Memo

PHOENIX ENVIRONMENTAL SCIENCES

To: Julie Mahony, Manager Environmental Approvals

From: Dr Grant Wells, Director/Manager Botany

Date: 18 August 2022

Scope: Research strategy for propagation/translocation of *Minuria tridens* at the Mardie Project

---

Dear Julie Mahony,

Phoenix Environmental Sciences (Phoenix) is pleased to present this research strategy for the propagation/translocation for *Minuria tridens* at the Mardie Project (the Project)

1 INTRODUCTION

BCI Minerals Ltd (BCI) is developing the Project, located approximately 80 km southwest of Karratha, Western Australia (WA). Populations of *Minuria tridens* have been recorded at the Project (Phoenix 2019a, 2021). The species is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Priority 1 flora at the State level. Any impact to recorded plants/populations of *M. tridens* are subject to an EPBC condition of the Project (DAWE 2022):

25. To minimise **impacts** on **EBPC Act** listed ***Minuria tridens***, the proponent must:

    a. Comply with conditions 5-1(2) to 5-4 of **WA Approval**. Reporting in condition 5-3(2) of the **WA Approval** must also be provided to the **Department** for review and the **Minister's** approval.

    b. If any ***Minuria tridens*** individuals or populations are found within the **development envelope** during the pre-clearance surveys required in condition 5-2 of the **WA Approval**, the proponent must do the following:

        i. Avoid the individual or population, if practicable.

        ii. If avoidance is not practicable then liaise with the **Department** to seek the possibly of translocating the individual(s) or populations(s).

        iii. If avoidance and translocation is not possible, then the approval holder must, prior to **impact** on the ***Minuria tridens*** individual or population, submit an Offset Strategy specifying how the **impact** will be offset in accordance with the **Environmental Offsets Policy**. If the Offset Strategy has not been approved by the **Minister** in writing within 9 months of the **impact**, and the **Minister** notifies the approval holder that the Offset Strategy is not suitable for approval, the **Minister** may, at least two months after so notifying the approval holder, approve a version of the Offset Strategy revised by the **Department**. The approval holder must implement the approved Offset Strategy for the remainder of the **life of the project**.

c. Complying with condition 12-1 of the **WA Approval** to monitor and manage **weed infestation**, feral rabbits, and indirect **impacts** of changes to groundwater and surface hydrology to the ***Minuria tridens*** individuals and populations identified in *Phoenix – Detailed Flora and vegetation survey for the Mardie project* (June 2020) and any ***Minuria tridens*** found during the pre-clearance surveys. This monitoring must be undertaken yearly for the **life of the project** or until suitable **evidence** is presented to the **Minster** who confirms in writing that ongoing monitoring is no longer required.

d. If any changes are recorded to ***Minuria tridens*** individuals and/or populations during this monitoring, the approval holder must contact the **Minister** within 6 months of known changes with a report that details further mitigation measures and management actions that will be implemented to mitigate the possible **impacts** to the ***Minuria tridens*** individuals and populations.

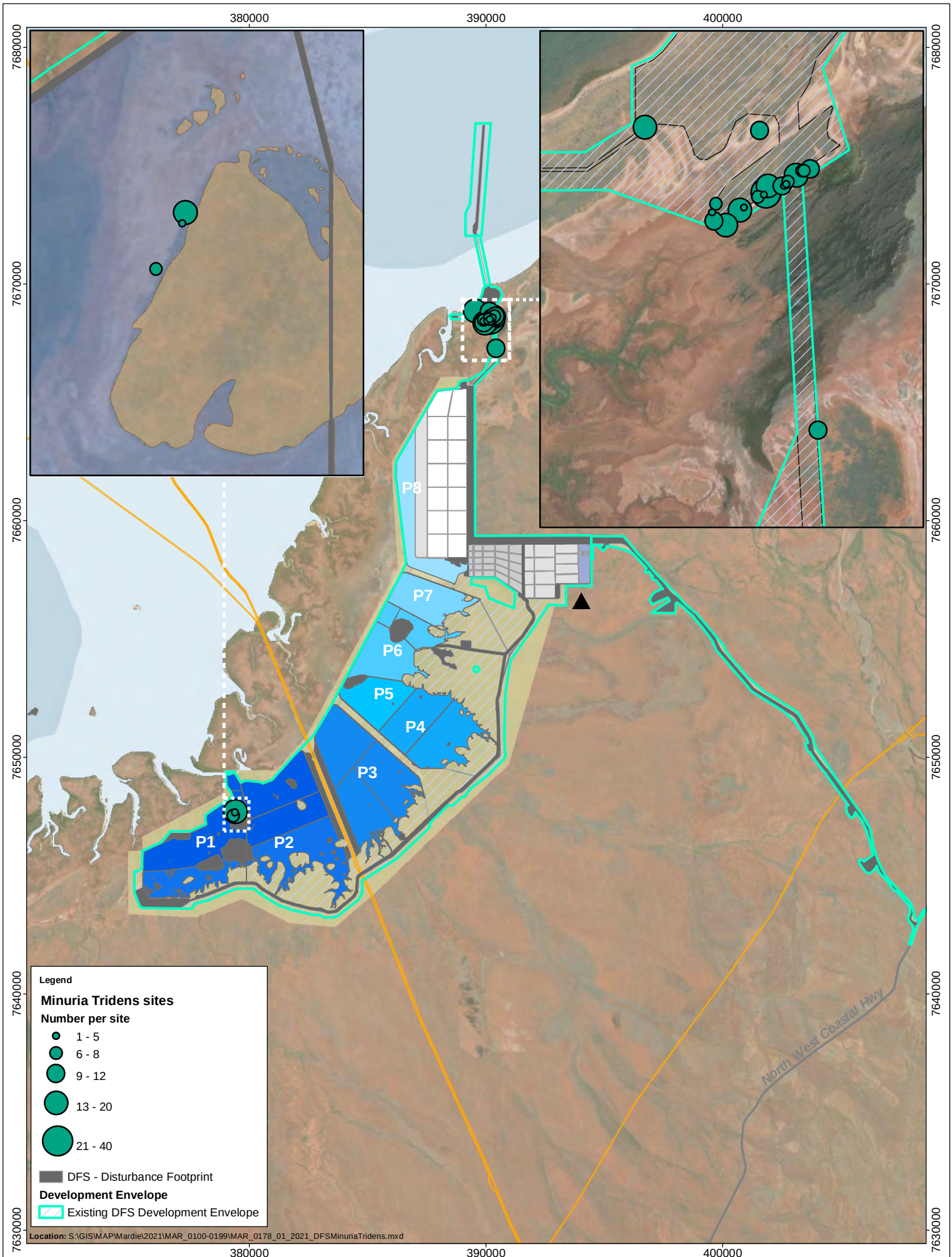
e. If the report identifies that mitigation and management actions are not possible, then condition 25(b)(iii) must be followed.

In addition, condition 5-3(2)(b) of WA Ministerial Statement No. 1175 (Minister for Environment; Climate Action 2021) requires:

> "where individuals of *Minuria tridens* are identified during pre-clearance surveys and cannot be avoided, development of a research strategy to inform the potential for re-establishment of a population of *Minuria tridens* in the region."

It has been determined that avoidance of impacts to some populations of *Minuria tridens (M. tridens)* at the Project is unavoidable (Figure 1). Subsequently, Phoenix Environmental Sciences Pty Ltd (Phoenix) was requested to prepare a research strategy to establish *M. tridens* in suitable habitat outside of the development footprint of the Project.

This document outlines the initial approach and methods for the development of the strategy.



0 km 5

GDA2020 MGA Zone 50

Scale: 1:200,000

N

Date: 20/04/2021

Drawn: Arjen.Tjalma

Requested: ENV

Page Size: A4

***Minuria tridens* locations at the Mardie Salt Project**

Figure: 1

2 METHODS

Status and description of *Minuria tridens*

Documents and databases describing population numbers and location records for *M. tridens* (**Error! Reference source not found.**) will be reviewed to provide a description of the current status and distribution of the species.

Identification of suitable habitat for *Minuria tridens*

M. tridens records from the surveys at the Project will be reviewed to determine known habitat for the species. Aerial imagery, topographical mapping and Phoenix's spatial database will be interrogated to identify potential suitable habitat outside of the Project development envelope.

A survey strategy will then be devised to search for suitable habitat/translocation sites for *M. tridens* outside of the development envelope. The survey strategy will be provided to the Department of Biodiversity, Conservation and Attractions (DBCA) for consultation on potential further research into the habitat for *Minuria tridens.*

Regional searches for *Minuria tridens*

Targeted regional surveys will be the primary focus of the *M. tridens* research strategy.

Following consultation with DBCA and potential further research into suitable habitat for *Minuria tridens*, a regional survey targeting identified suitable habitat will be conducted. The survey will be conducted during the optimal season to search for the species to be defined in consultation with DBCA. The results of the survey will be provided in a brief report that provides:

- Introduction/background of surveys including outline of consultation process with DBCA
- Detailed survey methods
- Survey outcomes, including:
    - Representative specimens from any populations located
    - Maps and spatial data of all populations located
    - Description of habitat for each population
    - Plant counts for each population
    - A record of the phenological state of plants at each population

Determination of reproduction characteristics and phenological cycle of *M. tridens*

A literature search will be conducted to determine reproduction characteristics of *M. tridens.*

Phoenix data will also be interrogated to determine the indicative phenological cycle of *M. tridens*, based on observations from several field surveys. This data will be used to devise a monitoring plan to record flower and seed set.

Investigation of translocation methods

Should targeted regional surveys fail to identify additional populations of *M. tridens* outside the Project Development Envelope, further research directions will be considered in consultation with DBCA and could include translocation and/or propagation.

A preliminary literature search (**Error! Reference source not found.**) has determined pre-sowing treatments and germination conditions (e.g., temperature, light) can significantly increase germination of Asteraceae species. Further literature searches will be conducted to identify presowing treatments and germination conditions to be trialled to optimise germination of *M. tridens.*

Memo

In addition, the preliminary literature search identified that Asteraceae species may be vegetatively propagated and transplanted. Further literature searches will be conducted to identify vegetative propagation methods utilised to maximise propagation of Asteraceae species to inform development of trials to propagate *M. tridens*.

It has been proposed to translocate the *M. tridens* plants that will be impacted by implementation of the Project. Translocation of Asteraceae species has been conducted previously (**Error! Reference source not found.**) and methods used previously will be investigated.

Translocation and propagation trials

A translocation trial will be developed utilising information provided in the guidelines for translocation of Threatened flora (Commander *et al.* 2018). It is proposed to conduct the translocation trial using plants that will be destroyed by the initial vegetation clearing works.

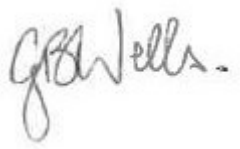
Seeding and/or cuttings trials will be conducted to determine effective propagation method(s).

Minuria tridens translocation plan

A detailed *M. tridens* translocation plan will be prepared and implemented following outcomes of trials.

An indicative timetable is provided in Table 2. Timeframes are subject to availability of specialist botanical resources and logistics.

Yours Sincerely,



Grant Wells

Principal Botanist/Director

Phoenix Environmental Sciences Pty Ltd

Table 1 Documents and databases to be reviewed

Reference	Title
Nano and Pavey (2008)	National Recovery Plan for *Olearia macdonnellensis, Minuria tridens* (Minnie Daisy) and *Actinotus schwarzii* (Desert Flannel Flower)
Phoenix (2019b)	Flora and vegetation assessment for the Mardie Project
Phoenix (2021)	*Minuria tridens* targeted search at Mardie Salt Project
WA Herbarium (1998-)	FloraBase
ALA (2022)	Atlas of living Australia
Afolayan *et al.* (1997)	Germination in *Helichrysum aureonitens* (Asteraceae): Effects of temperature, light, gibberellic acid, scarification and smoke extract
Schutz *et al.* (2002)	Seed dormancy, after-ripening and light requirements of four annual Asteraceae in south-western Australia
Wassner and Ravetta (2000)	Vegetative propagation of *Grindelia chiloensis* (Asteraceae)
Diatta *et al.* (2020)	Evaluation of biomass and vegetative propagation of *Spilanthes oleracea* Jacq. (Asteraceae)
Collier and Garbnett (2017)	Threatened plant translocation case study: *Cassinia rugata* (Wrinkled Dollybush), Asteraceae
Commander *et al.* (2018)	Guidelines for the translocation of Threatened plants in Australia

Table 2 Indicative timeframe for Minuria tridens propagation research

Task	Timeframe
Status and description of *M. tridens*	September2022
Identification of suitable habitat for *M. tridens*	September 2022
Regional Searches for *M. tridens*	October 2022 – April 2023[1]
Determination of reproduction characteristics and phenological cycle of *M. tridens*	September 2022 - September 2023
Investigation of translocation methods	March 2023 - April 2023
Translocation trials nine plants in Ponds 1 and 2 (Figure 1)	June 2022[2]
Translocation and propagation trials	July 2023 - September 2023
Prepare research report and draft translocation plan	October 2023 – April 2024
Submit to DWER CEO M. tridens translocation plan	June 2024

[1] dependent on phenological status of known populations, searches to be conducted when plants are in flower/fruit

[2] dependent on forecast rainfall events

Memo

Reference list

Afolayan, A., Meyer, J. & Leeuwner, D. 1997. Germination in *Helichrysum aureonitens* (Asteraceae): Effects of temperature, light, gibberellic acid, scarification and smoke extract. *South African Journal of Botany* **69**: 22-24.

ALA. 2022. *Atlas of Living Australia*. Available at: http://www.ala.org.au/

Collier, P. & Garbnett, R. 2017. Threatened plant translocation case study: *Cassinia rugata* (wrinkled Dollybush), Asteraceae. *Australiasian Plant Conservation* **26**: 21-24.

Commander, L., Coates, D. J., Broadhurst, L., Offord, C., Markinson, R. & Matthes, M. 2018. *Guidelines for the translocation of threatened plants in Australia: Third Edition*. Australian Network for Plant Conservation, Canberra, Australian Capital Territory.

DAWE. 2022. *Approval. Mardie Project, 80 km souith west of Karratha, WA (EPBC 2018/8236)*. Department of Agriculture, Water and the Environment, Canberra, ACT.

Diatta, W., Diatta, K., Fall, A. & Dieng, S. 2020. Evaluation of biomass and vegetative propagation of *Spilanthes oleracea* Jacq. (Asteraceae). *Journal of Botanical Research* **2**: 1-3.

Minister for Environment; Climate Action. 2021. *Statement that a proposal may be implemented (Environmental Protection Act 1986). Statement No. 1175 Mardie Project*. Minister for Environment; Climate Action, Perth, WA.

Nano, C. & Pavey, C. 2008. *National Recovery Plan for Olearia macdonnellensis, Minuria tridens (Minnie Daisy) and Actinotus schwarzii (Desert Flannel Flower)*. Department of Natural Resources, Environment, The Arts and Sport, Alice Springs, NT. National Recovery Plan. Available at: https://www.agric.wa.gov.au/declared-plants/declared-plant-requirements

Phoenix. 2019a. *Detailed flora and vegetation survey for the Mardie project*. Phoenix Environmental Sciences, Balcatta, WA. Unpublished report prepared for BCI Minerals Ltd.

Phoenix. 2019b. *Flora and vegetation assessment for the Mardie Project*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished memo prepared for BCI Minerals Ltd.

Phoenix. 2021. *Minuria tridens targeted search at Mardie Salt Project.* Unpublished memo prepared for BCI minerals (Mardie Salt Project).

Schutz, W., Milberg, P. & Lamont, B. 2002. Seed dormancy, after-ripening and light requirements of four annual Asteraceae in south-western Australia. *Annals of Botany* **90**: 707-714.

WA Herbarium. 1998-. *FloraBase - the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. Available at: http://florabase.dpaw.wa.gov.au/

Wassner, D. & Ravetta, D. 2000. Vegetative propagation of *Grindelia chiloensis* (Asteraceae). *Industrial crops and products* **11**: 7-10.