



PHOENIX

ENVIRONMENTAL SCIENCES

Regional survey for *Eremophila praecox* for the FIM IIE
Project

Prepared for KCGM Pty Ltd

November 2019

Final Report



Regional survey for Eremophila praecox for the FIM IIE Project

Prepared for KCGM Pty Ltd

Final Report

Authors: Alice Watt, Grant Wells

Date: 29 November 2019

Submitted to: Janine Cameron

Version history			
Name	Task	Version	Date
G. Wells	Draft for client comments	1.0	17 October 2019
G. Wells	Final submitted to client	2.0	24 October 2019
G. Wells	Update to proposed clearing area	3.0	29 November 2019

©Phoenix Environmental Sciences Pty Ltd 2019

The use of this report is solely for the Client for the purpose in which it was prepared. Phoenix Environmental Sciences accepts no responsibility for use beyond this purpose.

All rights are reserved and no part of this report may be reproduced or copied in any form without the written permission of Phoenix Environmental Sciences or the Client.

[Phoenix Environmental Sciences Pty Ltd](#)

1/511 Wanneroo Rd BALCATTWA WA 6021

P: 08 6323 5410

E: admin@phoenixenv.com.au

Project code: 1281-FIM-KCG-BOT

Contents

CONTENTS.....	I
LIST OF FIGURES.....	I
LIST OF TABLES.....	I
1 INTRODUCTION.....	2
1.1 Scope of works.....	5
2 EXISTING ENVIRONMENT.....	6
2.1 Land systems.....	6
2.2 Climate and weather.....	6
3 METHODS.....	8
3.1 Field survey.....	8
3.2 Taxonomy and nomenclature.....	9
3.3 Survey personnel.....	9
4 RESULTS.....	9
5 DISCUSSION.....	16
6 REFERENCES.....	18

List of Figures

Figure 1-1	Fimiston operational areas and Fim II Extension proposed clearing area.....	3
Figure 1-2	Desktop records of <i>Eremophila praecox</i> populations.....	4
Figure 2-1	Annual climate and weather data for Kalgoorlie-Boulder Airport (no. 012038) (BoM 2019).....	7
Figure 4-1	<i>Eremophila praecox</i> plants recorded during the field survey.....	10
Figure 4-2	Field survey records of <i>Eremophila praecox</i>	11

List of Tables

Table 2-1	Presence of <i>Eremophila praecox</i> records on land systems.....	6
Table 4-1	Records of <i>E. praecox</i> on land systems.....	12
Table 4-2	Vegetation types of <i>Eremophila praecox</i> populations.....	13
Table 4-3	Total known number plants of <i>Eremophila praecox</i> from regional surveys.....	15

1 INTRODUCTION

The Fimiston Operational Area forms part of Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) operations, located east of the City of Kalgoorlie-Boulder in the Goldfields region of Western Australia. This area contains the Fimiston Gold Mine Operations, which comprise the Fimiston Open Pit, waste rock dumps, tailings storage facilities (Fimiston I, Fimiston II and Kaltails) and infrastructure corridors.

In July 2019, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) to conduct a regional survey for the state listed Priority 1 flora *Eremophila praecox* for the Fimiston II Tailings Storage Facility (TSF) Expansion Project (Fim IIE Project). The regional survey was conducted to support a management plan for *Eremophila praecox* that may be required for the environmental approvals process for the Fim IIE Project. *E. praecox* has been recorded within and outside of the proposed clearing area for the Fim IIE Project (Figure 1-1).

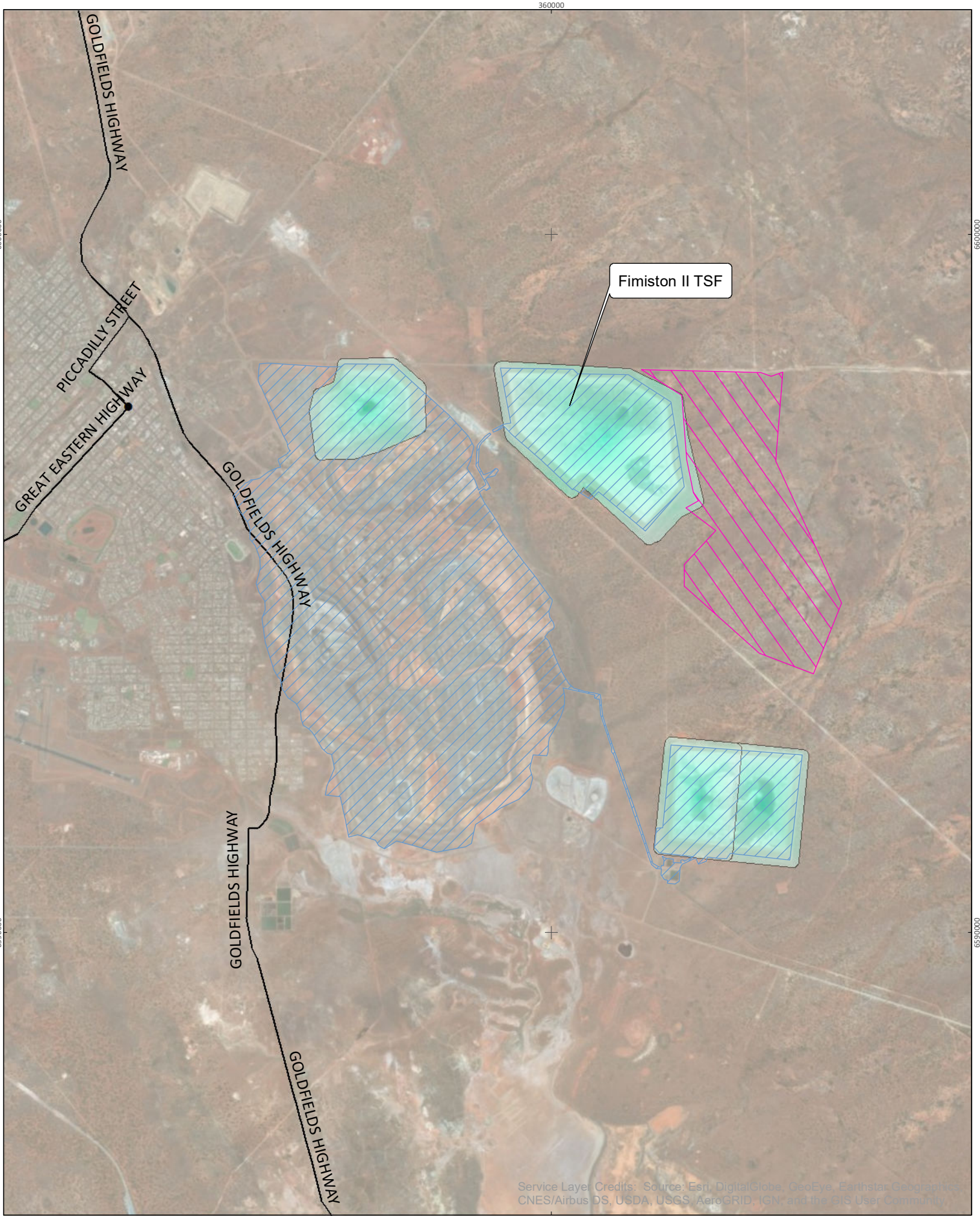
NatureMap (DBCA 2019c) list a total of 18 records for *Eremophila praecox* in Western Australia, of which 17 are located within 25 km of Kalgoorlie (Figure 1-2). The remaining record lies approximately 95 km to the south of Kalgoorlie. A solitary plant has also been recorded in the Eyre Peninsula region in South Australia (DBCA 2019c).

Since 2017 Phoenix Environmental Sciences (Phoenix) have discovered a further five populations for the species, including the population within the proposed clearing area for the Fim IIE Project. Two of the populations discovered by Phoenix extend the range recorded on NatureMap with one record occurring approximately 45 km to the north east of Kalgoorlie and the second approximately 38 km to the west of Kalgoorlie. The remaining populations, including the Fim IIE population occur within 20 km of Kalgoorlie but represent new populations as they do not occur within 500 m of any of the NatureMap records. In addition, Kalgoorlie Consolidated Gold Mines (KCGM) have identified other records (Kanowna Belle and St Ives, Janine Cameron pers. comm. to Grant Wells, email 05/07/2019) that may not be recorded on NatureMap. Subsequently these records have determined a broader distribution for the species both within and outside of the distribution currently available on NatureMap.

Prior to the current survey it was not possible to ascertain what proportion of the total population of *Eremophila praecox* is represented by the plants recorded in proposed clearing area for the Fim IIE Project as numbers of plants are not available for the majority of records. A record of two plants at one location, comments of uncommon and infrequent for a further two records and a comment of common for one record are the only details provided of population size on FloraBase (DBCA 2019b). Population sizes for Phoenix records are:


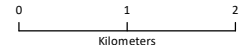
- nine plants (Phoenix 2018b)
- three plants (Phoenix 2018a)
- nine plants (Phoenix 2019c)
- 19 plants (Phoenix 2019b)
- three plants (Phoenix 2019a).

For all of the Phoenix records plants have been distributed over a broad area with individuals frequently spaced hundreds of meters apart. Records for *Eremophila praecox* have typically been located in Eucalypt woodlands with a variable shrub understorey with *Acacia* and *Eremophila* spp. common and occasionally with a *Triodia* grass layer. Subsequently, there is a large area of suitable habitat for the species both within and beyond the current recorded distribution. The typically sparse nature of the populations and the large area of suitable habitat indicate that the species may in fact be widespread but infrequently recorded.



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar, GeoBroadcast, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



KCGM - Regional survey for <i>Eremophila praecox</i> for FIM IIE Project	
Project No	1281
Date	29-Nov-19
Drawn by	AJ
Map author	GW
	
	
1:70,000 (at A4) GDA 1994 MGA Zone 51	




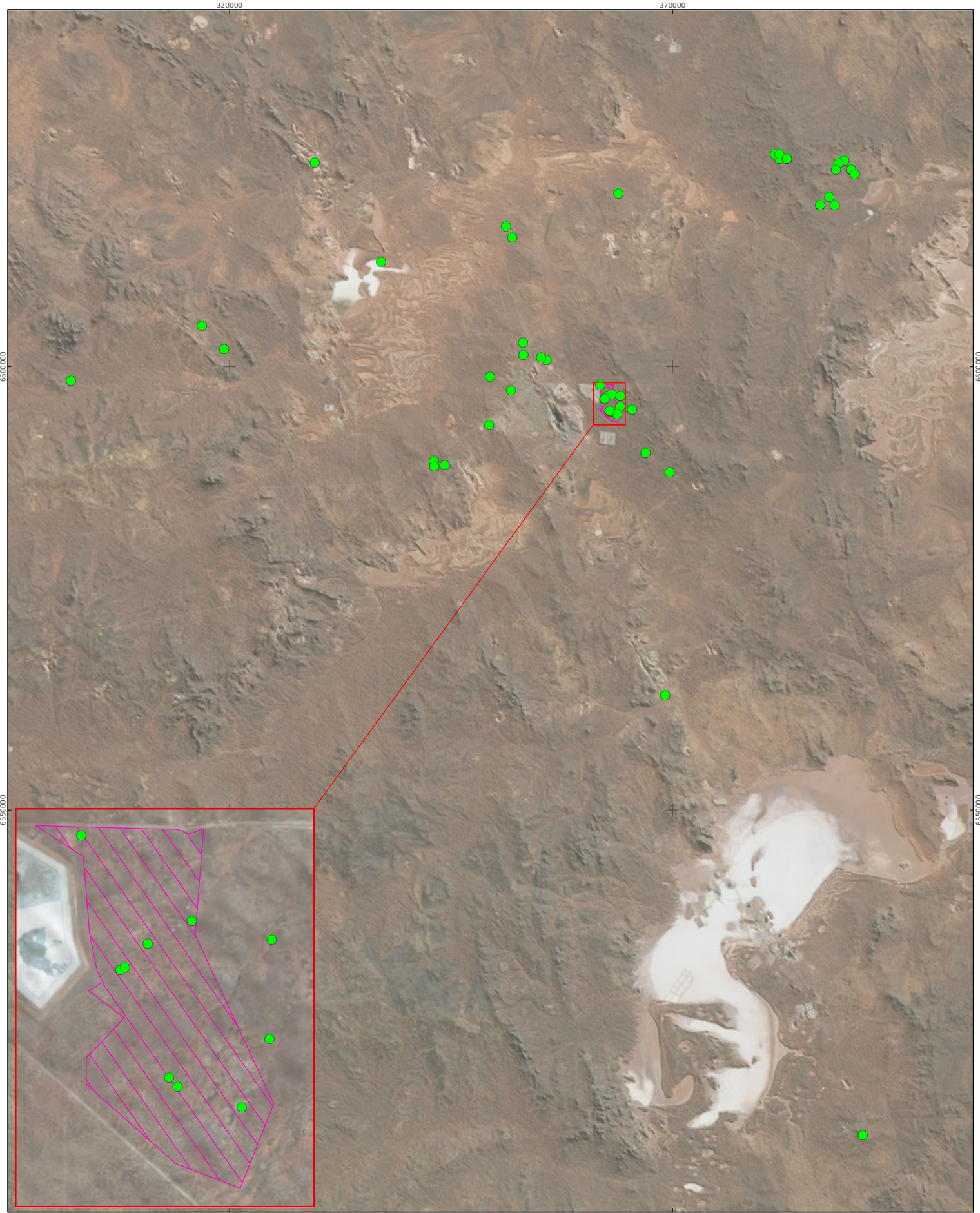

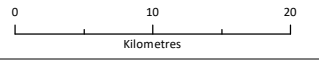
-  Tailings storage facilities
-  Fimiston operational areas
-  Proposed clearing area

Figure 1-1
Fimiston operational areas and Fim II Extension proposed clearing area



All information within this map is current as of 29-Nov-19. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



KCGM - Regional survey for <i>Eremophila praecox</i> for FIM IIE Project	
Project No	1281
Date	29-Nov-19
Drawn by	AJ
Map author	GW
	
	
1:550,000 (at A4) GDA 1994 MGA Zone 51	
<small>All information within this map is current as of 29-Nov-19. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.</small>	




 Proposed clearing area
 *Eremophila praecox* records

Figure 1-2

Desktop records of *Eremophila praecox* populations



PHOENIX
ENVIRONMENTAL SCIENCES

1.1 SCOPE OF WORKS

In order to inform the requirement for a management plan for *Eremophila praecox* for the Fim IIE Project Phoenix propose to conduct a regional targeted survey for the species to determine:

- population sizes of NatureMap and other records
- status of NatureMap records, i.e. undisturbed or disturbed
- locations of additional, as yet unknown populations

The purpose of the surveys would be to determine:

- a more accurate record of the distribution of the species
- what proportion of the entire species population plants are present in the Fim IIE survey area
- is it possible to seek a change to the status of the species based on the findings of the proposed surveys
- the likelihood of a requirement for a management plan at Fim IIE for the species.

2 EXISTING ENVIRONMENT

2.1 LAND SYSTEMS

The Department of Agriculture and Food Western Australia (DAFWA) has partially mapped the land systems of the Eastern Murchison and Eastern Goldfields subregions from aerial photography (DAFWA 2014). *Eremophila praecox* records occur on nine land systems (Table 2-1), with the majority of records present on the Mx43 land system.

Table 2-1 Presence of *Eremophila praecox* records on land systems

Land system	No. of records
BB5	5
Bevon	7
Deadman	4
Doney	1
Gumland	2
Moriarty	6
Mx40	1
Mx43	18
SV15	1
Total	45

2.2 CLIMATE AND WEATHER

The climate of the Eastern Goldfields subregion is described as arid to semi-arid and the Eastern Murchison is defined as arid, both with 200–300 mm of annual rainfall, the majority occurring during winter months (Cowan 2001a, b). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and historic climate data is located at Kalgoorlie-Boulder Airport (Site 012038; Latitude: 30.78°S Longitude: 121.45°E).

Kalgoorlie-Boulder Airport records the highest maximum mean monthly temperature (33.7°C) in January, the lowest maximum mean annual temperature (16.8°C) in July (BoM 2019). The highest minimum mean monthly temp (18.3°C) is recorded in January with the lowest (5.1°C) recorded in July (BoM 2019). Average annual rainfall is 267.7 mm with January, February and June recording the highest monthly averages (27.5, 31.2 and 27.2 mm respectively) (BoM 2019). Tropical rain-bearing depressions moving southwards from northern Australian waters can cause heavy rainfall events in summer (BoM 2019) (Figure 2-1).

Records from Kalgoorlie-Boulder Airport weather station shows average rainfall in the 12 months preceding the field surveys. The mean daily minimum and maximum temperatures were mainly average with above average temperatures recorded in February. In the three months prior to the survey total rainfall was below average (Figure 2-1).

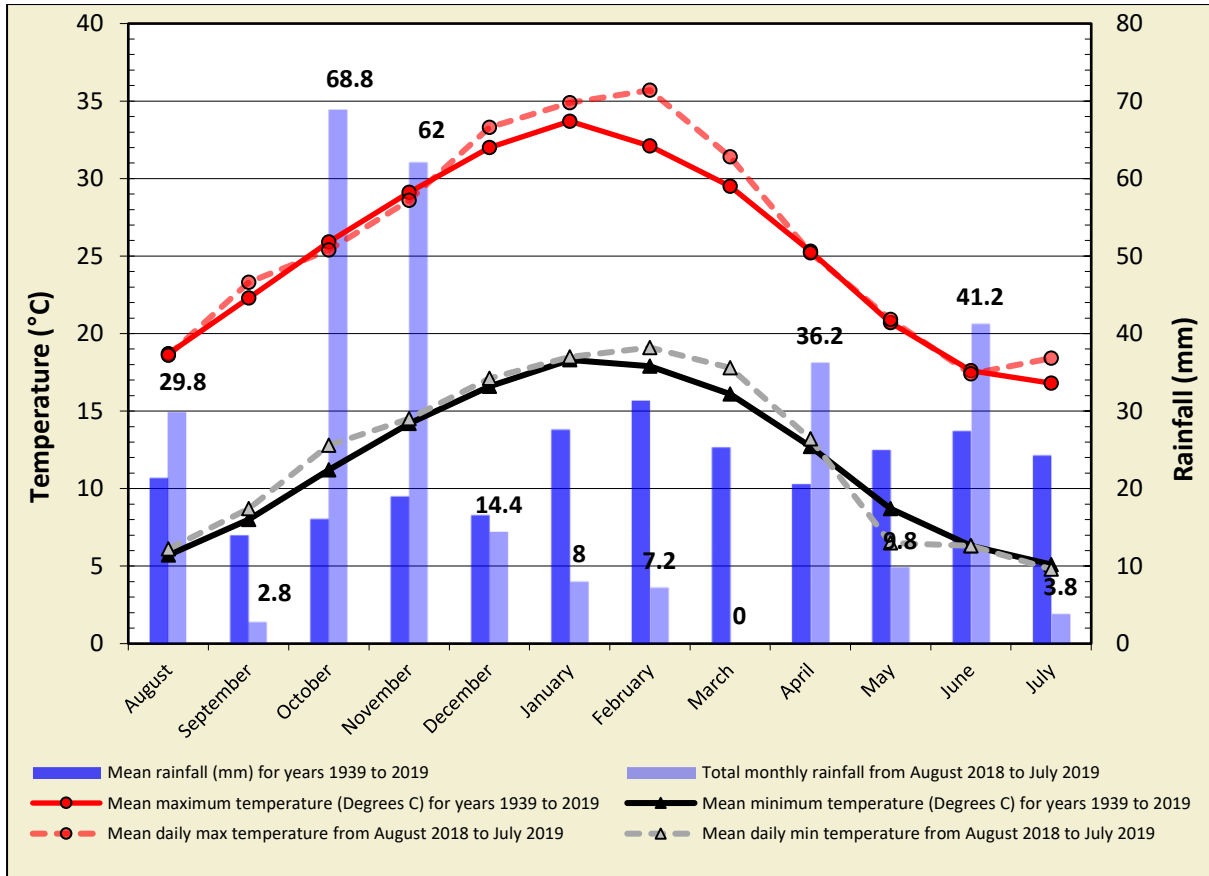


Figure 2-1 Annual climate and weather data for Kalgoorlie-Boulder Airport (no. 012038) (BoM 2019)

3 METHODS

3.1 FIELD SURVEY

The regional targeted flora survey was undertaken on 9-15 August 2019.

All NatureMap records, Phoenix records and records obtained from other sources was uploaded to an electronic tablet to facilitate location during the field survey. Where accessible, all known records of the species were visited within 85 km of the proposed clearing area for the Fim IIE Project to ascertain the status of the populations, i.e. extant or removed and to record the number of plants present. Foot searches were conducted in the vicinity of each record and in surrounding suitable habitat. Searches were also conducted in areas of suitable habitat that occur between the current records and beyond the current records in an attempt to identify further populations of the species.

Searches at each site typically comprised meandering transect searches with personnel spaced approximately 25 m apart. On average one hour was dedicated to searching each area and subsequently the searches do not represent comprehensive survey of all suitable habitat.

At all locations where plants were found, a specimen was collected for lodgement at the state herbarium and a relevé survey conducted to describe the habitat. The following information was recorded for each site:

- location – the geographic coordinates of the relevé
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System (ESCAVI 2003) and in accordance with EPA (2016)
- habitat – a brief description of landform and habitat
- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity
- vegetation condition – based on the condition scale for South-Western Interzone botanical province (EPA 2016)
- height and percentage foliage cover (PFC) – a visual estimate of cover at all sites of total vegetation, shrubs and trees >2 m tall, shrubs <2 m, grasses and herbs, as well as canopy cover of each species within quadrats
- photograph – a colour photograph of the vegetation
- flora species list – a list of co-occurring plants.

In addition the condition and status of the *E. praecox* population was recorded including:

- total number of plants recorded
- phenological state, i.e. sterile, flowering, fruiting state of each plant
- observations of plant health.

3.2 TAXONOMY AND NOMENCLATURE

Plant specimens were sent to Mike Hislop of the WA Herbarium for identification. Nomenclature for flora and vegetation used in this report follows that used by FloraBase (DBCA 2017) and the WA Herbarium.

3.3 SURVEY PERSONNEL

The flora survey was undertaken by Dr Grant Wells and Alice Watt. The taxonomic identification was confirmed with Mike Hislop of the WA Herbarium.

4 RESULTS

A total of 114 specimens were collected during the field survey. Of these 93 were determined to be *Eremophila praecox* (Figure 4-1). These specimens were recorded at locations that extend the distribution of the species to the north, south and east of the desktop records (

Figure 4-2). The remaining 21 specimens were determined to be a second morphotype that has been assigned to *E. praecox* by some taxonomists but has also been assigned to a hybrid of *Eremophila ionantha* x *E. scoparia*. It was the opinion of the taxonomist conducting the identification for this project that this second morphotype should not be considered representative of *E. praecox*:

“There are two morphotypes collected here. Those that I have confirmed as E. praecox match the type and Chinnock’s description of the species. Those that are just referred to Eremophila sp. are anomalous in that they have a glandular rather than dendritic vegetative indumentum and an entirely glabrous rather than sparsely hairy outer corolla surface.

Chinnock never referred any specimens of this second morphotype to E. praecox but Brown & Buirchell have together determined three collections to that species. Andrew Brown determined another collection of this second morphotype as E. ionantha x E. scoparia.

While it does seem possible that it is indeed a hybrid involving E. ionantha, I think that it is untenable to include it with E. praecox s. str.” (M. Hislop pers. com. To Alice Watt by email 16 September 2019).

It was not possible to access all of the desktop records for the species during the field survey as some populations occurred in active mining areas where access was prohibited and access to one population was restricted due to active roadworks (Figure 4-2). The number of plants present and the status of these populations could not therefore be determined.

No plants of *E. praecox* could be relocated within the vicinity of three of the NatureMap records (Figure 4-2). This included the southern-most desktop record for the species, despite a thorough foot search of an area with a radius of several hundred metres from the recorded location. There was no evident disturbance in the vicinity of the record that may account for the species removal from the area. The original record dates from 1997 with the species identified by B. Buirchell (DBCA 2019b). Specimens of the second morphotype were recorded in the vicinity of this record and subsequently it is apparent that the NatureMap/FloraBase record is for the morphotype not considered representative of *E. praecox*.

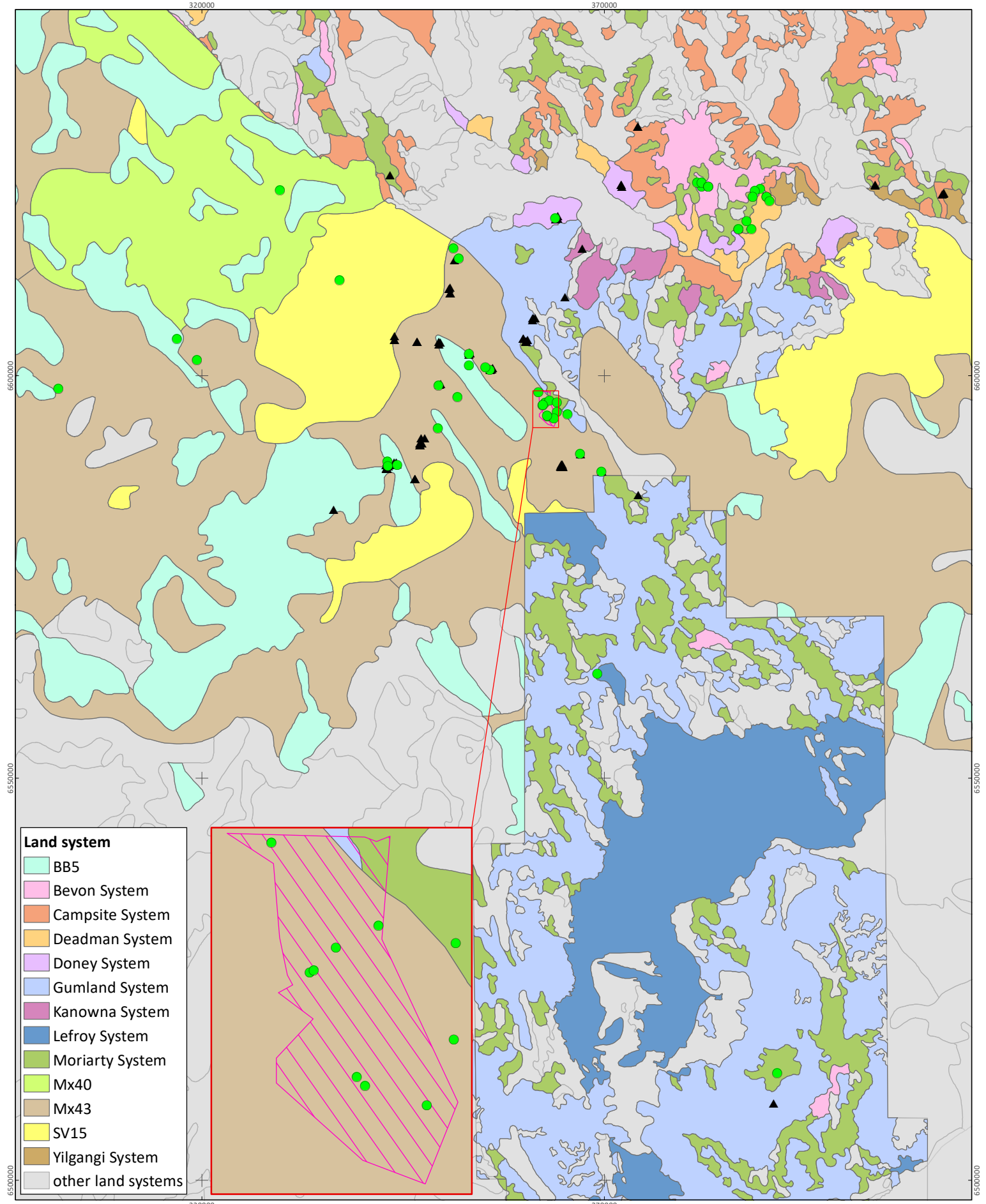
The remaining two records where plants could not be located occurred in a built up suburban area and an area developed for playing fields. These records date back to 1999 and it is therefore possible that the locations are not accurate or the plants recorded have subsequently been removed during development of the areas.

Plants of *E. praecox* were recorded during the current field survey within the vicinity of all remaining desktop records.

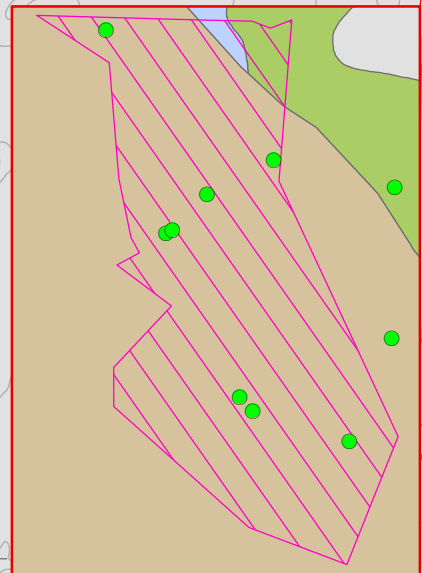
The new populations of *E. praecox* recorded during the field survey have expanded the number of land systems the species has been recorded to occur within from the nine identified from the desktop records to 12 (Table 4-1).



Figure 4-1 *Eremophila praecox* plants recorded during the field survey



- Land system**
- BB5
 - Bevon System
 - Campsite System
 - Deadman System
 - Doney System
 - Gumland System
 - Kanowna System
 - Lefroy System
 - Moriarty System
 - Mx40
 - Mx43
 - SV15
 - Yilgangi System
 - other land systems



KCGM - Regional survey for *Eremophila praecox* for FIM IIE Project

Project No	1281
Date	29-Nov-19
Drawn by	AJ
Map author	GW

1:600,000 (at A4) GDA 1994 MGA Zone 51

- Proposed clearing area
- Survey records
- Eremophila praecox* records

Figure 4-2
Field survey records of *Eremophila praecox*



All information within this map is current as of 29-Nov-19. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

Table 4-1 Records of *E. praecox* on land systems

Land system	Desktop records	Field survey records
BB5	9	15
Bevon	7	
Campsite		5
Deadman	6	
Doney	2	6
Gumland	2	14
Kanowna		1
Moriarty	11	2
Mx40	1	
Mx43	42	48
SV15	4	
Yilgangi		2
Total	84	93

The vegetation types in which *Eremophila praecox* was recorded are summarised in Table 4-2, more detailed site descriptions are provided in Appendix 1. The populations were typically located in *Eucalyptus* and/or *Casuarina* woodlands over a varied shrub layer frequently *Acacia*, *Eremophila*, *Senna* and *Maireana* species on flat to undulating plains in red clay loam soils. Two of the desktop records occurred on the slopes of low rocky hills in *Eucalyptus* woodland. Common co-occurring shrub species included *Acacia coolgardiensis*, *Eremophila scoparia*, *E. parvifolia* subsp. *auricampa*, *Scaevola spinescens*, *Maireana sedifolia*, *Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus*.

A flowering and/or fruiting specimen was collected from each new population recorded during the field survey. These specimens will be lodged with the state herbarium and significant flora report forms forwarded to the DBCA Threatened Species and Communities Branch.

From the number of plants recorded in the current survey and for previous surveys (Table 4-3), the eight plants within the proposed clearing area for the Fim IIE Project (Figure 4-2) represent 5.4% of the total plants from these combined surveys. Notably, plant numbers are not available for records that could not be accessed during the field survey.

Table 4-2 Vegetation types of *Eremophila praecox* populations

Site	Vegetation Condition	Vegetation Description
EO066	Very Good	Mid <i>Eucalyptus salmonophloia</i> woodland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland over isolated low <i>Atriplex vesicaria</i> , <i>Maireana triptera</i> and <i>Scaevola spinescens</i> shrubs.
EP022	Very Good	Tall <i>Eucalyptus longicornis</i> and <i>E. griffithsii</i> mallee woodland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over isolated low <i>Ptilotus obovatus</i> , <i>Atriplex</i> sp. and <i>Maireana georgei</i> shrubs.
EP029	Very Good	Mid open <i>Eucalyptus salubris</i> woodland over isolated mid <i>Acacia coolgardiensis</i> and <i>Eremophila scoparia</i> shrubs over low <i>Lycium australe</i> , <i>Maireana sedifolia</i> and <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> shrubland.
EP030	Very Good	Mid open <i>Casuarina pauper</i> woodland over mid sparse <i>Eremophila scoparia</i> , <i>Acacia coolgardiensis</i> and <i>Exocarpos aphyllus</i> shrubland over low <i>Lycium australe</i> , <i>Maireana sedifolia</i> and <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> shrubland.
EP031	Very Good	Mid open <i>Eucalyptus salubris</i> woodland over mid open <i>Acacia coolgardiensis</i> and <i>Eremophila scoparia</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Eremophila glabra</i> shrubland.
EP032	Very Good	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Acacia coolgardiensis</i> and <i>Eremophila scoparia</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Scaevola spinescens</i> shrubland.
EP035	Very Good	Mid <i>Eucalyptus salmonophloia</i> and <i>E. clellandii</i> woodland over mid sparse <i>Eremophila scoparia</i> shrubland over low open <i>Maireana sedifolia</i> and <i>Scaevola spinescens</i> shrubland.
EP036	Excellent	Mid <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>Melaleuca ?lateriflora</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Scaevola spinescens</i> shrubland.
EP045	Excellent	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salmonophloia</i> woodland over isolated mid <i>Eremophila scoparia</i> shrubs over low open <i>Atriplex</i> sp., <i>Maireana sedifolia</i> and <i>Tecticornia</i> sp. shrubland.
EP046	Very Good	Low <i>Eucalyptus lesoueffi</i> and <i>Casuarina ?pauper</i> woodland over tall open <i>Acacia coolgardiensis</i> and <i>Eremophila oldfieldii</i> shrubland over low open <i>Eremophila glabra</i> , <i>Westringia cephalantha</i> and <i>Eremophila pustulata</i> shrubland.
EP047	Very Good	Low <i>Eucalyptus lesoueffi</i> woodland over low <i>Scaevola spinescens</i> , <i>Acacia colletoides</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.
EP048	Good	Mid <i>Eucalyptus lesoueffi</i> woodland over sparse tall <i>Casuarina pauper</i> shrubland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.
EP057	Very Good	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Eremophila scoparia</i> , <i>E. glabra</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low sparse <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> , <i>Olearia muelleri</i> and <i>Atriplex vesicaria</i> shrubland.
EP061	Excellent	Mid <i>Eucalyptus salubris</i> and <i>E. oleosa</i> woodland over mid open <i>Eremophila scoparia</i> , <i>Santalum acuminatum</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Maireana sedifolia</i> , <i>Atriplex vesicaria</i> and <i>Scaevola spinescens</i> shrubland.

Regional survey for *Eremophila praecox* for the FIM IIE Project

Prepared for KCGM Pty Ltd

Site	Vegetation Condition	Vegetation Description
EP064	Good	Low <i>Eucalyptus salubris</i> woodland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland over low sparse <i>Atriplex vesicaria</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Maireana triptera</i> shrubland.
EP071	Excellent	Low open <i>Eucalyptus salubris</i> woodland over tall sparse <i>Casuarina pauper</i> shrubland over low open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland.
EP074	Very Good	Low <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Atriplex vesicaria</i> , <i>Lycium australe</i> and <i>Scaevola spinescens</i> shrubland.
EP076	Very Good	Mid <i>Eucalyptus salmonophloia</i> and <i>E. lesoueffi</i> woodland over mid <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland over low sparse <i>Olearia muelleri</i> and <i>Atriplex vesicaria</i> shrubland.
EP100	Very Good	Mid open <i>Eucalyptus salmonophloia</i> woodland over low open <i>Casuarina ?pauper</i> woodland over mid open <i>Eremophila oppositifolia</i> , <i>Atriplex nummularia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.
EP103	Very Good	Low <i>Eucalyptus salubris</i> and <i>E. lesoueffi</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>E. glabra</i> shrubland over low sparse <i>Ptilotus obovatus</i> and <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> shrubland.
EP104	Very Good	Mid <i>Eucalyptus lesoueffi</i> woodland over mid open <i>Acacia hemiteles</i> , <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.
EP110	Excellent	Mid <i>Eucalyptus lesoueffi</i> and <i>E. oleosa</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Cratystylis conocephalum</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Tecticornia</i> sp. shrubland.

Table 4-3 Total known number plants of *Eremophila praecox* from regional surveys

Survey	Number plants
Phoenix (2018a)	3
Phoenix (2018b)	9
Phoenix (2019a)	3
Phoenix (2019b)	19
Phoenix (2019c)	11
Jims Seeds (2005)	5
Janine Cameron pers. comm. to Grant Wells, email 05/07/2019	4
Current survey	93
Total	147

5 DISCUSSION

As all known records for *Eremophila praecox* could not be accessed during the field survey it is not possible to determine the exact proportion of the entire *E praecox* population currently present in the proposed clearing area for the Fim IIE Project. From the total known number of plants, the proportion of plants within the proposed clearing area is below 5.4% (eight of 147 plants). In addition, it must be noted that the current survey does not represent an exhaustive regional survey of all suitable habitat for the species. In fact, the survey conducted has identified a greater distribution for the species than previously recognised and has increased the known habitat types, both land systems and vegetation types for the species. This has increased the area of recognised suitable habitat for the species and subsequently it is highly likely that the proportion of plants present in the proposed clearing area is substantially lower than 5.4%.

The survey conducted has identified a broader distribution for the species than was previously known and the records support the notion that the species may in fact be widespread but infrequently recorded. As for previous surveys the plants recorded at each population were typically long distances apart.

Definitions of Priority species (DBCA 2019a) are as follows:

- Priority 1: Poorly-known species – species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
- Priority 2: Poorly-known species – species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
- Priority 3: Poorly-known species – species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
- Priority 4: Rare, Near Threatened and other species in need of monitoring
 - Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
 - Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

- Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Eremophila praecox is currently listed as a Priority 1 flora. It may be possible to make a case to reduce this status to at least Priority 2 as some populations occur on nature reserves, e.g. Karrawang Nature Reserve (DBCA 2019b) and Bullock Holes Timber Reserve (Phoenix 2019b) and therefore the species aligns more correctly with the Priority 2 definition. In addition, the increased number of populations recorded from the current survey may support application to a Priority 3 status as the species is now recognised from several populations.

In conclusion;

- The survey conducted has identified a greater distribution for the species than previously recognised and has increased the known habitat types, both land systems and vegetation types for the species. A greater understanding now exists of the most likely locations where populations of *Eremophila praecox* are likely to occur, making further identifications more likely.
- In future regional survey work, KCGM will continue to target identification of *Eremophila praecox* and will send specimens to the herbarium for identification and submit Threatened and Priority Flora report forms to the Species and Communities branch of DBCA to further increase available information on the species.

6 REFERENCES

- BoM. 2019. *Climate statistics for Australian locations*. Commonwealth of Australia, Bureau of Meteorology. Available at: <http://www.bom.gov.au/climate/data/>
- Cowan, M. 2001a. *Inter-Bioregionalisation of Australia*. Department of Conservation and Land Management, Perth, WA. Available at: <http://www.environment.gov.au/land/nrs/science/ibra#ibra>
- Cowan, M. 2001b. Murchison 1 (MUR1—East Murchison subregion). In: May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002*. Department of Conservation and Land Management, Perth, WA, pp. 466–479.
- DAFWA. 2014. *Soil-landscape systems of Western Australia*. Department of Agriculture and Food Western Australia, South Perth, WA. Dataset provided by DAFWA, April 2015.
- DBCA. 2017. *Florabase*. Department of Biodiversity, Conservation and Attractions. Available at: <http://florabase.dpaw.wa.gov.au/>
- DBCA. 2019a. *Conservation codes for Western Australian flora and fauna*. Department of Biodiversity, Conservation and Attractions, Kensington, WA. Available at: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>
- DBCA. 2019b. *Florabase*. Department of Biodiversity, Conservation and Attractions. Available at: <https://florabase.dpaw.wa.gov.au/>
- DBCA. 2019c. *NatureMap*. Department of Biodiversity, Conservation and Attractions. Available at: <https://naturemap.dpaw.wa.gov.au/default.aspx>
- EPA. 2016. *Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf
- ESCAVI. 2003. *National Vegetation Information System — Australian vegetation attribute manual (version 6.0)*. Executive Steering Committee for Australian Vegetation Information; Department of Environment and Heritage, Canberra, ACT. Available at: <http://www.environment.gov.au/node/18927>
- Jims Seeds, W. T. 2005. *Vegetation survey of the proposed Kanowna Belle to Red Hill pipeline area (M27/103, M27/164, M27/18, M27/23, M27/37, M27/22)*. Jim's Seeds, Weeds and Trees Pty Ltd, Boulder, WA. Unpublished report prepared for Placer Dome Australia Kanowna Belle Gold Mines Ltd.
- Phoenix. 2018a. *Gap analysis and biological surveys for the Fimiston Operations, Goldfields (Western Australia)*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished draft report prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd.
- Phoenix. 2018b. *Regional flora and vegetation and terrestrial fauna survey for the Gidji Operations*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished draft report prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd.
- Phoenix. 2019a. *Flora and vegetation survey for Mungari Operations Cutter's Ridge Project*. Phoenix Environmental Sciences, Balcatta, WA. Unpublished report prepared for Evolution Mining Ltd.
- Phoenix. 2019b. *Targeted flora and fauna surveys of proposed drill lines in the Bullock Holes Timber Reserve*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Newmont.
- Phoenix. 2019c. *Targeted flora and SRE survey for the FIM IIE Project*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd.

Appendix 1 **Habitat descriptions for *Eremophila praecox* populations**

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EO066	Type:	Quadrat (unbounded)
Date(s):	13 August 2019	Permanent:	No
Observer(s):	Grant Wells	Position:	-30.63717, 121.592231 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	30	Topography:	plain
Tree/shrub cover >2 m (%):	25	Soil colour:	red-orange,
Shrub cover <2 m (%):	15	Soil:	sandy clay, clay loam,
Grass cover (%):	0	Rock type:	quartz;
Herb cover (%):	0	Fire age:	>5 years
Vegetation condition:	Very Good, EPA (2016)	Disturbance	historic clearing, litter, vehicle tracks,
Land system:			
Vegetation description and type:	Mid <i>Eucalyptus salmonophloia</i> woodland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland over isolated low <i>Atriplex vesicaria</i> , <i>Maireana triptera</i> and <i>Scaevola spinescens</i> shrubs.		



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP022
Date(s):	10 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.793486, 121.408336 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	40
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	20
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Tall <i>Eucalyptus longicornis</i> and <i>E. griffithsii</i> mallee woodland over mid open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over isolated low <i>Ptilotus obovatus</i> , <i>Atriplex</i> sp. and <i>Maireana georgei</i> shrubs.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP026
Date(s):	10 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.733162, 121.427957 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	50
Tree/shrub cover >2 m (%):	20
Shrub cover <2 m (%):	35
Grass cover (%):	5
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Low <i>Eucalyptus griffithsii</i> woodland over isolated mid <i>Exocarpos aphyllus</i> and <i>Eremophila scoparia</i> shrubs over low <i>Acacia hemiteles</i> , <i>Halgania</i> andro and <i>Scaevola spinescens</i> shrubland.
Topography:	plain
Soil colour:	red-orange,
Soil:	sandy clay, clay loam,
Rock type:	none
Fire age:	>5 years
Disturbance:	historic clearing, litter,

Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP029	Type:	Quadrat (unbounded)
Date(s):	11 August 2019	Permanent:	No
Observer(s):	Grant Wells	Position:	-30.681861, 121.370807 (North-west)

Vegetation	Physical features
Total vegetation cover (%): 40	Topography: plain
Tree/shrub cover >2 m (%): 10	Soil colour: red-orange,
Shrub cover <2 m (%): 35	Soil: sandy clay, clay loam,
Grass cover (%): 0	Rock type: none
Herb cover (%): 0	Fire age: >5 years
Vegetation condition: Very Good, EPA (2016)	Disturbance: evidence of feral animals, historic clearing, vehicle tracks,

Land system:

Vegetation description and type: Mid open *Eucalyptus salubris* woodland over isolated mid *Acacia.coolgardiensis* and *Eremophila scoparia* shrubs over low *Lycium australe*, *Maireana sedifolia* and *Eremophila parvifolia* subsp. *auricampa* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBC list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP030	Type:	Quadrat (unbounded)
Date(s):	11 August 2019	Permanent:	No
Observer(s):	Grant Wells	Position:	-30.678113, 121.370644 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	45	Topography:	plain
Tree/shrub cover >2 m (%):	7	Soil colour:	red-orange,
Shrub cover <2 m (%):	40	Soil:	clay loam,
Grass cover (%):	0	Rock type:	none
Herb cover (%):	0	Fire age:	>5 years
Vegetation condition:	Very Good, EPA (2016)	Disturbance	current operations, exploration (drill pads and access tracks), grazing – low, historic clearing, livestock tracks, vehicle tracks,

Land system:

Vegetation description and type:

Mid open *Casuarina pauper* woodland over mid sparse *Eremophila scoparia*, *Acacia.coolgardiensis* and *Exocarpos aphyllus* shrubland over low *Lycium australe*, *Maireana sedifolia* and *Eremophila parvifolia* subsp. *auricampa* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBC list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP031
Date(s):	11 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.685277, 121.399707 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	35
Tree/shrub cover >2 m (%):	10
Shrub cover <2 m (%):	30
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Mid open <i>Eucalyptus salubris</i> woodland over mid open <i>Acacia coolgardiensis</i> and <i>Eremophila scoparia</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Eremophila glabra</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP032
Date(s):	11 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.684859, 121.427892 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	35
Tree/shrub cover >2 m (%):	20
Shrub cover <2 m (%):	20
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Acacia coolgardiensis</i> and <i>Eremophila scoparia</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Scaevola spinescens</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP035	Type:	Quadrat (unbounded)
Date(s):	11 August 2019	Permanent:	No
Observer(s):	Grant Wells	Position:	-30.497379, 121.367973 (North-west)

Vegetation	Physical features
Total vegetation cover (%): 45	Topography: undulating plain
Tree/shrub cover >2 m (%): 25	Soil colour: red-orange,
Shrub cover <2 m (%): 30	Soil: sandy clay, clay loam,
Grass cover (%): 0	Rock type: ferrous – ironstone; quartz;
Herb cover (%): 0	Fire age: >5 years
Vegetation condition: Very Good, EPA (2016)	Disturbance: historic clearing, livestock tracks, vehicle tracks,

Land system:

Vegetation description and type: Mid *Eucalyptus salmonophloia* and *E. clellandii* woodland over mid sparse *Eremophila scoparia* shrubland over low open *Maireana sedifolia* and *Scaevola spinescens* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP036
Date(s):	11 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.624144, 121.443969 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	55
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	40
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Excellent, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>Melaleuca?lateriflora</i> shrubland over low <i>Maireana sedifolia</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Scaevola spinescens</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP045
Date(s):	12 August 2019
Observer(s):	Alice Watt
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-31.543928, 121.851972 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	45
Tree/shrub cover >2 m (%):	30
Shrub cover <2 m (%):	25
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Excellent, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salmonophloia</i> woodland over isolated mid <i>Eremophila scoparia</i> shrubs over low open <i>Atriplex</i> sp., <i>Maireana sedifolia</i> and <i>Tecticornia</i> sp. shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP046
Date(s):	12 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.833169, 121.637234 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	60
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	40
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Low <i>Eucalyptus lesoueffi</i> and <i>Casuarina?pauper</i> woodland over tall open <i>Acacia coolgardiensis</i> and <i>Eremophila oldfieldii</i> shrubland over low open <i>Eremophila glabra</i> , <i>Westringia cephalantha</i> and <i>Eremophila pustulata</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP047
Date(s):	12 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.813449, 121.610194 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	40
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	20
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Low <i>Eucalyptus lesoueffi</i> woodland over low <i>Scaevola spinescens</i> , <i>Acacia colletoides</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP048	Type:	Quadrat (unbounded)
Date(s):	13 August 2019	Permanent:	No
Observer(s):	Alice Watt	Position:	-30.700235, 121.466854 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	40	Topography:	undulating plain
Tree/shrub cover >2 m (%):	20	Soil colour:	red-brown,
Shrub cover <2 m (%):	25	Soil:	sandy clay, clay loam,
Grass cover (%):	0	Rock type:	none
Herb cover (%):	0	Fire age:	>5 years
Vegetation condition:	Good, EPA (2016)	Disturbance	historic clearing, historic operations, litter, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Mid *Eucalyptus lesoueffi* woodland over sparse tall *Casuarina. pauper* shrubland over mid open *Eremophila scoparia*, *Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP057
Date(s):	13 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.549713, 121.581648 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	30
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	10
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Eremophila scoparia</i> , <i>E. glabra</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low sparse <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> , <i>Olearia muelleri</i> and <i>Atriplex vesicaria</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP060
Date(s):	13 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.583051, 121.615732 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	30
Tree/shrub cover >2 m (%):	20
Shrub cover <2 m (%):	15
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Good, EPA (2016)
Topography:	undulating plain
Soil colour:	red-orange,
Soil:	sandy clay, clay loam,
Rock type:	quartz;
Fire age:	>5 years
Disturbance	exploration (drill pads and access tracks), historic clearing, litter, livestock tracks, vehicle tracks,
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>E. interstans</i> shrubland over low open <i>Maireana sedifolia</i> , <i>Atriplex nummularia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBC list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP061
Date(s):	13 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.511675, 121.66709 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	30
Tree/shrub cover >2 m (%):	20
Shrub cover <2 m (%):	15
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Excellent, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus salubris</i> and <i>E. oleosa</i> woodland over mid open <i>Eremophila scoparia</i> , <i>Santalum acuminatum</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Maireana sedifolia</i> , <i>Atriplex vesicaria</i> and <i>Scaevola spinescens</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Site details			
Site:	EP064	Type:	Quadrat (unbounded)
Date(s):	13 August 2019	Permanent:	No
Observer(s):	Grant Wells	Position:	-30.446683, 121.689243 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	35	Topography:	undulating plain
Tree/shrub cover >2 m (%):	20	Soil colour:	red-orange,
Shrub cover <2 m (%):	20	Soil:	sandy clay, clay loam,
Grass cover (%):	0	Rock type:	ferrous – ironstone;
Herb cover (%):	0	Fire age:	not evident
Vegetation condition:	Good, EPA (2016)	Disturbance	historic clearing, large-scale clearing, litter, livestock tracks, vehicle tracks,

Land system:

Vegetation description and type: Low *Eucalyptus salubris* woodland over mid open *Eremophila scoparia*, *Maireana sedifolia* and *Atriplex nummularia* shrubland over low sparse *Atriplex vesicaria*, *Eremophila parvifolia* subsp. *auricampa* and *Maireana triptera* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBC list)

Site details	
Site:	EP071
Date(s):	14 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.525371, 122.084063 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	20
Tree/shrub cover >2 m (%):	5
Shrub cover <2 m (%):	20
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Excellent, EPA (2016)
Land system:	
Vegetation description and type:	Low open <i>Eucalyptus salubris</i> woodland over tall sparse <i>Casuarina pauper</i> shrubland over low open <i>Eremophila scoparia</i> , <i>Maireana sedifolia</i> and <i>Atriplex nummularia</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP074
Date(s):	15 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.515239, 121.995681 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	50
Tree/shrub cover >2 m (%):	30
Shrub cover <2 m (%):	30
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Low <i>Eucalyptus lesoueffi</i> and <i>E. salubris</i> woodland over mid open <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Atriplex vesicaria</i> , <i>Lycium australe</i> and <i>Scaevola spinescens</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP076	Type:	Quadrat (unbounded)
Date(s):	14 August 2019	Permanent:	No
Observer(s):	Alice Watt	Position:	-30.682838, 121.537741 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	30	Topography:	plain
Tree/shrub cover >2 m (%):	25	Soil colour:	red-orange,
Shrub cover <2 m (%):	15	Soil:	clay loam,
Grass cover (%):	0	Rock type:	none
Herb cover (%):	0	Fire age:	>5 years
Vegetation condition:	Very Good, EPA (2016)	Disturbance	excavation, historic clearing, litter, vehicle tracks,

Land system:

Vegetation description and type: Mid *Eucalyptus salmonophloia* and *E. lesoueffi* woodland over mid *Eremophila parvifolia* subsp. *auricampa*, *Maireana sedifolia* and *Atriplex nummularia* shrubland over low sparse *Olearia muelleri* and *Atriplex vesicaria* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details			
Site:	EP100	Type:	Quadrat (unbounded)
Date(s):	14 August 2019	Permanent:	No
Observer(s):	Alice Watt	Position:	-30.860028, 121.684272 (North-west)
Vegetation		Physical features	
Total vegetation cover (%):	40	Topography:	undulating plain
Tree/shrub cover >2 m (%):	15	Soil colour:	red-orange,
Shrub cover <2 m (%):	30	Soil:	clay loam,
Grass cover (%):	0	Rock type:	ferrous – ironstone;
Herb cover (%):	0	Fire age:	>5 years
Vegetation condition:	Very Good, EPA (2016)	Disturbance	historic clearing, large-scale clearing, litter, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type:

Mid open *Eucalyptus salmonophloia* woodland over low open *Casuarina?pauper* woodland over mid open *Eremophila oppositifolia*, *Atriplex nummularia* and *Senna artemisioides* subsp. *filifolia* shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP103
Date(s):	15 August 2019
Observer(s):	Alice Watt
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.871953, 121.288429 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	30
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	10
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Low <i>Eucalyptus salubris</i> and <i>E. lesoueffi</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>E. glabra</i> shrubland over low sparse <i>Ptilotus obovatus</i> and <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBC list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP104
Date(s):	15 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.82679, 121.358555 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	35
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	10
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Very Good, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> woodland over mid open <i>Acacia hemiteles</i> , <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

Regional survey for *Eremophila praecox*
Prepared for Kalgoorlie Consolidated Gold Mines

Site details	
Site:	EP110
Date(s):	15 August 2019
Observer(s):	Grant Wells
Type:	Quadrat (unbounded)
Permanent:	No
Position:	-30.839165, 121.394763 (North-west)
Vegetation	Physical features
Total vegetation cover (%):	35
Tree/shrub cover >2 m (%):	25
Shrub cover <2 m (%):	20
Grass cover (%):	0
Herb cover (%):	0
Vegetation condition:	Excellent, EPA (2016)
Land system:	
Vegetation description and type:	Mid <i>Eucalyptus lesoueffi</i> and <i>E. oleosa</i> woodland over mid sparse <i>Eremophila scoparia</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Cratystylis conocephalum</i> , <i>Eremophila parvifolia</i> subsp. <i>auricampa</i> and <i>Tecticornia</i> sp. shrubland.



Species	Cover (%)	Height (m)	Weed	Conservation status
<i>Eremophila praecox</i>				P1 (DBCA list)

