

CPS8191/1, EPBC 2017/7932

CD00116 Vasse Diversion Drain Upgrade Project

Targeted *Caladenia procera* survey

Prepared for Water Corporation

Approved by Professor Kingsley Dixon

Document Control			
Version	Author	Reviewer	Date
1	K. Allsopp	K Dixon	5 October 2020

1. Introduction

This memorandum presents the results of the targeted survey for *Caladenia procera* (Carbunup King Spider Orchid) carried out with guidance from Professor Kingsley Dixon as part of the CD00116 Vasse Diversion Drain Upgrade Project. The survey was conducted by foot on 14 September 2020 in the area indicated in **Figure 1**.

1.1. Existing Environmental Approvals

This document addresses requirements under the project environmental approvals as follows:

Table 1: CD00116 Vasse Diversion Drain Upgrade State and Federal Environmental Approvals Conditions relevant to this document

Reference	Condition	How the Condition is met
DWER Purpose Permit CPS8191/1		
9	Flora Management – <i>Caladenia procera</i> (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>	Targeted survey was undertaken by Professor Kingsley Dixon on 14 September 2020. Suitable habitat was inspected as indicated in Figure 1. Additional areas proposed for clearing, but considered unsuitable were traversed by Water Corporation Environmental Advisor and/or Tranen Restoration Ecologist with guidance provided by Professor Dixon.
9	Flora Management – <i>Caladenia procera</i> (b) The Permit holder shall ensure no clearing of any <i>Caladenia procera</i> individuals identified through the surveys required by condition 9(a)	No additional <i>Caladenia procera</i> individuals were identified within or directly adjacent to the project clearing area with the regrowth comprising a vegetation community atypical of that for <i>Caladenia procera</i> .

Reference	Condition	How the Condition is met
9	<p>Flora Management – <i>Caladenia procera</i></p> <p>(c) The Permit Holder shall ensure that no clearing occurs within 10 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;</p> <p>(d) Where clearing within 10 metres of individuals of <i>Caladenia procera</i> is unavoidable, the Permit Holder must:</p> <ul style="list-style-type: none"> (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; and (ii) Adhere to the Flora Management Plan required under condition 10 which has been approved by the CEO 	<p>The Flora Management Plan has been incorporated into Section 4.1.3 of the CD00116 Vasse Diversion Drain Upgrade: Construction Environmental Management Framework (Water Corporation 2020), provided to the DWER and AWE on 11 September 2020.</p> <p>The proposed fencing boundary to protect both the previously identified <i>C. procera</i> locations is depicted in Figure 4. The specifications are as follows:</p> <ul style="list-style-type: none"> • A 1 km stretch of vegetation has been identified as both containing and being potential orchid habitat. 1200mm ringlock fencing with shadecloth will be installed. • The Project Footprint has been reduced by two meters in width in the section between the previously identified orchids and Reserve Lot 52132. This has resulted in a reduction of 0.01 ha of overall clearing area.
9	<p>Flora Management – <i>Caladenia procera</i></p> <p>(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</p>	This document
9	<p>Flora Management – <i>Caladenia procera</i></p> <p>(f) If <i>Caladenia procera</i> are identified within 10 metres of the areas cross-hatched yellow on Plan 8191/1a, the targeted flora survey report must include the following:</p> <ul style="list-style-type: none"> (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; and (iii) the methodology used to survey the Permit area. 	<p>No additional individuals were identified during the survey.</p> <p>This document</p>
10	<p>Flora Management Plan</p> <p>Where clearing within 10 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:</p> <ul style="list-style-type: none"> (i) Details of the Permit Holder's attempts to avoid and minimise impacts to <i>Caladenia procera</i>; and (ii) Proposed methods of minimising and mitigating any indirect impacts to <i>Caladenia procera</i>. 	<p>The Flora Management Plan has been incorporated into Section 4.1.3 of the CD00116 Vasse Diversion Drain Upgrade: Construction Environmental Management Framework (Water Corporation 2020), provided to the DWER and AWE on 11 September 2020.</p> <p>This document</p>

Reference	Condition	How the Condition is met
EPBC 2017/7932 Approval Conditions		
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;	This Document The Flora Management Plan has been incorporated into Section 4.1.3 of the CD00116 Vasse Diversion Drain Upgrade: Construction Environmental Management Framework (Water Corporation 2020), provided to the DWER and AWE on 11 September 2020.
5	To minimise impacts to the Carbunup King Spider Orchid, the approval holder: (b) must not clear any Carbunup King Spider Orchid individuals identified through the targeted flora survey required by condition 5a;	No additional individuals were identified during the survey.
5	To minimise impacts to the Carbunup King Spider Orchid, the approval holder: (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.	No additional individuals were identified during the survey. Currently not required
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 with the results of the targeted flora survey which must contain the following information: (a) a. the date(s) targeted flora survey was conducted and the methodology used; and (b) b. a photograph of each individual of Carbunup King Spider Orchid identified during the targeted flora survey and map/s showing their location.	This document No additional individuals were identified during the survey.
9	The approval holder must implement a flora management plan as required by condition 10 of the clearing permit CPS 8191/1.	The Flora Management Plan has been incorporated into Section 4.1.3 of the CD00116 Vasse Diversion Drain Upgrade: Construction Environmental Management Framework (Water Corporation 2020), provided to the DWER and AWE on 11 September 2020

1.2. Project Context

The Vasse Diversion Drain ('the drain') is a 100-year-old strategic infrastructure corridor, originally constructed in the 1920s to create more arable land in the catchment, its primary function now, is to prevent flooding of the Busselton township. The drain diverts flows from the catchments of the Vasse and Sabina Rivers, covering a total area of 287 km².

The drain extends approximately 6.3 km from Geographe Bay, to the Busselton Golf Course (Error! Reference source not found.). The existing drain is variable widths along the length of the drain, not exceeding 44 m. Variation 2 covers a distance of 5.3 km, from Queen Elizabeth Avenue to south of the Chapman Hill Road Bridge. The proposal comprises the hydraulic and structural improvement of the drain to meet the 1-in-100 AEP. This will involve:

- Refurbishment of the levee banks from CH800 to CH1300. Temporary coffer dams will be installed and the flow diverted to allow for scouring of the channel, reconstruction of the levees, respraying of the levee walls and repair of the pedestrian bridge footings.
- CH1300 to CH5500 the levees will be deconstructed to ground level and reconstructed between 5 m – 11 m wider. The pedestrian will be jacked up and extended to accommodate the widening in this section.
- From CH5600 – CH6200 the levees will be deconstructed to ground level, the channel will be widened to accommodate a Department of Water and Environment gauging station, and the levees will be reconstructed 5 m – 11 m wider than the existing structures.
- CH6000 – CH6200 will include the reconstruction of the spillway and deepening of the diversion dam, which may involve some dewatering. A dewatering licence will be obtained by the Corporation. This work will include increasing capacity of the culvert connecting the diversion drain to the lower Vasse River.

The total clearing area for the proposal is 2.16 ha, of which 1.57 ha is permanent clearing for the ultimate design if the drain

2. Species Profile

Caladenia procera (Carbunup King Spider Orchid) is a State and Federally Listed, critically endangered species.

Caladenia procera is a perennial herb that dies back to a dormant tuber over the summer months. The species occurs as solitary plants or in small clumps, growing up to 70 cm tall, with a single pale green leaf that is 10-30 cm long and 6-10 mm wide.

The flowers are c. 5-9 cm across and appear in groups of 1-4 on a scape 35-70 cm tall. The stiffly-held petals and sepals of the flowers are greenish lemon yellow with lines and spots of dull maroon to pink. The labellum is also greenish yellow with pale pink to fawn radiating stripes, ending in a dark maroon recurved tip (Department of Environment and Conservation, 2011).

Plate 1: *Caladenia procera* specimens in bloom, taken Monday 14 September 2020, Busselton. (Photo credit: K. Allsopp)



Caladenia procera is known mainly from a linear range of less than 15 km to the south-west of Busselton, where it grows in Jarrah, Marri and Peppermint woodland on alluvial sandy-clay loam flats with *Anigozanthos manglesii* (Hopper and Brown 2001) and a high incidence of graminoid species (*Lepidosperma* spp, *Mesomelaena* spp). It has a disjunct occurrence approximately 70 km north near Kemerton, where a single plant has been found (Department of Environment and Conservation, 2011).

2.1. Key Threatening Processes

Key Threatening processes identified for the species include:

- Land clearing for development
- Habitat fragmentation
- Road and firebreak, and utility maintenance
- Weed invasion
- Inappropriate Fire regimes
- Grazing
- Recreational impacts, and
- Unauthorised translocation.

2.2. Previous Surveys

A number of previous Flora and Vegetation surveys have been undertaken for the project:

- GHD, 2017a. *Vasse Diversion Drain Upgrade: Flora and Fauna Study* (Level 1 Flora and Vegetation Survey).
- GHD, 2017b. *Vasse Diversion Drain: Fauna and Vegetation Assessment – Additional Survey Area*

- GHD, 2017c. *Vasse Diversion Drain: Carburnup King Spider Orchid, Targeted Survey*.
- EcoEdge Consulting, 2019. *Reconnaissance and Targeted Flora and Vegetation Surveys along Vasse Diversion Drain*
- EcoEdge Consulting, 2020, *Addendum to Detailed and Targeted Flora and Vegetation Survey: Vasse Diversion Drain Upgrade*

Copies of these documents are publicly available on the project website

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

A peer review of four flora and vegetation assessments conducted at the Vasse Diversion Drain was undertaken by EcoEdge (2019) for the Water Corporation. All field surveys and resulting reports were found to be thorough and credible, up and to that point. The two insufficiencies noted, which were both identified by the surveying ecologist / botanist, were the lack of access to all of the survey area in GHD 2017a and the March timing of the survey of additional areas in GHD 2017b.

The Corporation engaged EcoEdge to undertake a Targeted survey in 2019 to comply with the *Draft Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as 'Threatened' under the Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia, 2013). During this survey two sites were determined by sufficiently recognisable as *C. procera*, both locations were reported to the DBCA as per requirements of s40 of the WABC Act 2016.

2.3. Vegetation Description

The survey area has been mapped as the following vegetation complexes:

- Quindalup Complex, described as coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay;
- Vasse Complex, described as mixture of the closed scrub of *Melaleuca* species fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca* species and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). Will include areas dominated by *Tecticornia* and *Sarcocornia* species (Samphire) near Mandurah and south of the Capel River.; and

Multiple flora and vegetation surveys conducted over the last 10 years (see Section 2.2, Figure 2 and Figure 3), most recently in 2019 describe the following vegetation units and condition in the survey area (EcoEdge 2019):

- *Corymbia calophylla* and *Agonis flexuosa* with occasional *Banksia littoralis* and *Melaleuca raphiophylla* mid open forest over *Acacia cochlearis*, *A. saligna*, *Hibbertia cuneiformis* *Jacksonia furcellata*, *Kunzea glabrescens* and *Spyridium globulosum* open shrubland over *Adenanthos meisneri*, *Conospermum caeruleum*, *Daviesia physodes*, *Hardenbergia comptoniana*, *Hibbertia hypericoides*, *Leucopogon propinquus* low shrubland over *Lepidosperma squamatum* and *Tetraria octandra* sedgeland and *Caesia micrantha*, *Chamaescilla corymbosa*, *Conostylis aculeata* subsp. *gracilis*, *Opercularia hispidula*, *Sowerbaea laxiflora*, **Sparaxis bulbifera*, **Watsonia meriana* var. *bulbillifera* and **Zantedeschia aethiopica* mid forbland on dark brown sandy loams. ('*Eucalyptus rudis*, *Corymbia calophylla* and *Agonis flexuosa* Closed Low Forest' PEC). (Degraded-Good)

- *Agonis flexuosa* low woodland and scattered *Acacia saligna* or *A. cochlearis* tall shrubs over **Ehrharta longifolia*, **Watsonia meriana* and other introduced herbaceous species (mainly Completely Degraded)
- *Melaleuca cuticularis*, *M. lanceolata* and *M. raphiophylla* tall open shrubland over *Gahnia trifida* and *Baumea juncea* sedgeland (Good-Very Good) (Part of Conservation category wetland)
- *Agonis flexuosa* woodland over *Acacia littorea*, *Olearia axillaris* and *Spyridium globulosum* tall open shrubland over *Lepidosperma gladiatum* sedgeland (Good-Very Good)
- **Eragrostis curvula*, **Cenchrus clandestinus* grassland, scattered *Acacia saligna* shrubs, bare areas and watercourse (Completely Degraded)

3. Methodology

This survey represents the third targeted survey for the *C. procera* in line with the *Draft Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as 'Threatened' under the Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 2013). A reference site, Reserve Lot 52132, in close proximity to the project area was used to confirm the *C. procera* were flowering, as per the guidelines.

The targeted survey area (**Figure 1**) was traversed, on foot, by Professor Dixon, accompanied by Klara Allsopp (Water Corporation Environmental Advisor) and Alex Johnston (Tranen Revegetation South-west, Restoration Ecologist).

Other areas of clearing proposed for the project were not suitable habitat for the orchid, either being degraded to completely degraded, or unsuitable vegetation soil and hydrological conditions (See **Figure 2** and **Figure 3**).

All proposed clearing areas for the project were inspected by Klara Allsopp and/or Alex Johnston.

For each suspected orchid population located within the Survey Area, the following was recorded:

- Co-ordinate locations (using hand-held GPS)
- Photograph, and
- Estimated population size.

3.1. Survey Limitations

Aspect	Constraint	Comment
Scope	No	The Survey scope was prepared in consultation with the Corporation, compliant with the <i>Draft Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as 'Threatened' under the Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth of Australia, 2013) and in compliance with project environmental approval requirements
Proportion of flora identified	No	The Survey was carried out in mid-September with a reference site to confirm the species was flowering. Reconnaissance visits were undertaken in late August and early September to identify individuals in advance of the survey event.

Climatic and seasonal effects	No	Rainfall at the gauge at Busselton Aero (009603) is showing 612 mm up to September 2020. This is below the average for this station from (which has been operational from 1997 to 2020). Anecdotal evidence suggests the rainfall was potentially actually higher on the coast, areas in Dunsborough have received greater than 800mm. Regardless, the prolific flowering at a number of reference sites, including immediately adjacent to the project area demonstrate the climate and weather conditions were favourable to the species.
Availability of contextual information	No	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have been carried out in the Swan Coastal Plain. Population extent and distribution was known by the assessor.
Completeness of survey	No	Habitat considered suitable for the species was surveyed extensively on foot by the subject matter expert. Other areas were assessed in advance by the Water Corporation Environmental Advisor and Revegetation Consultant. No other populations were identified.
Skill and knowledge of the botanist	No	The Subject Matter Expert has extensive experience in orchid conservation science and is world-acknowledged in orchid biology appropriate to conducting a survey for orchids. He conceived, developed and led the orchid research group at Kings Park for 32 years, is highly published in orchid science (65 orchid science and conservation related scientific publications and books including several specifically on Western Australian orchids) and thus is well positioned to be a SME in orchid science and conservation.

4. Results

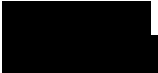



A number of Reconnaissance surveys were undertaken prior to 14 September 2020 to identify and monitor leaf shoots prior to flowering. Dates, photos, co-ordinates and personnel are provided in the table below.

No additional confirmed individuals of *C. procera* were found within the approved clearing area with the later flowering of *C. attingens* (which possesses similar leaves to *C. procera*) providing an additional identification of plants which were in early bud.

Date/Location	Photo	Personnel
14 August 2020 [REDACTED]		K. Allsopp Water Corporation

Date/Location	Photo	Personnel
14 August 2020 		K. Allsopp Water Corporation Location identified in EcoEdge, (2019). <i>C. procera</i> was confirmed through flowering individual. Note that <i>C. attingens</i> was also co-located in this area. 2020 Comments: multiple orchid leaves located in proximity to 2019 individual.
14 August 2020 Co-ordinates -33.664964, 115.330595		K. Allsopp Water Corporation Location identified in EcoEdge, (2019). Unconfirmed location, no photos or flower provided in the report. Note that <i>C. attingens</i> was also positively identified in this location. 2020 comments: Leaf shoot resembled <i>C. procera</i> but late flowering is more indicative of <i>C. attingens</i>

Date/Location	Photo	Personnel
4 September 2020 		Alex Johnston Tranen Revegetation South-west Various locations east of the pedestrian bridge – late flowering (right image) indicative of <i>Caladenia attingens</i> .
4 September 2020 		Alex Johnston Tranen Revegetation South-west Location identified in EcoEdge, (2019). <i>C. procera</i> was confirmed through flowering individual. Note that <i>C. attingens</i> was also co-located in this area indicated by the later flowering (flower stems just emerging).

Date/Location	Photo	Personnel
14 September 2020 		<p>A. Johnston Location identified in EcoEdge, (2019). Unconfirmed location, no photos or flower provided in the report. Note that <i>C. attingens</i> was also positively identified in this location.</p> <p>2020 comments: Same location Identified by K. Allsopp on 14 August 2020. Leaf has been chewed. Flowering stem present.</p>
14 September 2020 Reference Site 		<p>K. Dixon K. Allsopp A. Johnston</p> <p>Reference Site. Multiple locations. Many flowering specimens present.</p>

Date/Location	Photo	Personnel
14 September 2020 Reference Site 		K. Dixon K. Allsopp A. Johnston Reference Site. Multiple locations. Many flowering specimens present.
14 September Additional Reference Site 		K. Allsopp Reference Site – to confirm flowering specimens at the request of a Local Friends of Shepherd's Park Group Comment 2020: This was an informal site visit at the request of a local group. Additional photos and locations have been provided as an attachment for Regulator information.

5. References

Commonwealth of Australia, 2008. Approved Conservation Advice for *Caladenia procera* (Carbunup King Spider Orchid). Online, <http://www.environment.gov.au/biodiversity/threatened/species/pubs/68679-conservation-advice.pdf>

Department of Biodiversity Conservation and Attractions, 2009. *IRP No.175 Carbunup King Spider Orchid (Caladenia procera), 2004- 2009*, prepared by Gillian Stack and Val English. Cited in IRP No. 316 Carbunup King Spider Orchid (*Caladenia procera*), 2011-2016.

Department of Biodiversity Conservation and Attractions, 2011. *IRP No. 316 Carbunup King Spider Orchid (Caladenia procera), 2011-2016*, revised by Nick Casson. Online <https://www.environment.gov.au/system/files/resources/054a081e-8cc0-4548-867a-b1d6d8b44b2a/files/caladenia-procera.pdf>

EcoEdge Consulting, 2019. Reconnaissance and Targeted Flora and Vegetation Surveys along Vasse Diversion Drain. Prepared for Water Corporation, Western Australia.

EcoEdge Consulting, 2020. Addendum to Detailed and Targeted Flora and Vegetation Survey. Vasse Diversion Drain Upgrade. Prepared for Water Corporation, Western Australia.

GHD, 2009. Report for Vasse Diversion Drain Upgrade: Fauna and Flora Study (Level 1 Fauna Survey). Prepared for Water Corporation, Western Australia.

GHD, 2017a. Vasse Diversion Drain Upgrade: Flora and Fauna Study (Level 1 Fauna Survey). Prepared for Water Corporation, Western Australia.

GHD, 2017b. Vasse Diversion Drain: Fauna and Vegetation Assessment – Additional Survey Area. Prepared for Water Corporation, Western Australia.

GHD, 2017c. Vasse Diversion Drain: Carbunup King Spider Orchid, Targeted Survey. Prepared for Water Corporation, Western Australia.

Attachment 1

Report Figures

[REDACTED]

[REDACTED]



LEGEND

Vegetation Type

- VU-A
- VU-B
- VU-C
- VU-D
- VU-E

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Data Source: Water Corporation - Development Area Footprint [2020] Native Vegetation Clearing Area [2020] Targeted Orchid Survey Area [2020]

1:9,301 at A4
0 80 160 240
Metres



Coordinate System:
GDA 1994 MGA Zone 50
Vertical Datum: AHD
DATE: 22/09/2020
AUTHOR: ALLSOPK0



CPS8191/1, 2017/7932
CD00116
Vasse Diversion Drain Upgrade
Vegetation Type
EcoEdge 2020

Figure No 2



LEGEND

VEGCOND

- Completely Degraded
- Degraded
- Good
- Very Good

1:9,301 at A4
0 80 160 240
Metres



Coordinate System:
GDA 1994 MGA Zone 50
Vertical Datum: AHD
DATE: 22/09/2020
AUTHOR: ALLSOPK0



CPS8191/1, 2017/7932
CD00116
Vasse Diversion Drain Upgrade
Vegetation Condition
EcoEdge 2020

[REDACTED]

[REDACTED]

[REDACTED]

