are lumped with Short Hollows in this report.

Short Hollow – a short hollow log, capped at one end and chained with plastic coated chain to a tree, to minimise damage to the tree branch. Short hollows were chosen to trial as they may prove less attractive to European Honeybees *Apis mellifera* than long hollows and possums will shelter in short natural hollows.

Dome – a wire dome made from two hanging baskets wired together, with a quarter cut out for the entrance and lined with *Agonis flexuosa* leaves and twigs.*

Dome with Coconut Dome – a wire dome with matching coconut fibre liner and entrance hole. Two of these also contained paperbark*

Cup – a single hanging basket installed as a wire cup.*

Cup with Coconut – a single hanging basket lined with coconut.*

Plastic bucket – a plastic filter bucket.*

*In all cases, WA Peppermint *Agonis flexuosa* sprigs from the possum's nearest tree were added to each artificial drey to try to mimic as closely as possible the natural smell of the animal's home range. In some instances where an animal's natural drey could not be salvaged, material from the natural drey was added to an artificial drey to make the drey smell more familiar to the animal and perhaps make it more likely to be used.

Artificial shelters were installed throughout the project area, outside the impact area. Eighteen dreys and hollows were installed by Tree Surgeons WA, while they were installing the rope bridges. The remaining 68 relocated and artificial dreys were installed by Bamford Consulting Ecologists' personnel. Details of all dreys relocated and all installed shelters are given in Figures 2 and 3 and Appendices 2 and 3. Examples of shelter designs are provided in Appendix 1, Images 2 to 7.

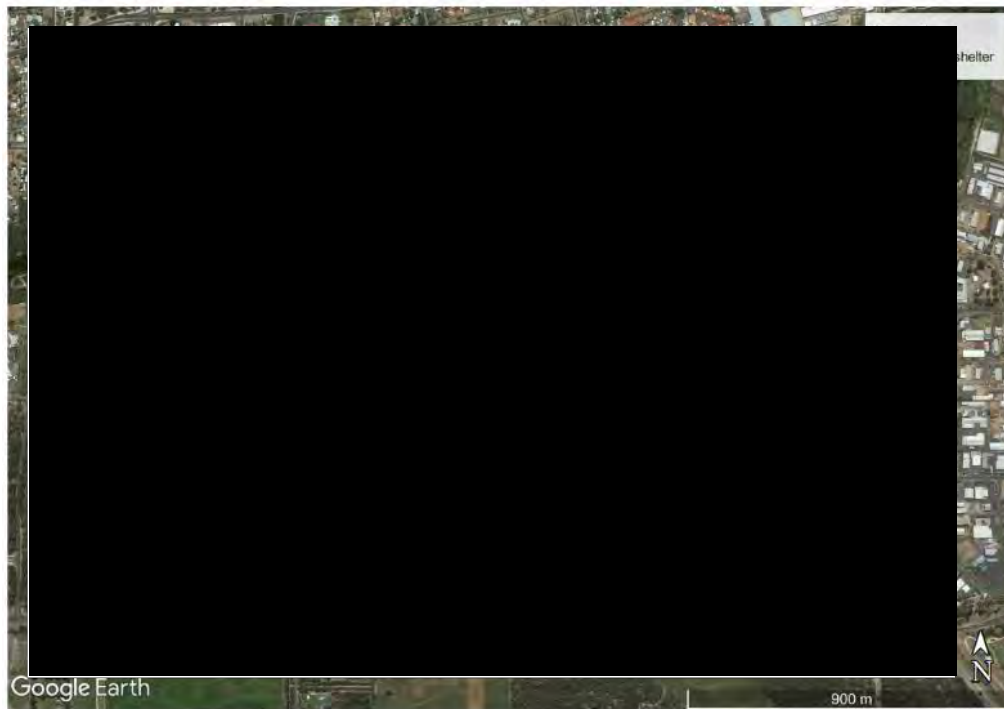


Figure 2. Locations of shelters for Western Ringtail Possums installed along the Vasse Drain in Busselton in October and November 2020.



Figure 3. The southern project area (VROS) off Chapman Hill Road along the Vasse Diversion Drain and [REDACTED], showing installed artificial shelters in red. The green marker was the location of a [REDACTED] which a possum was displaced during clearing. It ran to a hollow (marked in white), behaving as if it knew the location. This hollow immediately adjacent to works was occupied in January 2021, despite active construction taking place nearby. Since March 2021, the hollow has been unoccupied, however a new natural drey was discovered in March 2021, [REDACTED] (see Appendix 2, Figure 15)

Monitoring of Artificial Shelters

A check of all artificial shelters was carried out on six occasions throughout 2021 (January, March, April-May, August, September) and in January 2022. All locations were checked, shelters were photographed, and the state of the shelters recorded, noting any that needed repair or replacement. A pole camera was used to determine if the shelters were occupied by possums or had evidence of recent use (see Appendix 1, Image 34).

Monitoring of Natural Dreys

During the monitoring, a number of new Natural Dreys were discovered in the study area. Locations and occupancy of these dreys were recorded, and they were added to future monitoring sessions. If a natural drey became disused and fell from the tree it was excluded from future monitoring. Natural dreys that remained in trees continued to be checked, as these will sometimes be repaired and reused by possums.

Monitoring of Rope Bridges

A range of brands (Reconyx, Bushnell, Acorn, Swift Enduro) of motion sensitive cameras were trialled to monitor use of the rope bridges on three sessions of three nights during the year. The trials were undertaken to determine which cameras would appropriately target animal movement and not record the movement of ropes or branches. Three, one hour watches were also undertaken using binoculars.

When analysing camera data, groups of images of the same species taken less than five minutes apart were scored as a single instance to avoid overestimating the number of animals using the bridges.

In addition, opportunistic searches for scats underneath the rope bridges were undertaken during other monitoring activities.

RESULTS

Numbers of Possums

Figures 4 and 5 show the locations of Western Ringtail Possums prior to displacement, to provide context for interpreting the results of post-disturbance monitoring.

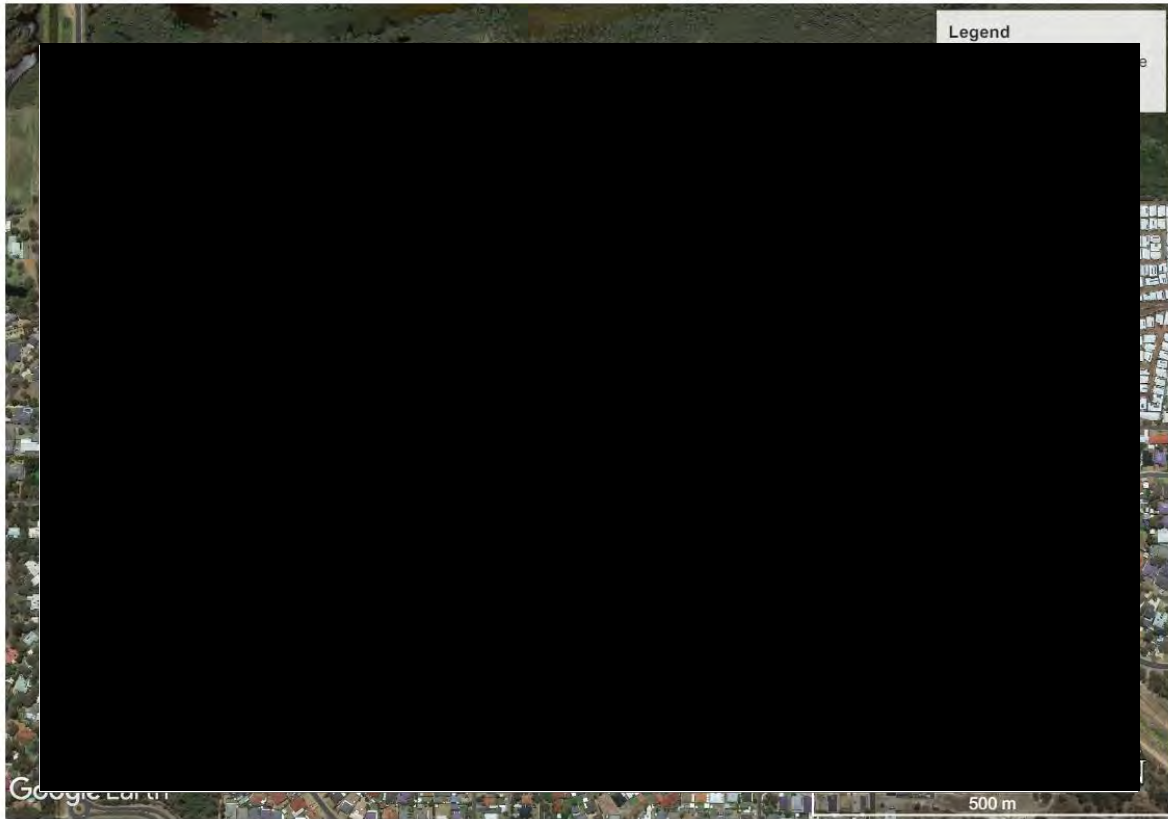


Figure 4. Locations of Western Ringtail Possums along the Vasse Drain in Busselton in October and November 2020, prior to displacement. White dots denote possums +/- joeys which were displaced, blue points indicate possums which were on the border of clearing works and were not moved as their trees were retained. Two of these retained trees contained possums in January 2021, despite being immediately adjacent to construction work, and one of them was occupied in January 2022.

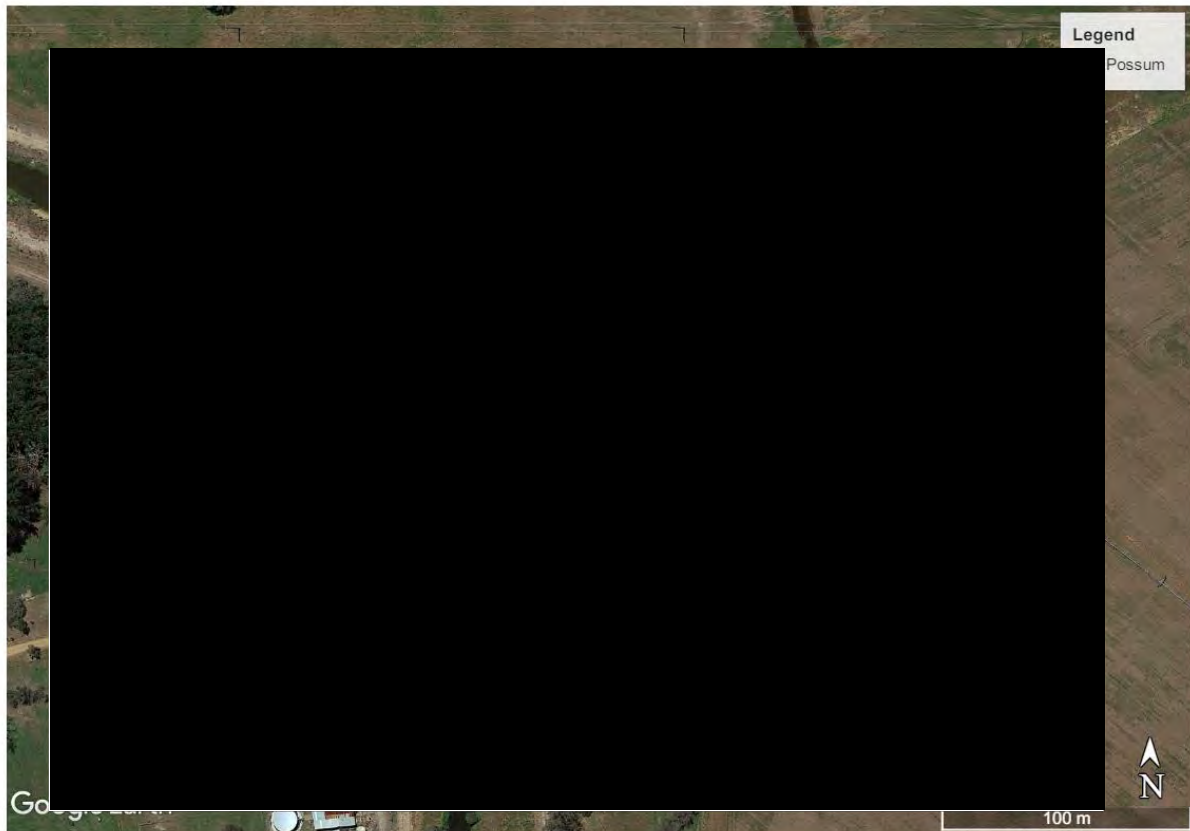


Figure 5. Locations of Western Ringtail Possums in the southern (VROS) site prior to displacement in November 2020. See Appendix 2, Figure 15 for results from January 2021 onwards.

Summary tables of data for Year One of monitoring are given in Table 1 and Appendix 2. Figures 7 to 9 illustrate the usage of natural and artificial dreys, and the numbers of possums in each monitoring period.

Numbers and locations of Possums

In January 2021, 14 of 38 possums (37%) were on branches not associated with dreys while six were using artificial shelters (16%). In January 2022, eight of 45 possums (18%) were using artificial shelters and although some were outside, or in the entrance of their drey, all possums were associated with dreys (see Figure 6). The numbers of natural dreys in January 2021 was 18 but in January 2022 it was 35. The overall number of possums was also higher in January 2022 than in 2021 (38 in January 2021, and 45 in January 2022).



Figure 6. Use of natural and artificial shelters by Western Ringtail Possums along the Vasse Diversion Drain in Busselton between January 2021 and January 2022.

Artificial shelters were used consistently throughout the year. Twelve to 18% of possums located during monitoring periods were using artificial shelters. The lowest usage was during the September monitoring period when 12% of possums were in artificial shelters. Artificial ‘short hollows’ were the most commonly occupied (80% were used in at least one monitoring period) with 60% (4 out of 6) plastic filter buckets being used on at least one occasion (see Table 1 and Figure 7). Coconut-lined dreys were used until possums harvested the coconut for use elsewhere, after which they not used. Two artificial shelters were lined with paperbark and coconut and one of these was used in five of six monitoring periods. The second was also used and lasted longer than coconut alone, however additional trials will need to be made to confirm this due to the small sample size (only two dreys contained paperbark due to the availability of sustainably sourced material).

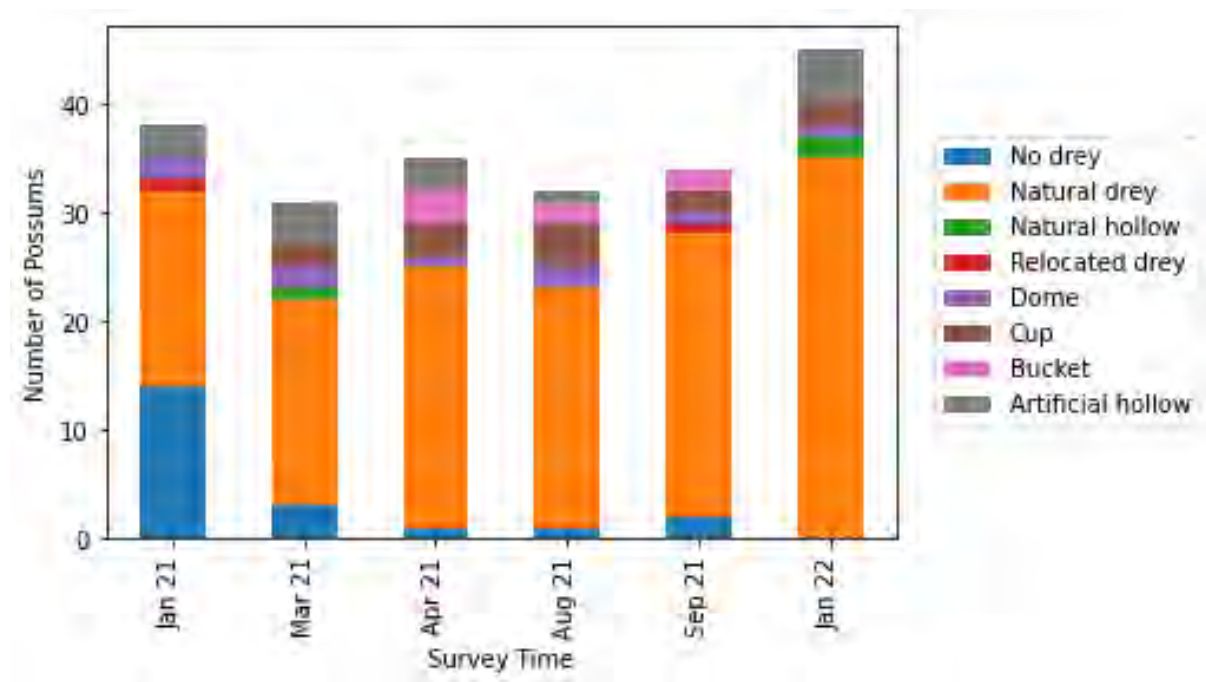


Figure 7. Comparison of the use of a range of artificial shelter designs by Western Ringtail Possums along the Vasse Diversion Drain in Busselton between January 2021 and January 2022.

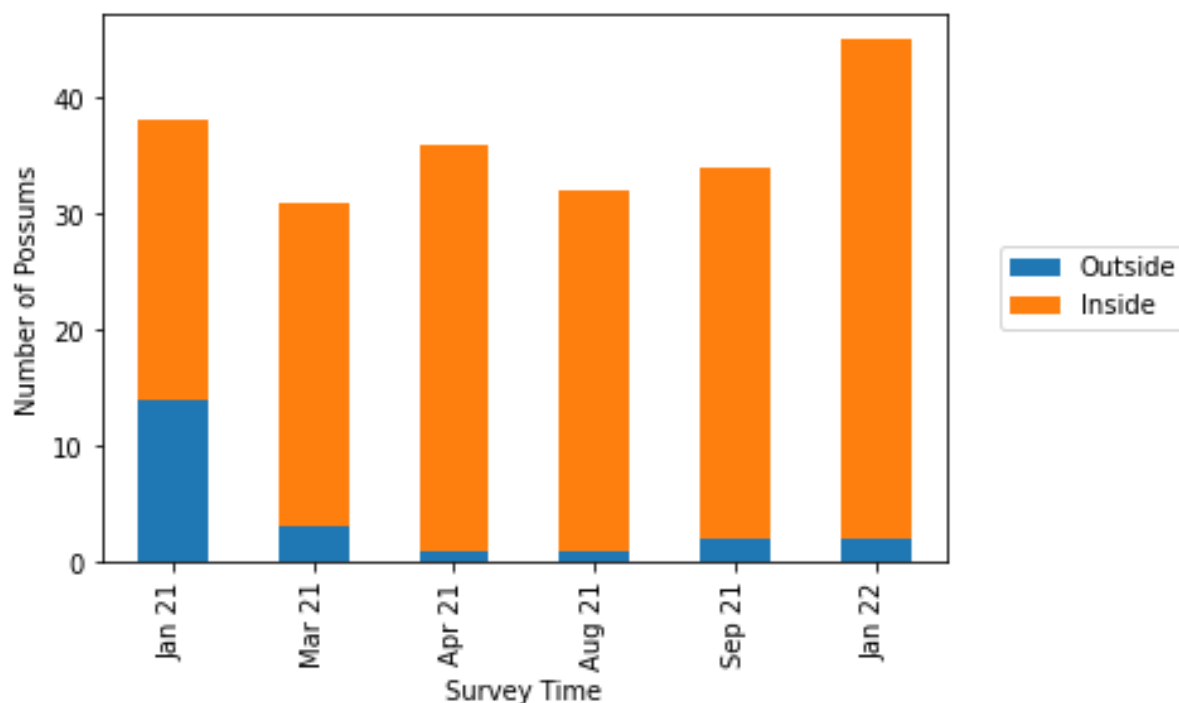


Figure 8. Comparison between possums inside and outside dreys between January 2021 and January 2022. Note that the 14 animals outside dreys in January 2021 did not appear to be associated with dreys. In March 2021, only four animals were outside, and did not appear to be associated with dreys. Subsequently, most animals were near to a natural or artificial drey. In January 2022, all animals were associated with dreys.

Table 1. Numbers and designs of artificial shelters installed along the Vasse Diversion Drain and their use by possums from January 2021 – January 2022.

Shelter type	Number installed	Number occupied in at least one monitoring period	Notes	Percentage of drey type occupied or used in at least one monitoring period
Relocated Natural Drey (NAT)	24	2	Two occupied in Sept 2021 One of these was maintained but empty in Jan 2022	2 (1%)
Dome with Coconut (DoCo)	17	4 (+1 maintained but empty when checked)	One drey was occupied in all but Jan 2022, others only occupied on one monitoring period. 2 of the 5 had paperpark as well as coconut. Most of the coconut fibre had been rearranged or removed by Jan 2022.	5 (29%)
Cup without Coconut (Cup)	12	1		1 (8%)
Cup with Coconut (CuCo)	14	6		6 (43%)
Installed or relocated Hollow (Hol)	10	8	3 hollows were occupied on 3 monitoring periods, 1 hollow was occupied twice, 3 hollows were occupied on a single monitoring period	8 (80%)
Dome without Coconut (Dom)	5	1	This drey has lots of peppermint twigs, and was open but sheltered	1 (20%)
Plastic Filter Bucket (Buc)	6	4	One was occupied in 3 of six monitoring periods	4 (60%)
Totals	87	26	1 (maintained)	27 (30%)
Totals excluding relocated dreys	63	24	1 (maintained)	38%

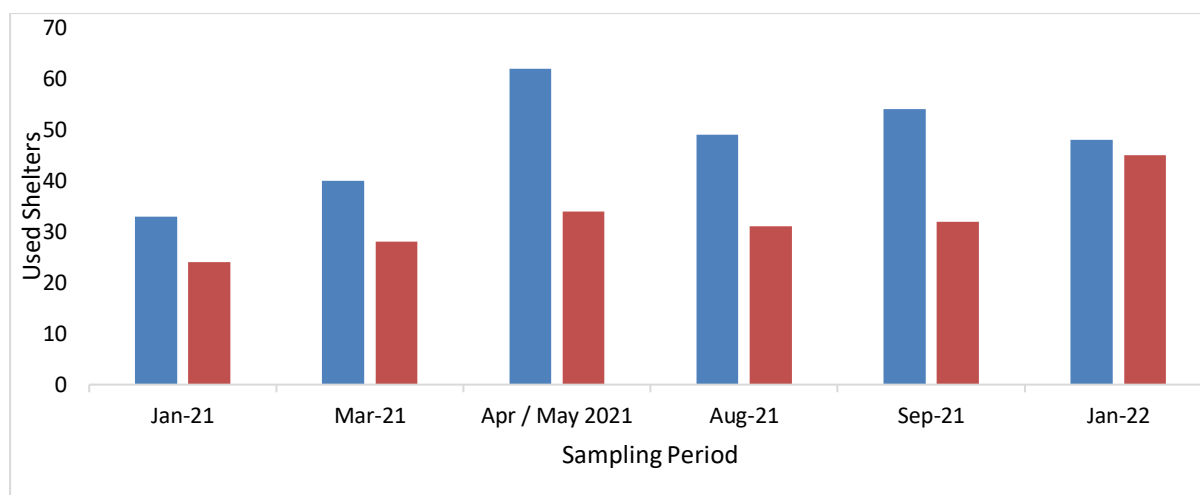


Figure 9. Numbers of shelters with evidence of use (blue) and occupied (red) during January 2021 – January 2022 monitoring periods. Used shelters included those that were occupied when checked, and those which had signs of recent use, such as fresh leaves, an obvious entrance and open area inside. This is likely an underestimate, as artificial and natural hollows are often not lined, and so recent use is difficult to determine.

Construction of Natural Dreys

Appendix 2, Figures 12 to 14 show time series with the locations of natural dreys constructed between January 2021 and January 2022. The largest number of new natural dreys was recorded in March 2021, with a small number of new ones being recorded in subsequent monitoring periods.

Use of Rope Bridges

During the first two camera sessions, sensitivity settings and movement of rope bridges and vegetation were problematic, resulting in over 24,000 photos, with no images of possums. One photo was taken of a juvenile White-faced Heron perched on one of the bridges. In January 2022 however, three instances of bridge use by possums were recorded over two nights in the revegetation area adjacent to Cook St industrial area. One was a Brushtail Possum, while the other two instances were of Western Ringtail Possums. A solitary Western Ringtail Possum was recorded on 19/01/22, and a female and joey were photographed over a five-minute period on 20/01/22, walking along, and perching on the rope. See Images 15 to 22, in Appendix 1, and on the cover of this report.

Western Ringtail Possum scats were observed under the rope bridge adjacent to Cook St industrial area in September 2021. See Image 26 in Appendix 1.

Behavioural Observations

January 2022 monitoring period (18 – 22 January 2022) occurred during an extended period of 38 degree days. A number of possums in January 2022 were observed with tails hanging out of dreys and hollows (Appendix 1, Image 31), and one was on its back with its pouch open and exposed to the air (Appendix 1, Image 30). Another hollow contained a collection of fur at the entrance which appeared to have been pulled out by the possum (see Appendix 1, Image 29).

One mother and joey were on the ground in a culvert with damp soil and green foliage when we came to check their drey, presumably keeping cool. When they saw us, they ran up the nearby tree and sat near their drey. We avoided photographing the drey and moved on quickly to minimise further disturbance.

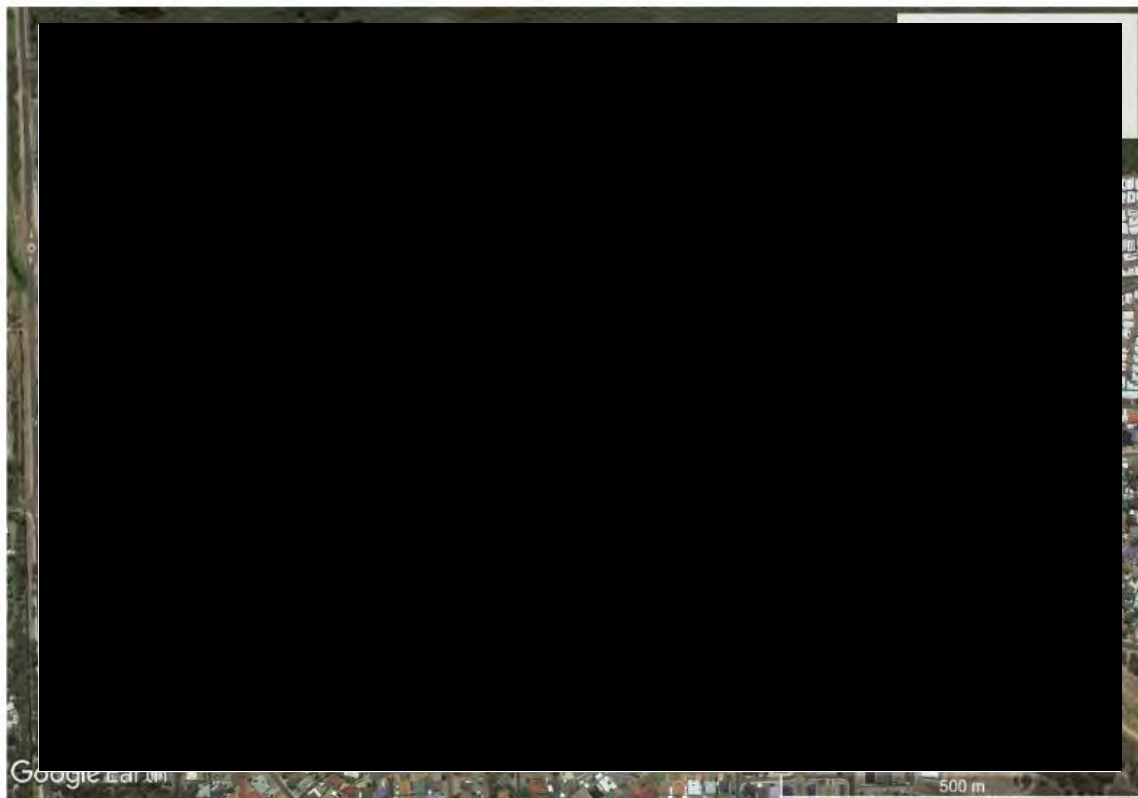


Figure 10. *Opportunistic records of Western Ringtail Possums along the Vasse Drain in Busselton during January 2021. Three of the natural dreys (white points) contained two possums. Data for other monitoring periods is displayed in Appendices 2 and 3.*

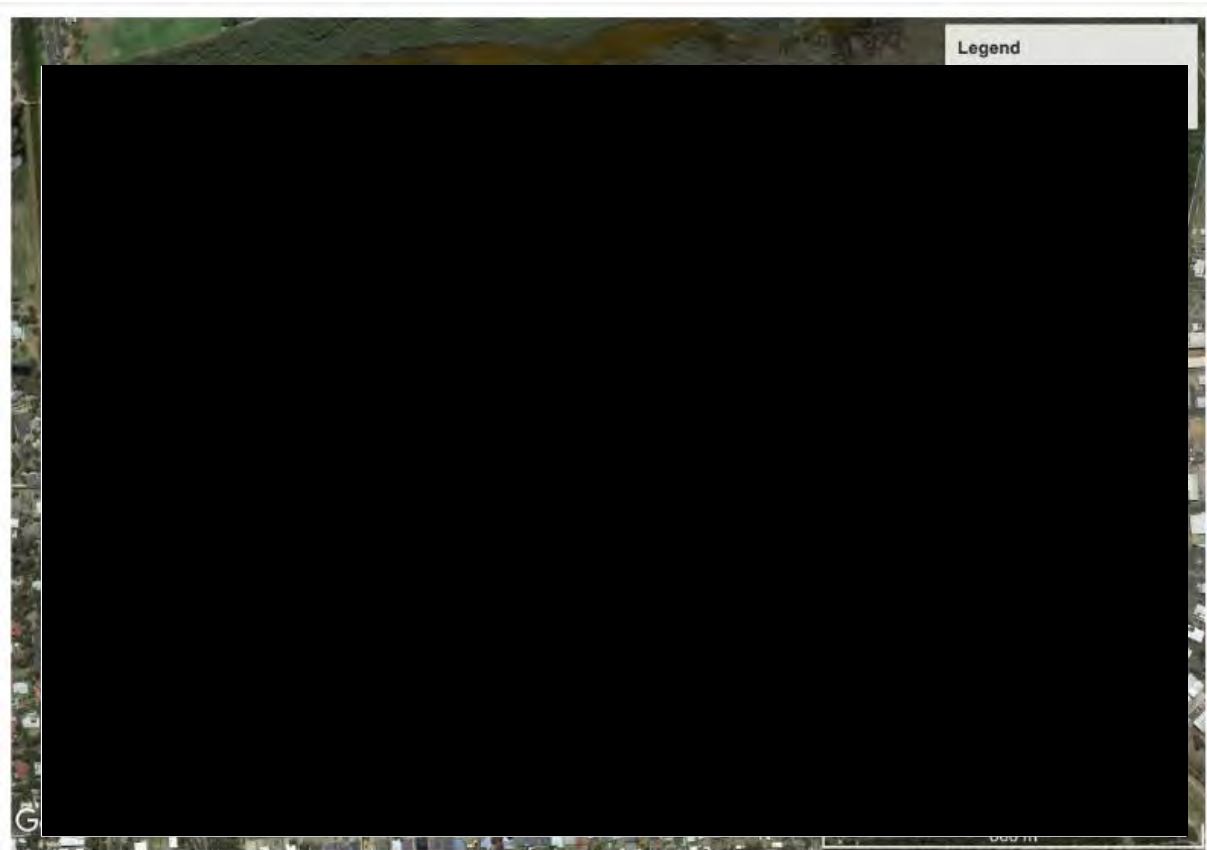


Figure 11. *Use of artificial shelters by Western Ringtail Possums along the Vasse Drain in Busselton during January 2021. Red points indicate shelters which contained possums when surveyed, blue points indicate shelters which contained green Agonis leaves or where coconut fibre had been rearranged.*

DISCUSSION

The first year of Possum monitoring following the drain widening works on the VDD and VROS has produced some encouraging preliminary results. The overall numbers of Possums have remained remarkably stable throughout the year; from 38 in January 2021, dropping to a minimum of 32 in August 2021 and increasing to 45 in January 2022. This suggests that the widening works have not had a large impact on the population numbers to date.

The use of the displacement technique outlined in the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al., 2020) to move possums from the clearing area appears to have been successful. All 36 possums were displaced from the clearing area without injury, many needing to be moved by less than 20 m. Most would only have been moved within their existing home ranges. By avoiding or minimising handling, personnel were able to keep stress to the animals to a minimum. Cowan et al. (2020), links the poor survival of relocated animals to the stress associated with their capture, handling and transport. Studies of Western Ringtail Possums report high mortality of relocated animals (Clarke, 2011, Thompson & Thompson, 2009) however observations from the first year of the present study suggest that many animals remained in the area following displacement. Ongoing surveys will better inform these preliminary observations.

Relocated dreys were probably important initially but most became disused once the possums had the opportunity to build new dreys or adopted artificial shelters. Interestingly, two relocated dreys were being used in September 2021 and one was still being maintained in January 2022 although was not occupied on the day of monitoring. Since possums have multiple dreys in their home range, the animal almost certainly uses this drey on occasions.

Artificial shelters were adopted quickly and have been used consistently throughout the monitoring period. The availability of additional shelter is likely to have supported the population of possums following displacement and may have contributed to the sustained increase in numbers of possums in January 2022 by providing additional shelter for newly independent juveniles.

While relocated dreys probably perform an important function temporarily, ultimately they will need to be replaced with additional artificial shelters, to fulfil commitments made as part of project approvals to install double the number of artificial shelters as were removed and maintaining them for ten years (DWER Clearing permit CPS 8191/1). Many new, natural dreys were constructed adjacent to the clearing area between January and March 2021, suggesting that some displaced possums had chosen a new location within their home range and built a natural drey. Smaller numbers of new, natural dreys continued to be constructed in areas adjacent to the clearing area, throughout the rest of the sampling period (Figures 12 to 15, Appendix 1), probably at a rate more consistent with the natural turnover of dreys due to disturbance caused by weather events and other non-human impacts. It will be interesting to see if increasing the numbers of artificial dreys increases usage of them in the long term, or if some animals prefer to build their own.

Many new, natural dreys were constructed across the site between January and March 2021. Some were close to maternity dreys, suggesting that juveniles had initially built dreys close to their mothers. The construction of many natural dreys during this period may also have been due to displaced animals constructing new dreys to replace the dreys that were cleared, and those relocated dreys which had begun to deteriorate. In January 2021, 14 possums were counted on branches, apparently not associated with dreys, whereas in March 2021 only four were not associated with dreys. Although three possums were out of their dreys in January 2022 (probably due to the hot weather), all of them were associated with dreys. In particular, one mother and joey were on the ground in a culvert with damp soil and green foliage when we came to check their drey, presumably keeping cool. When they saw us, they ran up the nearby tree and sat near their drey. We avoided photographing the drey and moved on quickly to minimise further disturbance. It would be interesting to compare the number of natural dreys constructed between January and March in future years, without the disturbance caused by displacement and drain widening works.

The number of possums using natural hollows is probably an underestimate, as the pole camera is not always able to detect them, if the hollow is curved. In January 2022, two animals were detected because their tails were hanging from their hollow. In some parts of their range with a greater number of trees with large hollows, Western Ringtail Possums rarely build dreys and are often difficult to detect without spotlighting transects, as they spend their days deep in hollow trees. Since the numbers of suitable natural hollows in the trees along the Vasse Diversion Drain is small, and spotlighting transects were carried out at the site before works began, the numbers of animals remaining undetected within the study site is likely to be low (less than five animals).

During the hot weather in January 2022, possums exhibited a range of behaviours probably associated with cooling. Hanging tails in the breeze, plucking hair and exposing bare skin on their tails, bellies and pouches, and seeking shelter in cool, damp vegetation are all behaviours that are likely to help the possums to manage their temperature in heat extremes. Saliva spreading has been observed to be used as a cooling mechanism in Red Kangaroos (Dawson et al., 1974). Van Helden et al. (2021) found Western Ringtail Possum abundance to be correlated to canopy cover in Albany. Revegetation and continued access to shady gardens are likely to be important to the long-term survival of the possum population in Busselton.

Artificial shelters are being used by the possums, with the preferred designs varying perhaps due to seasonal changes in weather conditions, or the breeding cycle of the animals. Artificial ‘short hollows’ were the most commonly occupied design (80% were used in at least one monitoring period). Short hollows seem to be preferred in the non-breeding season, however only one artificial hollow was observed to be used by a mother with a joey, presumably because hollows are not easily expanded to accommodate a growing joey. In Busselton, maternity dreys sometimes have a ‘granny flat’ arrangement when the juvenile is close to independence (pers. obs.), and this would be more difficult to accommodate in a short hollow. Short hollows are highly favoured at other times of year however and have the advantage over large hollows that to-date, none has attracted feral bees.

Artificial shelters were used consistently throughout the year. Twelve to 18% of possums located during monitoring periods were using artificial shelters. The lowest usage was during the September monitoring period, when mothers have large joeys, and probably prefer natural dreys which they can ‘extend’.

Black plastic buckets were initially unused but were a popular choice in August and September 2021. One bucket was occupied on three of the six monitoring periods. Domes were popular when covered with coconut but were mostly unused once the coconut was removed by the possums or had collapsed. One peppermint lined dome without coconut was also used. Two coconut-lined domes also contained paperbark. Both these domes were used, one was occupied in five of the six monitoring periods. It is possible that the waterproofing and insulating properties of paperbark, long recognised and utilised by Noongar people (Hansen and Horsfall, 2019) are also valued by the possums. Artificial shelters lined with paperbark and coconut appear more attractive and lasted longer than coconut alone, however additional trials will need to be made to confirm this due to the small sample size (only two dreys due to the availability of sustainably sourced paperbark).

Cups were used consistently and continued to be used even when coconut had deteriorated, unlike the domes, possibly because the animals could escape more easily and felt less vulnerable to predators than inside an immovable wire frame with only one exit.

These are preliminary data only on the preference of different artificial drey designs and are confounded to some extent by the short-term disturbance caused by the drain widening project, and by the deterioration in coconut, which may have changed the attractiveness and functionality of the coconut-lined cups and domes. The reduction in use of the domes may have been due to the increase in natural dreys, and the possums’ preference for sheltering in dreys they have constructed themselves, or it may simply be that they are no longer as attractive once the coconut has been removed. In some cases, the coconut was harvested by the possums to construct an alternate drey elsewhere! Additional artificial shelters are required to be added to replace the deteriorated relocated natural dreys, so it is proposed that these dreys be a selection of paperbark-lined, coconut fibre and plastic filter buckets, to provide further data on the most effective shelters to support populations of possums in disturbed areas with insufficient natural shelter. To answer this question, it would be necessary to maintain a more regular monitoring regime than has been proposed beyond Year One. This would allow additional coconut and paperbark-lined dreys, and plastic filter buckets to be progressively reintroduced and monitored throughout the site at different times of year, to account for seasonal variation in drey choice. This possibility will be discussed with the client.

VROS

Clearing in the VROS area has resulted in a highly fragmented landscape, and possums and the artificial dreys are on a ‘dead end’ without connectivity, and with less vegetation than in 2020, so are probably less attractive to possums. The artificial dreys in the VROS area were used initially, and although one possum stayed immediately adjacent to the VROS area in a natural hollow (WP1 in Figure 15, Appendix 2) throughout most of the construction period, it

was no longer in the hollow in March 2021 and a natural drey (466) was found further north along the river, which was probably constructed by this individual (see Figure 15, Appendix 2). By September 2021, this drey had deteriorated and no evidence of possums was found in the area. This is probably to be expected, given the number of trees removed and the consequent loss of habitat and connectivity. If trees are replanted outside the VROS structure, this effect could be reversed in time, however the land surrounding the VROS area is privately owned farmland, so any plantings in the area would need to be negotiated with the landowner.

Rope Bridges

Rope bridges were used by both Brushtail and Western Ringtail Possums. It is encouraging to find clear evidence of their use. Previous studies such as Yokochi and Bencini (2015) which monitored Western Ringtail Possums' use of rope bridges, found that the animals began using them within 36 days of installation. In their study the structures were heavily engineered, static bridges which move less in windy conditions, and tend to have less vegetation to interfere with the functioning of cameras. The movement of ropes and branches has made monitoring of the bridges in this study more difficult than expected, resulting in thousands of photos of non-target objects at high sensitivity, and no photos at lower sensitivity. The results of the trial of different camera brands was encouraging, with Swift Enduro demonstrating the most effective detection of possums. We will therefore deploy more Swift Enduro cameras in the coming year to better assess rope bridge usage.

Despite the difficulty of achieving consistent results, we were able to demonstrate that the bridge design is successful. Western Ringtail Possums are comfortable using the bridges and were recorded on consecutive nights in January 2022, along with a Brushtail Possum. A sequence of several minutes shows a mother and joey wandering along a bridge very securely (see Images 22 to 25 in Appendix 1).

The value of each tree

Bamford et al (2021) noted that animals were continuing to use trees retained immediately adjacent to the clearing area while work continued on site and emphasised the importance of retaining individual trees where possible. Several of the trees in the strip of vegetation immediately adjacent to the impact area continue to be used by possums. These include several trees with dreys which were marked to be cleared in November 2020. After consideration, a decision was made by the client and contractor to retain them. Three animals recorded in January 2021 were in dreys or hollows directly overlooking the construction site but the animals had persisted in them, tolerating the disturbance. These sites continued to be used during 2021 and one retained, natural drey, immediately adjacent to the drain, was still in use in January 2022. Decisions made to reduce clearing, even by a single tree, can improve the outcome for fauna.

In order to maintain the displaced animals at the site in the long term despite the reduction in habitat, it is essential that additional food resources are provided in the form of revegetation, as soon as is practical. Although food resources do not appear to be limiting at present and

all animals appear in good condition, there is a risk that drought conditions or insufficient nitrogen in leaves will begin to affect the population. The wide range of plant species selected for revegetation and being implemented by Tranen (Tranen Revegetation SouthWest, 2020), including Coojong *Acacia saligna*, *Kunzea sp.* and Marri *Corymbia calophylla*, as well as WA Peppermint *Agonis flexuosa*, and a range of understorey plants will provide the varied diet which Mathieson et al. (2020) found Western Ringtail Possums prefer. Some plants are already beginning to resprout along the fence line adjacent to the impact area and will rapidly begin to provide additional food (see Image 32, Appendix 1).

Revegetation will also re-establish and enhance connectivity, supplemented by the rope bridges which were installed by Tree Surgeons WA. Increased connectivity will allow possums to move between the population along the drain and the rest of Busselton to access food resources, expand home ranges and find mates, improving the species' long-term viability in the area. Rope bridges and revegetation will also enable possums to travel without going to the ground, avoiding the risks of Foxes and cars, both identified as major threats to the viability of the Busselton population by (Yokochi *et al.*, (2015).

An alternative explanation to the increase in numbers of possums in January 2022 could be lack of connectivity; if juveniles were unwilling or unable to disperse to other areas due to reduced connectivity. This seems unlikely, as researchers such as Yokochi et al. (2015) have suggested that stranded animals tend to go to the ground and cross roads (with associated mortality) and possums have demonstrated their ability to use the installed rope bridges.

Engaging the community

Part of the long-term success of the project will be engaging the community in areas adjacent to the drain with possum conservation, helping them to value the critically endangered species which shares their suburb. Many of the animals monitored in this study have home ranges which overlap with residential and industrial properties, and so the actions of the human occupants of their home ranges could have a huge impact of the success or otherwise of the Water Corporation's rehabilitation in the area. Encouraging residents to retain and replant native trees, provide connectivity above ground to keep possums away from domestic pets, and being prepared to accept the occasional rose bloom or nectarine being harvested by possums (or netting the trees) will help to ensure the possums' long-term survival in the suburbs. There is increasing evidence that Western Ringtail Possums survive better in suburbs than they do in remnant bushland (Van Helden et al., 2020, Busschots et al., 2021), so residents can play a vital role in the species' conservation.

Although the Vasse Diversion Drain Widening Project has caused disruption to the Busselton population of Western Ringtail Possums in the short term, it has the potential to contribute to the possums' long term survival by improving the availability of high nutrient foliage for food, increasing the availability of suitable structures for protection/breeding, and canopy continuity to escape predation and other threats, all issues identified as important by Department of Parks and Wildlife, (2017) and Bamford et al., (2019). In addition, ongoing engagement with residents adjoining the drain to encourage them to make their backyards possum-friendly will

contribute to sustaining the possum population in the long term. Future monitoring of the Western Ringtail Possum population along the drain as part of this project will help to show if this potential is realised and can be sustained.

CONCLUSIONS

While only preliminary data, the first year of possum monitoring at the VDD and VROS sites suggests that the minimal displacement method, choosing to retain trees that were on the border of the development, providing artificial shelters and rope bridges have minimised the impact on the possum population. The population has remained stable, and shown a slight increase in January 2022, suggesting a good survival of juveniles following the 2021 breeding season. The increase in numbers is probably a reflection of high rainfall in spring but may also reflect the provision of additional shelter.

Relocated natural dreys were probably important in the short term but most became disused after a few months, and most possums were found in newly constructed natural dreys, and in artificial shelters by March 2021. A small number of relocated natural dreys continue to be used however the provision of additional artificial dreys is likely to be helping to support a higher population. Artificial dreys were used by the possums at a rate of 12 to 18% (percent of possums recorded in an artificial shelter during a monitoring period), although there appeared to be a seasonal pattern in their preferred designs. Artificial hollows appeared to be favoured in the non-breeding season, whereas plastic buckets and cups with coconut were chosen at other times of year. More paperbark lined domes should be trialled once a sustainable source of paperbark is identified, as the sample size is too small at present. There is insufficient data to draw firm conclusions yet regarding drey design, because of the confounding effects of disturbance and seasonality, and harvesting of coconut by possums.

Since 41 dreys were removed during clearing, replacement of relocated natural dreys is required to meet the condition 15 of DWER Purpose Permit CPS8191/1 (Bamford et al. 2020) to increase the number of additional shelters to 82. This would require an additional 18 shelters. These could include a range of artificial designs, as well as replacing coconut in some existing dreys. Follow-up monitoring is recommended to determine whether the loss of coconut is a factor in the reduced use of domes later in the monitoring period. At present, twice yearly monitoring is to be conducted. Increasing the frequency of monitoring (ideally six, but at least three times per year) would assist in assessing the use of replenished and additional artificial dreys and would provide greater confidence in conclusions about preferred drey design.

In January 2021, a number of possums were observed without an associated drey, however in January 2022, despite numbers of possums being higher, all were associated with dreys, even if they were outside them, suggesting that they had adjusted to their altered home ranges and new shelters after 12 months. Future monitoring will demonstrate if the higher population can be maintained, with increased shelter, food plants and connectivity.

The rope bridge design has been demonstrated to be appropriate for use by possums, therefore increasing connectivity for urban possums in the area.

Once revegetation is established sufficiently to provide additional food sources for the possums, monitoring will demonstrate if possum numbers rise, and if the population expands to use additional areas of the study site which are currently unsuitable.

RECOMMENDATIONS

- A proportion of artificial shelters where coconut fibre is collapsing should be repaired. This will need to be done sequentially so as not to bias the results of the disturbance study, and to account for any seasonal effects in their use.
- Relocated Natural Dreys should be replaced with artificial shelters to bring the total back up to the 82 shelters required as part of DWER Purpose Permit CPS8191/1, condition 15. This would require an additional 18 shelters. Additional short hollows, plastic filter buckets and wire domes / cups with paperbark and coconut seem the best choice, given preliminary results.
- To gain a detailed understanding of the seasonal usage of artificial dreys, monitoring would need to be maintained at four - six times per year beyond Year One. The existing program reverts to twice yearly sampling from 2022 onwards, which will collect enough data to measure the overall population size and expansion into the revegetation areas but will not provide sufficient data to detect seasonal usage of the site, including changing preferences for artificial drey designs. This information would be valuable to collect to inform future rehabilitation projects if budget were available to maintain a more frequent monitoring regime.
- Revegetation should continue as quickly as possible to increase food resources and connectivity.
- Additional monitoring time may be required to detect and re-check all natural dreys once revegetation is advanced enough to support additional possums. This may require an additional day's monitoring for each session from the 2024 season.
- The location of the Fox den identified in Bamford et.al. (2021), south of the drain in the Council reserve is still active. This observation should be forwarded to the City of Busselton Environmental Officers for their information.
- Residents should be encouraged to plant appropriate food and shelter plants for possums to improve connectivity and support their continued occurrence in the suburbs of Busselton.
- The Busselton community should be provided with opportunities to learn more about the possums and promote their occurrence as an asset. This could include workshops to make artificial shelters, plant local plants and encourage a sense of custodianship of the possums.
- When clearing works are required in areas containing Western Ringtail Possums, displacement rather than relocation should be the preferred option to minimise disturbance to the animals, provided that sufficient habitat remains.
- Every tree is important for species such as Western Ringtail Possums. In situations where trees are on the border of a development, they should be retained if possible.

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Appendix 1. Photographs



Images 2-7. A selection of designs of Artificial Shelters: Dome – no coconut (Dom); Short Hollow (Hol); Cup with coconut (CuCo); Cup – no Coconut (Cup); Plastic Bucket (Buc); Dome with coconut (DoCo). More detailed analysis will be possible once more data has been collected.



Image 8 (left). *A platform natural drey containing a Western Ringtail Possum mother and large joey taken in October 2020.*



Image 9 (right). *A dome-shaped natural drey containing one or two possums. Numbers of possums can be difficult to determine in dome-shaped dreys without disturbing the occupants.*



Image 10. *An example of a Relocated Natural Drey. Relocated Natural Dreys were probably an important interim measure in November 2020 for newly displaced possums. One Relocated Drey were still being maintained in January 2022 but others were disused, or had deteriorated.*



Image 11. *Relocated Natural drey in use during the September 2021 monitoring period. Although most relocated natural dreys were only used for a short period and were not maintained, two of them have continued to be maintained and used. The dark fur of the possum is visible between the twigs near the top of the drey. This drey was unoccupied when checked January 2022 but was still being so was likely still in use.*



Image 12. *Motion sensitive cameras were attached to trees and directed towards the rope bridges. It was difficult to position them in positions without vegetation obstructing the view of the ropes, and setting the sensitivity so that they would detect possums without taking large numbers of photos of moving rope and branches.*



Image 13. Multiple dreys in one flowering *Melaleuca nesophila*. Although this species is not native to the South-West, it produces abundant nectar and is a good example of the non-native food resources available in the suburbs of Busselton.



Images 14 & 15. *Possums frequently harvested coconut fibre from the coconut-lined dreys resulting in the denuding of most lined cups and dreys by January 2022. Additional lined dreys will need to be provided to augment the number of lined dreys available for Possums in this study.*



Image 16. Rope Bridge along College Avenue installed by Tree Surgeons WA. Project Approvals require six rope bridges to be maintained for 10 years to help improve connectivity for possums, so they do not need to come to the ground.



Image 17. Revegetation along College Ave installed by Tranen Revegetation SouthWest. These plantings will increase connectivity, shelter and food supplies.



Image 18. Brushtail Possum on rope bridge [REDACTED] on 20 January 2022, demonstrating that the design is suitable for both species of possums.



Image 19. *Western Ringtail Possum crossing the rope bridge [REDACTED] Busselton on 19th January 2022. First in a series of three photos (Images 19 – 21)*



Image 20. *Western Ringtail Possum crossing the rope [REDACTED] Busselton on 19th January 2022. Second in a series of three photos (Images 19 – 21)*



Image 21. Western Ringtail Possum crossing the rope [REDACTED] Busselton on 19th January 2022. Third in a series of three photos (Images 19 – 21)



Image 22. Western Ringtail Possums crossing the rope bridge [REDACTED] This is the first in a series of four images (Images 22-25) of a mother and joey walking across and perching on the rope (selected from a group of 20 images captured on January 20 2022). The animals appeared unconcerned by the rope, very comfortable walking across and stayed on the rope for several minutes.



Image 23. Western Ringtail Possums crossing the rope bridge [REDACTED]. This is the second in a series of four images (Images 22-25) of a mother and joey walking across and perching on the rope (selected from a group of 20 images captured on January 20 2022). The animals appeared unconcerned by the rope, very comfortable walking across and stayed on the rope for several minutes.



Image 24. Western Ringtail Possums crossing the rope bridge [REDACTED] This is the third in a series of four images (Images 22-25) of a mother and joey walking across and perching on the rope (selected from a group of 20 images captured on January 20 2022). The animals appeared unconcerned by the rope, very comfortable walking across and stayed on the rope for several minutes.



Image 25. *Western Ringtail Possums crossing the rope bridge adjacent to Cook St. This is the fourth in a series of four images (Images 22-25) of a mother and joey walking across and perching on the rope (selected from a group of 20 images captured on January 20 2022). The animals appeared unconcerned by the rope, very comfortable walking across and stayed on the rope for several minutes.*



Images 26 & 27. *Possum scat with boot for scale (left). One of several found on the path beneath the rope bridge south of Cook St industrial area (right) during the September 2021 monitoring period in the area to be revegetated. Scats had not been recorded along the pathway prior to the rope bridges being installed.*



Image 28. *A Western Ringtail Possum in an artificial hollow in January 2022. Artificial hollows were frequently occupied by single animals outside the breeding season but held more than one animal on only one occasion. Mothers and joeys were more commonly seen in dreys, perhaps because they provide the opportunity to 'build on' extra space for the joey.*



Image 29. *Western Ringtail Possum in January 2022, keeping cool in 38 deg. heat. This individual appeared to have removed fur from its body, presumably to help with thermoregulation.*

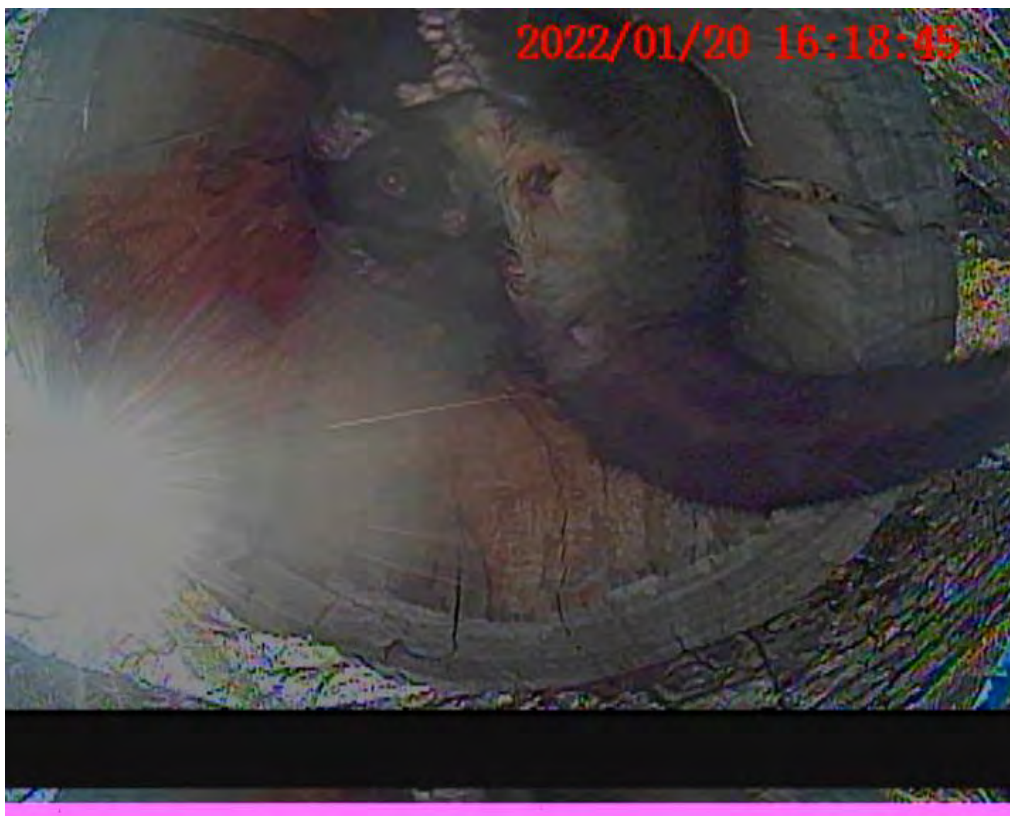


Image 30. *Western Ringtail Possum in January 2022, keeping cool in 38 deg. heat. This individual appeared to be exposing the bare skin under its tail and spreading saliva on and in the pouch to help it thermoregulate.*



Image 31. *An occupied natural hollow at [REDACTED] in January 2022. The tail of a possum is visible, hanging from the entrance to the hollow. This behaviour was frequently observed in January 2022 when the temperature was 38 degrees. Presumably hanging the tail out of the hollow is used as a cooling mechanism.*



Image 32. Retained WA Peppermint tree (*Agonis flexuosa*) containing a natural drey on [REDACTED] which contained a possum in all but two monitoring periods, even during works. A decision was made to retain this tree although it was on the edge of the clearing zone. Its continued use by a possum throughout 2021 - 2022 illustrates the importance of decisions to retain individual trees. Also visible are regenerating Coojong (*Acacia saligna*) seedlings, which will provide important, high-nitrogen forage for possums within two years.



Image 33 (left). *By January 2021, a number of the artificial shelters containing coconut had been rearranged. In this case, the possum obviously preferred to choose an alternate location to create its own shelter using coconut from the artificial drey!*

Image 34 (right). *Artificial Shelters were checked using a pole camera if necessary. Examples of pole camera images may be seen in Images 28 to 30.*

Appendix 2. Time series maps showing Natural and Artificial Dreys (January 2021) and the new Natural Dreys discovered in each subsequent monitoring period (March 2021 – January 2022).

Figure 12. Western end of the drain to Queen Elizabeth Avenue.

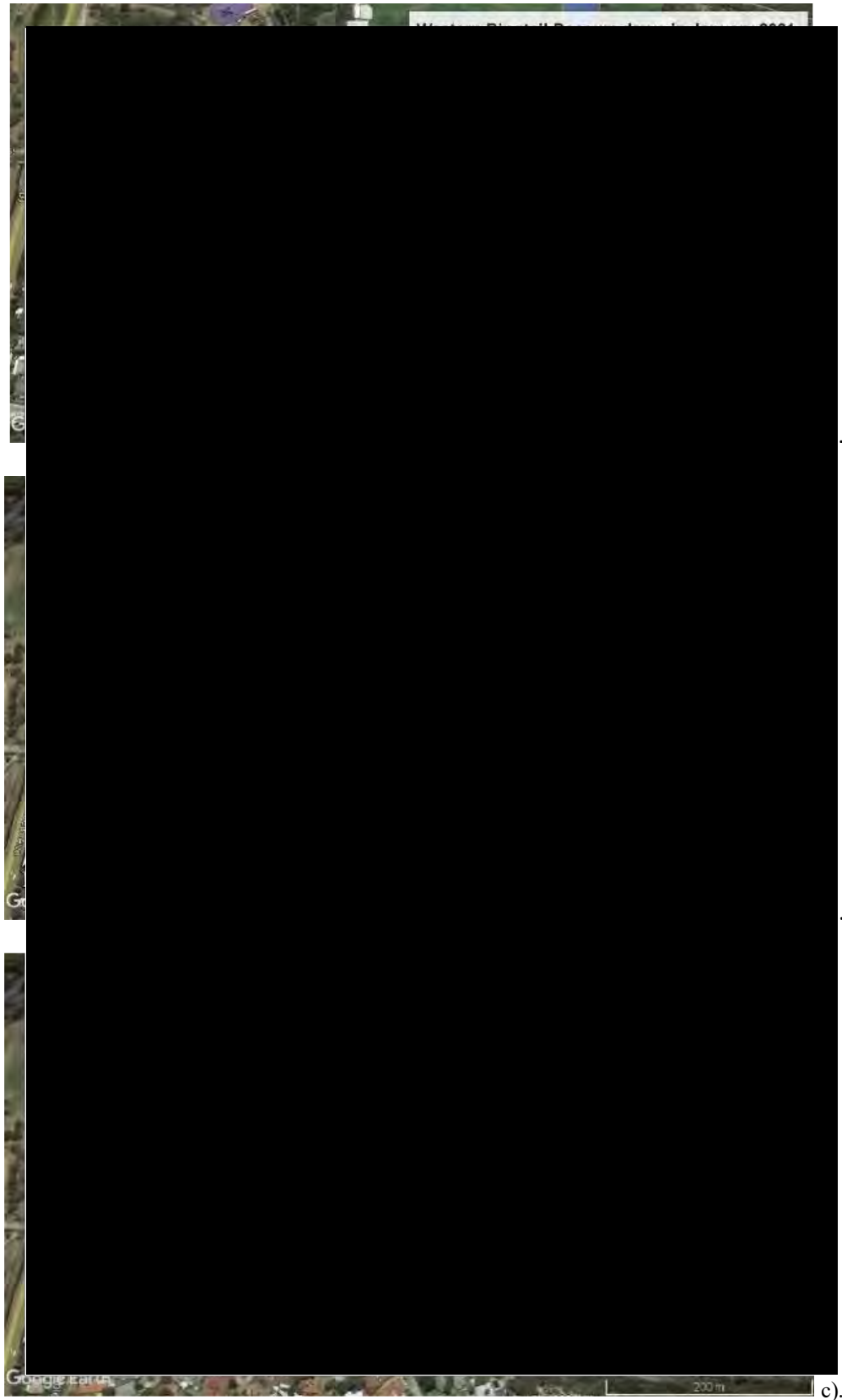


Figure 12 (cont.)



Figure 13. Central section of College Avenue. Time series maps showing Natural and Artificial Dreys (January 2021) and the new Natural Dreys discovered in each subsequent monitoring period (March 2021 – January 2022).

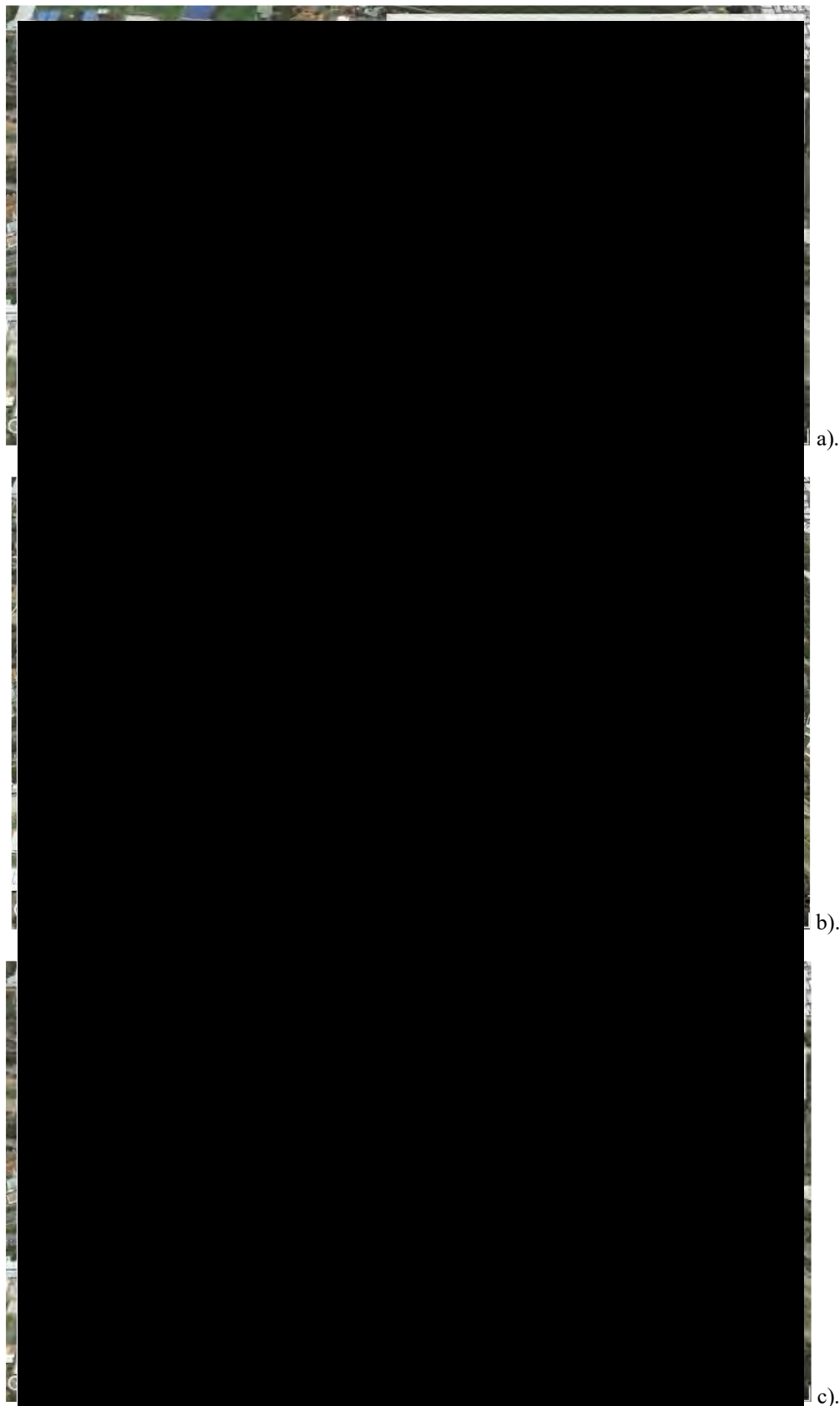


Figure 13 (cont.)



Figure 14. Eastern end of College Avenue, showing the Council reserve. Time series maps showing Natural and Artificial Dreys (January 2021) and the new Natural Dreys discovered in each subsequent monitoring period (March 2021 – January 2022).

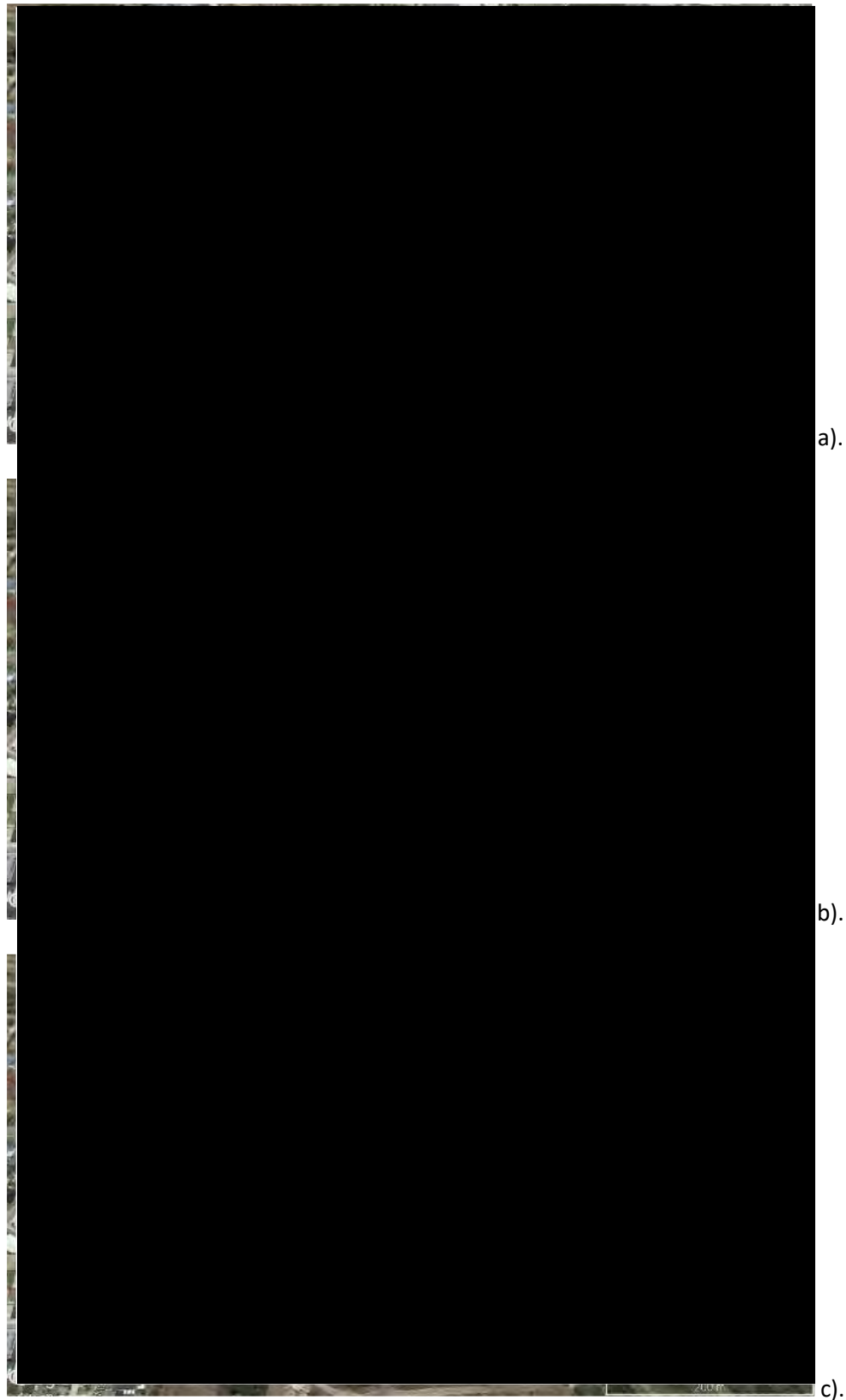


Figure 14 (cont.)

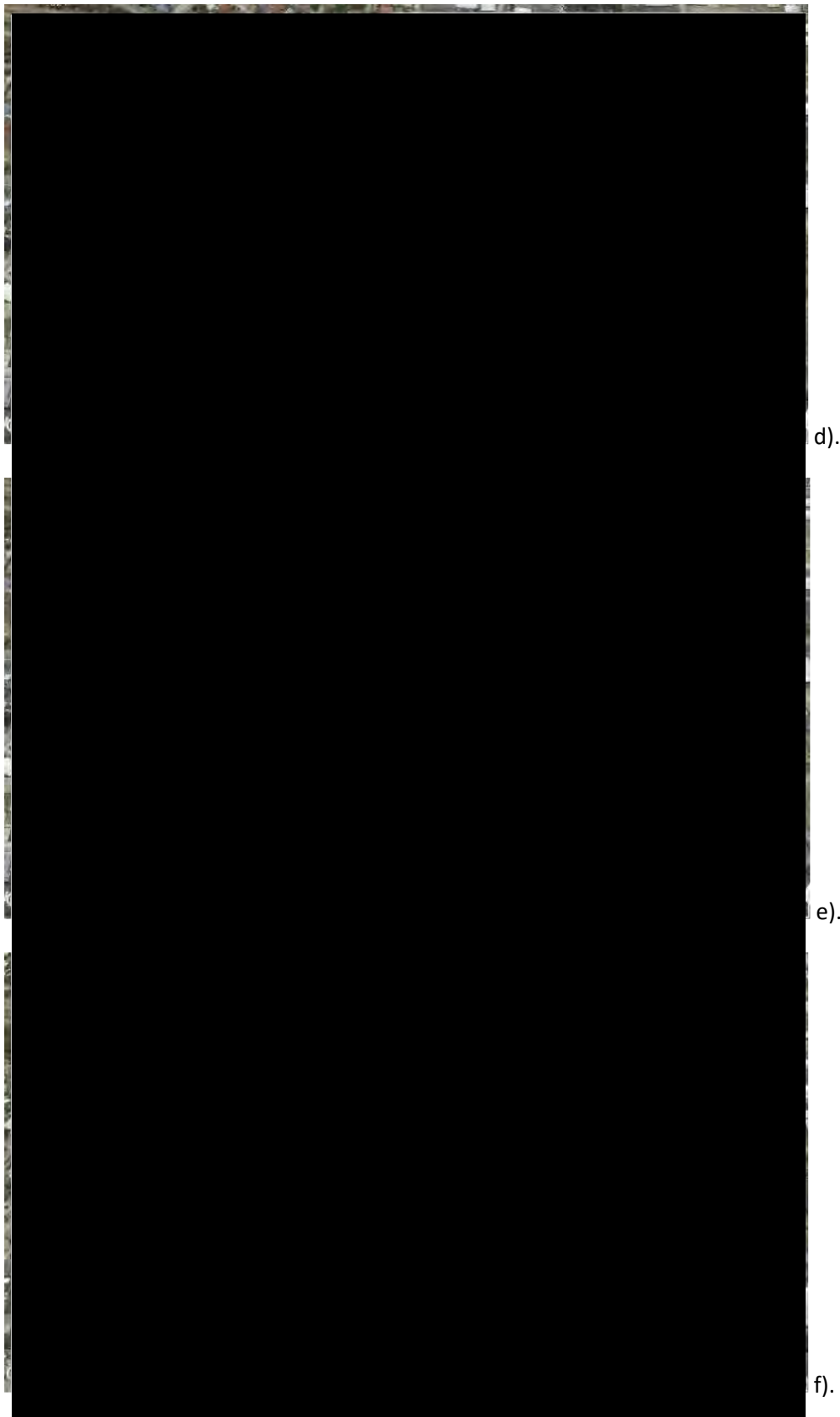
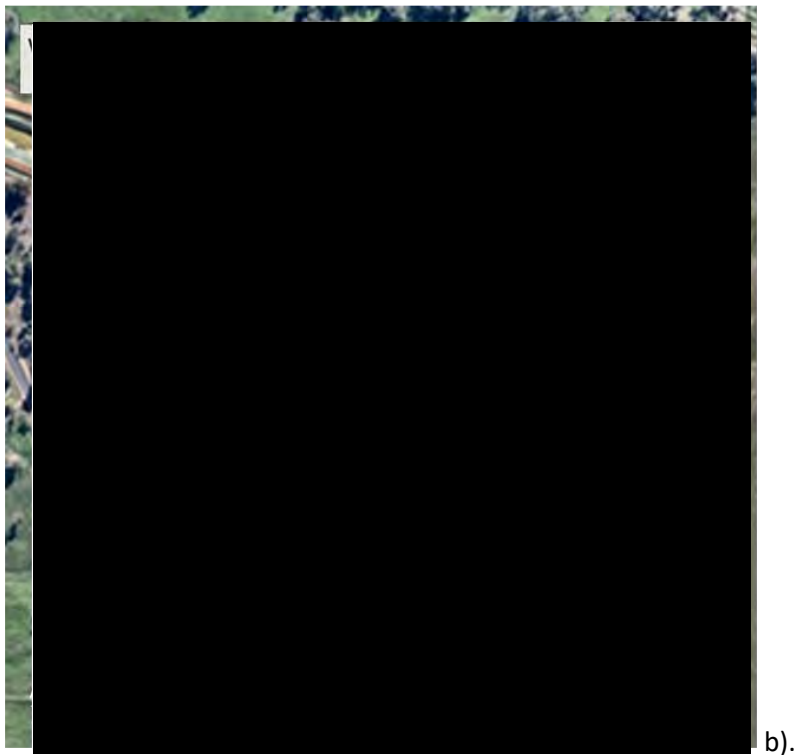
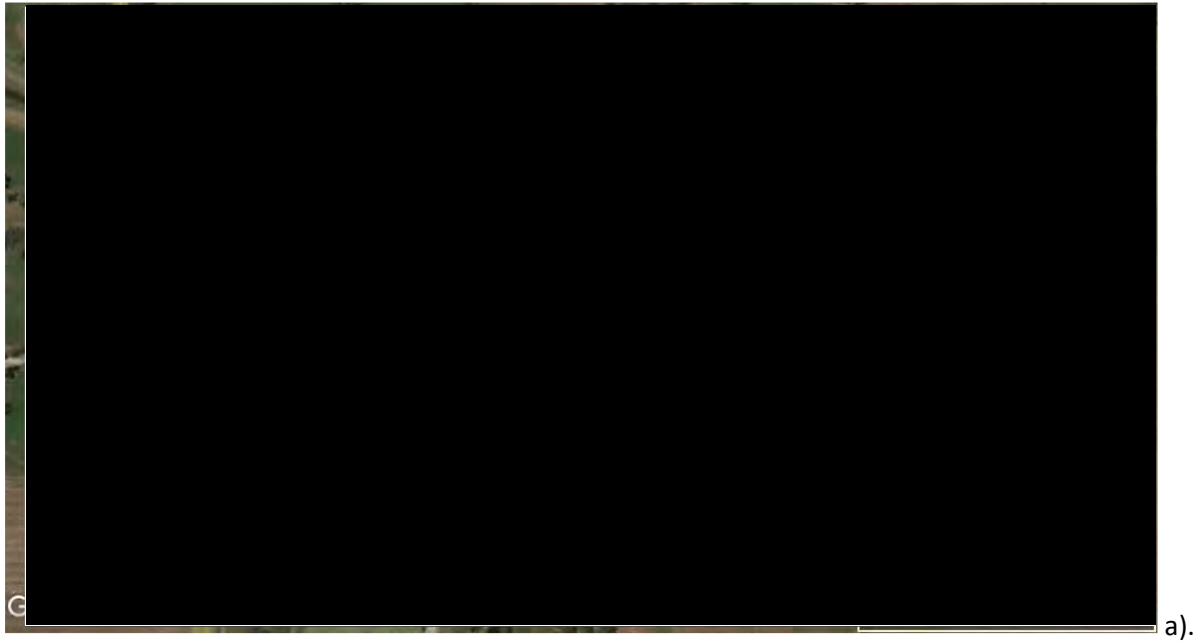


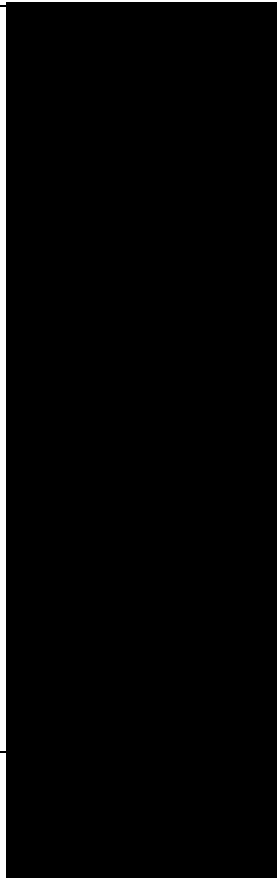
Figure 15. Vasse River Overflow Structure (VROS) area. Time series maps showing Natural and Artificial Dreys (January 2021) and a new Natural Drey discovered in March 2021. No additional dreys were discovered at the VROS after March 2021.

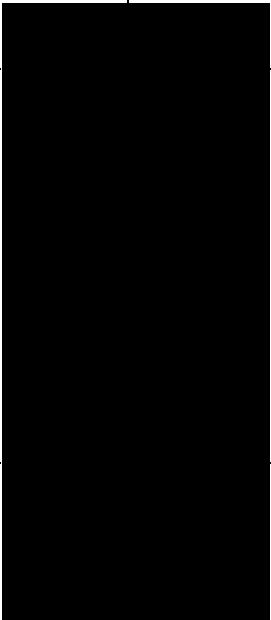


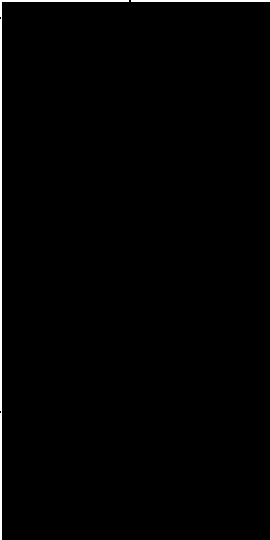
Appendix 3. Table showing relocated and artificial dreys and logs installed outside the clearing zone of the project area. Types of shelters are: DoCo= Dome with coconut fibre (and Agonis leaves), Dom = Dome (with Agonis leaves only), CuCo = Cup with coconut fibre, Cup = Cup (with Agonis leaves only), Buc = Plastic Bucket, Hol = Hollow, Nat = Relocated Natural Drey. Poss. = number of Possums observed using the shelter. The locations of each shelter are plotted in Figures 4 and 5.

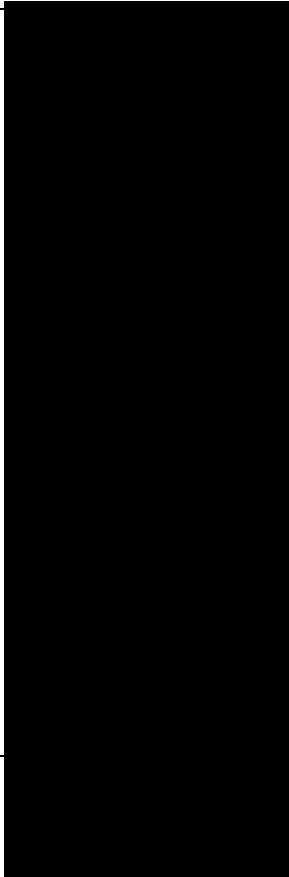
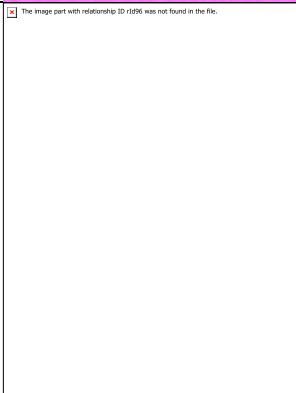
ID	Easting	Northing	Type	Tree	Possum numbers during 6 monitoring periods: Jan, Mar, May, Aug, Sept 2021, Jan 2022	Used	Photos	Notes
S1	■■■■■	■■■■■	DoCo	E. rudis	0 0 0 0 0 0	Unused		Collapsed coconut, very close to edge of works

S2		Dom	A. flexuosa	0 0 0 0 0	Unused		Very close to edge of works
S3		Dom	A. flexuosa	0 0 0 0 0	Unused		old leaves only
S4		DoCo	E. rudis	0 1 0 0 0	used		Coconut collapsed – needs repair

S5			Dom	E. rudis	0 0 0 0 1	Used		Old Agonis, Dense
S6			DoCo	C. calophylla	0 0 0 0 0	Used		some newer Agonis leaves, likely recent use - Rattus burst out of drey when checked

								
S7			Dom	A. flexuosa	0 0 0 0 0	Unused		Only old leaves in drey
S8			CuCo	A. flexuosa	0 0 0 0 0	Unused		old leaves only

								
S9			Nat	A. flexuosa	0 0 - - -	Unused		Blown down
S10			Nat	A. flexuosa	0 - 0 - -	Unused		Degraded, then not found

S11			Cup	A. flexuosa	0 0 0 0 0	Unused		Old leaves only
S12			Buc	E. marginata	0 0 0 0 0	Unused		empty

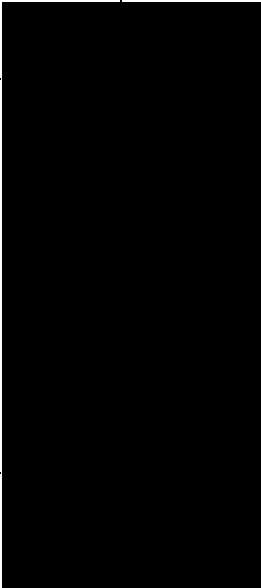
								
S13			CuCo	A. flexuosa	0 1 0 0 0	Unused	 	dry Agonis leaves

S14		Cup	A. flexuosa	0 0 0 0 0	Unused		Lots of dead leaves
S15		Buc	A. flexuosa	0 0 1 1 1 0	Used		Few leaves, occupied in May, August and Sept
S16		Nat	A. flexuosa	0 0 ----	Unused		Degraded, then not found

S17		CuCo	A. flexuosa	0 0 0 0 0	Unused	 	Lots of brown, old leaves
S18		Nat	A. flexuosa	0 0 0 0 0	Unused		Brown old Agonis

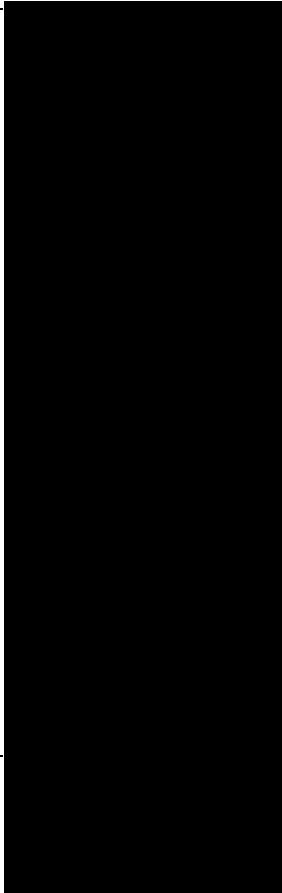
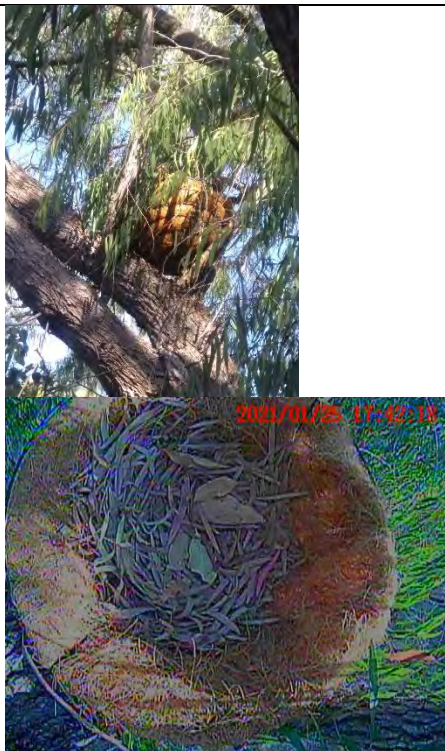
S19		Cup	A. flexuosa	0 0 0 0 0	Unused		Exposed location
S20		Buc	A. flexuosa	0 0 0 0 0	Unused		Dead leaves, no evidence of use
S21		CuCo	A. flexuosa	0 0 0 1 0 0	Used		lots of dead Agonis leaves, pole camera photo taken. Occupied on one occasion.

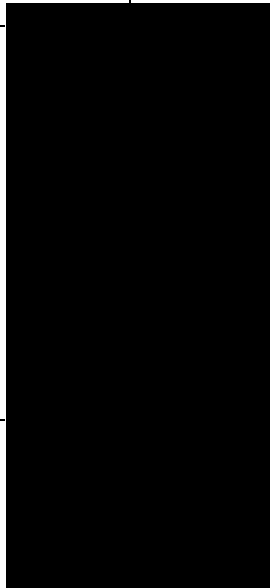
S22		Nat	A. flexuosa	0 0 - - - -	Unused		Platform still there but disused, then not found
S23		Cup	A. flexuosa	0 0 0 0 0 0	Unused		Leaves mostly gone
S24		DoCo	C. calophylla	0 0 0 0 0 0	Unused		coconut collapsed

								
S25			Nat	A. flexuosa	0 0 0 0 0	Unused		No fresh Agonis
S26			Nat	Kunzea sp.	0 0 0 0 0	Unused		in good condition.

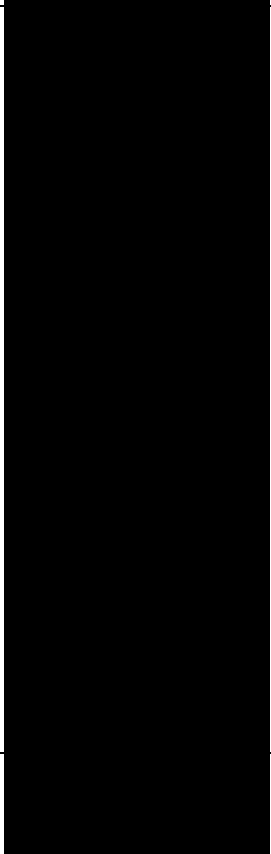
S27		Nat	Kunzea sp.	0 0 0 0 0	Unused		Collapsed
S28		Nat	Kunzea sp.	0 0 0 0 -	Used		light leaf cover but possibly used. Not found in Jan 2022
S29		Nat	A. flexuosa	0 0 0 0 - -	Unused		Degraded, not found in Sept 21

S30			CuCo	C. calophylla	0 0 1 1 0 1	Used	 	been used but empty. Coconut collapsed. Often used during the year.
S31			Cup	C. calophylla	0 0 0 0 0 0	Unused		few leaves

S32			CuCo	A. flexuosa	0 0 0 0 0	Used		may have been used
S33			Dom	A. flexuosa	0 0 0 0 0	Unused		Old leaves

								
S34		Buc	A. flexuosa	0 0 1 0 1 0	Used		Few leaves	
S35		DoCo	A. saligna	0 0 0 0 0 0	Unused			

								
S36			Cup	A. flexuosa	0 0 0 0 0	Unused		Few leaves
S37			Nat	A. flexuosa	0 0 0 0 0	Unused		Falling down

S38			Nat	A. flexuosa	1 0 0 0 0	Used		Only old leaves seen from outside but drey in good condition, possum inside in January 2021 then not occupied subsequently
S39			Nat	A. flexuosa	0 0 0 0 0	Unused		Old leaves but still in good condition

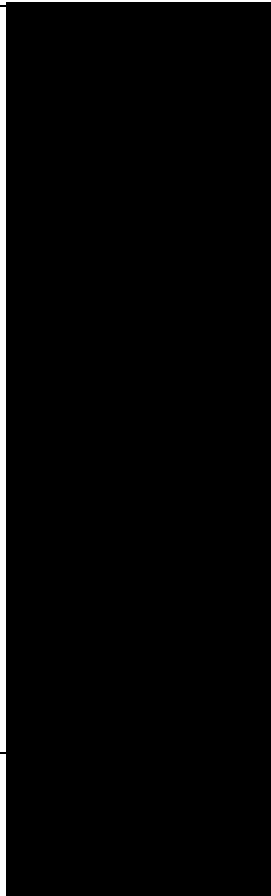
S40		Cuco	A. flexuosa	0 0 0 1 0 0	Used		Occupied in August
S41		Nat	A. flexuosa	0 0 0 0 1 0	Unused		Degraded, still some Agonis leaves in it

S42			Nat	A. flexuosa	0 0 0 0 0	Unused		Degraded
S43			Nat	A. flexuosa	0 0 0 0 0	Unused		Large drey, good condition
S44			Buc	A. flexuosa	0 0 1 0 0	Used		Old leaves. Occupied in April / May

S45		Nat	A. flexuosa	0 0 0 0 0	Unused	No photo	Good condition, old leaves
S46		Nat	A. flexuosa	0 0 0 0 0	Unused		Good condition

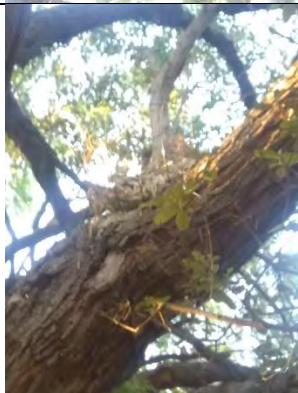
S47			Nat	A. flexuosa	0 0 0 0 0	Unused		Degraded
S48			Cup	A. flexuosa	0 0 1 0 1 0	Used		Old leaves, occupied in April / May and September
S49			CuCo	A. flexuosa	0 1 0 0 0 0	Used		Coconut Base pulled out, occupied in March

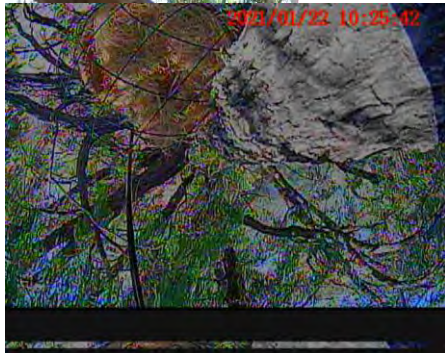
S50			8	Buc	A. flexuosa	0 0 0 1 0 0	Used		Occupied in August
S51			5	Cup	A. flexuosa	0 0 0 0 0 0	Unused	 	Lots of old leaves

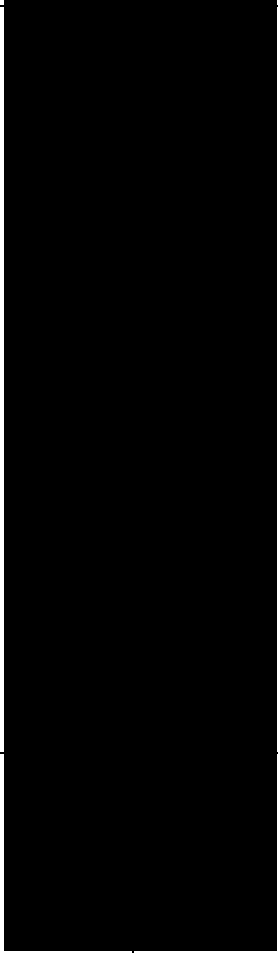
S52			CuCo	A. flexuosa	0 0 0 0 0	Unused	 	Few leaves left
S53			Cup	A. flexuosa	0 0 0 0 0	Unused		few leaves

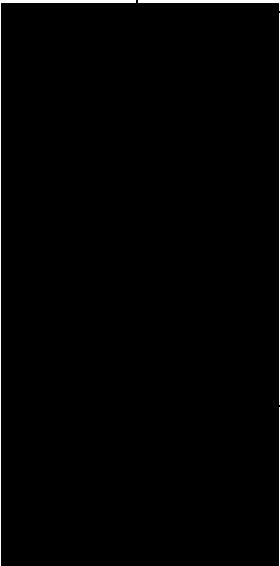
S54			DoCo	A. flexuosa	0 0 0 0 0	Unused		Artificial Drey originally installed at D05R but then relocated to D23H, material had been rearranged - possible possum use but empty on 25/01/21. No subsequent evidence of use.
S55			DoCo	M. cuticularis	0 0 0 0 0	Unused		Collapsed Difficult for possum to enter – needs repair

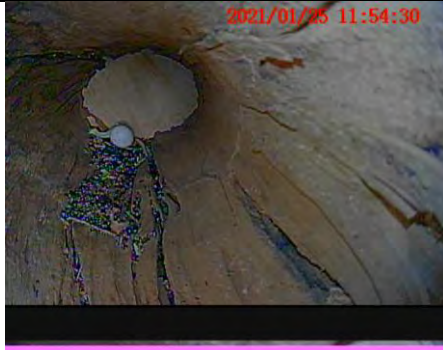
S56		Nat	A. flexuosa	0 0 0 0 1 0	Used		Large Agonis. Used in September, still maintained
S57		CuCo	A. flexuosa	0 0 0 0 0 0	Unused	 	Large Agonis, very full, old drey inserted into shelter

S58			Cup	A. flexuosa	0 0 0 0 0	Used		Fresh leaves present, likely used, but empty when checked in Jan 2021. Not occupied when checked subsequently
S59			Nat	A. flexuosa	0 0 0 0 0	Unused		Still some Agonis leaves
S60			Cup	A. flexuosa	0 0 0 0 0	Unused		Still some Agonis leaves

S61			DoCo	A. flexuosa	0 0 0 0 0	Unused		Coconut collapsed – needs repair
S62			DoCo	A. flexuosa	0 0 0 0 0	Unused	 	Coconut collapsed – needs repair

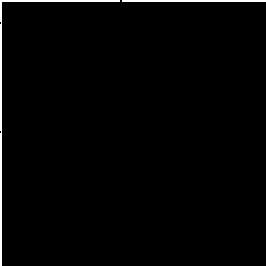
S63			Hol	E. patens	0 0 0 1 0 0	Used		Approx. 8m high, relocated from E. rudis in Links Ct. Occupied in August
S64			Hol	E. patens	0 0 0 0 0 0	Unused		relocated from E. rudis in Links Ct

								
S65			DoCo	A. flexuosa	0 0 0 0 0	Unused		Coconut dome collapsed
S66			Hol	C. calophylla	0 0 0 0 0	Unused		pigeon egg inside, another broken on ground below in Jan 2021. Nest in September 2021 (probably Bronzewing).

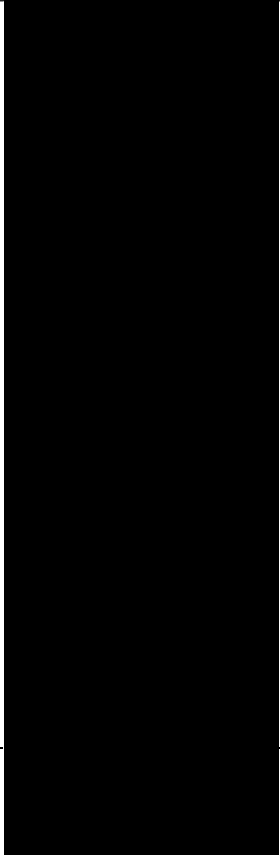
								
S67			Cup	<i>E. marginata</i>	0 0 0 0 0	Unused		few old leaves
S68			DoCo	<i>A. flexuosa</i>	0 0 0 0 0	Used		coconut taken and placed further up tree, some blown down

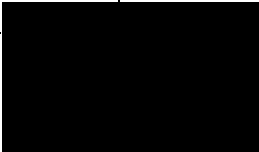
								
S69			DoCo	A. flexuosa	0 0 0 1 0 0	Used	 	natural drey inserted into artificial drey, Coconut collapsed in Jan 21, but occupied in August

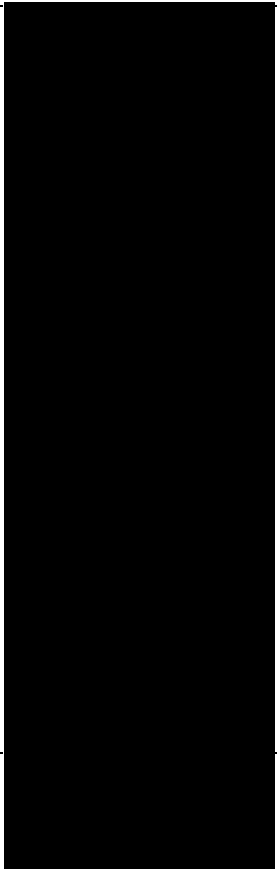
S70			Hol	A. flexuosa	1 1 0 0 0	Used		Possum in base of log in Jan and Mar 21.
S71			CuCo	A. flexuosa	0 0 1 1 0 1	Used		coconut rearranged, removed from base, occupied in April / May, August and Jan 2022

								
S72			Nat		0 – 0 -0 0 -		No photo	deteriorated and difficult to locate
S73			Hol	A. flexuosa	0 0 0 0 1	Used		A few old leaves only. Occupied in Jan 2022

								
S74			DoCo	E. rudis	0 0 0 0 0	Used	 	coconut still in good condition, looks like it had been used, in January 2021, but not since.

S75			Hol	A. flexuosa	0 0 0 0 1	Used		Slightly green leaves in bottom, probably used in Jan 2021, occupied in Jan 2022
S76			DoCo	A. flexuosa	1 0 0 0 0	Used		coconut rearranged – visible from the outside, possum inside. Not recorded as occupied since Jan 21

								
S77			Hol	C. calophylla	1 2 1 0 0 1	Used	 	Possum regularly recorded. The only short hollow which has recorded a mother and joey inside (Mar 21)

S78			CuCo	C. calophylla	0 0 0 0 0	Unused		coconut collapsed. Needs repair
S79			Hol	E. rudis	1 0 1 0 0	Used		Possum recorded on two occasions

								
S80			DoCo	A. flexuosa	1 1 1 1 1 0	Used	 	Klara's Lodge. Paperbark had been rearranged – visible from outside, possum inside all but Jan 2022. One of only two dreys with Paperbark, which may be key to its success.

S81			Hol	A. flexuosa	0 0 0 0 1	Used			Used in Jan 2022
S82			Nat	A. flexuosa	0 0 0 0 0	Unused			Dry, collapsed
S83			Hol	C. calophylla	0 1 1 0 0 1	Used			Occupied in 3 of 6 monitoring periods

S84			Nat	Ground	0 0	Unused		On ground, blown out of tree. Not found after March 21
S85			DoCo	<i>E. marginata</i>	0 0 0 0 0	Unused		Coconut collapsed – needs repair
S86			DoCo	<i>C. calophylla</i>	0 0 0 0 0	Unused		

								
S87		up	A. flexuosa	0 0 0 0 0	Unused		In Large Agonis	
S88		up	A. flexuosa	-- 0 0 0 0	Used		Coconut removed	

Monitoring of the Western Ringtail Possum following Clearing along the Vasse Diversion Drain, Busselton

Year Two

January 2022 – February 2023



Image 1: Western Ringtail Possum using rope bridge (J Bamford)

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30th May 2023

Executive Summary

The Water Corporation widened the Vasse Diversion Drain in Busselton in 2020 - 2021 for flood mitigation, and since the conservation significant Western Ringtail Possum occurs in remnant vegetation that was impacted by drain widening, Bamford Consulting Ecologists was commissioned to undertake the displacement of possums prior to clearing along the drain in two areas: a northern area between Queen Elizabeth Avenue and the Busselton Bypass Road, and a southern area near the Golf Course (VROS). BCE was also commissioned to conduct ongoing monitoring of the population and their use of installed shelters and rope bridges over a ten-year period, as a condition of the approval of the drain widening project. This report covers the second year of post-disturbance monitoring (January 2022 – February 2023).

Of the 43ha project area surveyed in 2019 prior to the project's approval, where 206 dreys and at least 66 possums were recorded, only 1.9ha was cleared in 2020. Forty-one dreys and hollows and 36 possums were identified in the impact area prior to clearing. Prior to and during clearing in November 2020, all possums were successfully relocated into adjacent vegetation without mortality or injury. Of the 41 dreys found, 23 were able to be relocated, and a further 63 artificial shelters (dreys and hollows) were installed, making a total of 88 new shelter locations (a commitment was made to provide 82 additional shelters). Rope bridges were also installed along the north side of the drain adjacent to College Avenue and Scott Street, to increase connectivity and reduce the need for possums to go to the ground to travel between trees, where they are at risk of predation by foxes, cats and dogs.

Since most possums could remain within their home ranges, handling was avoided where possible to minimise stress. In most cases, animals could be displaced into adjacent vegetation without handling them. Trees were checked and animals displaced immediately prior to clearing, to avoid them returning to the clearing area. Eleven possums had to be hand-captured and moved; four were moved without touching them, while contained within or holding onto the top of an artificial or natural drey; two were moved while within hollows; and two were moved by encouraging them to climb onto the net and carrying them to safety while perched on top of the net. The remaining 17 were displaced by gently disturbing them from their dreys and herding them to adjacent, safe trees. Clearing debris was then removed immediately to prevent animals trying to return.

As part of compliance for the project approval, a ten-year monitoring program is underway to determine:

- the effects of disturbance on the numbers and distribution of Western Ringtail Possums adjacent to the disturbance areas along the Vasse Diversion Drain,
- Whether artificial shelters are used by possums and can contribute to the maintenance of the population, post-disturbance,
- Which shelter designs are preferred by Western Ringtail Possums,
- Whether rope bridges will be used by possums and are therefore effective in improving connectivity in a disturbed landscape,

- Whether revegetation is being accessed by possums and results in increased habitat for the species during a ten-year period.

Six monitoring periods were undertaken during Year One; January, March, April / May, August, September 2021, and January 2022. In Year Two, there were two monitoring periods; December 2022 and February 2023. There were 38 possums recorded in the area adjacent to works in January 2021, following the disturbance. The numbers remained remarkably stable, with a minimum of 31 recorded in March 2021, which is consistent with the dispersal of juveniles, and had increased to 45 in January 2022. In Year Two, there were 40 in December 2022 and post-breeding numbers jumped up to 64 by February 2023. The high numbers of possums could be explained by a good breeding season, the abandonment of a fox den in the Council reserve, the provision of additional shelters and rope bridges, and the revegetation which may have begun to improve the quality of food plants available to the animals. Future monitoring will help to determine the factors affecting the population. It seems likely that many of the animals found during monitoring are those who were displaced from the impact area but have stayed and continued to breed within their remaining home ranges.

One hundred new natural dreys were recorded in the two sampling periods in Year Two, which is an impressive number. Many of the dreys were unoccupied, which is to be expected as possums often build and use more than one drey, however the large number of new dreys correlates with the high number of possums (64) recorded for Year Two.

Both Brushtail and Western Ringtail Possums were recorded using rope bridges again in Year Two, confirming that the design is successful. Rope bridges adjacent to Cook St appear to have provided safe access for possums into trees that were previously unavailable to them. Revegetation in the area will further support the movement of these animals. Future monitoring will help to determine the extent to which rope bridges are contributing to connectivity.

Artificial shelters were used consistently in both sampling periods in Year Two. Twenty-seven percent of the possums recorded during the December 2022 monitoring period and 20% of possums recorded in February 2023 were using artificial shelters. Plastic filter buckets were the most frequently occupied artificial dreys (50% were used in at least one monitoring period) in December 2022 and February 2023, followed by 'short hollows', 30% of which were used in at least one monitoring period. Coconut-lined cups and domes were also used at lower rates, including an empty cup which a possum chose to re-line with natural materials.

In Year One, there were six monitoring periods and results showed a seasonal difference in the preferred design of artificial shelters. In Year Two, only two monitoring periods were scheduled, so it was not possible to draw detailed conclusions on the seasonal use of different designs. More frequent sampling would provide a more robust assessment of seasonal variation in drey preference.

Unlike the results of monitoring along the Vasse Diversion Drain between Queen Elizabeth Avenue and the Busselton Bypass Road, possums have not been detected in any of the artificial dreys at the VROS since March 2021, although an empty natural drey was recorded in Year One. It is likely that fragmentation of the area has made it unsuitable for possums, and this is likely to continue unless revegetation occurs in collaboration with the farmers adjacent to the site.

Tranen Revegetation SouthWest is continuing revegetation work, which will provide increased food and connectivity. Once vegetation has established, it should also provide additional locations for natural dreys to be constructed, and possibly result in an increase in the population of possums. Additional dreys and an increase in possum numbers should be detectable within the ten-year monitoring timeframe for the project.

Relocated natural dreys performed an important function immediately following displacement of the possums but have deteriorated and none was used in Year Two. Fourteen were replaced with artificial shelters in February 2023, and further replacements will be required in Year Three to maintain the numbers of additional dreys provided, as committed to as part of approvals for the project. Since artificial dreys continue to be used at a consistent rate, it will be interesting to see if increasing the numbers of them increases their use, and if numbers of possums continue to increase.

Revegetation should proceed as quickly as practical to ensure the animals continue to have sufficient food resources to support them during lean times. The increased connectivity provided by plantings and rope bridges will also allow possums to move between the population along the drain and the rest of Busselton, improving the species' long-term viability in the area.

Results of the second year of monitoring support the findings of Year One monitoring that the displacement and disturbance due to drain works had not greatly impacted possum numbers, that artificial shelters are helping to house the population and that rope bridges are of a suitable design to keep possums off the ground and improve connectivity. The numbers of possums at the study site post-breeding have increased for the last two years since January 2021. Future monitoring will help to better assess these initial findings, and effects of revegetation work, which is likely to provide significant positive impact within the next ten years.

INTRODUCTION

The Water Corporation manages a network of drains in the vicinity of Busselton and in October 2020 – April 2021 works were undertaken to widen the Vasse Diversion Drain for flood mitigation. This widening affected some vegetation alongside the drain, but not the full width of this vegetation. An Environmental Impact Assessment conducted by GHD (2017) found that the Western Ringtail Possum *Pseudocheirus occidentalis*, which is a listed conservation significant species (Critically Endangered under both the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Biodiversity Conservation Act 2016*) occurred in vegetation adjacent to the drain. Widening of the drain could affect >0.5ha of what might be primary corridor habitat for the species (*sensu* DEWHA 2009) and based on EPBC Act Policy Statement 3.10 (DEWHA 2009), this would be a significant impact. Therefore, the Department of Biodiversity, Conservation and Attractions requested the Water Corporation provide more information on the distribution and abundance of this species along the drain. Bamford Consulting Ecologists was commissioned to undertake this work in 2019.

The Vasse Drain Diversion Upgrade project was assessed Bilaterally by the DWER Native Vegetation branch under Part V of the EP Act [WA] and by AWE under the EPBC Act 1999 [Cwth] and the project was referred under the *EPBC Act* (Cwth). The project is a ‘*Controlled Action*,’ so all activities must be undertaken in compliance with conditions set in the EPBC 2017/7932 Approval Conditions.

Following surveys of the 43ha project area in March 2019, where 206 dreys and at least 66 possums were recorded, areas were revised and only 2.16ha was identified as the impact area to be cleared in 2020.

A Fauna Management Plan for the Vasse Diversion Drain Upgrade was developed by Bamford Consulting Ecologists as part of the Approvals process and provides a detailed description of commitments and approach, as well as a summary of current research on Western Ringtail Possums and their requirements (Bamford et al., 2020). Implementation of the plan commenced in October 2020, prior to works commencing.

The Water Corporation committed to revegetation to re-establish and improve connectivity of vegetation, and the installation of rope bridges and fauna shelters, including ten years of maintenance and monitoring with the aim that any long-term effect of the works will be a positive one. Bamford Consulting Ecologists was commissioned to undertake relocation and subsequent monitoring of fauna in response to the disturbance and amelioration activities. The agreed approach was to gently displace the animals from the clearing zone but keep them within their home ranges where possible. By avoiding or minimising handling, personnel were able to keep stress to the animals to a minimum. Cowan et al. (2020), links the poor survival of relocated animals to the stress associated with their capture, handling and transport. Studies of Western Ringtail Possums report high mortality of relocated animals (Clarke, 2011, Thompson & Thompson, 2009). Transfer of parasites (Dunlop & Watson, 2022) can also occur when animals are moved out of their home ranges. Since the disturbance

was only to affect a narrow area, displacement, rather than translocation was the preferred option.

Western Ringtail Possums are nocturnal and shelter in tree hollows, or build shelters called ‘dreys’ in which they sleep during the day. Dreys are clumps of twigs and leaves that are generally quite conspicuous and placed in the mid canopy of trees (See Images 8 & 9 in Appendix 1). A possum may have five to eight dreys across a home range of 0.5 – 1.5ha, and home ranges overlap (Jones, 2000).

Clearing works were carried out from October to December 2020 and construction was completed in April 2021. Artificial shelters were installed, Western Ringtail Possums and other fauna were displaced from the clearing areas in October and November 2020, and a survey was carried out in January 2021 to make a preliminary assessment of the shelters and the possum population following displacement. Monitoring of possums and their use of shelters and rope bridges has continued during 2021 – 2022 (Year One) and 2022 – 2023 (Year Two). This report covers Year Two of the study; the period of January 2022 to February 2023.

Over its ten-year period, the monitoring program aims to determine:

- the effects of disturbance on the numbers and distribution of Western Ringtail Possums adjacent to the disturbance areas along the Vasse Diversion Drain,
- Whether artificial shelters are used by possums and can contribute to the maintenance of the population, post-disturbance,
- Which shelter designs are preferred by Western Ringtail Possums,
- Whether rope bridges will be used by possums and are therefore effective in improving connectivity in a disturbed landscape,
- Whether revegetation is being accessed by possums and results in increased habitat for the species during a ten-year period.

This Year Two report analyses data collected to date to inform these questions.

METHODS

Description of Project Area

The project area consists of land along two parts of the Vasse Diversion Drain (Figure 1). The northern area lies between the Busselton Bypass Road in the south and Bussell Highway in the north and includes some extra land in small reserves to the south of the drain. Much of the vegetation consists of Peppermint *Agonis flexuosa* forest and woodland, with varying proportions of Marri *Corymbia calophylla*, Flooded Gum *Eucalyptus rudis*, Jarrah *Eucalyptus marginata*, Coojong *Acacia saligna*, Swamp Banksia *Banksia littoralis*, Modong *Melaleuca priessiana* (Saltwater Paperbark *Melaleuca cuticularis* where the drain crosses The Broadwater), Spearwood *Kunzea* sp., and occasional other tree and tall shrub species. The understorey is generally in poor condition. Vegetation is in best condition on the south side of

the drain, between Queen Elizabeth Avenue and the Busselton Bypass Road. Open areas of weedy grasses are present, although these are being managed as part of rehabilitation.

The southern area lies adjacent to the Busselton Golf Course, east of Chapman Hill Rd and includes land on the eastern side of the drain, as well as encompassing a section of the Vasse River. This is the site of the Vasse River Overflow Structure (VROS). The vegetation is generally degraded and in places parkland cleared and grazed, with an open woodland of Peppermint and Flooded Gum, some planted, non-native eucalypts and some riparian woodland along the Vasse River. The trees which provided some connectivity through the site were removed for construction of the VROS, so the remaining vegetation is fragmented (see Figure 1c).

The total area cleared was 1.9ha (see Figure 1 a, b and c), however the project area for this study also includes sites in adjacent bushland and rehabilitation areas into which artificial shelters, relocated dreys and rope bridges have been installed, and will increasingly include the rehabilitation areas as plantings mature and become attractive to possums.

(a)



(b)



(c)



Figure 1 (a,b,c). The project areas. The northern site (a and b) stretches from Busselton Bypass Road in the south to Queen Elizabeth Avenue in the north. Figure 1(c) shows the Vasse River Overflow Structure (VROS) site. Areas that were cleared are hatched yellow.

Approach

This report covers the second year of a ten-year study following the disturbance and relocation of possums due to clearing. All relocation work was carried out in accordance with the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al., 2020) and focussed on minimal disturbance to the animals. During clearing, animals had been displaced as little as possible, ideally within their existing home ranges, while moving them from the impact area. In most cases, this was able to be done without capturing the possums, to minimise disturbance and stress to the animals. Thirty-six possums were displaced from the clearing area during operations. All animals were relocated successfully without injury or mortality. In most cases, the animals were moved no more than 20 metres and in some cases as little as five metres. Details of the displacement techniques employed are given in Bamford et al. (2021).

Since most animals were not handled, they were not individually marked, so assessment of the population is undertaken by recording numbers and locations of animals and dreys. Given the sedentary nature of most of the animals, this is likely to be an accurate measure of the impact due to clearing and means that disturbance of the animals (and confounding of the results by the impacts of handling) has been kept to an absolute minimum.

Rope bridges are monitored using motion sensitive cameras, observation and scat records to search for evidence of use.

Survey methods

Monitoring is undertaken by Amanda (Mandy) Bamford (B.Sc. Hons. Zool.) and Mike Bamford (B.Sc. Hons. Ph.D. Biol.). Mandy and Mike have many years of experience in management of the Western Ringtail Possum (hereafter referred to as possum). The work was carried out under DPIRD Scientific licence (ethics) U261/2021-2022, DBCA Permit numbers TFA 2020-0149-2, TFA 2020-0149 and FR28000164, undertaken with reference to the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al, 2020) and informed by observations in Bamford et al (2021) and Bamford et al (2022). Field assistance was provided by Jake Bamford (B.C.I.), Joshua Bamford (B.Sc. B.Mus. Hons. M.A. D.Phil.[Oxon.]), Andrew McCreery (B.Sc.) and Nathan Ducker (B.Ed.). Data Management was undertaken by Joshua Bamford.

Possum monitoring was carried out in December 2022, and February 2023. Monitoring was carried on fine days once the sun was up to protect camera equipment and minimise disturbance to possums. Previous experience (Bamford pers. obs.) is that possums are often only dozing on overcast days or at first light and are easily disturbed. In bright sunlight they are usually firmly asleep and dreys may be checked without disturbing them. All artificial shelters and relocated natural dreys were checked with binoculars or a pole camera to assess their status and check for possums. Natural dreys, hollows and possums sighted out of dreys adjacent to the cleared area were also recorded opportunistically. Recognising that it was important to minimise disturbance during monitoring, the pole camera was used for the minimal time, and just close enough to check for activity and take a photo, to disturb the animals as briefly as possible. In some natural dreys, it was not possible to access the drey using the pole camera without disturbing the animal, in which case the drey was checked using binoculars.

Handling of Fauna

No fauna requires handling as part of the post-disturbance monitoring phase of the project. Checking of dreys is done with minimal disturbance and cameras are unbaited, so do not alter the behaviour of the animals. Bamford Consulting Ecologists operates under Scientific Use Licence U261 2021-2022 and if animals require handling for any reason, personnel use techniques outlined in the Fauna Sampling Manual by Bamford et al. (2013).

Relocated and Artificial Dreys

As outlined in the Fauna Management Plan (Bamford et al., 2020), a range of shelter types was installed in the project area in a variety of locations to augment the shelters available in

relocation areas and trial the attractiveness to possums of the different designs. The types included:

Relocated Natural Drey – a drey cut out from a tree before it was cleared and wired up into a tree outside the clearing zone.

Relocated Long Hollow – a long hollow cut from a tree in the clearing zone. There were only two of these so results are lumped with Short Hollows in this report.

Short Hollow – a short hollow log, capped at one end and chained with plastic coated chain to a tree, to minimise damage to the tree branch. Short hollows were chosen to trial as they may prove less attractive to European Honeybees *Apis mellifera* than long hollows and possums will shelter in short natural hollows.

Dome – a wire dome made from two hanging baskets wired together, with a quarter cut out for the entrance and lined with *Agonis flexuosa* leaves and twigs.*

Dome with Coconut Dome – a wire dome with matching coconut fibre liner and entrance hole. Two of these also contained paperbark*

Cup – a single hanging basket installed as a wire cup.*

Cup with Coconut – a single hanging basket lined with coconut.*

Plastic bucket – a plastic filter bucket.*

*In all cases, WA Peppermint *Agonis flexuosa* sprigs from the possum's nearest tree were added to each artificial drey to try to mimic as closely as possible the natural smell of the animal's home range. In some instances where an animal's natural drey could not be salvaged, material from the natural drey was added to an artificial drey to make the drey smell more familiar to the animal and perhaps make it more likely to be used.

Artificial shelters were installed throughout the project area, outside the impact area. Eighteen dreys and hollows were installed by Tree Surgeons WA, while they were installing the rope bridges. The remaining 68 relocated and artificial dreys were installed by Bamford Consulting Ecologists' personnel. Details of all dreys relocated and all installed shelters are given in Figures 2 and 3 and Appendices 2 and 3. Examples of shelter designs are provided in Appendix 1, Images 2 to 7.

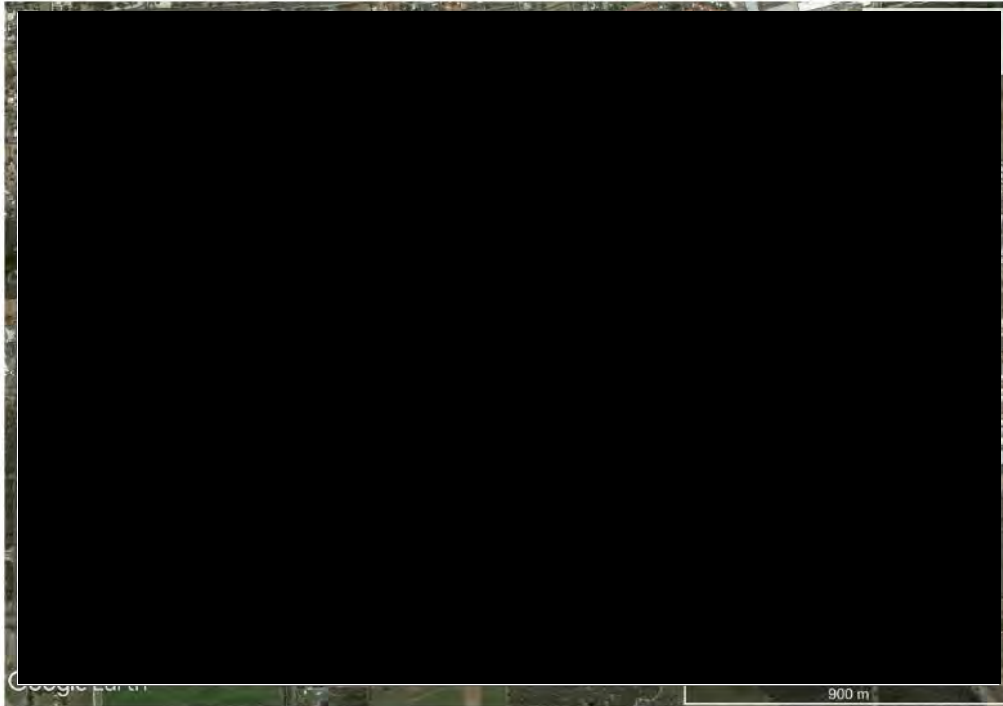


Figure 2. Locations of shelters for Western Ringtail Possums installed along the Vasse Drain in Busselton in October and November 2020.

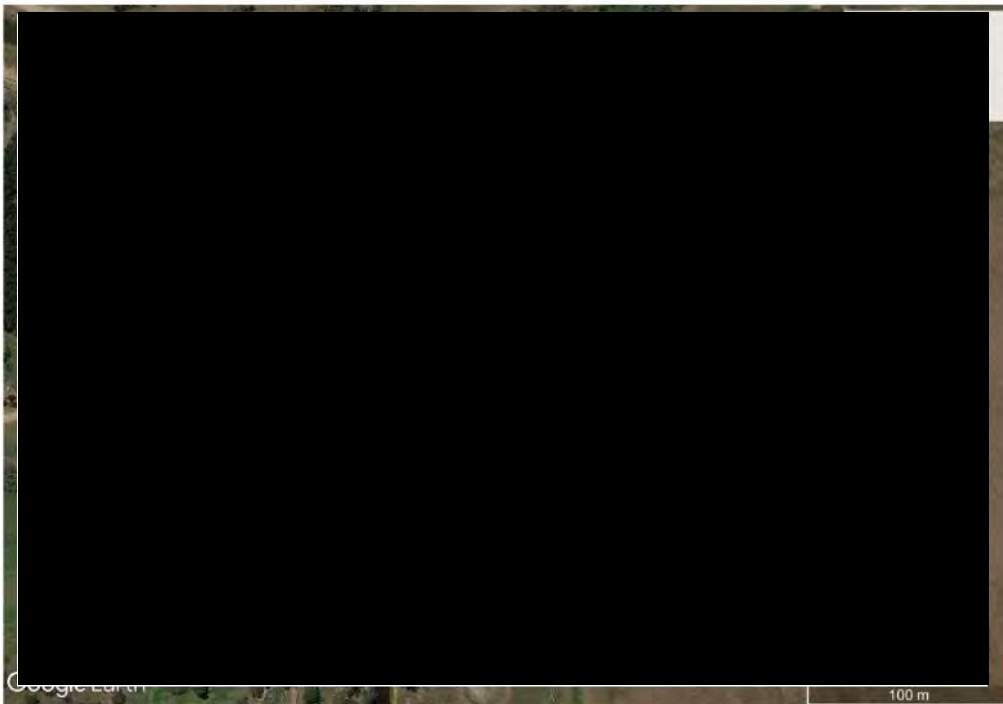


Figure 3. The southern project area (VROS) off [redacted] the Vasse Diversion Drain and extending north along a natural drainage line, showing installed artificial shelters in red. The green marker was the location of a large [redacted] which a possum was displaced during clearing. It ran to a hollow (marked in white), behaving as if it knew the location. This hollow immediately adjacent to works was occupied in January 2021, despite active construction taking place nearby. Since March 2021, the hollow has been unoccupied, however a new natural drey was discovered in March 2021, further to the [redacted] (see Appendix 2, Figure 15)

Monitoring of Artificial Shelters

A check of all artificial shelters was carried out on two occasions in 2022 (January and December) and in February 2023. December 2022 and February 2023 are the focus of this Year Two report. All locations were checked, shelters were photographed, and the state of the shelters recorded, noting any that needed repair or replacement. A pole camera was used to determine if the shelters were occupied by possums or had evidence of recent use (see Appendix 1, Image 16).

Replacement of Relocated Natural Dreys

Since many of the Relocated Natural Dreys that were installed during clearing had fallen down or become unusable, 14 additional artificial shelters were installed in February 2023 to replace those that had been lost. They were installed in similar locations to the dreys that they replaced. All the new shelters were photographed and images are provided in Appendix 3.

Monitoring of Natural Dreys

During the monitoring, a number of new, natural dreys were discovered in the study area. Locations and occupancy of these dreys were recorded, and they were added to future monitoring sessions. If a natural drey became disused and fell from the tree it was excluded from future monitoring. Natural dreys that remained in trees continued to be checked, as these will sometimes be repaired and reused by possums.

Monitoring of Rope Bridges

Two brands (Reconyx, Swift Enduro) of motion sensitive cameras were used to monitor use of the rope bridges on two sessions of three nights concurrently with the shelter monitoring periods. Cameras were set at a range of angles depending on the locations of ropes and adjacent branches.

When analysing camera data, groups of images of the same species taken less than five minutes apart were scored as a single instance to avoid overestimating the number of animals using the bridges.

In addition, opportunistic searches for scats underneath the rope bridges were undertaken during other monitoring activities.

RESULTS

Numbers of Possums

Figures 4 and 5 show the locations of Western Ringtail Possums prior to displacement, to provide context for interpreting the results of post-disturbance monitoring. Note that one retained tree on the edge of the drain where construction occurred has continued to record a possum in both Years One and Two.

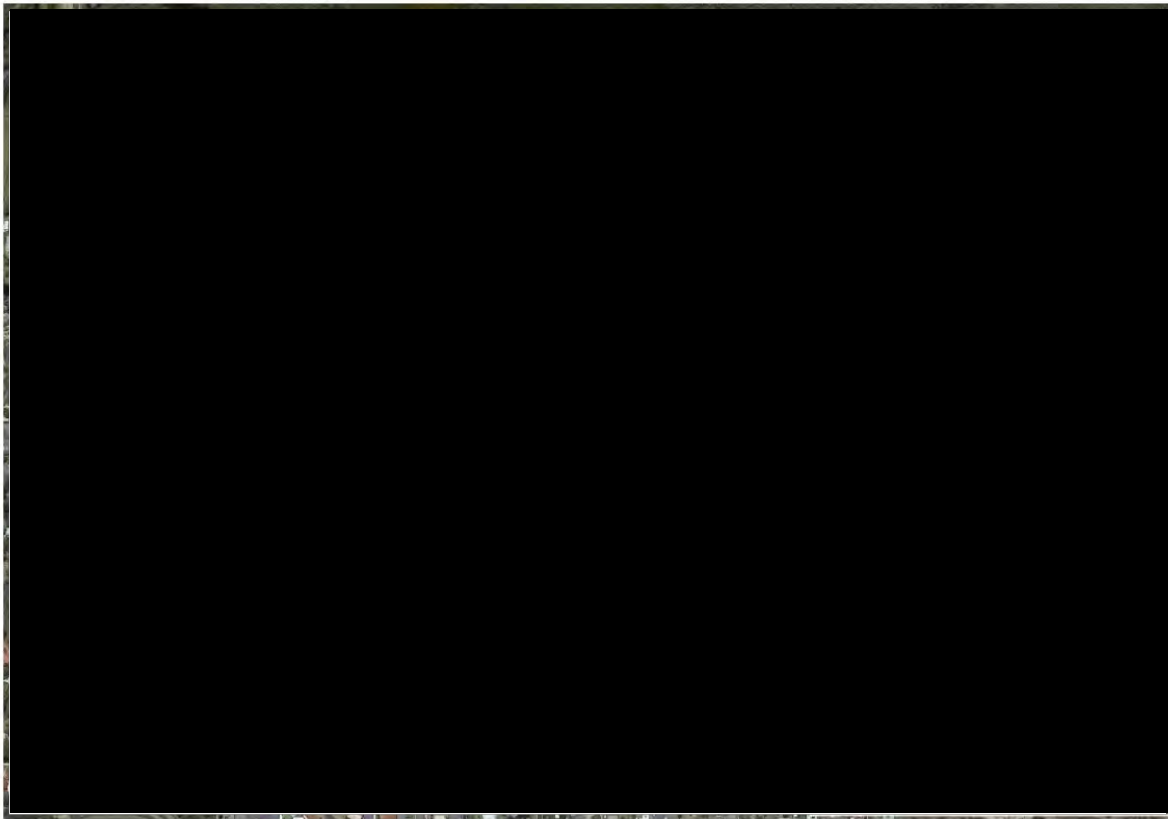


Figure 4. *Locations of Western Ringtail Possums along the Vasse Drain in Busselton in October and November 2020, prior to displacement. White dots denote possums +/- joeys which were displaced, blue points indicate possums which were on the border of clearing works and were not moved as their trees were retained. Two of these retained trees contained possums in January 2021, despite being immediately adjacent to construction work, and one of them was occupied in January 2022, and again in February 2023.*

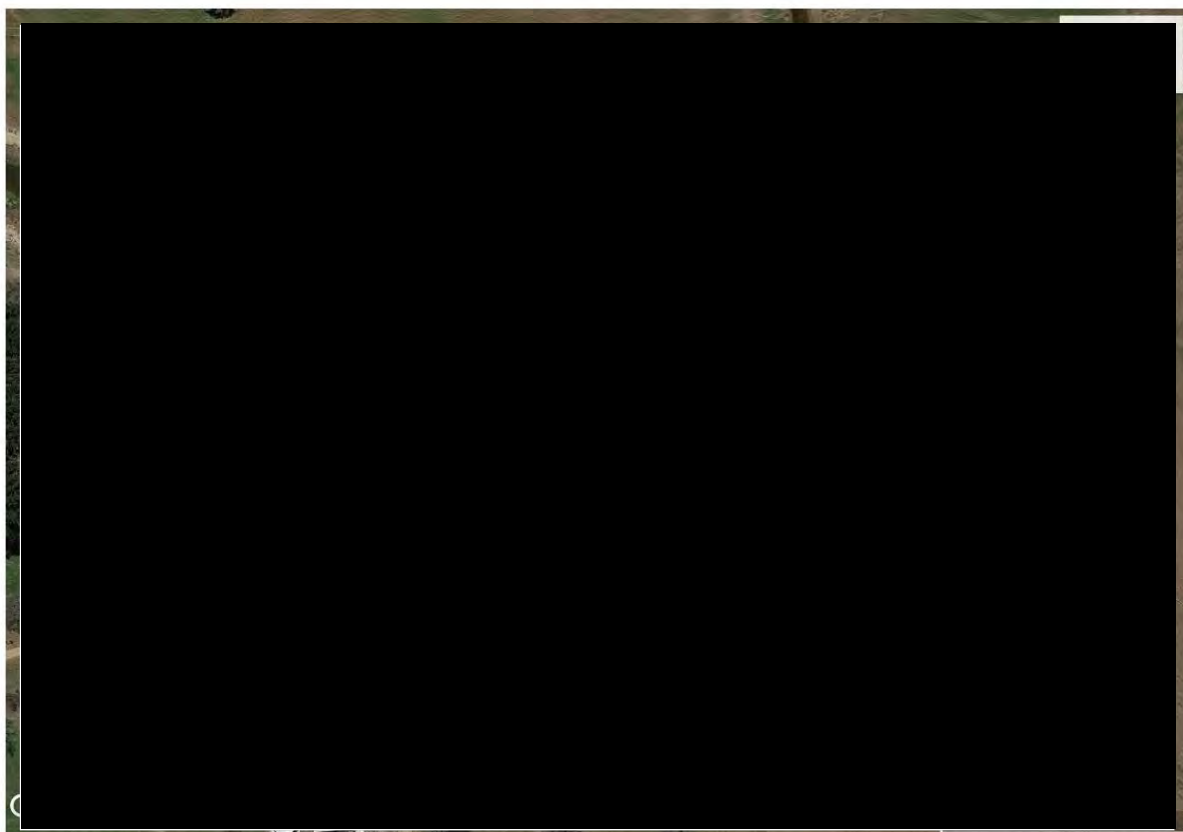


Figure 5. *Locations of Western Ringtail Possums in the southern (VROS) site prior to displacement in November 2020. See Appendix 2, Figure 12 for results from January 2021 onwards. No possums were observed in the VROS area in Year Two of monitoring.*

Summary tables of data for Year Two of monitoring are given in Table 1 and Appendix 3, with Year One data for comparison. Figures 6 and 7 illustrate the usage of natural and artificial dreys, and the numbers of possums in each monitoring period. Figure 10 shows the locations of possums along the drain in Year Two.

Numbers and locations of Possums

In January 2021, 14 of 38 possums (37%) were on branches not associated with dreys while six were using artificial shelters (16%). In January 2022, eight of 45 possums (18%) were using artificial shelters and although some were outside, or in the entrance of their drey, all possums were associated with dreys. In February 2023, four possums (6%) did not appear to be associated with a drey (see Figure 6). In February 2023, 13 possums (20%) were using artificial shelters. The numbers of natural dreys in January 2021 was 18 but in January 2022 it was 35. By February 2023 there were 100 natural dreys, ranging from recent to disused. The post-breeding count of possums was also higher in February 2023 than in either 2021 or 2022 (38 in January 2021, 45 in January 2022 and 64 by February 2023).

Appendix 2, Figures 12 and 13 show the locations of new natural dreys in December 2022 and February 2023. The majority of new dreys recorded were in the Reserve in December 2022, but in February 2023, records were distributed more evenly, including along the narrow strip of vegetation South of the Drain.

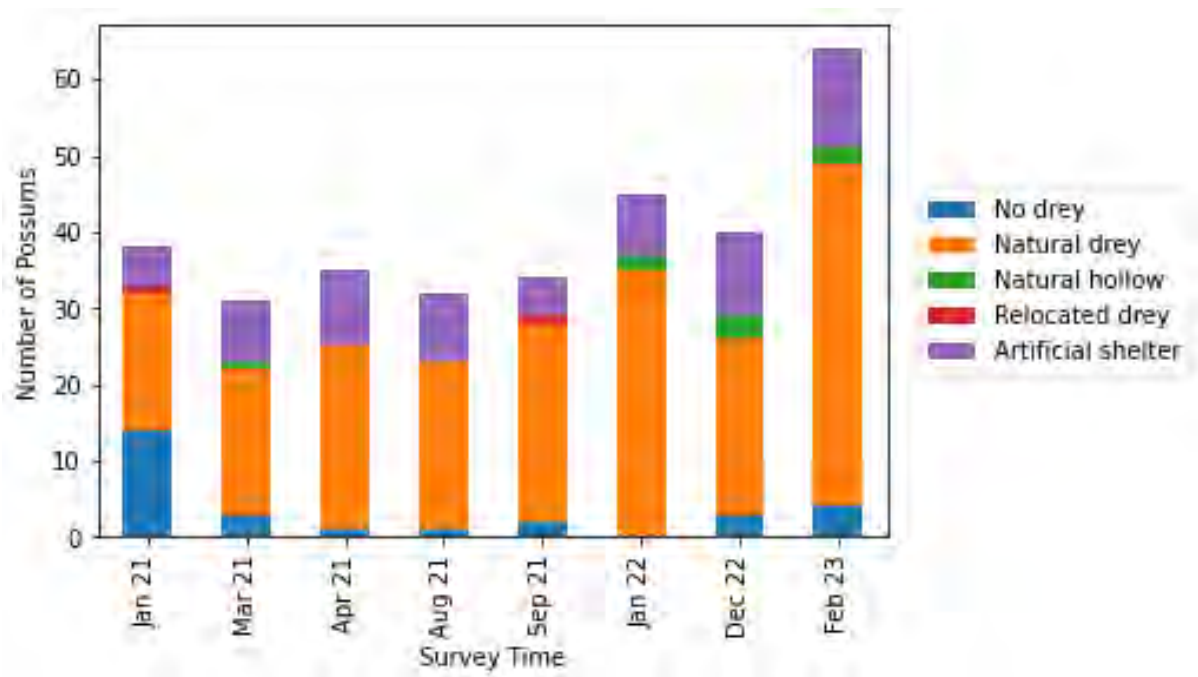


Figure 6. Use of natural and artificial shelters by Western Ringtail Possums along the Vasse Diversion Drain in Busselton between January 2021 and February 2023. Note the continued use of artificial shelters and the large number of natural dreys that had been constructed, possibly by dispersing juvenile animals.

Artificial shelters have continued to be used in all sampling periods. In Year Two, 27% (December 2022) and 20% (February 2023) of possums located were using artificial shelters. Plastic filter buckets were the most frequently used design in Year Two with 50% (3 out of 6) being used on at least one occasion (see Table 1 and Figure 7). Artificial ‘short hollows’ were the next most commonly occupied, with 30% (3 out of 10) being used in at least one monitoring period). Much of the coconut in the cups and domes had been harvested or rearranged by the possums by Year Two, however in one case, a possum later re-lined the drey (a cup) with new material (see Image 32, in Appendix 1).

Overall, 17% of artificial shelters were recorded as used by possums at least once in Year Two. Note that this is a minimum percentage as the dreys were only monitored on two occasions during Year Two, and dreys could have been in use at other times.

On one occasion in Year Two, a Brushtail Possum (*Trichosurus vulpecula*) was recorded using a short hollow (see Appendix 1, Image 34). This record was not included in the analysis of artificial drey use.

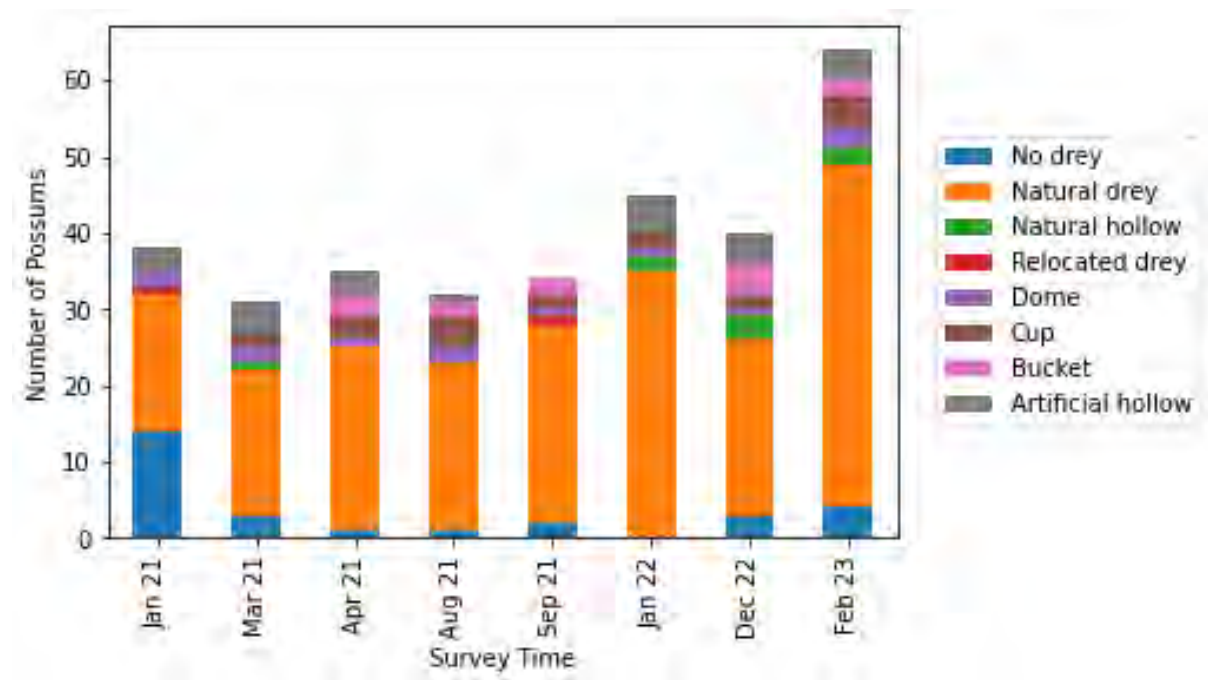


Figure 7. Comparison of the use of a range of artificial shelter designs by Western Ringtail Possums along the Vasse Diversion Drain in Busselton between January 2021 and February 2023.

Table 1. Numbers and designs of artificial shelters installed along the Vasse Diversion Drain and their use by possums from January 2021 – February 2023. Year One and Year Two results are separated for comparison. Note that Year One records included six sampling periods, whereas Year Two results are based on only two sampling periods.

Shelter type	Number installed	Number occupied in at least one monitoring period	Notes	Percentage of drey type occupied or used in at least one monitoring period
Relocated Natural Drey (NAT)	Year 1 24 Year 2 6 intact 14 replaced Feb'23	2 0	14 of these were replaced in Feb 2023 with artificial shelters at the same locations	2 (1%) 0
Dome with Coconut (DoCo)	17	Year 1 4 Year 2 1	One drey was occupied in both sampling periods.	5 (29%) 1%
Cup without Coconut (Cup)	12	Year 1 1 Year 2 1		1 (8%) 1(8%)
Cup with Coconut (CuCo)	14	Year 1 6 Year 2 2		6 (43%)
Installed or relocated Hollow (Hol)	10	Year 1 8 Year 2 3	Two hollows were occupied in both monitoring periods, One hollow was occupied in one monitoring period	8 (80%) 3 (30%)
Dome without Coconut (Dom)	5	Year 1 1 Year 2 1	This drey (Year 2) had been used but was not occupied in either sampling period.	1 (20%) 1 (20%)
Plastic Filter Bucket (Buc)	6	Year 1 4 Year 2 3	One was occupied in both sampling periods, two were occupied in one sampling period.	4 (60%) 3 (50%)
Totals	88 70	Year 1 26 Year 2 11	1 (maintained)	27 (30%) 11 (16%)
Totals excluding relocated dreys	63 63 14 relocated dreys were replaced in Feb '23 A further 4 will be replaced during 2023	Year 1 24 Year 2 11 *	1 (maintained)	38% 17%* *note that this is based on only two sampling periods rather than six in Year One so is not directly comparable.

Construction of Natural Dreys

Of the 100 natural dreys monitored during Year Two, 61 of them were new. In December 2022, 33 new natural dreys were recorded. A further 28 new natural dreys were recorded in February 2023.

Use of Rope Bridges

During the two camera sessions, many Ringtail and some Brushtail Possums were observed using the bridges. In February 2023 there were 71 individual photographs in 17 instances. See Images 20 to 26, in Appendix 1, and the cover of this report, for examples.

Western Ringtail Possum scats were observed during both sampling sessions under the rope bridges adjacent to Cook St industrial area. See Image 27 in Appendix 1.

Opportunistic Observations

A dead possum was found adjacent to a fox scat and was likely subject to fox predation. The fox den which was active in the Council Reserve during 2020 – 2022 was observed to have been abandoned in December 2022 and February 2023.

One artificial shelter (short hollow S66) contained a Brushtail Possum on 15/12/2022.

In December 2022, some possums were observed lying on their backs with their pouches open (see Appendix 1, Image 31).

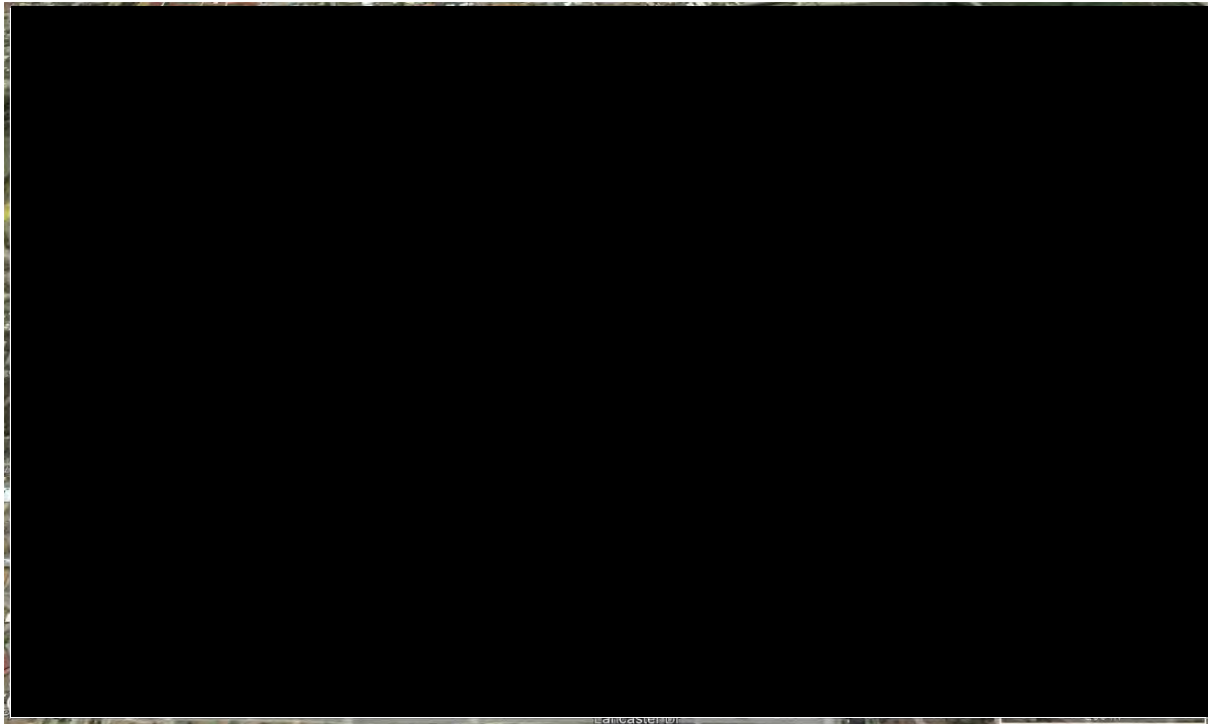


Figure 10. *Records of Western Ringtail Possums along the Vasse Drain in Busselton in Year Two.*

DISCUSSION

The second year of possum monitoring has consolidated the positive results from the first year. In the second year, 40 animals were recorded in the December sampling period and this increased to 64 animals by February, once the young were independent. Since six of the animals counted in December were joeys, an adjusted minimum number of adults would be 34, indicating a stable population size in comparison with previous years (32 in August 2021). This suggests that the possum management as part of drain widening works have not had a large impact on the population numbers to date. It also suggests that the possums have bred well in Year Two, and a large number of juveniles appeared to be beginning to disperse during February.

The use of the displacement technique outlined in the Fauna Management Plan for the Vasse Diversion Drain Upgrade (Bamford et al., 2020) to move possums from the clearing area appears to have been successful. All 36 possums were displaced from the clearing area without injury, many needing to be moved by less than 20 m. Most would only have been moved within their existing home ranges. By avoiding or minimising handling, personnel were able to keep stress to the animals to a minimum. Cowan et al. (2020), links the poor survival of relocated animals to the stress associated with their capture, handling and transport. Studies of Western Ringtail Possums report high mortality of relocated animals (Clarke, 2011, Thompson & Thompson, 2009) however observations from the first two years of the present study suggest that many animals have remained in the area following displacement. Ongoing surveys will better inform these observations.

Relocated dreys were probably important initially but most became disused once the possums had the opportunity to build new dreys or adopted artificial shelters. Interestingly, two relocated dreys were being used in September 2021 and one was still being maintained in January 2022 although was not occupied on the day of monitoring. By February 2023, none of the relocated dreys appeared to still be in use. Fourteen of the 18 relocated dreys that had blown down or were not found were replaced in February 2023, and monitoring of the use of these additional artificial dreys will commence from the next monitoring period and reported on in the Year Three Monitoring Report. Relocated natural dreys will continue to be replaced with additional artificial shelters as needed to fulfil commitments made as part of project approvals to install double the number of artificial shelters as were removed and maintaining them for ten years (DWER Clearing permit CPS 8191/1).

Artificial shelters were adopted quickly and have been used consistently (16% and 19%) in both sampling periods in Year Two. The availability of additional shelter is likely to have supported the population of possums following displacement and may have contributed to the sustained increase in numbers of possums at the ends of the breeding seasons (45 in January 2022, 64 in February 2023) by providing additional shelter for newly independent juveniles.

Many new, natural dreys were constructed across the site between December 2022 and February 2023, as was observed between January and March 2021. Some were close to maternity dreys, suggesting that juveniles had initially built dreys close to their mothers. The

results from Year Two suggest that there may also have been dispersal along the drain from the Council reserve in February 2023 as joeys became independent (see Appendix 2).

The number of possums using natural hollows is probably an underestimate, as the pole camera is not always able to detect them, if the hollow is curved. In January 2022, two animals were detected because their tails were hanging from their hollow. In some parts of their range with a greater number of trees with large hollows, Western Ringtail Possums rarely build dreys and are often difficult to detect without spotlighting transects, as they spend their days deep in hollow trees. Since the numbers of suitable natural hollows in the trees along the Vasse Diversion Drain is small, and spotlighting transects were carried out at the site before works began, the numbers of animals remaining undetected within the study site is likely to be low (less than five animals).

During hot weather in January 2022, and in December 2022, possums exhibited a range of behaviours probably associated with cooling. Hanging tails in the breeze, plucking hair and exposing bare skin on their tails, bellies and pouches, and seeking shelter in cool, damp vegetation are all behaviours that are likely to help the possums to manage their temperature in heat extremes. Saliva spreading has been observed to be used as a cooling mechanism in Red Kangaroos (Dawson et al., 1974). Van Helden et al. (2021) found Western Ringtail Possum abundance to be correlated to canopy cover in Albany. Revegetation and continued access to shady gardens are likely to be important to the long-term survival of the possum population in Busselton.

Artificial shelters are being used by the possums, with the preferred designs varying perhaps due to seasonal changes in weather conditions, or the breeding cycle of the animals. In Year One, artificial 'short hollows' were the most commonly occupied design (80% were used in at least one monitoring period), and although 30% of them were used in one of the two sampling periods in Year Two, the most popular design was the plastic buckets, 50% of which were occupied on at least one of the two sampling periods. In Year One, during which the dreys were sampled on six occasions, different drey designs appeared to be popular at different times of year. With only two sampling periods during Year Two however, it is not possible to assess seasonal variation in attractiveness of the different drey designs. In Year One, short hollows seemed to be preferred in the non-breeding season, however only one artificial hollow was observed to be used by a mother with a joey, presumably because hollows are not easily expanded to accommodate a growing joey. In Busselton, maternity dreys sometimes have a 'granny flat' arrangement when the juvenile is close to independence (pers. obs.), and this would be more difficult to accommodate in a short hollow. Short hollows were highly favoured at other times of year in Year One, however and have the advantage over large or long hollows that to-date, none has attracted feral bees.

In Year Two, artificial shelters were used at a similar rate in both sampling periods. Twenty to 27% of possums located during monitoring periods were using artificial shelters, which suggests that they may be providing an important additional resource. It will be interesting to see if the proportions stay the same, as the relocated natural dreys are replaced and the numbers of artificial dreys increase.

Black plastic buckets continued to be a popular choice in Year Two, with 50% of them occupied on at least one of the two sampling periods. Domes were popular when covered with coconut but were mostly unused once the coconut was removed by the possums or had collapsed. One peppermint lined dome without coconut was also used. Two coconut-lined domes also contained paperbark. Both these domes were used in Year One, one was occupied in five of the six monitoring periods. In Year Two however, it had deteriorated and was no longer used. It is possible that the waterproofing and insulating properties of paperbark, long recognised and utilised by Noongar people (Hansen and Horsfall, 2019) are also valued by the possums. Artificial shelters lined with paperbark and coconut appear more attractive and lasted longer than coconut alone, however additional trials will need to be made to confirm this due to the small sample size (only two dreys due to the availability of sustainably sourced paperbark).

Cups were used in both sampling periods in Year Two, including one cup without coconut, in which a possum constructed a drey (see Image 32 in Appendix 1). This cup was marked to be re-lined, but following this observation, it was decided not to re-line dreys, and to instead observe their use without maintenance or disturbance.

These are preliminary data only on the preference of different artificial drey designs and are confounded to some extent by the short-term disturbance caused by the drain widening project in Year One, and by the deterioration in coconut, which may have changed the attractiveness and functionality of the coconut-lined cups and domes. In some cases, the coconut was harvested by the possums to construct an alternate drey elsewhere! Additional artificial shelters are being added to replace the deteriorated relocated natural dreys. These dreys are a selection of lined cups and plastic filter buckets, to provide further data on the most effective shelters to support populations of possums in disturbed areas with insufficient natural shelter. Additional short hollows will also be installed if available.

To address the question of the seasonality in drey choice, it would be necessary to maintain a more regular monitoring regime than has been proposed for at least some years beyond Year Two. This would allow drey use to be monitored throughout the site at different times of year, as occurred in Year One, to detect seasonal variation in drey choice. This possibility will be discussed with the client.

VROS

Clearing in the VROS area has resulted in a highly fragmented landscape, and possums and the artificial dreys are on a 'dead end' without connectivity, and with less vegetation than in 2020, so are probably less attractive to possums. The artificial dreys in the VROS area were used initially, and although one possum stayed immediately adjacent to the VROS area in a natural hollow throughout most of the construction period, it was no longer in the hollow in March 2021 and a natural drey was found further north along the river, which was probably constructed by this individual. By September 2021, this drey had deteriorated and no evidence of possums was found in the area. No fresh evidence of possums was found during Year Two surveys. This is probably to be expected, given the number of trees removed and

the consequent loss of habitat and connectivity. If trees are replanted outside the VROS structure, this effect could be reversed in time, however the land surrounding the VROS area is privately owned farmland, so any plantings in the area would need to be negotiated with the landowner.

Rope Bridges

Rope bridges were again used by both Brushtail and Western Ringtail Possums in 2022-23. It is encouraging to find clear evidence of their continued use. Previous studies such as Yokochi and Bencini (2015) which monitored Western Ringtail Possums' use of rope bridges, found that the animals began using them within 36 days of installation. In their study the structures were heavily engineered, static bridges which move less in windy conditions than ropes, and tend to have less vegetation to interfere with the functioning of cameras. The trial of different camera angles has resulted in a much better result, with 17 instances and over 70 photos of possums using bridges, with both Reconyx and Swift Enduro demonstrating effective detection of possums.

The value of each tree

Bamford et al (2021) noted that animals were continuing to use trees retained immediately adjacent to the clearing area while work continued on site and emphasised the importance of retaining individual trees where possible. Several of the trees in the strip of vegetation immediately adjacent to the impact area continue to be used by possums in 2022/23. These include several trees with dreys which were marked to be cleared in November 2020. After consideration, a decision was made by the client and contractor to retain them. Three animals recorded in January 2021 were in dreys or hollows directly overlooking the construction site but the animals had persisted in them, tolerating the disturbance. These sites continued to be used during 2021 and one retained tree with a natural drey, immediately adjacent to the drain, was still in use in February 2023. Decisions made to reduce clearing, even by a single tree, can improve the outcome for fauna.

To maintain the displaced animals at the site in the long term despite the reduction in habitat, it is essential that additional food resources are provided in the form of revegetation, as soon as is practical. Although food resources do not appear to be limiting at present and all animals appear in good condition, there is a risk that drought conditions or insufficient nitrogen in leaves will begin to affect the population. The wide range of plant species being revegetated by Tranen (Tranen Revegetation SouthWest, 2020), including Coojong *Acacia saligna*, *Kunzea sp.* and Marri *Corymbia calophylla*, as well as WA Peppermint *Agonis flexuosa*, and a range of understorey plants will provide the varied diet which Mathieson et al. (2020) found Western Ringtail Possums prefer. This revegetation is progressing well and will soon be providing high quality food for possums. The regrowth of plants along the fence line adjacent to the impact area is also progressing well and will rapidly begin to provide additional food (see Image 33, Appendix 1).

Revegetation will also re-establish and enhance connectivity, supplemented by the rope bridges which were installed by Tree Surgeons WA. Increased connectivity will allow possums to

move between the population along the drain and the rest of Busselton to access food resources, expand home ranges and find mates, improving the species' long-term viability in the area. Rope bridges and revegetation will also enable possums to travel without going to the ground, avoiding the risks of foxes and cars, both identified as major threats to the viability of the Busselton population by (Yokochi *et al.*, (2015).

An alternative explanation to the continued increase in numbers of possums by February 2023 could be lack of connectivity; if juveniles were unwilling or unable to disperse to other areas due to reduced connectivity. This seems unlikely, as researchers such as Yokochi *et al.* (2015) have suggested that stranded animals tend to go to the ground and cross roads (with associated mortality) and possums have demonstrated their ability to use the installed rope bridges.

Engaging the community

Part of the long-term success of the project will be engaging the community in areas adjacent to the drain with possum conservation, helping them to value the critically endangered species which shares their suburb. Many of the animals monitored in this study have home ranges which overlap with residential and industrial properties, and so the actions of the human occupants of their home ranges could have a huge impact of the success or otherwise of the Water Corporation's rehabilitation in the area. Encouraging residents to retain and replant native trees, provide connectivity above ground to keep possums away from domestic pets, and being prepared to accept the occasional rose bloom or nectarine being harvested by possums (or netting the trees) will help to ensure the possums' long-term survival in the suburbs. There is increasing evidence that Western Ringtail Possums survive better in suburbs than they do in remnant bushland (Van Helden *et al.*, 2020, Busschots *et al.*, 2021), so residents can play a vital role in the species' conservation.

Although the Vasse Diversion Drain Widening Project caused disruption to the Busselton population of Western Ringtail Possums in the short term, it has the potential to contribute to the possums' long term survival by improving the availability of high nutrient foliage for food, increasing the availability of suitable structures for protection/breeding (artificial shelters, revegetation), and canopy continuity to escape predation and other threats (rope bridges and revegetation), all issues identified as important by Department of Parks and Wildlife, (2017) and Bamford *et al.*, (2019). In addition, ongoing engagement with residents adjoining the drain to encourage them to make their backyards possum-friendly will contribute to sustaining the possum population in the long term. Future monitoring of the Western Ringtail Possum population along the drain as part of this project will help to show if this potential is realised and can be sustained.

CONCLUSIONS

While only two sampling sessions were undertaken in Year Two, the second year of possum monitoring at the VDD and VROS sites suggests that the minimal displacement method, choosing to retain trees that were on the border of the development, providing artificial shelters and rope bridges have minimised the impact on the possum population. The population has remained stable following the initial disturbance, has shown a slight increase in January 2022,

and a substantial increase again in February 2023, suggesting a good survival of juveniles following the 2021 and 2022 breeding seasons. The increase in numbers may reflect the provision of additional shelter, and possibly a decrease in the fox population. One dead possum was discovered during sampling in Year Two, probably the result of fox predation, however fox predation is likely to have decreased following the abandonment of the fox den in the Reserve.

The population of possums is stable and increasing in all areas except the VROS area, where no possums were observed during Year Two. It is likely that the lack of connectivity and reduction in cover following construction has made the remaining vegetation less attractive to possums. Revegetation of the surrounding area (mostly private farmland) would be required to make the area more attractive to possums.

Relocated natural dreys were probably important in the short term but most became disused after a few months, and most possums were found in newly constructed natural dreys, and in artificial shelters by March 2021. Relocated natural dreys were no longer being used in Year Two, but artificial dreys are being used consistently, and the provision of artificial dreys is likely to be helping to support a higher population. In Year One there appeared to be a seasonal pattern in their preferred designs. Artificial hollows appeared to be favoured in the non-breeding season, whereas plastic buckets and cups with coconut were chosen at other times of year, however it was not possible to determine seasonal preferences with only two sampling periods in Year Two. It will be interesting to see if the additional, newly installed replacement shelters (to replace the relocated dreys) are used by the possums. There is insufficient data to draw firm conclusions regarding drey design, because of the confounding effects of disturbance and seasonality, however plastic buckets followed by short hollows were the most frequently used in Year Two of the study.

Since 41 dreys were removed during clearing, replacement of relocated natural dreys is required to meet the condition 15 of DWER Purpose Permit CPS8191/1 (Bamford et al. 2020) to increase the number of additional shelters to 82. This requires an additional 18 shelters. Fourteen of these have so far been installed, with an additional four to be installed in coming months. As the remaining six relocated natural dreys deteriorate, these will also be replaced. Follow-up monitoring is recommended to determine if these new dreys are being used and if those with coconut are being harvested by the possums. In Year Two, twice yearly monitoring was conducted. While this demonstrated the use of the dreys, the rates of use were lower (probably an artifact of lower sampling effort – two rather than six data points for each drey) so a ‘rate per sampling period’ needed to be calculated. It was also not possible to detect seasonal differences in the use of dreys. Increasing the frequency of monitoring (ideally six, but at least three times per year) would assist in assessing the use of replenished and additional artificial dreys and would provide greater confidence in conclusions about preferred drey design.

In January 2021, a number of possums were observed without an associated drey, however in January 2022, despite numbers of possums being higher, all were associated with dreys, even if they were outside them, suggesting that they had adjusted to their altered home ranges and

new shelters after 12 months. In February 2023, a small number of possums did not appear to be associated with dreys, which may reflect a natural level of drey use, or a particularly high number of juveniles, following an exceptionally good breeding season. Future monitoring will demonstrate if a higher population can be maintained, with increased shelter, food plants and connectivity.

The rope bridge design has been demonstrated to be appropriate for use by possums, therefore increasing connectivity for urban possums in the area. The rope bridges adjacent to Cook St Industrial area were used by possums in both sampling periods.

Once revegetation is established sufficiently to provide additional food sources for the possums, monitoring will demonstrate if possum numbers rise, and if the population expands to use additional areas of the study site which are currently unsuitable.

RECOMMENDATIONS

- Artificial shelters where coconut fibre is collapsing should be observed but not repaired at this stage, in case possums choose to rebuild a drey inside them.
- Relocated Natural Dreys should continue to be replaced with artificial shelters to bring the total back up to or exceed the minimum of 82 shelters required as part of DWER Purpose Permit CPS8191/1, condition 15. This would require an additional 10 shelters. Additional short hollows, plastic filter buckets and wire domes / cups with paperbark and coconut seem the best choice, given preliminary results.
- To gain a detailed understanding of the seasonal usage of artificial dreys, monitoring would need to be conducted at a rate of three - six times per year in at least some of the remaining eight years of the study. The existing program is for twice yearly sampling from 2022 onwards, which will collect enough data to measure the overall population size and expansion into the revegetation areas but will not provide sufficient data to detect seasonal usage of the site, including changing preferences for artificial drey designs. This information would be valuable to collect to inform future rehabilitation projects if budget were available to maintain a more frequent monitoring regime.
- Revegetation should continue as quickly as possible to increase food resources and connectivity.
- Additional monitoring time may be required to detect and re-check all natural dreys once revegetation is advanced enough to support additional possums. This may require an additional day's monitoring for each session from the 2024 season.
- The fox den identified in Bamford et.al. (2021), south of the drain in the Council reserve has been abandoned. The den and all evidence of foxes should be monitored for any future activity.
- Residents should be encouraged to plant appropriate food and shelter plants for possums to improve connectivity and support their continued occurrence in the suburbs of Busselton.
- The Busselton community should be provided with opportunities to learn more about the possums and promote their occurrence as an asset. This could include workshops to make artificial shelters, plant local plants and encourage a sense of custodianship of the possums.
- When clearing works are required in areas containing Western Ringtail Possums, displacement rather than relocation should be the preferred option to minimise disturbance to the animals, provided that sufficient habitat remains.
- Every tree is important for species such as Western Ringtail Possums. In situations where trees are on the border of a development, they should be retained if possible.

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Appendix 1. Photographs



Images 2-7. A selection of designs of Artificial Shelters: Dome – no coconut (Dom); Short Hollow (Hol); Cup with coconut (CuCo); Cup – no Coconut (Cup); Plastic Bucket (Buc); Dome with coconut (DoCo). More detailed analysis will be possible once more data has been collected.



Image 8 (left). *A platform natural drey containing a Western Ringtail Possum mother and large joey taken in October 2020.*



Image 9 (right). *A dome-shaped natural drey containing one or two possums. Numbers of possums can be difficult to determine in dome-shaped dreys without disturbing the occupants.*



Image 10. *An example of a Relocated Natural Drey. Relocated Natural Dreys were probably an important interim measure in November 2020 for newly displaced possums. One Relocated Drey were still being maintained in January 2022 but by February 2023, all relocated natural dreys were disused or had fallen apart.*



Image 11. Motion sensitive cameras were installed on various angles and directed towards the rope bridges. The angle depended on the position of vegetation obstructing the view of the ropes, so possums were photographed without taking large numbers of photos of moving rope and branches. See Images 20 – 26 for examples of motion sensitive camera photos.



Image 12. Multiple dreys in one flowering *Melaleuca nesophila*. Although this species is not native to the South-West, it produces abundant nectar and is a good example of the non-native food resources available in the suburbs of Busselton.



Images 13 & 14. *Possums frequently harvested coconut fibre from the coconut-lined dreys resulting in the denuding of most lined cups and dreys by January 2022. It was planned to replace coconut in the dreys, however in Year Two, one possum re-lined an empty drey with natural material, so the decision was made to leave them undisturbed to see if more possums would choose to rebuild in them.*



Image 15 (left). By January 2021, a number of the artificial shelters containing coconut had been rearranged. In this case, the possum obviously preferred to choose an alternate location to create its own shelter using coconut from the artificial drey!

Image 16 (right). Artificial Shelters were checked using a pole camera if necessary. Examples of pole camera images may be seen in Images 28 to 30.



Image 18. Rope Bridge along [REDACTED] installed by Tree Surgeons WA. Project Approvals require six rope bridges to be maintained for 10 years to help improve connectivity for possums, so they do not need to come to the ground.



Image 19. *Revegetation adjacent to the industrial area in [REDACTED] by Tranen Revegetation SouthWest. These plantings are establishing well and will rapidly increase connectivity, shelter and food supplies for possums. Possums prefer a range of food plants, particularly those with high nitrogen such as *Acacia saligna*, so these plantings will provide high quality food for them. The seedlings used include a wide range of plant species which will benefit not only possums but increase local biodiversity.*



Image 20. *Brushtail Possum* on rope bridge adjacent to [REDACTED] on 17 February 2023, demonstrating that the design is suitable for both species of possums.



Image 21. *Western Ringtail Possum* crossing the same rope bridge as shown in the previous image, adjacent to [REDACTED] n Busselton on 17 February 2023.



Image 22. Western Ringtail Possum crossing the rope bridge adjacent to [REDACTED] Busselton on 19th January 2022. First in a series of three photos (Images 19 – 21)



Image 23. Western Ringtail Possum crossing the rope bridge adjacent to [REDACTED] in Busselton on 19th January 2022. Second in a series of three photos (Images 19 – 21)



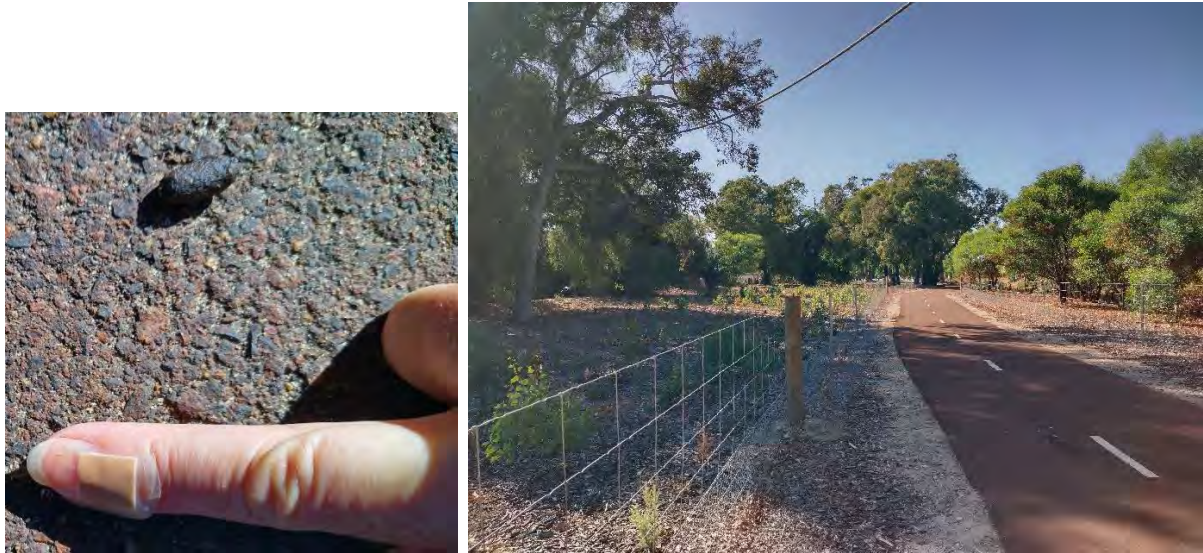
Image 24. *Western Ringtail Possum crossing the rope bridge adjacent to [REDACTED] Busselton on 19th January 2022. Third in a series of three photos (Images 19 – 21)*



Image 25. *Western Ringtail Possums crossing the rope bridge in February 2023. This camera was set underneath the rope facing upwards to avoid moving vegetation. This technique worked well in areas with open ground between trees.*



Image 26. *Brushtail crossing the same rope bridge as shown in the previous photo. This camera was set facing upwards, underneath the rope, to minimise the camera being triggered by moving vegetation.*



Images 27 & 28. *Possum scat with finger for scale (left). One of several found on the path beneath the rope [REDACTED] (right) during the February 2023 monitoring period in the area being revegetated. Scats had not been recorded along the pathway prior to the rope bridges being installed. The revegetation (right) is already having a positive visual impact, and once it is large enough, it should provide additional nesting and high quality feeding sites for possums.*



Image 29. *A Western Ringtail Possum in an artificial hollow in February 2023. Identification is often easily made as Ringtails often hang their tail out of the hollow, especially on warm days.*

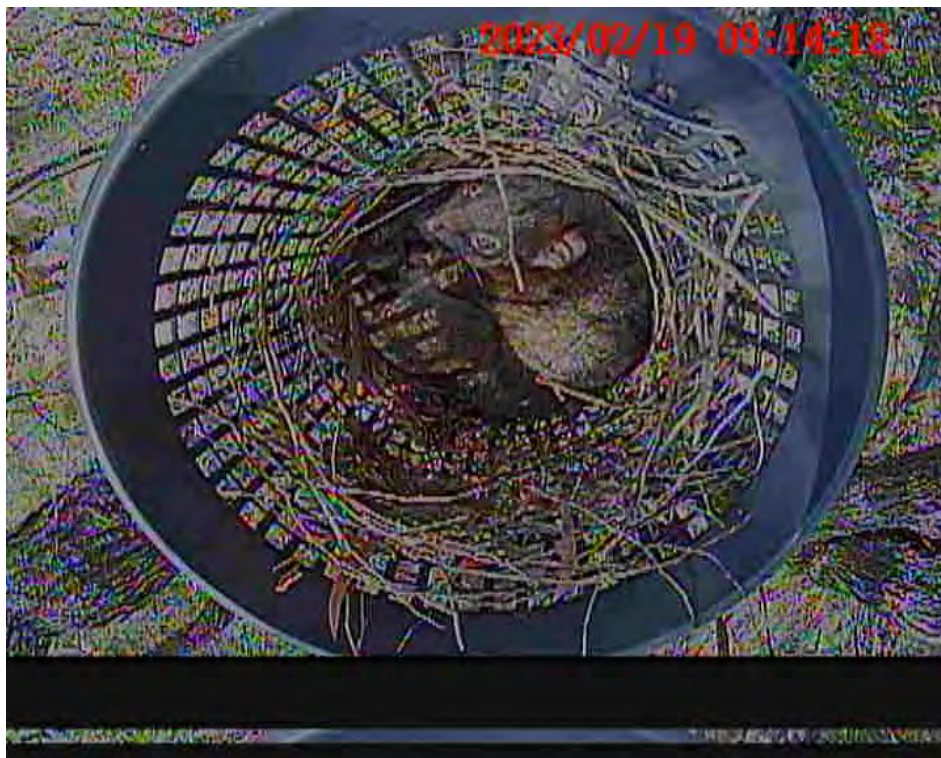


Image 30. *Western Ringtail Possum in February 2023, in a plastic filter bucket. These were the most popular drey design in Year Two, with 50% of them being occupied during at least one sampling period..*



Image 31. *Western Ringtail Possum in December 2022, keeping cool. This individual appeared to be exposing the bare skin under its tail and spreading saliva on and in the pouch to help it thermoregulate.*



Image 32 *An occupied artificial drey, rebuilt with natural materials by the possum, subsequent to most of the coconut being removed some months previously. The possum is just visible as a dark shape under the fresh twigs. After observing this behaviour, the decision was made not to replace coconut that had been removed, to see if other possums would choose to rebuild dreys that had been pulled apart.*



Image 33. Retained WA Peppermint tree (*Agonis flexuosa*) containing a natural drey on the edge of the impact area on the south side of the drain which contained a possum in all but two monitoring periods, even during works. A decision was made to retain this tree although it was on the edge of the clearing zone. Its continued use by a possum throughout 2021 – February 2023 illustrates the importance of decisions to retain individual trees. Also visible are regenerating Coojong (*Acacia saligna*) seedlings, which will provide important, high-nitrogen forage for possums within two years.



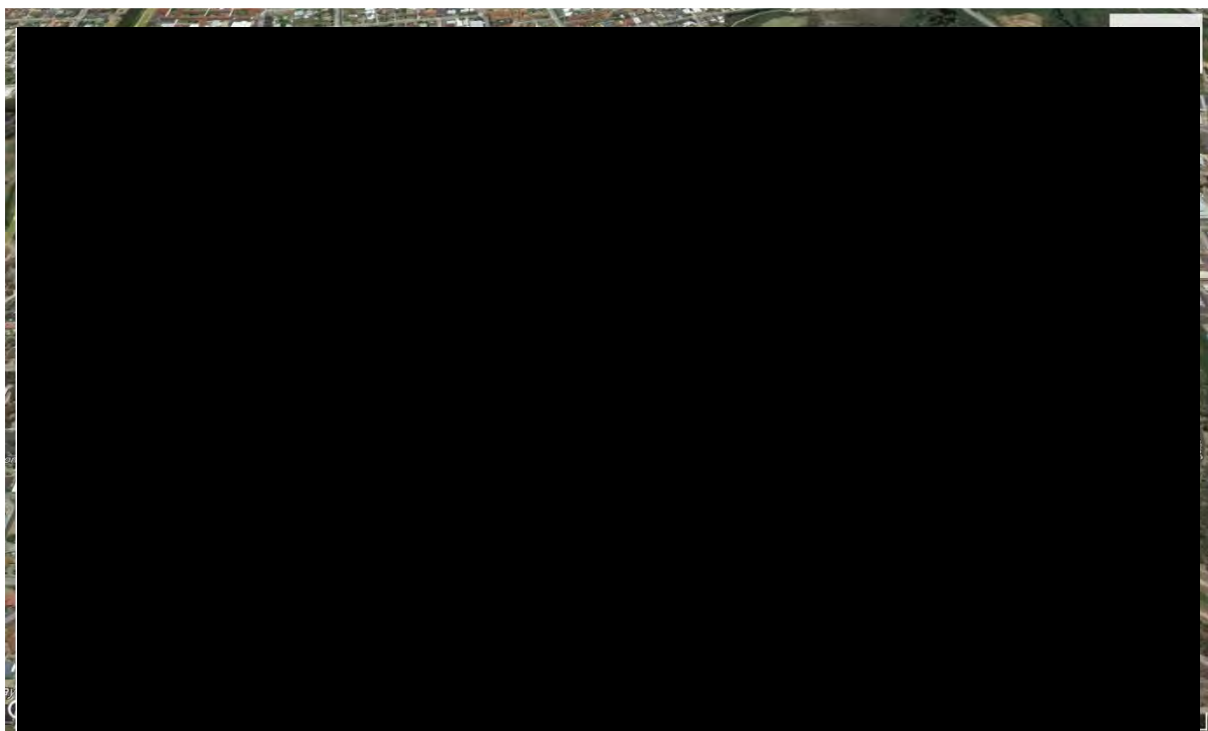
Image 34. Artificial 'Short Hollow' S66 contained a Brushtail Possum in December 2022. Brushtail Possums are not commonly recorded using the short hollows, probably as they are larger than Western Ringtail Possums and probably prefer larger hollows. This record was not included in the analysis of artificial drey use, however it demonstrates the additional value of increased shelter for non-target species, as well as for Ringtails. Animals such as bats, birds, geckoes and invertebrates will also benefit from the increased structure provided by the shelters, particularly in disturbed areas, or those under rehabilitation.

Appendix 2. Time series maps showing new Natural Dreys discovered in December 2022 (12a.) and February 2023 (12b.).

Figure 12. New Natural Dreys in Year Two of Sampling

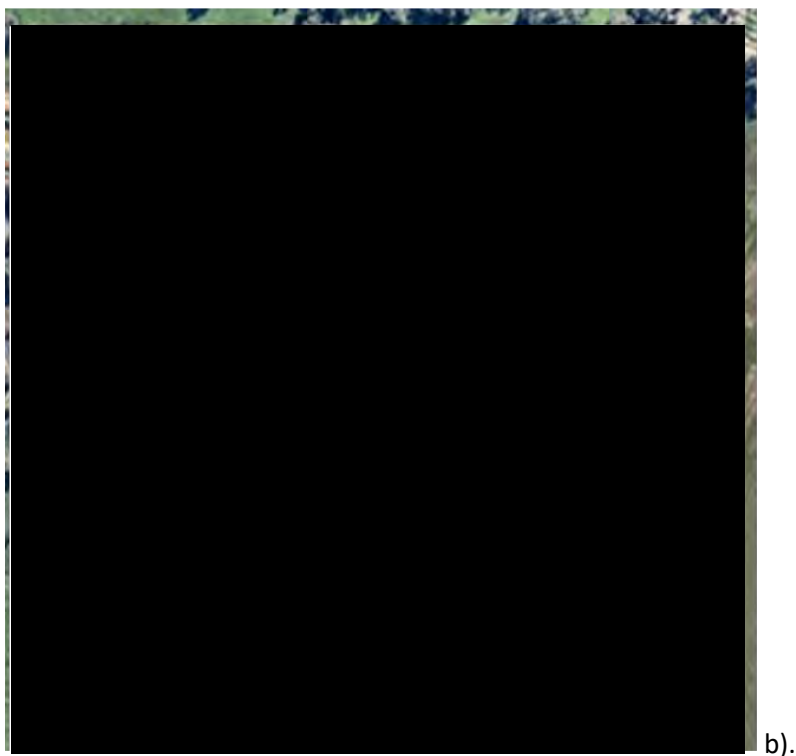


a). December 2022. Dreys appear to be congregated near to the Reserve.



b) February 2023. By February 2023, new dreys have been constructed along the south of the drain, perhaps reflecting post-breeding dispersal.

Figure 13. Vasse River Overflow Structure (VROS) area. Time series maps showing Natural and Artificial Dreys (January 2021) and a new Natural Drey discovered in March 2021. No additional dreys were discovered at the VROS in Year Two.

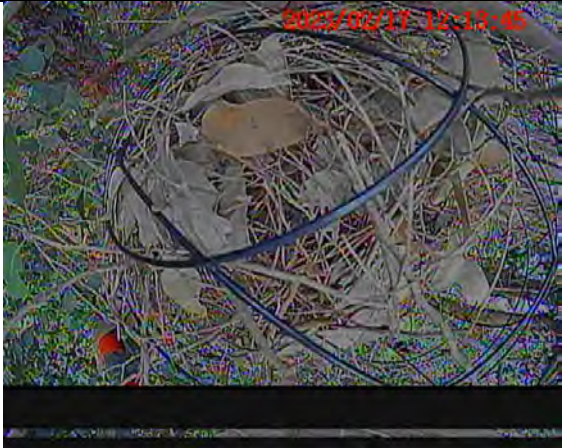


Appendix 3. Table showing relocated and artificial dreys and logs installed outside the clearing zone of the project area. Types of shelters are: DoCo= Dome with coconut fibre (and Agonis leaves), Dom = Dome (with Agonis leaves only), CuCo = Cup with coconut fibre, Cup = Cup (with Agonis leaves only), Buc = Plastic Bucket, Hol = Hollow, Nat = Relocated Natural Drey. Poss. = number of Possums observed using the shelter. The locations of each shelter are plotted in Figures 4 and 5.

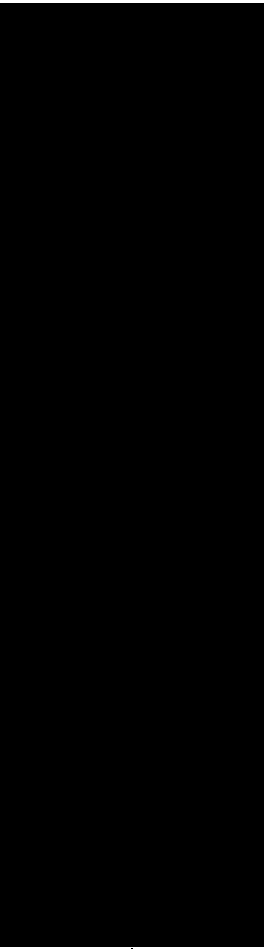
ID	Easting	Northing	Type	Tree	Possum numbers during 8 monitoring periods: Year One (line one): Jan, Mar, May, Aug, Sept 2021, Jan 2022 Year Two (line two): Dec 2022, Feb 2023.	Used	Photos	Notes

S1			DoC o	<i>E. rudis</i>	0 0 0 0 0 0 0	Unuse d		Collapsed coconut, very close to edge of works
S2			Dom	<i>A. flexuosa</i>	0 0 0 0 0 0 0	Unuse d		Very close to edge of works

S3			Dom	A. flexuosa	0 0 0 0 0 0 0	Unuse d		old leaves only
S4			DoC o	E. rudis	0 1 0 0 0 0 0	used		Coconut collapsed – needs repair

S5			Dom	<i>E. rudis</i>	0 0 0 0 1 0 0	Used		Old Agonis, Dense
S6			DoC o	<i>C. calophylla</i>	0 0 0 0 0 0 0	Unuse d		

S7		Dom	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Only old leaves in drey
S8		CuCo	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Bare twig only – needs replacing.
S9		Nat	A. flexuosa	0 0 - - - - -	Unuse d	Not found – Replaced Feb 2023	Replaced. Installed Large Black Bucket now S9R
S10		Nat	A. flexuosa	0 – 0 - - - -	Unuse d	Not found – Replaced Feb 2023	Replaced. Installed Black Cup with Coconut now S10R

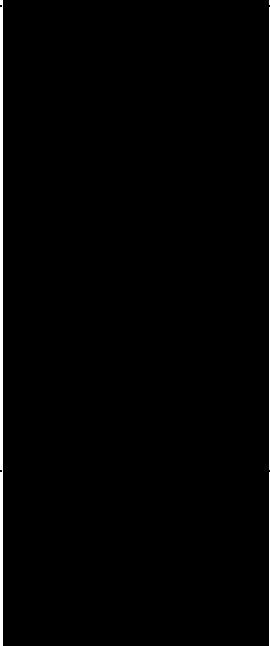
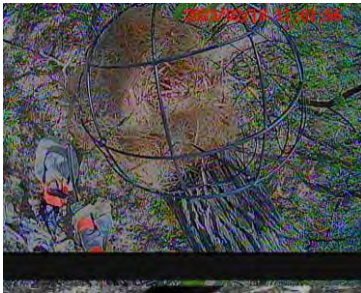
S11			Cup	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Empty
S12			Buc	E. marginat a	0 0 0 0 0 0 0	Used		Lined with sticks

S13			CuCo	A. flexuosa	0 1 0 0 0 0 0 0	Unuse d				dry Agonis leaves
S14			Cup	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d				Lots of dead leaves

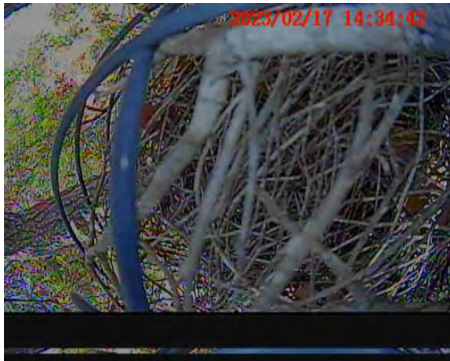
S15		Buc	A. flexuosa	0 0 1 1 1 0 0 0	Used			Few leaves, probably used on occasions
S16		Nat	A. flexuosa	0 0 ---- --	Unused	Not found - replaced		Degraded, then not found – replaced with DoCo S16R
S17		CuCo	A. flexuosa	0 0 0 0 0 0 0 0	Unused			Lots of brown, old leaves

S18			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d				Brown old Agonis
S19			Cup	A. flexuosa	0 0 0 0 0 0 0	Unuse d				Exposed location

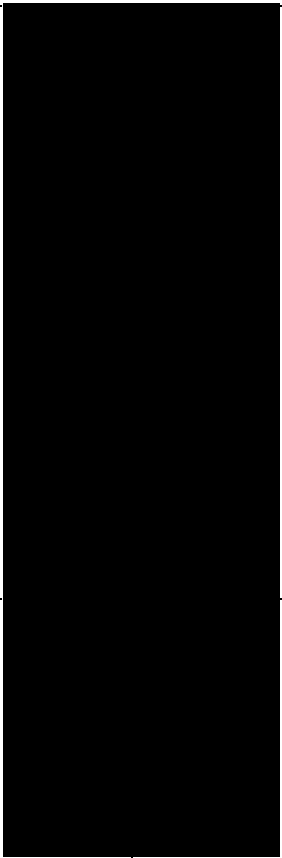
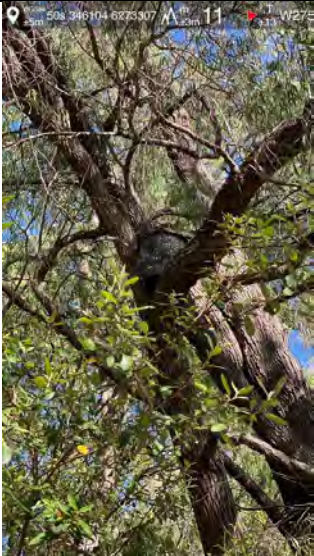
S20			Buc	A. flexuosa	0 0 0 0 0 1 0	Unuse d Used	 	Dead leaves, Used in Dec 2022 Nose of possum visible in pole camera photo.
S21			CuCo	A. flexuosa	0 0 0 1 0 0 0 0	Used		lots of dead Agonis leaves. Occupied on one occasion.

S22 a			DoC o	A. flexuosa	0 0 - - - - 0 0	Unuse d	 	Nat Drey was replaced at the beginning of Year Two. Coconut removed but does not look recently used.
S23			Cup	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d	 	No fresh material

S24		DoC	C. calophylla	0 0 0 0 0 0 0 0	Unused		Coconut gone
S25		Nat	A. flexuosa	0 0 0 0 0 0 0 0	Unused		No fresh material
S26		Nat	Kunzea sp.	0 0 0 0 0 0 0 0	Unused		Needs replacing
S27		Nat	Kunzea sp.	0 0 0 0 0 0 0 0	Unused	Replaced Feb 2023	Black Cup w. coconut S27R
S28		Nat	Kunzea sp.	0 0 0 0 0 - - -	Used	Replaced Feb 2023	Black Cup w. coconut S28R
S29		Nat	A. flexuosa	0 0 0 0 - - - -	Unused	Replaced Feb 2023	Large Plastic Bucket S29R

S30		CuCo	C. calophyll a	0 0 1 1 0 1 0 0	Used	 	Been used but empty on monitoring days. Coconut almost gone and sticks added. Often used during Year One.
S31		Cup	C. calophyll a	0 0 0 0 0 0 0 0	Unuse d		few leaves

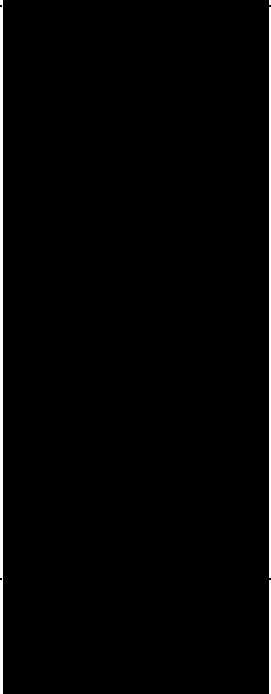
S32		CuCo	A. flexuosa	0 0 0 0 0 0 1	Used Used		Appears to have been used recently
S33		Dom	A. flexuosa	0 0 0 0 0 0 0	Unuse d Used	 	Old leaves, but looks to have been used.

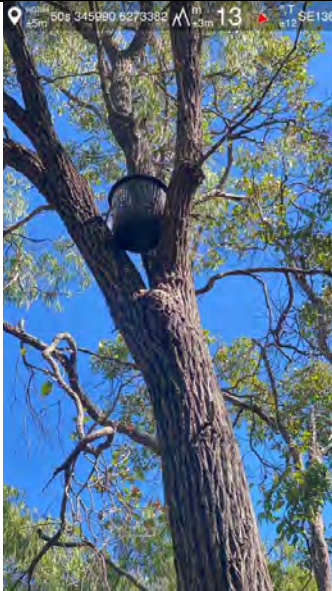
S34			Buc	A. flexuosa	0 0 1 0 1 0 1 1	Used Used	 	Occupied on both sampling occasions in Year Two.
S35			DoC o	A. saligna	0 0 0 0 0 0 0 0	Used		Material added – no possum

S36			Cup	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d		Few leaves
S37			Nat	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d		Falling down, needs replacing.

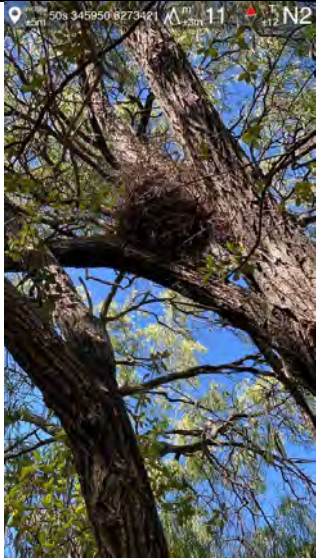
S38		Nat	A. flexuosa	1 0 0 0 0 0 0	Used		Only old leaves seen from outside but drey in good condition, possum inside in January 2021 then not occupied during sampling but probably used occasionally .
S39		Nat	A. flexuosa	0 0 0 0 0 0 -	Unuse d	To be replaced	Not found in Feb 2023, needs replacing.

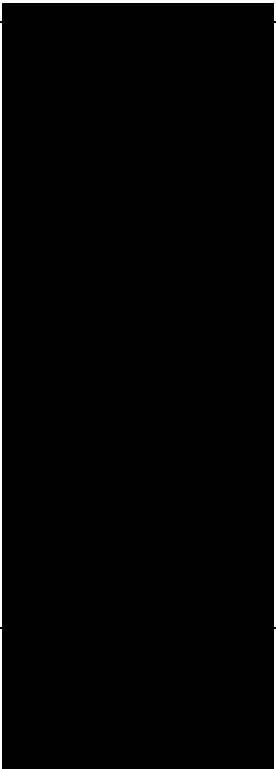
S40			Cuco	A. flexuosa	0 0 0 1 0 0 0 1	Used			Filled with natural material by possum
S41			Nat	A. flexuosa	0 0 0 0 1 0 0 0	Unuse d			Degraded, will need replacing.

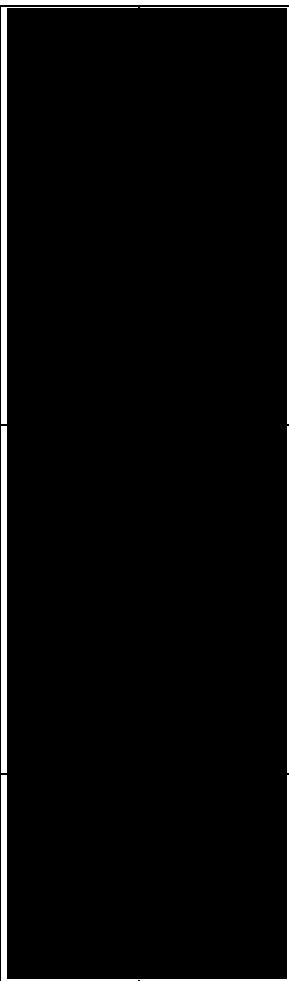
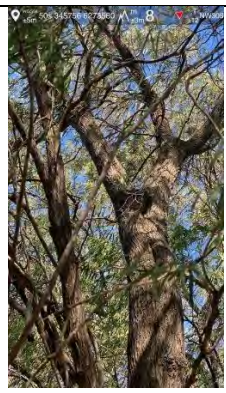
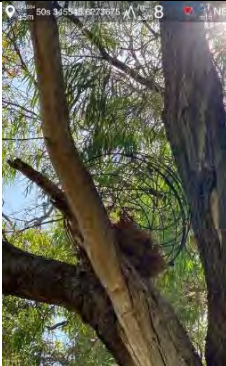
S42			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Degraded but still in tree. Not in use.
S43			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Large drey, still in tree, but not in use. Will need replacing soon.

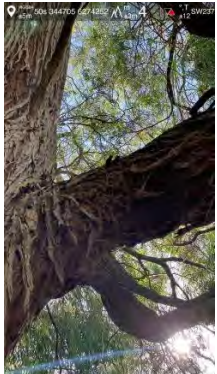
S44			Buc	A. flexuosa	0 0 1 0 0 0 2 0	Used Used	 	December 2022 the bucket contained a mother and joey – the first time that a bucket has recorded more than a single animal.
S45			Nat	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d		Replaced with Cup with Coconut, now S45R

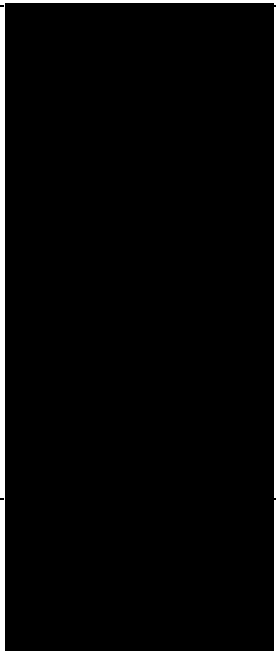
S46			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Replaced with Large Filter Bucket, now S46R
S47			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Replaced with Large Filter Bucket, now S47R

S48			Cup	A. flexuosa	0 0 1 0 1 0 1 1	Used Used		Occupied in both monitoring periods in Year 2.
S49			CuCo	A. flexuosa	0 1 0 0 0 0 1 0	Used Used		Coconut removed and sticks added, occupied in Dec 2022.

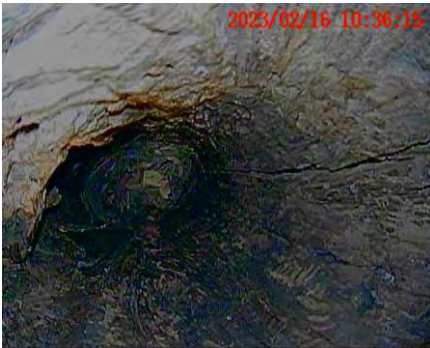
S50			Buc	A. flexuosa	0 0 0 1 0 0 0 0	Used	 	Twig lined, has been used.
S51			Cup	A. flexuosa	0 0 0 0 0 0 0 0	Unuse d		Few old leaves only

S52			CuCo	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Empty
S53			Cup	A. flexuosa	0 0 0 0 0 0 0	Unuse d		few leaves
S54			DoC o	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Coconut removed in Year One. No evidence of recent use.

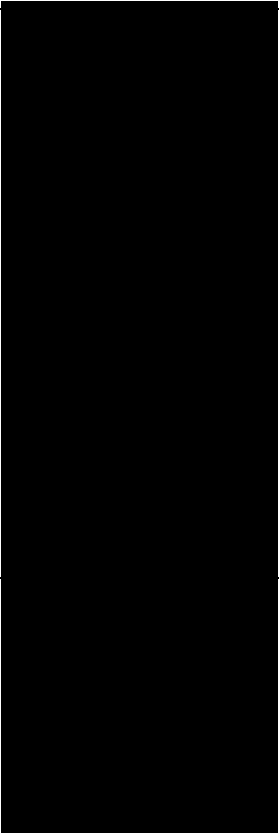
S55			DoC o	M. cuticulari s	0 0 0 0 0 0 0	Unuse d		Collapsed Difficult for possum to enter – needs repair - Now empty dome
S56			Nat	A. flexuosa	0 0 0 0 1 0 0 0	Used		Large Agonis. Used in September 2021, still has platform but prob. not recently used.
S57			CuCo	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Large Agonis, very full, old drey inserted into shelter

S58			Cup	A. flexuosa	0 0 0 0 0 0 0	Used				Some fresh leaves in Year One. Very few leaves in Year Two.
S59			Nat	A. flexuosa	0 0 0 0 0 0 0	Unused				Replaced with large plastic filter bucket 17/02/2023

S60		Cup	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Still some Agonis leaves
S61		DoC o	A. flexuosa	0 0 0 0 0 - -	Unuse d	 	Coconut collapsed
S62		DoC o	A. flexuosa	0 0 0 0 0 - -	Unuse d	Damaged due to drain maintenance – replaced in February 2023	Damaged, replaced with Cup with Coconut
S63		Hol	E. patens	0 0 0 1 0 0 - -	Used		Approx. 8m high, relocated from E.

							 	rudis in Links Ct. Occupied in August 2021, not in Year Two monitoring
S64			Hol	E. patens	0 0 0 0 0 0 0	Unuse d	 	relocated from E. rudis in Links Ct

S65			DoC o	A. flexuosa	0 0 0 0 0 0 0	Unuse d			Coconut dome collapsed
S66			Hol	C. calophyll a	0 0 0 0 0 1(B) 0	Unuse d Used			Brushtail in Dec 2022

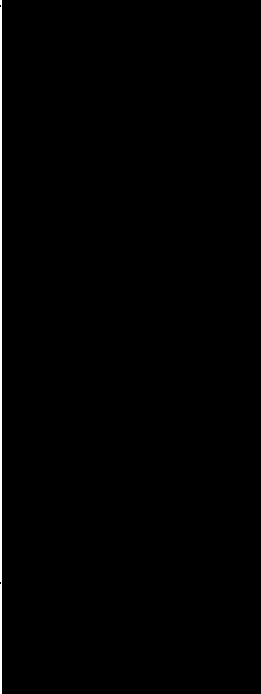
S67			Cup	E. marginat a	0 0 0 0 0 0 0	Unuse d			few old leaves
S68			DoC o	A. flexuosa	0 0 0 0 0 0 0	Used			coconut taken and placed further up tree, some blown down

S69			DoC o	A. flexuosa	0 0 0 1 0 0 0 0	Used		natural drey inserted into artificial drey, Coconut collapsed in Jan 21, but occupied in August 21. Not occupied in Year Two.
S70			Hol	A. flexuosa	1 1 0 0 0 0 0 0	Used		Possum in base of log in Jan and Mar 21.

S71			CuCo	A. flexuosa	0 0 1 1 0 1 0 0	Used		coconut rearranged, removed from base, occupied in April / May, August and Jan 2022
S72			Nat		0 – 0 -0 0 - - -			Replaced with Large Filter Bucket, now 72R

S73			Hol	A. flexuosa	0 0 0 0 1 0 0	Used Unuse d			A few old leaves only. Occupied in Jan 2022
S74			DoC o	E. rudis	0 0 0 0 0 1 1	Used Used			coconut still in fairly good condition, used in both sampling periods in Year 2 – tail clearly visible in image.

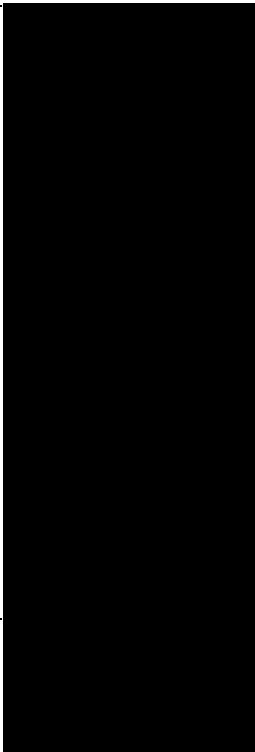
S75			Hol	A. flexuosa	0 0 0 0 1 0 0	Used		Slightly green leaves in bottom, probably used in Jan 2021, occupied in Jan 2022
S76			DoC o	A. flexuosa	1 0 0 0 0 0 0	Used		coconut rearranged – visible from the outside, possum inside. Not recorded as occupied since Jan 21

S77			Hol	C. calophylla	1 2 1 0 0 1 1 1	Used Used			Possum regularly recorded. The only short hollow which has recorded a mother and joey inside (Mar 21)
S78			CuCo	C. calophylla	0 0 0 0 0 0 0 0	Unused			coconut collapsed. Needs repair

S79			Hol	<i>E. rudis</i>	1 0 1 0 0 0 1 1	Used Used	 	Possum recorded on both monitoring sessions in Year 2.
S80			DoC o	<i>A. flexuosa</i>	1 1 1 1 1 0 0 0	Used		Most of lining has gone.

S81			Hol	A. flexuosa	0 0 0 0 1 0 1	Used	 	Tail visible in photo
S82			Nat	A. flexuosa	0 0 0 0 0 0 0	Unuse d		Dry, collapsed, needs replacing

S83			Hol	C. calophyll a	0 1 1 0 0 1 1 0	Used Used			Occupied in 3 of 6 monitoring periods
S84			Nat	Ground	0 0 - - - - - -	Unuse d	Replaced February 2023		Replaced with Large Black Bucket S84R

S85			DoC o	E. marginat a	0 0 0 0 0 0 0	Unuse d		Coconut mostly gone
S86			DoC o	C. calophyll a	0 0 0 0 0 0 0	Unuse d		Coconut removed

S87			Cup	A. flexuosa	0 0 0 0 0 0 0	Unuse d			Empty and not used.
S88			Cup	A. flexuosa	- - 0 0 0 0 0 0	Used			Coconut removed

Appendix E: Revegetation and rehabilitation

Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #12 January 2022

Activity Date(s):	17/12/21 - 21/01/22	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 &	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
26/11/20 – 23/12/20	Matting	Installed over 800m ² of coir mesh across the western VDD Embankment zone.
02/12/20 – 23/12/20	Brushwall installation	50m Initial section of brushwall installed on western bank + 20m of embankment palisade.
04/01/21 – 21/01/21	Weed control	Manual, mechanical and chemical weed control along VDD embankments.
11/01/21 – 15/01/21	Brushwalling	Installation of 110lm of brushwall along western bank + 65lm of mid-slope brush palisade. Total brushwall is now 160lm + 85lm of brush palisade.
13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
22/01/21 – 22/02/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.
22/01/21 – 08/02/21	Embankment regrading and matting	Continuation of bank preparation and matting on western embankment (200m ²) and majority of eastern embankment (800m ²). Total matting and embankment preparation areas is now approx. 3,000m ²
22/01/21 – 22/02/21	Baseline monitoring report	Preparation and submission of baseline monitoring report. This report provides further definition of completion criteria and an overview of site conditions prior to commencement of on-ground works.

08/01/21 – 11/02/21	Relocation and resspreading topsoil	Relocation of soil stockpiles in the Quindalup Dune zone to allow for ACM removal. Resspreading soil following confirmation of ACM removal.
04/02/21 – 22/02/21	Mulch procurement and site preparation planning	Confirm mulch order and deposit for material. Planning for distribution and logistics of mulch cartage and stockpiling. Coordination and confirmation of machinery for spreading.
09/02/21 – 12/02/21	Aboriginal engagement – Roelands Village	Contribution to four days of machinery operation training for Roelands Village civil construction trainees. The works were undertaken to assist the Geographe Community Landcare Nursery increase nursery capacity to accommodate additional requirements for the project.
11/02/21 – 18/02/21	Greenwaste and woody weeds	Clearing and removal of Greenwaste (weed and dead material). 30m ³ of weed material disposed of at waste facility and over 100m ³ stockpiled on site for future removal and resspreading of larger logs for habitat.
17/02/21	Aboriginal engagement – Undalup Association	On-country meeting and consultation with Cultural Custodians to discuss the project scope for the development of cultural / biodiversity nodes within the site. Confirmation to commence works 12/02/21.
23/02/21 – 23/03/21	Weed control	Weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
03/03/21 – 09/03/21	Palisade construction	Construction and completion of 3x palisade areas along the western embankment.
12/03/21 – 19/03/21	Aboriginal engagement	Two days of Undalup's indigenous ranger team (x3) performing site preparation tasks (weed control, rubbish removal and fuel load reduction) in the Southern PEC zone. Additional reporting to be provided in the next period.
17/03/21 – 22/03/21	Mulch installation	675m ³ of mulch supplied and spread (mechanical and manual) across 9,000m ² of the eastern PEC zone.
24/03/21 – 25/05/21	Weed control	On-going follow-up weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
24/03/21 – 07/05/21	Aboriginal engagement – Wadandi Rangers	On-going support for site works from Undalup Association's Wadandi rangers both on site and at GCLN. Please see attached progress reports from Undalup.
19/04/21 – 23/04/21	Ripping	Soil ripping via tractor mounted tine across Central PEC and Quindalup Dune revegetation zones. Approx. 1.5 ha covered.
13/05/21 – 21/05/21	Mulch installation	315m ³ of mulch supplied and spread (mechanical and manual) across 6,000m ² of the Quindalup Dune zone.
24/03/21 – 25/05/21	Procurement	Purchase and delivery of corflute tree guards, stakes and root barrier.
27/05/21	Procurement: Tree stake supply	Supply of all hardwood stakes (1800x50x50mm) for mature trees.
04/06/21 & 17/06/21	Weed control	On-going weed control focussing on the QD and VDD Embankment areas prior to planting
22/06/21 – 24/06/21	Procurement: Seedling supply	Supply of all seedlings (exc. lower embankment) for the Quindalup Dune and VDD Embankment zones. Total number of seedlings: 23,610

01/07/21	Matting	Completion of matting along the final section (700m ²) of the VDD Embankment near the pedestrian bridge.
05/07/21 - 19/07/21	Planting	21,543 seedlings installed in the QD and VDD Embankment zones. Lower Embankment to be planted in spring. Refer to table attached for details.
08/07/21	Ripping	0.5ha of the Western PEC zone (Corner of College Ave / QE Ave) was ripped prior to mulch spreading.
12/07/21 - 16/07/21	Mulching	Mechanical spreading of mulch across the Central and Western PEC zones. Total of 7,000m ² spread. Further manual spreading / trimming to be completed.
12/07/21	Tree removal and greenwaste removal	Removal of unstable tree at the Donovan property and removal of greenwaste from the Western PEC zone.
21/07/21 - 22/07/21	Plant deliveries and batching	Delivery and batching of remaining seedlings for 2021. See attached table for details
22/07/21 - 23/07/21	Fencing	QD and Embankment zone post & rail and public management fencing completed.
25/06/21 - 22/07/21	Weed control	Various follow-up herbicide weed control undertaken where possible, including: QD, VDD Embankments, Western PEC, Central PEC, Eastern PEC and Western Basin PEC.
25/06/21 - 22/07/21	Aboriginal engagement - Undalup Association	Undalup Wadandi Rangers assisting Geographe Community Landcare Nursery preparing stock for the project and assisting with capacity upgrades.
27/07/21	Slashing VDD Levees (separate PO)	Manual slashing (brushcutter) of VDD levee external banks adjacent to revegetation areas. Performed under separate work order.
27/07/21 - 28/07/21	Mulch spreading (manual)	Final manual trim of mulched areas in Central PEC and Western PEC planting areas. Additional assistance provided by Undalup Association.
30/07/21 - 13/08/21	Aboriginal engagement	Assistance with manual spreading of mulch at Western PEC. 2 days (30/08 & 13/08).
03/08/21 - 18/08/21	Weed control	Targeted spot spraying within 2021 planting sites over 4 days. Additional retreatment of 2022 planting sites (EPEC, Possum Corridor) blanket spraying.
05/08/21 - 20/08/21	C. procera monitoring	Commenced monitoring growth and health of known & reference populations of C. procera adjacent to construction boundary.
09/08/21 - 10/08/21	WPEC fencing	324m of fencing installed around Western PEC Restoration Zone. Inc. 1.2m ringlock + 900mm rabbit mesh skirt. 2m clearance from base of levee.
13/08/21	Mulch spreading	Transport and spreading of mulch from WPEC to QD Zone eastern bank.
13/08/21 - 19/08/21	Mature trees install	Install 214 mature trees along pathway in CPEC. Included root barrier, soil conditioner, Terracottem, mulching, stakes and ties.
23/08/21	CPEC planting	Commencement of planting along CPEC inc. tree guards and fertiliser tablets. Final planting list included below.
24/08/21 - 21/09/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.

25/08/21 - 10/09/21	Planting and guard install	Install remaining plants and guards in CPEC and Western PEC Restoration Zone. Total of 14,617 plants and 11,261 guards installed.
30/08/21 - 13/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in WPEC Open zone. Total of 3,149 plants and 2,539 guards installed.
13/09/21 - 21/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in CPEC swale zone. Total of 6,000 plants installed in swale.
23/09/21	Tree install	Plant remaining mature tree in QD Zone and install signage.
(05/08/21) - 13/10/21	C. procera monitoring	Weekly inspections and recording of <i>Caladenia procera</i> population within the SPEC. Inspections conducted from August to October.
1/10/21	Weed control; tree guard maintenance	Manual and herbicide weed control. Removal and reinstatement of damaged tree guards. Central PEC
04/10/21	Weed control	Manual and herbicide weed control. QD & Western PEC.
14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L

2022 Ordered Planting List

Species	Quindalup Dune Restoration	VDD Embankment Restoration Upper	VDD Embankment Restoration Lower	QE Ave Swale Restoration	Central PEC Restoration	Eastern PEC Low Fuel	Eastern PEC Open	Eastern PEC Restoration	Total
Tree Species									
Agonis flexuosa	100	0	0	50	0	0	500	500	1,150
Banksia grandis	0	0	0	0	0	0	500	500	1,000
Banksia littoralis	0	0	0	100	0	0	300	300	700
Corymbia calophylla	0	0	0	0	50	0	500	500	1,050
Eucalyptus decipiens	0	0	0	0	50	0	300	300	650
Eucalyptus rudis	0	0	0	100	0	0	300	300	700
Melaleuca preissiana	0	0	0	0	0	0	100	100	200
Melaleuca raphiophylla	0	0	0	100	0	0	100	100	300
Sub-Total	100	0	0	350	100	0	2,600	2,600	5,750
Shrub Species									
Acacia cochlearis	50	50	0	0	0	0	0	0	100
Acacia littorea	50	50	0	150	0	0	0	0	250
Acacia pulchella	0	0	0	0	100	0	150	500	750
Acacia saligna	0	0	0	50	50	0	50	200	350
Acacia stenoptera	0	0	0	0	100	0	100	400	600
Adenanthos meisneri	0	0	0	0	100	0	500	500	1,100
Daviesia physodes	0	0	0	0	200	0	200	300	700
Diplolaena dampieri	100	0	0	0	0	0	0	0	100
Gompholobium capitatum	0	0	0	0	200	0	300	500	1,000
Gompholobium tomentosum	0	0	0	0	0	0	350	500	850
Hakea prostrata	0	0	0	0	50	0	100	500	650
Hakea varia	0	0	0	150	50	0	100	500	800
Hibbertia cuneiformis	50	25	0	0	250	0	300	400	1,025
Hibbertia racemosa	0	0	0	0	100	0	350	400	850
Hovea trisperma	0	0	0	0	150	0	300	300	750
Jacksonia furcellata	0	0	0	0	100	0	50	300	450
Kunzea glabrescens	0	0	0	0	100	0	50	400	550
Melaleuca cuticularis	0	0	0	150	0	0	0	0	150
Melaleuca incana	0	0	0	150	0	0	0	0	150
Melaleuca viminea	0	0	0	125	0	0	0	0	125
Olearia axillaris	50	0	0	0	0	0	0	0	50
Phyllanthus calycinus	150	150	0	0	250	0	350	300	1,200
Rhagodia baccata	0	0	0	200	0	0	0	0	200
Spyridium globulosum	50	0	0	100	100	0	150	500	900
Xanthorrhoea brunonis	0	0	0	0	100	0	100	300	500
Xanthorrhoea preissii	0	0	0	0	100	0	100	300	500
Sub-Total	500	275	0	1,075	2,100	0	3,600	7,100	14,650
Herbs and Groundcover Species									
Anigozanthos manglesii	0	0	0	0	150	0	1000	800	1,950
Centella asiatica	0	0	0	1000	0	0	1500	1500	4,000
Conostylis aculeata	0	0	0	0	150	500	1200	700	2,550
Dampiera linearis	0	0	0	0	0	300	500	400	1,200
Hardenbergia comptoniana	10	0	0	0	0	150	300	200	660
Kennedia prostrata	0	0	0	0	146	500	900	500	2,046
Patersonia occidentalis	0	0	0	0	150	600	1200	700	2,650
Samolus junceus	0	0	0	250	0	0	0	0	250
Samolus repens	0	0	0	250	0	0	0	0	250
Scaevola crassifolia	50	0	0	0	0	0	0	0	50
Sub-Total	60	0	0	1,500	596	2,050	6,600	4,800	15,606
Rushes and Sedges									
Baumea juncea	0	0	0	1100	200	502	1163	1032	3,997
Ficinia nodosa	250	315	0	0	0	0	0	0	565
Juncus kraussii	0	0	500	1000	0	0	0	0	1,500
Juncus kraussii - advanced	0	0	500	0	0	0	0	0	500
Lepidosperma gladiatum	217	150	0	750	0	0	0	0	1,117
Lepidosperma longitudinale	0	0	0	900	0	0	300	300	1,500
Lepidosperma squamatum	0	0	0	0	0	0	300	300	600
Sub-Total	467	465	1,000	3,750	200	502	1,763	1,632	9,779
TOTAL	1,127	740	1,000	6,675	2,996	2,552	14,563	16,132	45,785

Selected Site Progress Images



Quindalup Dune - September 2020



Quindalup Dune - December 2021



VDD Embankment - September 2020



VDD Embankment - December 2021



VDD Embankment - December 2021



VDD Embankment Palisades- December 2021



Western PEC Restoration - December 2021



Central PEC Restoration - December 2021

Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #13 February 2022

Activity Date(s):	22/01/22 - 24/02/22	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
18/10/21 – 22/10/21	Levee selective herbicide spraying	Selective spraying of broadleaf weeds on levees adjacent to reveg sites.
20/10/21 & 29/10/21; 02/11/21; 02/02/22; 08/02/22	Levee slashing (5x events (partially included in previous reports))	Spring 2021 and summer 2022 slashing. Brushcutting all external levee embankments adjacent to reveg areas.
25/01/22; 31/01/22; 04/02/22; 09/02/22; 17/02/22; 19/02/22	Weed control (6x events)	Weed control (Summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
03/02/22; 15/02/22 – 16/02/22	Watering	2x watering events over Feb-22. CPEC, WPEC and QD seedlings and mature trees
01/02/22 – 02/02/22	Mulch deliveries	Remaining mulch delivered to EPEC zone.
21/02/22 – 24/02/22	Mulch spreading	Machine spreading of mulch in EPEC.

Recent site photos available on the C-D00116 Revegetation Work Sharefile

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
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13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
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14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 & 19/01/22	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.

Selected Site Progress Images (External Levee)





Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #14: March - May 2022

Activity Date(s):	25/02/22 - 31/05/22	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
03/03/22 – 13/03/22	Watering	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 6,000L used per event.
21/03/22 – 28/04/22	Weed control	Weed control (Remaining summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control. Additional woody weed control CPEC and SPEC.
28/04/22 – 06/05/22	Tree Guard Maintenance	Tree guard maintenance and removal along CPEC. Approx. 3,500 guards removed.
20/04/22 – 18/05/22	Matting	Installation of 1,500m ² of coir mesh installed along QE Ave Swale.
20/05/22 – 23/05/22	Seedling deliveries	Delivery of seedlings for 2022 planting works. Estimated final numbers at 45,785
01/05/22 – 23/05/22	Monitoring	Autumn-22 field vegetation monitoring.

Recent site photos available on the C-D00116 Revegetation Work Sharefile

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
26/11/20 – 23/12/20	Matting	Installed over 800m ² of coir mesh across the western VDD Embankment zone.
02/12/20 – 23/12/20	Brushwall installation	50m Initial section of brushwall installed on western bank + 20m of embankment palisade.
04/01/21 – 21/01/21	Weed control	Manual, mechanical and chemical weed control along VDD embankments.
11/01/21 – 15/01/21	Brushwalling	Installation of 110lm of brushwall along western bank + 65lm of mid-slope brush palisade. Total brushwall is now 160lm + 85lm of brush palisade.
13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
22/01/21 – 22/02/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.
22/01/21 – 08/02/21	Embankment regrading and matting	Continuation of bank preparation and matting on western embankment (200m ²) and majority of eastern embankment (800m ²). Total matting and embankment preparation areas is now approx. 3,000m ²
22/01/21 – 22/02/21	Baseline monitoring report	Preparation and submission of baseline monitoring report. This report provides further definition of completion criteria and an overview of site conditions prior to commencement of on-ground works.

08/01/21 – 11/02/21	Relocation and resspreading topsoil	Relocation of soil stockpiles in the Quindalup Dune zone to allow for ACM removal. Resspreading soil following confirmation of ACM removal.
04/02/21 – 22/02/21	Mulch procurement and site preparation planning	Confirm mulch order and deposit for material. Planning for distribution and logistics of mulch cartage and stockpiling. Coordination and confirmation of machinery for spreading.
09/02/21 – 12/02/21	Aboriginal engagement – Roelands Village	Contribution to four days of machinery operation training for Roelands Village civil construction trainees. The works were undertaken to assist the Geographe Community Landcare Nursery increase nursery capacity to accommodate additional requirements for the project.
11/02/21 – 18/02/21	Greenwaste and woody weeds	Clearing and removal of Greenwaste (weed and dead material). 30m ³ of weed material disposed of at waste facility and over 100m ³ stockpiled on site for future removal and resspreading of larger logs for habitat.
17/02/21	Aboriginal engagement – Undalup Association	On-country meeting and consultation with Cultural Custodians to discuss the project scope for the development of cultural / biodiversity nodes within the site. Confirmation to commence works 12/02/21.
23/02/21 – 23/03/21	Weed control	Weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
03/03/21 – 09/03/21	Palisade construction	Construction and completion of 3x palisade areas along the western embankment.
12/03/21 – 19/03/21	Aboriginal engagement	Two days of Undalup's indigenous ranger team (x3) performing site preparation tasks (weed control, rubbish removal and fuel load reduction) in the Southern PEC zone. Additional reporting to be provided in the next period.
17/03/21 – 22/03/21	Mulch installation	675m ³ of mulch supplied and spread (mechanical and manual) across 9,000m ² of the eastern PEC zone.
24/03/21 – 25/05/21	Weed control	On-going follow-up weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
24/03/21 – 07/05/21	Aboriginal engagement – Wadandi Rangers	On-going support for site works from Undalup Association's Wadandi rangers both on site and at GCLN. Please see attached progress reports from Undalup.
19/04/21 – 23/04/21	Ripping	Soil ripping via tractor mounted tine across Central PEC and Quindalup Dune revegetation zones. Approx. 1.5 ha covered.
13/05/21 – 21/05/21	Mulch installation	315m ³ of mulch supplied and spread (mechanical and manual) across 6,000m ² of the Quindalup Dune zone.
24/03/21 – 25/05/21	Procurement	Purchase and delivery of corflute tree guards, stakes and root barrier.
27/05/21	Procurement: Tree stake supply	Supply of all hardwood stakes (1800x50x50mm) for mature trees.
04/06/21 & 17/06/21	Weed control	On-going weed control focussing on the QD and VDD Embankment areas prior to planting
22/06/21 – 24/06/21	Procurement: Seedling supply	Supply of all seedlings (exc. lower embankment) for the Quindalup Dune and VDD Embankment zones. Total number of seedlings: 23,610

01/07/21	Matting	Completion of matting along the final section (700m ²) of the VDD Embankment near the pedestrian bridge.
05/07/21 - 19/07/21	Planting	21,543 seedlings installed in the QD and VDD Embankment zones. Lower Embankment to be planted in spring. Refer to table attached for details.
08/07/21	Ripping	0.5ha of the Western PEC zone (Corner of College Ave / QE Ave) was ripped prior to mulch spreading.
12/07/21 - 16/07/21	Mulching	Mechanical spreading of mulch across the Central and Western PEC zones. Total of 7,000m ² spread. Further manual spreading / trimming to be completed.
12/07/21	Tree removal and greenwaste removal	Removal of unstable tree at the Donovan property and removal of greenwaste from the Western PEC zone.
21/07/21 - 22/07/21	Plant deliveries and batching	Delivery and batching of remaining seedlings for 2021. See attached table for details
22/07/21 - 23/07/21	Fencing	QD and Embankment zone post & rail and public management fencing completed.
25/06/21 - 22/07/21	Weed control	Various follow-up herbicide weed control undertaken where possible, including: QD, VDD Embankments, Western PEC, Central PEC, Eastern PEC and Western Basin PEC.
25/06/21 - 22/07/21	Aboriginal engagement - Undalup Association	Undalup Wadandi Rangers assisting Geographe Community Landcare Nursery preparing stock for the project and assisting with capacity upgrades.
27/07/21	Slashing VDD Levees (separate PO)	Manual slashing (brushcutter) of VDD levee external banks adjacent to revegetation areas. Performed under separate work order.
27/07/21 - 28/07/21	Mulch spreading (manual)	Final manual trim of mulched areas in Central PEC and Western PEC planting areas. Additional assistance provided by Undalup Association.
30/07/21 - 13/08/21	Aboriginal engagement	Assistance with manual spreading of mulch at Western PEC. 2 days (30/08 & 13/08).
03/08/21 - 18/08/21	Weed control	Targeted spot spraying within 2021 planting sites over 4 days. Additional retreatment of 2022 planting sites (EPEC, Possum Corridor) blanket spraying.
05/08/21 - 20/08/21	C. procera monitoring	Commenced monitoring growth and health of known & reference populations of C. procera adjacent to construction boundary.
09/08/21 - 10/08/21	WPEC fencing	324m of fencing installed around Western PEC Restoration Zone. Inc. 1.2m ringlock + 900mm rabbit mesh skirt. 2m clearance from base of levee.
13/08/21	Mulch spreading	Transport and spreading of mulch from WPEC to QD Zone eastern bank.
13/08/21 - 19/08/21	Mature trees install	Install 214 mature trees along pathway in CPEC. Included root barrier, soil conditioner, Terracottem, mulching, stakes and ties.
23/08/21	CPEC planting	Commencement of planting along CPEC inc. tree guards and fertiliser tablets. Final planting list included below.
24/08/21 - 21/09/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.

25/08/21 - 10/09/21	Planting and guard install	Install remaining plants and guards in CPEC and Western PEC Restoration Zone. Total of 14,617 plants and 11,261 guards installed.
30/08/21 - 13/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in WPEC Open zone. Total of 3,149 plants and 2,539 guards installed.
13/09/21 - 21/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in CPEC swale zone. Total of 6,000 plants installed in swale.
23/09/21	Tree install	Plant remaining mature tree in QD Zone and install signage.
(05/08/21) - 13/10/21	C. procera monitoring	Weekly inspections and recording of <i>Caladenia procera</i> population within the SPEC. Inspections conducted from August to October.
1/10/21	Weed control; tree guard maintenance	Manual and herbicide weed control. Removal and reinstatement of damaged tree guards. Central PEC
04/10/21	Weed control	Manual and herbicide weed control. QD & Western PEC.
14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 & 19/01/22	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.
18/10/21 – 22/10/21	Levee selective herbicide spraying	Selective spraying of broadleaf weeds on levees adjacent to revegetation sites.
20/10/21 & 29/10/21; 02/11/21; 02/02/22; 08/02/22	Levee slashing (5x events (partially included in previous reports))	Spring 2021 and summer 2022 slashing. Brushcutting all external levee embankments adjacent to revegetation areas.

25/01/22; 31/01/22; 04/02/22; 09/02/22; 17/02/22; 19/02/22	Weed control (6x events	Weed control (Summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
03/02/22; 15/02/22 – 16/02/22	Watering	2x watering events over Feb-22. CPEC, WPEC and QD seedlings and mature trees
01/02/22 – 02/02/22	Mulch deliveries	Remaining mulch delivered to EPEC zone.
21/02/22 – 24/02/22	Mulch spreading	Machine spreading of mulch in EPEC.

Selected Site Progress Images (QD Before and After)





Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #15: June - July 2022

Activity Date(s):	01/06/22 - 19/07/22	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
02/06/22 – 29/06/22	Weed control	4x weed control events across QD, QE Ave swale, Central PEC & Eastern PEC. Inc. herbicide spraying and manual removal.
07/06/22 – 13/07/22	Planting and tree guard installation	Installation of seedlings to QD (infill), QE Ave Swale, Central PEC (infill) & Eastern PEC. Totals provided in attachment. Planting included augering/ripping & fertiliser tablet supply & install. Approx. 6k tree guards installed in selected areas
10/06/22 – 15/06/22	Tree guard maintenance	Removal of selected guards across Central PEC. Approx. 5,000 guards removed.
09/06/22 – 30/06/22	Fencing	Installation of 1,685lm of herbivore protection fencing across Eastern PEC.
01/06/22 – 01/07/22	Monitoring Reporting	Data input and draft report preparation (to be submitted).

Recent site photos available on the C-D00116 Revegetation Work Sharefile

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
26/11/20 – 23/12/20	Matting	Installed over 800m ² of coir mesh across the western VDD Embankment zone.
02/12/20 – 23/12/20	Brushwall installation	50m Initial section of brushwall installed on western bank + 20m of embankment palisade.
04/01/21 – 21/01/21	Weed control	Manual, mechanical and chemical weed control along VDD embankments.
11/01/21 – 15/01/21	Brushwalling	Installation of 110lm of brushwall along western bank + 65lm of mid-slope brush palisade. Total brushwall is now 160lm + 85lm of brush palisade.
13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
22/01/21 – 22/02/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.
22/01/21 – 08/02/21	Embankment regrading and matting	Continuation of bank preparation and matting on western embankment (200m ²) and majority of eastern embankment (800m ²). Total matting and embankment preparation areas is now approx. 3,000m ²
22/01/21 – 22/02/21	Baseline monitoring report	Preparation and submission of baseline monitoring report. This report provides further definition of completion criteria and an overview of site conditions prior to commencement of on-ground works.

08/01/21 – 11/02/21	Relocation and resspreading topsoil	Relocation of soil stockpiles in the Quindalup Dune zone to allow for ACM removal. Resspreading soil following confirmation of ACM removal.
04/02/21 – 22/02/21	Mulch procurement and site preparation planning	Confirm mulch order and deposit for material. Planning for distribution and logistics of mulch cartage and stockpiling. Coordination and confirmation of machinery for spreading.
09/02/21 – 12/02/21	Aboriginal engagement – Roelands Village	Contribution to four days of machinery operation training for Roelands Village civil construction trainees. The works were undertaken to assist the Geographe Community Landcare Nursery increase nursery capacity to accommodate additional requirements for the project.
11/02/21 – 18/02/21	Greenwaste and woody weeds	Clearing and removal of Greenwaste (weed and dead material). 30m ³ of weed material disposed of at waste facility and over 100m ³ stockpiled on site for future removal and resspreading of larger logs for habitat.
17/02/21	Aboriginal engagement – Undalup Association	On-country meeting and consultation with Cultural Custodians to discuss the project scope for the development of cultural / biodiversity nodes within the site. Confirmation to commence works 12/02/21.
23/02/21 – 23/03/21	Weed control	Weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
03/03/21 – 09/03/21	Palisade construction	Construction and completion of 3x palisade areas along the western embankment.
12/03/21 – 19/03/21	Aboriginal engagement	Two days of Undalup's indigenous ranger team (x3) performing site preparation tasks (weed control, rubbish removal and fuel load reduction) in the Southern PEC zone. Additional reporting to be provided in the next period.
17/03/21 – 22/03/21	Mulch installation	675m ³ of mulch supplied and spread (mechanical and manual) across 9,000m ² of the eastern PEC zone.
24/03/21 – 25/05/21	Weed control	On-going follow-up weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
24/03/21 – 07/05/21	Aboriginal engagement – Wadandi Rangers	On-going support for site works from Undalup Association's Wadandi rangers both on site and at GCLN. Please see attached progress reports from Undalup.
19/04/21 – 23/04/21	Ripping	Soil ripping via tractor mounted tine across Central PEC and Quindalup Dune revegetation zones. Approx. 1.5 ha covered.
13/05/21 – 21/05/21	Mulch installation	315m ³ of mulch supplied and spread (mechanical and manual) across 6,000m ² of the Quindalup Dune zone.
24/03/21 – 25/05/21	Procurement	Purchase and delivery of corflute tree guards, stakes and root barrier.
27/05/21	Procurement: Tree stake supply	Supply of all hardwood stakes (1800x50x50mm) for mature trees.
04/06/21 & 17/06/21	Weed control	On-going weed control focussing on the QD and VDD Embankment areas prior to planting
22/06/21 – 24/06/21	Procurement: Seedling supply	Supply of all seedlings (exc. lower embankment) for the Quindalup Dune and VDD Embankment zones. Total number of seedlings: 23,610

01/07/21	Matting	Completion of matting along the final section (700m ²) of the VDD Embankment near the pedestrian bridge.
05/07/21 - 19/07/21	Planting	21,543 seedlings installed in the QD and VDD Embankment zones. Lower Embankment to be planted in spring. Refer to table attached for details.
08/07/21	Ripping	0.5ha of the Western PEC zone (Corner of College Ave / QE Ave) was ripped prior to mulch spreading.
12/07/21 - 16/07/21	Mulching	Mechanical spreading of mulch across the Central and Western PEC zones. Total of 7,000m ² spread. Further manual spreading / trimming to be completed.
12/07/21	Tree removal and greenwaste removal	Removal of unstable tree at the Donovan property and removal of greenwaste from the Western PEC zone.
21/07/21 - 22/07/21	Plant deliveries and batching	Delivery and batching of remaining seedlings for 2021. See attached table for details
22/07/21 - 23/07/21	Fencing	QD and Embankment zone post & rail and public management fencing completed.
25/06/21 - 22/07/21	Weed control	Various follow-up herbicide weed control undertaken where possible, including: QD, VDD Embankments, Western PEC, Central PEC, Eastern PEC and Western Basin PEC.
25/06/21 - 22/07/21	Aboriginal engagement - Undalup Association	Undalup Wadandi Rangers assisting Geographe Community Landcare Nursery preparing stock for the project and assisting with capacity upgrades.
27/07/21	Slashing VDD Levees (separate PO)	Manual slashing (brushcutter) of VDD levee external banks adjacent to revegetation areas. Performed under separate work order.
27/07/21 - 28/07/21	Mulch spreading (manual)	Final manual trim of mulched areas in Central PEC and Western PEC planting areas. Additional assistance provided by Undalup Association.
30/07/21 - 13/08/21	Aboriginal engagement	Assistance with manual spreading of mulch at Western PEC. 2 days (30/08 & 13/08).
03/08/21 - 18/08/21	Weed control	Targeted spot spraying within 2021 planting sites over 4 days. Additional retreatment of 2022 planting sites (EPEC, Possum Corridor) blanket spraying.
05/08/21 - 20/08/21	C. procera monitoring	Commenced monitoring growth and health of known & reference populations of C. procera adjacent to construction boundary.
09/08/21 - 10/08/21	WPEC fencing	324m of fencing installed around Western PEC Restoration Zone. Inc. 1.2m ringlock + 900mm rabbit mesh skirt. 2m clearance from base of levee.
13/08/21	Mulch spreading	Transport and spreading of mulch from WPEC to QD Zone eastern bank.
13/08/21 - 19/08/21	Mature trees install	Install 214 mature trees along pathway in CPEC. Included root barrier, soil conditioner, Terracottem, mulching, stakes and ties.
23/08/21	CPEC planting	Commencement of planting along CPEC inc. tree guards and fertiliser tablets. Final planting list included below.
24/08/21 - 21/09/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.

25/08/21 - 10/09/21	Planting and guard install	Install remaining plants and guards in CPEC and Western PEC Restoration Zone. Total of 14,617 plants and 11,261 guards installed.
30/08/21 - 13/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in WPEC Open zone. Total of 3,149 plants and 2,539 guards installed.
13/09/21 - 21/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in CPEC swale zone. Total of 6,000 plants installed in swale.
23/09/21	Tree install	Plant remaining mature tree in QD Zone and install signage.
(05/08/21) - 13/10/21	C. procera monitoring	Weekly inspections and recording of <i>Caladenia procera</i> population within the SPEC. Inspections conducted from August to October.
1/10/21	Weed control; tree guard maintenance	Manual and herbicide weed control. Removal and reinstatement of damaged tree guards. Central PEC
04/10/21	Weed control	Manual and herbicide weed control. QD & Western PEC.
14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 & 19/01/22	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.
18/10/21 – 22/10/21	Levee selective herbicide spraying	Selective spraying of broadleaf weeds on levees adjacent to revegetation sites.
20/10/21 & 29/10/21; 02/11/21; 02/02/22; 08/02/22	Levee slashing (5x events (partially included in previous reports))	Spring 2021 and summer 2022 slashing. Brushcutting all external levee embankments adjacent to revegetation areas.

25/01/22; 31/01/22; 04/02/22; 09/02/22; 17/02/22; 19/02/22	Weed control (6x events)	Weed control (Summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
03/02/22; 15/02/22 – 16/02/22	Watering	2x watering events over Feb-22. CPEC, WPEC and QD seedlings and mature trees
01/02/22 – 02/02/22	Mulch deliveries	Remaining mulch delivered to EPEC zone.
21/02/22 – 24/02/22	Mulch spreading	Machine spreading of mulch in EPEC.
03/03/22 – 13/03/22	Watering	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 6,000L used per event.
21/03/22 – 28/04/22	Weed control	Weed control (Remaining summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control. Additional woody weed control CPEC and SPEC.
28/04/22 – 06/05/22	Tree Guard Maintenance	Tree guard maintenance and removal along CPEC. Approx. 3,500 guards removed.
20/04/22 – 18/05/22	Matting	Installation of 1,500m ² of coir mesh installed along QE Ave Swale.
20/05/22 – 23/05/22	Seedling deliveries	Delivery of seedlings for 2022 planting works. Estimated final numbers at 45,785
01/05/22 – 23/05/22	Monitoring	Autumn-22 field vegetation monitoring.

VDD Upgrade Revegetation 2022 Planting Final numbers									
Species	Quindalup Dune Restoration	VDD Embankment Restoration Upper	VDD Embankment Restoration Lower	QE Ave Swale Restoration	Central PEC Restoration	Eastern PEC Low Fuel	Eastern PEC Open	Eastern PEC Restoration	Total
Tree Species									
Agonis flexuosa	100	0	0	50	0	0	500	500	1,150
Banksia grandis	0	0	0	0	126	0	437	437	1,000
Banksia littoralis	0	0	0	100	126	0	437	437	1,100
Corymbia calophylla	0	0	0	0	50	0	500	500	1,050
Eucalyptus decipiens	0	0	0	0	50	0	300	300	650
Eucalyptus rudis	0	0	0	100	0	0	300	300	700
Melaleuca preissiana	0	0	0	0	0	0	100	100	200
Melaleuca raphiophylla	0	0	0	100	0	0	100	100	300
Sub-Total	100	0	0	350	352	0	2,674	2,674	6,150
Shrub Species									
Acacia cochlearis	50	50	0	0	0	0	0	0	100
Acacia littorea	50	50	0	150	0	0	0	0	250
Acacia saligna	0	0	0	50	50	0	50	200	350
Adenanthos meisneri	0	0	0	0	100	0	500	500	1,100
Daviesia physodes	0	0	0	0	200	0	200	300	700
Diploaena dampieri	100	0	0	0	0	0	0	0	100
Gompholobium capitatum	0	0	0	0	120	0	200	400	720
Gompholobium tomentosum	0	0	0	0	0	0	350	500	850
Hakea prostrata	0	0	0	0	50	0	100	500	650
Hakea varia	0	0	0	150	50	0	100	500	800
Hibbertia cuneiformis	50	25	0	0	250	0	300	400	1,025
Hibbertia racemosa	0	0	0	0	100	0	350	400	850
Jacksonia furcellata	0	0	0	0	63	0	63	136	262
Kunzea glabrescens	0	0	0	0	100	0	50	400	550
Melaleuca cuticularis	0	0	0	150	0	0	0	0	150
Melaleuca incana	0	0	0	150	0	0	0	0	150
Melaleuca viminea	0	0	0	125	0	0	0	0	125
Olearia axillaris	50	0	0	0	0	0	0	0	50
Rhagodia baccata	0	0	0	200	0	0	0	0	200
Spyridium globulosum	50	0	0	100	100	0	150	500	900
Xanthorrhoea brunonis	0	0	0	0	100	0	100	300	500
Xanthorrhoea preissii	0	0	0	0	100	0	100	300	500
Sub-Total	350	125	0	1,075	1,383	0	2,613	5,336	10,882
Herbs and Groundcover Species									
Anigozanthos manglesii	0	0	0	0	150	0	1000	800	1,950
Centella asiatica	0	0	0	1000	0	0	1500	1500	4,000
Conostylis aculeata	0	0	0	0	150	500	1200	700	2,550
Dampiera linearis	0	0	0	0	0	300	500	400	1,200
Hardenbergia comptoniana	10	0	0	0	0	150	300	200	660
Patersonia occidentalis	0	0	0	0	150	600	1200	700	2,650
Samolus junceus	0	0	0	250	0	0	0	0	250
Samolus repens	0	0	0	250	0	0	0	0	250
Scaevola crassifolia		50	0	0	0	0	0	0	50
Sub-Total	10	50	0	1,500	450	1,550	5,700	4,300	13,560
Rushes and Sedges									
Baumea juncea	0	0	0	600	700	502	1163	1032	3,997
Ficinia nodosa	250	315	0	0	0	0	0	0	565
Juncus kraussii	0	0	500	1000	0	0	0	0	1,500
Juncus kraussii - advanced	0	0	500	0	0	0	0	0	500
Lepidosperma gladiatum	217	150	0	750	0	0	0	0	1,117
Lepidosperma longitudinale	0	0	0	900	0	0	300	300	1,500
Lepidosperma squamatum	0	0	0	0	0	0	300	300	600
Sub-Total	467	465	1,000	3,250	700	502	1,763	1,632	9,779
TOTAL	927	640	1,000	6,175	2,885	2,052	12,750	13,942	40,371

- Orange cells denotes planting to be completed.

Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #16: July - November 2022

Activity Date(s):	18/07/22 – 30/11/22	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
20/07/22 11/08/22 – 15/08/22 01/09/22 – 14/09/22 27/09/22 – 30/09/22 18/10/22 – 19/10/22 24/10/22 – 26/10/22 08/11/22 14/11/22 28/11/22	Weed Control (16 days – 376hrs)	On-going management of weeds using various methods (manual, mechanical, herbicide) across all active revegetation areas: QD, WPEC, CPEC, EPEC, Possum Corridor). Very high seasonal weed abundance due to cooler conditions resulted in a protracted growing season for winter / spring weeds.
05/08/22 09/08/22 16/09/22 14/10/22 03/11/22 07/11/22	Tree Guard Removal	All guards progressively removed from CPEC and WPEC. Decision was made to remove all remaining guards in these areas due to vandalism and public concerns from plastic waste.
01/08/22 – 02/08/22 12/09/22 – 13/09/22	Levee weed management (selective herbicide spraying)	Broadleaf selective boom spraying of all external levee banks adjacent to revegetation sites.
05/10/22 – 12/10/22 27/10/22 14/11/22 – 15/11/22	Levee Weed Management (slashing)	Mechanical slashing of external levee banks adjacent to revegetation sites.
18/10/22 – 21/10/22	2023 Seedling orders	Developed planting plan and confirmed seedling orders for 2023.
02/11/22 – 04/11/22	Spring 2022 Monitoring	Field monitoring of all revegetation sites. Data analysis and report to be completed.

Recent site photos available on the C-D00116 Revegetation Work Sharefile

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
26/11/20 – 23/12/20	Matting	Installed over 800m ² of coir mesh across the western VDD Embankment zone.
02/12/20 – 23/12/20	Brushwall installation	50m Initial section of brushwall installed on western bank + 20m of embankment palisade.
04/01/21 – 21/01/21	Weed control	Manual, mechanical and chemical weed control along VDD embankments.
11/01/21 – 15/01/21	Brushwalling	Installation of 110lm of brushwall along western bank + 65lm of mid-slope brush palisade. Total brushwall is now 160lm + 85lm of brush palisade.
13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
22/01/21 – 22/02/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.
22/01/21 – 08/02/21	Embankment regrading and matting	Continuation of bank preparation and matting on western embankment (200m ²) and majority of eastern embankment (800m ²). Total matting and embankment preparation areas is now approx. 3,000m ²
22/01/21 – 22/02/21	Baseline monitoring report	Preparation and submission of baseline monitoring report. This report provides further definition of completion criteria and an overview of site conditions prior to commencement of on-ground works.

08/01/21 – 11/02/21	Relocation and resspreading topsoil	Relocation of soil stockpiles in the Quindalup Dune zone to allow for ACM removal. Resspreading soil following confirmation of ACM removal.
04/02/21 – 22/02/21	Mulch procurement and site preparation planning	Confirm mulch order and deposit for material. Planning for distribution and logistics of mulch cartage and stockpiling. Coordination and confirmation of machinery for spreading.
09/02/21 – 12/02/21	Aboriginal engagement – Roelands Village	Contribution to four days of machinery operation training for Roelands Village civil construction trainees. The works were undertaken to assist the Geographe Community Landcare Nursery increase nursery capacity to accommodate additional requirements for the project.
11/02/21 – 18/02/21	Greenwaste and woody weeds	Clearing and removal of Greenwaste (weed and dead material). 30m ³ of weed material disposed of at waste facility and over 100m ³ stockpiled on site for future removal and resspreading of larger logs for habitat.
17/02/21	Aboriginal engagement – Undalup Association	On-country meeting and consultation with Cultural Custodians to discuss the project scope for the development of cultural / biodiversity nodes within the site. Confirmation to commence works 12/02/21.
23/02/21 – 23/03/21	Weed control	Weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
03/03/21 – 09/03/21	Palisade construction	Construction and completion of 3x palisade areas along the western embankment.
12/03/21 – 19/03/21	Aboriginal engagement	Two days of Undalup's indigenous ranger team (x3) performing site preparation tasks (weed control, rubbish removal and fuel load reduction) in the Southern PEC zone. Additional reporting to be provided in the next period.
17/03/21 – 22/03/21	Mulch installation	675m ³ of mulch supplied and spread (mechanical and manual) across 9,000m ² of the eastern PEC zone.
24/03/21 – 25/05/21	Weed control	On-going follow-up weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
24/03/21 – 07/05/21	Aboriginal engagement – Wadandi Rangers	On-going support for site works from Undalup Association's Wadandi rangers both on site and at GCLN. Please see attached progress reports from Undalup.
19/04/21 – 23/04/21	Ripping	Soil ripping via tractor mounted tine across Central PEC and Quindalup Dune revegetation zones. Approx. 1.5 ha covered.
13/05/21 – 21/05/21	Mulch installation	315m ³ of mulch supplied and spread (mechanical and manual) across 6,000m ² of the Quindalup Dune zone.
24/03/21 – 25/05/21	Procurement	Purchase and delivery of corflute tree guards, stakes and root barrier.
27/05/21	Procurement: Tree stake supply	Supply of all hardwood stakes (1800x50x50mm) for mature trees.
04/06/21 & 17/06/21	Weed control	On-going weed control focussing on the QD and VDD Embankment areas prior to planting
22/06/21 – 24/06/21	Procurement: Seedling supply	Supply of all seedlings (exc. lower embankment) for the Quindalup Dune and VDD Embankment zones. Total number of seedlings: 23,610

01/07/21	Matting	Completion of matting along the final section (700m ²) of the VDD Embankment near the pedestrian bridge.
05/07/21 - 19/07/21	Planting	21,543 seedlings installed in the QD and VDD Embankment zones. Lower Embankment to be planted in spring. Refer to table attached for details.
08/07/21	Ripping	0.5ha of the Western PEC zone (Corner of College Ave / QE Ave) was ripped prior to mulch spreading.
12/07/21 - 16/07/21	Mulching	Mechanical spreading of mulch across the Central and Western PEC zones. Total of 7,000m ² spread. Further manual spreading / trimming to be completed.
12/07/21	Tree removal and greenwaste removal	Removal of unstable tree at the Donovan property and removal of greenwaste from the Western PEC zone.
21/07/21 - 22/07/21	Plant deliveries and batching	Delivery and batching of remaining seedlings for 2021. See attached table for details
22/07/21 - 23/07/21	Fencing	QD and Embankment zone post & rail and public management fencing completed.
25/06/21 - 22/07/21	Weed control	Various follow-up herbicide weed control undertaken where possible, including: QD, VDD Embankments, Western PEC, Central PEC, Eastern PEC and Western Basin PEC.
25/06/21 - 22/07/21	Aboriginal engagement - Undalup Association	Undalup Wadandi Rangers assisting Geographe Community Landcare Nursery preparing stock for the project and assisting with capacity upgrades.
27/07/21	Slashing VDD Levees (separate PO)	Manual slashing (brushcutter) of VDD levee external banks adjacent to revegetation areas. Performed under separate work order.
27/07/21 - 28/07/21	Mulch spreading (manual)	Final manual trim of mulched areas in Central PEC and Western PEC planting areas. Additional assistance provided by Undalup Association.
30/07/21 - 13/08/21	Aboriginal engagement	Assistance with manual spreading of mulch at Western PEC. 2 days (30/08 & 13/08).
03/08/21 - 18/08/21	Weed control	Targeted spot spraying within 2021 planting sites over 4 days. Additional retreatment of 2022 planting sites (EPEC, Possum Corridor) blanket spraying.
05/08/21 - 20/08/21	C. procera monitoring	Commenced monitoring growth and health of known & reference populations of C. procera adjacent to construction boundary.
09/08/21 - 10/08/21	WPEC fencing	324m of fencing installed around Western PEC Restoration Zone. Inc. 1.2m ringlock + 900mm rabbit mesh skirt. 2m clearance from base of levee.
13/08/21	Mulch spreading	Transport and spreading of mulch from WPEC to QD Zone eastern bank.
13/08/21 - 19/08/21	Mature trees install	Install 214 mature trees along pathway in CPEC. Included root barrier, soil conditioner, Terracottem, mulching, stakes and ties.
23/08/21	CPEC planting	Commencement of planting along CPEC inc. tree guards and fertiliser tablets. Final planting list included below.
24/08/21 - 21/09/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.

25/08/21 - 10/09/21	Planting and guard install	Install remaining plants and guards in CPEC and Western PEC Restoration Zone. Total of 14,617 plants and 11,261 guards installed.
30/08/21 - 13/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in WPEC Open zone. Total of 3,149 plants and 2,539 guards installed.
13/09/21 - 21/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in CPEC swale zone. Total of 6,000 plants installed in swale.
23/09/21	Tree install	Plant remaining mature tree in QD Zone and install signage.
(05/08/21) - 13/10/21	C. procera monitoring	Weekly inspections and recording of <i>Caladenia procera</i> population within the SPEC. Inspections conducted from August to October.
1/10/21	Weed control; tree guard maintenance	Manual and herbicide weed control. Removal and reinstatement of damaged tree guards. Central PEC
04/10/21	Weed control	Manual and herbicide weed control. QD & Western PEC.
14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 & 19/01/22	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.
18/10/21 – 22/10/21	Levee selective herbicide spraying	Selective spraying of broadleaf weeds on levees adjacent to revegetation sites.
20/10/21 & 29/10/21; 02/11/21; 02/02/22; 08/02/22	Levee slashing (5x events (partially included in previous reports))	Spring 2021 and summer 2022 slashing. Brushcutting all external levee embankments adjacent to revegetation areas.

25/01/22; 31/01/22; 04/02/22; 09/02/22; 17/02/22; 19/02/22	Weed control (6x events)	Weed control (Summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
03/02/22; 15/02/22 – 16/02/22	Watering	2x watering events over Feb-22. CPEC, WPEC and QD seedlings and mature trees
01/02/22 – 02/02/22	Mulch deliveries	Remaining mulch delivered to EPEC zone.
21/02/22 – 24/02/22	Mulch spreading	Machine spreading of mulch in EPEC.
03/03/22 – 13/03/22	Watering	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 6,000L used per event.
21/03/22 – 28/04/22	Weed control	Weed control (Remaining summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control. Additional woody weed control CPEC and SPEC.
28/04/22 – 06/05/22	Tree Guard Maintenance	Tree guard maintenance and removal along CPEC. Approx. 3,500 guards removed.
20/04/22 – 18/05/22	Matting	Installation of 1,500m ² of coir mesh installed along QE Ave Swale.
20/05/22 – 23/05/22	Seedling deliveries	Delivery of seedlings for 2022 planting works. Estimated final numbers at 45,785
01/05/22 – 23/05/22	Monitoring	Autumn-22 field vegetation monitoring.
02/06/22 – 29/06/22	Weed control	4x weed control events across QD, QE Ave swale, Central PEC & Eastern PEC. Inc. herbicide spraying and manual removal.
07/06/22 – 13/07/22	Planting and tree guard installation	Installation of seedlings to QD (infill), QE Ave Swale, Central PEC (infill) & Eastern PEC. Totals provided in attachment. Planting included augering/ripping & fertiliser tablet supply & install. Approx. 6k tree guards installed in selected areas
10/06/22 – 15/06/22	Tree guard maintenance	Removal of selected guards across Central PEC. Approx. 5,000 guards removed.
09/06/22 – 30/06/22	Fencing	Installation of 1,685lm of herbivore protection fencing across Eastern PEC.
01/06/22 – 01/07/22	Monitoring Reporting	Data input and draft report preparation (to be submitted).

VDD Upgrade Revegetation 2022 Planting Final numbers									
Species	Quindalup Dune Restoration	VDD Embankment Restoration Upper	VDD Embankment Restoration Lower	QE Ave Swale Restoration	Central PEC Restoration	Eastern PEC Low Fuel	Eastern PEC Open	Eastern PEC Restoration	Total
Tree Species									
Agonis flexuosa	100	0	0	50	0	0	500	500	1,150
Banksia grandis	0	0	0	0	126	0	437	437	1,000
Banksia littoralis	0	0	0	100	126	0	437	437	1,100
Corymbia calophylla	0	0	0	0	50	0	500	500	1,050
Eucalyptus decipiens	0	0	0	0	50	0	300	300	650
Eucalyptus rudis	0	0	0	100	0	0	300	300	700
Melaleuca preissiana	0	0	0	0	0	0	100	100	200
Melaleuca raphiophylla	0	0	0	100	0	0	100	100	300
Sub-Total	100	0	0	350	352	0	2,674	2,674	6,150
Shrub Species									
Acacia cochlearis	50	50	0	0	0	0	0	0	100
Acacia littorea	50	50	0	150	0	0	0	0	250
Acacia saligna	0	0	0	50	50	0	50	200	350
Adenanthos meisneri	0	0	0	0	100	0	500	500	1,100
Daviesia physodes	0	0	0	0	200	0	200	300	700
Diploaena dampieri	100	0	0	0	0	0	0	0	100
Gompholobium capitatum	0	0	0	0	120	0	200	400	720
Gompholobium tomentosum	0	0	0	0	0	0	350	500	850
Hakea prostrata	0	0	0	0	50	0	100	500	650
Hakea varia	0	0	0	150	50	0	100	500	800
Hibbertia cuneiformis	50	25	0	0	250	0	300	400	1,025
Hibbertia racemosa	0	0	0	0	100	0	350	400	850
Jacksonia furcellata	0	0	0	0	63	0	63	136	262
Kunzea glabrescens	0	0	0	0	100	0	50	400	550
Melaleuca cuticularis	0	0	0	150	0	0	0	0	150
Melaleuca incana	0	0	0	150	0	0	0	0	150
Melaleuca viminea	0	0	0	125	0	0	0	0	125
Olearia axilaris	50	0	0	0	0	0	0	0	50
Rhagodia baccata	0	0	0	200	0	0	0	0	200
Spyridium globulosum	50	0	0	100	100	0	150	500	900
Xanthorrhoea brunonis	0	0	0	0	100	0	100	300	500
Xanthorrhoea preissii	0	0	0	0	100	0	100	300	500
Sub-Total	350	125	0	1,075	1,383	0	2,613	5,336	10,882
Herbs and Groundcover Species									
Anigozanthos manglesii	0	0	0	0	150	0	1000	800	1,950
Centella asiatica	0	0	0	1000	0	0	1500	1500	4,000
Conostylis aculeata	0	0	0	0	150	500	1200	700	2,550
Dampiera linearis	0	0	0	0	0	300	500	400	1,200
Hardenbergia comptoniana	10	0	0	0	0	150	300	200	660
Patersonia occidentalis	0	0	0	0	150	600	1200	700	2,650
Samolus junceus	0	0	0	250	0	0	0	0	250
Samolus repens	0	0	0	250	0	0	0	0	250
Scaevola crassifolia		50	0	0	0	0	0	0	50
Sub-Total	10	50	0	1,500	450	1,550	5,700	4,300	13,560
Rushes and Sedges									
Baumea juncea	0	0	0	600	700	502	1163	1032	3,997
Ficinia nodosa	250	315	0	0	0	0	0	0	565
Juncus kraussii	0	0	500	1000	0	0	0	0	1,500
Juncus kraussii - advanced	0	0	500	0	0	0	0	0	500
Lepidosperma gladiatum	217	150	0	750	0	0	0	0	1,117
Lepidosperma longitudinale	0	0	0	900	0	0	300	300	1,500
Lepidosperma squamatum	0	0	0	0	0	0	300	300	600
Sub-Total	467	465	1,000	3,250	700	502	1,763	1,632	9,779
TOTAL	927	640	1,000	6,175	2,885	2,052	12,750	13,942	40,371
Tree Guards	0	0	0	0	2,885	0	2,375	0	5,260
Fertiliser tablets	927	640	0	6,175	2,885	2,052	12,750	13,942	39,371

Vasse Diversion Drain Upgrade Revegetation – Water Corporation

Post Activity Report #17: December 2022 to February 2023

Activity Date(s):	01/12/22 – 28/02/23	Conducted By:	Alex Johnston
Site Reference:	VDD Upgrade Revegetation	Reviewed By:	Matt Blunt
Area (ha):	14.5ha		

Action Taken

Date(s):	Activity	Description
06/12/22	Sign installation	Revegetation signs installed at strategic locations across revegetation sites.
05/01/23 & 16/01/23	Brushwall installation	Installation of matting and brushwall section on VDD Embankment.
17/01/23 – 18/01/23	Levee weed control	Slashing of all external levee embankments
25/01/23	Monitoring and reporting	Spring 2022 monitoring report submitted 25/01/23
06/12/22 03/01/23 – 11/01/23 01/02/23 – 02/02/23 24/02/23 – 28/02/23	Weed control (10 days – 189 hours	On-going management of weeds using various methods (manual, mechanical, herbicide) across all active revegetation areas. Additional woody weed control in Possum Corridor and Southern PEC.
18/01/23 – 20/01/23 27/02/23 – 28/02/23 (16/12/22 – 25/02/23)	Watering (2x site-wide events) & 6x QE Ave swale	Watering of mature trees (CPEC) and active revegetation zones. Additional fortnightly watering QE Ave swale (tanker).
09/12/22 19/01/23	Possum Infrastructure maintenance	Infrastructure assessment with arborist and adjustments to rope bridges (College Ave).

Recent site photos available on the C-D00116 Revegetation Work Sharefile

Previous Action Taken

Date(s):	Activity	Description
26/10/20 – 05/11/20	Vegetation salvage	Selective removal, transport and initial propagation of native species within clearing area. Performed in collaboration with Aboriginal businesses and GCLN.
26/10/20 – 02/11/20	Pathway construction and hardstand removal	Installation of 150m x 2m crushed limestone pathway through Quindalup Dune Zone. Removal and stockpiling of gravel material from former Water Corp Depot for later removal and replacement with appropriate topsoil.
14/10/20 – 15/10/20	Baseline monitoring	Performed baseline monitoring of all revegetation zones. 34 quadrats and 34 photo monitoring points + bushland condition monitoring.
01/10/20 – 20/11/20	Plant and embankment material procurement	Procurement and delivery of all embankment materials for future works. Confirmation of tubestock and mature tree orders for 1 st year planting in 2021.
24/11/20 – 08/12/20	Brushlog fabrication	Construction of 300 Brushlog units. Pre-fabrication prior to install for safe and efficient transport and installation.
24/11/20 – 24/12/20	Weed control	Selective herbicide application, hand weeding and slashing. Focus on areas planned for revegetation in 2021.
24/11/20 – 21/12/20	Embankment regrading	Mechanical and manual regrading of embankments, exotic tree stump removal and various green waste removal.
26/11/20 – 23/12/20	Matting	Installed over 800m ² of coir mesh across the western VDD Embankment zone.
02/12/20 – 23/12/20	Brushwall installation	50m Initial section of brushwall installed on western bank + 20m of embankment palisade.
04/01/21 – 21/01/21	Weed control	Manual, mechanical and chemical weed control along VDD embankments.
11/01/21 – 15/01/21	Brushwalling	Installation of 110lm of brushwall along western bank + 65lm of mid-slope brush palisade. Total brushwall is now 160lm + 85lm of brush palisade.
13/01/21 – 15/01/21	Matting	Installation of 1,200m ² of coir mesh matting. Total matting area is now approx. 2,000m ²
13/01/21 – 19/01/21	Weed control	Selective and targeted follow-up herbicide spraying across a number of revegetation areas.
19/01/21 – 18/02/21	Local provenance material collections	Establishment of project seed bank and selective collections of provenance seed from nearby reserves. 12 man-days completed in total. Partial processing of collected seed and seed bank storage as required. See attached status report.
22/01/21 – 22/02/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.
22/01/21 – 08/02/21	Embankment regrading and matting	Continuation of bank preparation and matting on western embankment (200m ²) and majority of eastern embankment (800m ²). Total matting and embankment preparation areas is now approx. 3,000m ²
22/01/21 – 22/02/21	Baseline monitoring report	Preparation and submission of baseline monitoring report. This report provides further definition of completion criteria and an overview of site conditions prior to commencement of on-ground works.

08/01/21 – 11/02/21	Relocation and resspreading topsoil	Relocation of soil stockpiles in the Quindalup Dune zone to allow for ACM removal. Resspreading soil following confirmation of ACM removal.
04/02/21 – 22/02/21	Mulch procurement and site preparation planning	Confirm mulch order and deposit for material. Planning for distribution and logistics of mulch cartage and stockpiling. Coordination and confirmation of machinery for spreading.
09/02/21 – 12/02/21	Aboriginal engagement – Roelands Village	Contribution to four days of machinery operation training for Roelands Village civil construction trainees. The works were undertaken to assist the Geographe Community Landcare Nursery increase nursery capacity to accommodate additional requirements for the project.
11/02/21 – 18/02/21	Greenwaste and woody weeds	Clearing and removal of Greenwaste (weed and dead material). 30m ³ of weed material disposed of at waste facility and over 100m ³ stockpiled on site for future removal and resspreading of larger logs for habitat.
17/02/21	Aboriginal engagement – Undalup Association	On-country meeting and consultation with Cultural Custodians to discuss the project scope for the development of cultural / biodiversity nodes within the site. Confirmation to commence works 12/02/21.
23/02/21 – 23/03/21	Weed control	Weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
03/03/21 – 09/03/21	Palisade construction	Construction and completion of 3x palisade areas along the western embankment.
12/03/21 – 19/03/21	Aboriginal engagement	Two days of Undalup's indigenous ranger team (x3) performing site preparation tasks (weed control, rubbish removal and fuel load reduction) in the Southern PEC zone. Additional reporting to be provided in the next period.
17/03/21 – 22/03/21	Mulch installation	675m ³ of mulch supplied and spread (mechanical and manual) across 9,000m ² of the eastern PEC zone.
24/03/21 – 25/05/21	Weed control	On-going follow-up weed control across various revegetation zones. Re-treating WPEC, CPEC, EPEC & QD zones. Herbicide spraying, manual and woody weeds
24/03/21 – 07/05/21	Aboriginal engagement – Wadandi Rangers	On-going support for site works from Undalup Association's Wadandi rangers both on site and at GCLN. Please see attached progress reports from Undalup.
19/04/21 – 23/04/21	Ripping	Soil ripping via tractor mounted tine across Central PEC and Quindalup Dune revegetation zones. Approx. 1.5 ha covered.
13/05/21 – 21/05/21	Mulch installation	315m ³ of mulch supplied and spread (mechanical and manual) across 6,000m ² of the Quindalup Dune zone.
24/03/21 – 25/05/21	Procurement	Purchase and delivery of corflute tree guards, stakes and root barrier.
27/05/21	Procurement: Tree stake supply	Supply of all hardwood stakes (1800x50x50mm) for mature trees.
04/06/21 & 17/06/21	Weed control	On-going weed control focussing on the QD and VDD Embankment areas prior to planting
22/06/21 – 24/06/21	Procurement: Seedling supply	Supply of all seedlings (exc. lower embankment) for the Quindalup Dune and VDD Embankment zones. Total number of seedlings: 23,610

01/07/21	Matting	Completion of matting along the final section (700m ²) of the VDD Embankment near the pedestrian bridge.
05/07/21 - 19/07/21	Planting	21,543 seedlings installed in the QD and VDD Embankment zones. Lower Embankment to be planted in spring. Refer to table attached for details.
08/07/21	Ripping	0.5ha of the Western PEC zone (Corner of College Ave / QE Ave) was ripped prior to mulch spreading.
12/07/21 - 16/07/21	Mulching	Mechanical spreading of mulch across the Central and Western PEC zones. Total of 7,000m ² spread. Further manual spreading / trimming to be completed.
12/07/21	Tree removal and greenwaste removal	Removal of unstable tree at the Donovan property and removal of greenwaste from the Western PEC zone.
21/07/21 - 22/07/21	Plant deliveries and batching	Delivery and batching of remaining seedlings for 2021. See attached table for details
22/07/21 - 23/07/21	Fencing	QD and Embankment zone post & rail and public management fencing completed.
25/06/21 - 22/07/21	Weed control	Various follow-up herbicide weed control undertaken where possible, including: QD, VDD Embankments, Western PEC, Central PEC, Eastern PEC and Western Basin PEC.
25/06/21 - 22/07/21	Aboriginal engagement - Undalup Association	Undalup Wadandi Rangers assisting Geographe Community Landcare Nursery preparing stock for the project and assisting with capacity upgrades.
27/07/21	Slashing VDD Levees (separate PO)	Manual slashing (brushcutter) of VDD levee external banks adjacent to revegetation areas. Performed under separate work order.
27/07/21 - 28/07/21	Mulch spreading (manual)	Final manual trim of mulched areas in Central PEC and Western PEC planting areas. Additional assistance provided by Undalup Association.
30/07/21 - 13/08/21	Aboriginal engagement	Assistance with manual spreading of mulch at Western PEC. 2 days (30/08 & 13/08).
03/08/21 - 18/08/21	Weed control	Targeted spot spraying within 2021 planting sites over 4 days. Additional retreatment of 2022 planting sites (EPEC, Possum Corridor) blanket spraying.
05/08/21 - 20/08/21	C. procera monitoring	Commenced monitoring growth and health of known & reference populations of C. procera adjacent to construction boundary.
09/08/21 - 10/08/21	WPEC fencing	324m of fencing installed around Western PEC Restoration Zone. Inc. 1.2m ringlock + 900mm rabbit mesh skirt. 2m clearance from base of levee.
13/08/21	Mulch spreading	Transport and spreading of mulch from WPEC to QD Zone eastern bank.
13/08/21 - 19/08/21	Mature trees install	Install 214 mature trees along pathway in CPEC. Included root barrier, soil conditioner, Terracottem, mulching, stakes and ties.
23/08/21	CPEC planting	Commencement of planting along CPEC inc. tree guards and fertiliser tablets. Final planting list included below.
24/08/21 - 21/09/21	Weed control	Follow-up herbicide application to areas to be revegetated in 2021.

25/08/21 - 10/09/21	Planting and guard install	Install remaining plants and guards in CPEC and Western PEC Restoration Zone. Total of 14,617 plants and 11,261 guards installed.
30/08/21 - 13/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in WPEC Open zone. Total of 3,149 plants and 2,539 guards installed.
13/09/21 - 21/09/21	Planting and guard install (Undalup Association)	Installation of plants and guards in CPEC swale zone. Total of 6,000 plants installed in swale.
23/09/21	Tree install	Plant remaining mature tree in QD Zone and install signage.
(05/08/21) - 13/10/21	C. procera monitoring	Weekly inspections and recording of <i>Caladenia procera</i> population within the SPEC. Inspections conducted from August to October.
1/10/21	Weed control; tree guard maintenance	Manual and herbicide weed control. Removal and reinstatement of damaged tree guards. Central PEC
04/10/21	Weed control	Manual and herbicide weed control. QD & Western PEC.
14/10/21	Weed control	Manual and herbicide weed control. QD
20/10/21 - 21/10/21	Levee slashing	1/12 slashing of levee external embankments adjacent to revegetation sites.
21/10/21	Weed control	Manual and herbicide weed control. Western PEC
25/10/21 - 26/10/21	Planting	Completed planting of lower VDD Embankments (3,500 plants total).
10/11/21 - 11/11/21	Weed control	Manual and herbicide weed control. QD, WPEC & CPEC
10/11/21 & 15/11/21	Palisade construction	4/4 palisade area construction in Quindalup Dune.
16/11/21 - 17/11/21	Monitoring	Quadrat set-up and monitoring of all revegetation areas
20/11/21 - 30/11/21	Plant orders	Developing and ordering the tubestock planting list for 2022. 30% deposit required upfront to secure orders.
06/12/21 - 14/12/21	Weed control	Manual and herbicide weed control. QD, WPEC, CPEC and Eastern PEC.
06/12/21	Watering	Watering of all mature tree in CPEC. Total of 4000L
21/12/21; 4/01/22; 17/1/22	Watering (3x events)	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 12,000L used. Watering of BayOK included 17/01
22/12/21 - 18/01/22	Weed control (3x events)	Weed control (covering Spr-21 treatment) was utilised across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
07/01/22 & 19/01/22	Mulch deliveries and site preparation	Additional site preparation in EPEC and delivery of 210m ³ of mulch delivered to site.
17/12/21 - 24/12/21	Plant procurement	Completion of plant procurement for 2022 including Stage 3 plants. 45,785 total plants
04/01/22 - 20/01/22	Monitoring / reporting	Processing and analysis of monitoring data and drafting of report.
18/10/21 – 22/10/21	Levee selective herbicide spraying	Selective spraying of broadleaf weeds on levees adjacent to revegetation sites.
20/10/21 & 29/10/21; 02/11/21; 02/02/22; 08/02/22	Levee slashing (5x events (partially included in previous reports))	Spring 2021 and summer 2022 slashing. Brushcutting all external levee embankments adjacent to revegetation areas.

25/01/22; 31/01/22; 04/02/22; 09/02/22; 17/02/22; 19/02/22	Weed control (6x events)	Weed control (Summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control.
03/02/22; 15/02/22 – 16/02/22	Watering	2x watering events over Feb-22. CPEC, WPEC and QD seedlings and mature trees
01/02/22 – 02/02/22	Mulch deliveries	Remaining mulch delivered to EPEC zone.
21/02/22 – 24/02/22	Mulch spreading	Machine spreading of mulch in EPEC.
03/03/22 – 13/03/22	Watering	Watering of mature trees (CPEC), WPEC and QD zones fortnightly. Total 6,000L used per event.
21/03/22 – 28/04/22	Weed control	Weed control (Remaining summer-22 treatment) across all 2021 and 2022 revegetation sites. Manual, chemical and mechanical control. Additional woody weed control CPEC and SPEC.
28/04/22 – 06/05/22	Tree Guard Maintenance	Tree guard maintenance and removal along CPEC. Approx. 3,500 guards removed.
20/04/22 – 18/05/22	Matting	Installation of 1,500m ² of coir mesh installed along QE Ave Swale.
20/05/22 – 23/05/22	Seedling deliveries	Delivery of seedlings for 2022 planting works. Estimated final numbers at 45,785
01/05/22 – 23/05/22	Monitoring	Autumn-22 field vegetation monitoring.
02/06/22 – 29/06/22	Weed control	4x weed control events across QD, QE Ave swale, Central PEC & Eastern PEC. Inc. herbicide spraying and manual removal.
07/06/22 – 13/07/22	Planting and tree guard installation	Installation of seedlings to QD (infill), QE Ave Swale, Central PEC (infill) & Eastern PEC. Totals provided in attachment. Planting included augering/ripping & fertiliser tablet supply & install. Approx. 6k tree guards installed in selected areas
10/06/22 – 15/06/22	Tree guard maintenance	Removal of selected guards across Central PEC. Approx. 5,000 guards removed.
09/06/22 – 30/06/22	Fencing	Installation of 1,685lm of herbivore protection fencing across Eastern PEC.
01/06/22 – 01/07/22	Monitoring Reporting	Data input and draft report preparation (to be submitted).
20/07/22 11/08/22 – 15/08/22 01/09/22 – 14/09/22 27/09/22 – 30/09/22 18/10/22 – 19/10/22 24/10/22 – 26/10/22 08/11/22 14/11/22 28/11/22	Weed Control (16 days – 376hrs)	On-going management of weeds using various methods (manual, mechanical, herbicide) across all active revegetation areas: QD, WPEC, CPEC, EPEC, Possum Corridor). Very high seasonal weed abundance due to cooler conditions resulted in a protracted growing season for winter / spring weeds.
05/08/22 09/08/22 16/09/22 14/10/22 03/11/22 07/11/22	Tree Guard Removal	All guards progressively removed from CPEC and WPEC. Decision was made to remove all remaining guards in these areas due to vandalism and public concerns from plastic waste.

01/08/22 – 02/08/22 12/09/22 – 13/09/22	Levee weed management (selective herbicide spraying)	Broadleaf selective boom spraying of all external levee banks adjacent to revegetation sites.
05/10/22 – 12/10/22 27/10/22 14/11/22 – 15/11/22	Levee Weed Management (slashing)	Mechanical slashing of external levee banks adjacent to revegetation sites.
18/10/22 – 21/10/22	2023 Seedling orders	Developed planting plan and confirmed seedling orders for 2023.
02/11/22 – 04/11/22	Spring 2022 Monitoring	Field monitoring of all revegetation sites. Data analysis and report to be completed.

Appendix F: Regulator liaison

Margaret McCormack

From: Sean Nicholson <Sean.Nicholson@watercorporation.com.au>
Sent: Wednesday, 29 June 2022 9:31 AM
To: epbcmonitoring@awe.gov.au; Post Approval; compliance@environment.gov.au; Info
Cc: Louis Tang; Lara Fox; Alyce Nehme; Alex Gower; Margaret McCormack; Giles Glasson
Subject: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report

CAUTION: This email originated from outside of RPS.

Good Morning,

In accordance with the permit Conditions below, the Corporation has prepared the Annual Environmental Compliance Report for environmental approvals at the WA State and Federal Level for the CD00116 - Vasse Diversion Drain Upgrade. Practical completion of the construction works was 18 June 2021. Revegetation planting and weed management work is ongoing, in addition to minor completions work (e.g. installation of railings and stairs).

2017/7932	16. The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must: a. publish each compliance report on the website within 60 business days following the relevant 12 month period; b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication; c. keep all compliance reports publicly available on the website until this approval expires; d. exclude or redact sensitive ecological data from compliance reports published on the website; and e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication.
CPS 8191/1	19. Reporting (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report: (i) of records required under condition 18 of this Permit; and (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.

2017/7932, CPS 8191/1 , CD00116 Vasse Diversion Drain Annual Environmental Compliance Report

<https://filetransfer.rpsgroup.com.au/link/i4x1D6N4VpudLHYNFtJrTL>

Please note this link will expire by 29 July 2022. Please contact me if you need to access the document after this date.

If you have any queries about the Compliance report or have any difficulties downloading the documentation, please do not hesitate to contact me. As per 2017/7932 Condition 16(a), the Corporation will make this compliance report available (with sensitive ecological information redacted) on the project website within 60 days.

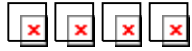
<https://yoursay.watercorporation.com.au/VasseDrainUpgrade>

Regards,

Sean Nicholson
Senior Environment Advisor
Assets Planning and Delivery
Water Corporation

E sean.nicholson@watercorporation.com.au

T (08) 9420 2125



watercorporation.com.au

Water Corporation acknowledges the Traditional Owners throughout Western Australia and their continuing connection to the land, water and community. We pay our respects to all members of the Aboriginal communities and their cultures and to Elders past, present and emerging.



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Margaret McCormack

From: Sean Nicholson <Sean.Nicholson@watercorporation.com.au>
Sent: Thursday, 30 June 2022 9:10 AM
To: epbcmonitoring@awe.gov.au; Post Approval; compliance@environment.gov.au; Info
Cc: Louis Tang; Lara Fox; Alyce Nehme; Alex Gower; Margaret McCormack; Giles Glasson
Subject: RE: 2017/7932, CPS 8191/1, CD00116 - Vasse Diversion Drain Upgrade - Annual Environmental Compliance Report - published on website

CAUTION: This email originated from outside of RPS.

Good morning,

In accordance with the permit Conditions below, the Corporation has published the Annual Environmental Compliance Report for environmental approvals at the WA State and Federal Level for the CD00116 - Vasse Diversion Drain Upgrade, on the Corporations project website (with sensitive ecological information redacted).

2017/7932	16. The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must: a. publish each compliance report on the website within 60 business days following the relevant 12 month period; b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication; c. keep all compliance reports publicly available on the website until this approval expires; d. exclude or redact sensitive ecological data from compliance reports published on the website; and e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication.
CPS 8191/1	19. Reporting (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report: (i) of records required under condition 18 of this Permit; and (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.

The report can be publicly accessed via <https://yoursay.watercorporation.com.au/VasseDrainUpgrade> and navigating to Document Library > Management Plans and Reports. Or you can access it directly via the link below.

<https://yoursay.watercorporation.com.au/50705/widgets/276465/documents/236850>

Regards,

Sean Nicholson
Senior Environment Advisor
Water Corporation

E: sean.nicholson@watercorporation.com.au
T: (08) 9420 2125

From: Sean Nicholson
Sent: Wednesday, 29 June 2022 9:31 AM
To: epbcmonitoring@awe.gov.au; Post Approval <PostApproval@awe.gov.au>; compliance@environment.gov.au;