AngloGold Ashanti Australia Ltd

Sunrise Dam Gold Mine

Native Vegetation Clearing Permit Application

Supporting Document

August 2024

ANGLOGOLD ASHANTI

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1 SITE INFORMATION

1.1 Background

AngloGold Ashanti Australia Limited (AGAA) operates the Sunrise Dam Gold Mine (SDGM/Project) in the Eastern Goldfields of Western Australia, 49 km south of Laverton (Figure 1). AGAA proposes extensions to its mining operations at SDGM, primarily for borrow pits, roads, and support infrastructure development associated with expansion of the centrally thickened discharge tailings storage facility (CTD TSF).

Proposed disturbance will be up to 125 ha within the proposed clearing permit application area.

1.2 Regional Setting

SDGM is located on the southern portion of the Archaean Laverton Tectonic Zone, within the Yilgarn Block of Western Australia. The regional geology is defined by a deep profile of transported (aeolian, alluvium, colluvium) and laterised soils and palaeochannel deposits above weathered and fractured Archean bedrock.

The area is within the Eastern Murchison subregion of the Murchison Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (Thackway and Cresswell, 1995). This subregion is characterised by internal drainage and extensive areas of elevated red desert sandplains with some breakaway complexes and minimal dune development. Salt lake systems feature within the region and are associated with occluded palaeodrainage systems. Vegetation is predominantly mulga woodland, rich in ephemerals, hummock grassland, saltbush shrublands and *Tecticornia* shrublands (Cowan 2001).

1.3 Topography and Landforms

SDGM is located on the eastern foreshore of Lake Carey, within the Lake Carey Catchment, which forms part of the broader Salt Lake Basin. The drainage system of this basin comprises large and broad, southeast trending drainage systems variously referred to as salt-lake drainage systems, palaeorivers, or palaeodrainages. These palaeodrainages have very low gradients and contain small to very large playa lakes such as Lake Carey.

There are no major river systems in the vicinity of the application area, although there are several unnamed ephemeral drainage lines that drain in a generally east to west direction from the local catchment divide some 17 km east of the proposed application area towards Lake Carey. The ground elevation over the application area slopes gently from approximately 570 mAHD at the eastern edge, down to 404 mAHD at the western edge with an average ground slope in the order of 0.6 to 0.7%.

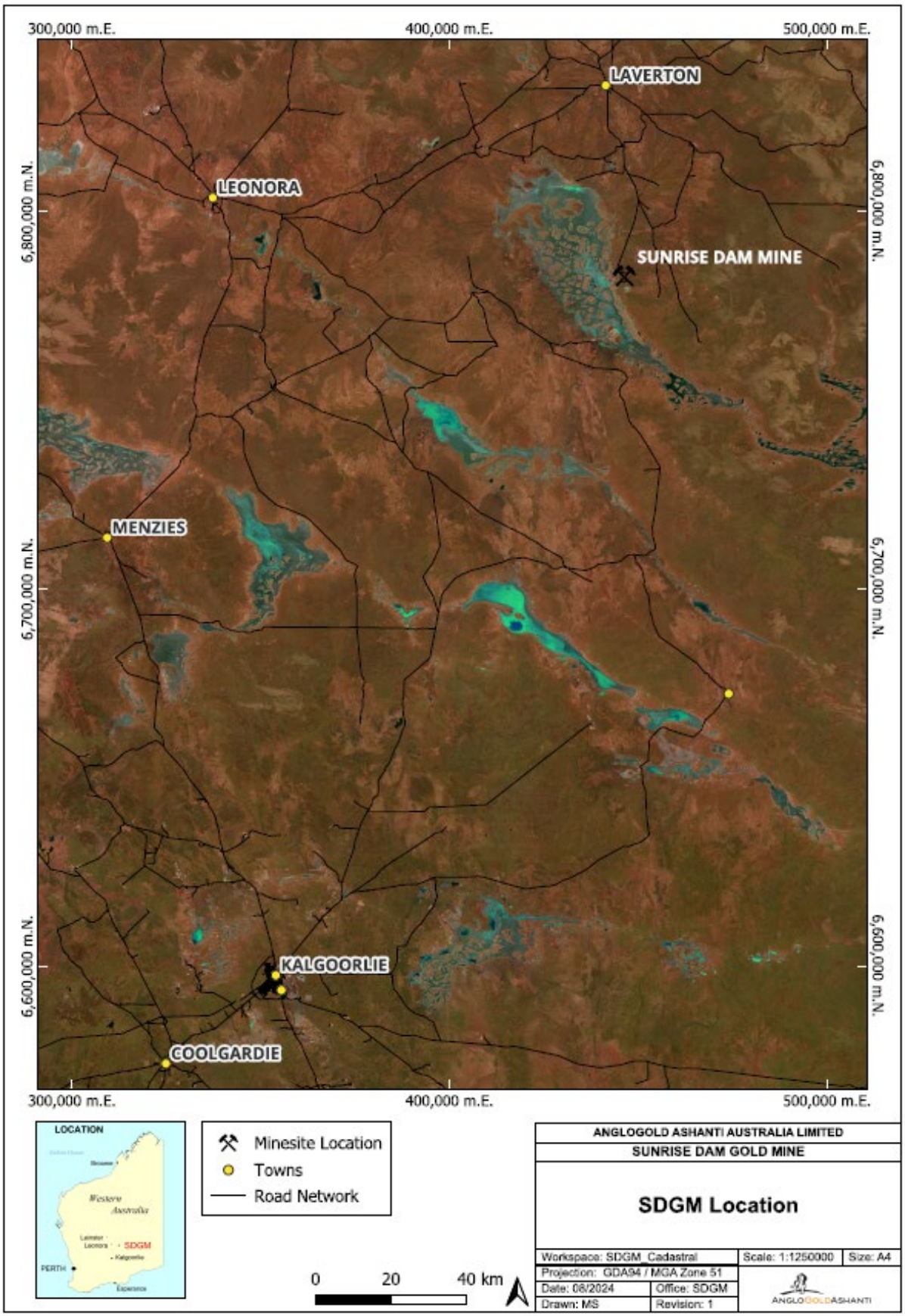

Figure 1: Sunrise Dam Regional Location

In terms of the rangeland land system classifications by Van Vreeswyk et al. (1994), the application area contains four land systems:

- Rainbow Land System - Alluvial plains subject to sheet flow; often with fine ironstone gravel mantles over hardpans;
- Carnegie Land System - Salt lakes with fringing saline alluvial plains, kopi dunes and sandy banks, supporting halophytic shrublands and Acacia tall shrublands;
- Kirgella Land System - Extensive sandplain, with scattered hummock grasslands and mulga and mallee shrublands; and
- Gundockerta - Extensive, gently undulating plains generally with abundant stony mantles, and less extensive, lower alluvial plains with narrow central zones receiving more concentrated run-on.

1.4 Soils

SDGM abuts the shores of Lake Carey where the soils are pale-orange crusted sands of salt and gypsum. The lake bed consists of stiff red clay, commonly with a surface efflorescence of salt crystals. The aeolian dunes immediately east of the lake consist of gypsiferous to sandy soils. The soils east of the dunes are sandy, shallow and poorly developed. Between the dunes and in low-lying areas, clay-pans comprise fine soils that are hard when dry, but not trafficable when wet. The areas bordering these clay-pans often consist of loamy soils.

Salinity has been identified as a significant constraint to plant growth at SDGM (JCS 1995). Salinity, which shows no consistent pattern with depth, averages 34,000 mg/kg TDS (3.4% by weight) and pH in excess of 8 is common (and can be as high as 9; JCS 1995).

Further east of the Carnegie land system, away from the shoreline of Lake Carey, soils have more consistent properties of being red loamy sands to sandy loams, acid to neutral pH, highly permeable and well drained, low plant water holding capacity and low ESP. Soil/subsoil depths range between 0.45 m and 0.8 m depending on the presence of hard pan.

Organic matter-rich topsoil is almost non-existent at SDGM and surrounds since the vegetation is predominantly halophytic (along the lake edges) or sparse on the sand plain with low vigour and productivity.

1.5 Hydrology

1.5.1 Surface Hydrology

SDGM is located on the north-eastern foreshore of Lake Carey, within the Lake Carey Catchment which has a catchment area of 113,900 km^2. This catchment forms part of the broader Salt Lake Basin No. 024 (total catchment area 441,000 km^2) and is not a proclaimed catchment. The drainage system of this basin comprises three large and broad, sub-parallel, southeast trending drainage systems variously referred to as salt-lake drainage systems, palaeorivers or palaeodrainages.

These palaeodrainages have very low gradients and at intervals contain small to very large playa lakes such as Lake Carey (with an area of approximately 1,000 km^2). During occasional intense

rainfall events the lakes may fill, and in very rare events some may overflow, link-up, and discharge on to the Nullarbor Plain through Ponton Creek.

Any creeks and drainages located within the SDGM operational area are ephemeral in nature. However, flows will occur episodically during the summer months from January to March, when the potential exposure to high intensity cyclonic or tropical depression related rainfall is greatest.

1.5.2 Hydrogeology

SDGM lies within the proclaimed Goldfields Groundwater Area. The regional stratigraphy consists of at least four distinct lithological groups, namely:

- Quaternary aeolian, alluvium and lake deposits.
- Cenozoic laterite weathering profile;
- Cenozoic alluvial/colluvial deposits; and
- Archaean basement.

The surface formations have undergone significant weathering and diagenetic alteration throughout the Cenozoic Era, developing a deep lateritic profile (MBS 2022). The predominantly gneissic Archaean basement was once incised by ancient NNE draining streams, which are now buried beneath 30 metres or more of Cenozoic alluvium and clayey colluvium deposits. The basement and Cenozoic deposits have in turn been subjected to millions of years of continuous lateritic weathering, which has created a gently undulating semi-arid terrain with generally low relief.

Groundwater at SDGM is typically hypersaline.

Whilst depth to groundwater decreases from east to west along with groundwater flows westwards towards Cleo/Sunrise Pit and Lake Carey, the application area is influenced by the presence of the CTD TSF which is central to the application area.

1.6 Vegetation and Flora

SDGM lies within Beard's (1990) Austin Botanical District that is characterised by Mulga Low Woodlands and has numerous salt flats surrounding salt lakes, vegetated by halophytes and samphires (*Tecticornia* sp.).

1.6.1 Flora

Across vegetation surveys at SDGM, 425 species have been recorded in the greater SDGM area (Mattiske Consulting Pty Ltd 2022). The most commonly represented families were the Chenopodiaceae (85 taxa), Fabaceae (64 taxa), Asteraceae (58 taxa), Poaceae (44 taxa) and Scrophulariaceae (37 taxa). In 2022, Mattiske Consulting Pty Ltd refreshed baseline survey data and filled gaps to provide continuous coverage across SDGM tenure and beyond. AGAA maintains a comprehensive layer of vegetation mapping across the SDGM area.

No Threatened plant taxa pursuant to the *Biodiversity Conservation Act* 2016 or the *Environment Protection and Biodiversity Conservation Act* 1999 have been recorded at SDGM (Mattiske Consulting Pty Ltd 2022). The Priority 1 species *Tecticornia mellarium* has been recorded in vegetation associations C3, C5 and C9, near the edges of Lake Carey. Further work by AGAA has found this species is much more extensive on islands across Lake Carey (e.g. Mattiske Consulting

Pty Ltd 2018). This taxon is relatively restricted in distribution within the SDGM survey areas to the fringes of Lake Carey, thus is highly unlikely to occur in the application area. The Priority 3 taxon *Melaleuca apostiba* has been recorded in areas of vegetation association M2, less than 1 km south of the mining area and on either side of Bindah Rd approximately 4 km south of the CTD TSF (Mattiske Consulting Pty Ltd 2018). Further afield it is recorded as ranging approximately 250 km, from as far north as Lake Wells to areas just south of Lake Carey, frequently along the edges of salt lakes in sandy soil. Given the application area is away from the edges of Lake Carey, and the absence of the M2 vegetation association in the application area, *M. apostiba* is unlikely to occur within the application area.

Surveys have identified 19 weed species across SDGM. None of the weeds are listed as a Prohibited Organism pursuant to Section 12 of the *Biosecurity and Agriculture Management Act* 2007. Only *Tamarix aphylla* is described as a Declared Pests species after being recorded in in 2004 but was not identified in the 2022 survey. **Tamarix aphylla* is also a Weed of National Significance as a declared pest in category of exempt, requiring no permit of conditions for keeping (DPIRD 2022, DAWE 2022).

1.6.2 Vegetation

The latest vegetation mapping compiled by Mattiske Consulting Pty Ltd (2022) for the area surrounding SDGM includes 36 vegetation associations, comprising:

- Sixteen Acacia woodlands;
- Two Eucalyptus woodlands;
- Two Melaleuca woodlands;
- Two shrublands; and
- Fourteen chenopod associations.

The application area contains six vegetation communities and cleared land, as shown in Figure 2. These are:

- A2: Open Low Woodland to Woodland of *Acacia aneura* var. *aneura, Acacia aneura* var. *intermedia* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp.*, Maireana triptera, Solanum lasiophyllum.*
- A3: Low mixed Woodland of *Acacia aneura, Acacia tetragonophylla, Exocarpos aphyllus, Hakea preissii, Pittosporum angustifolium, Santalum spicatum* over *Eremophila ?metallicorum, Cratystylis subspinescens, Eremophila latrobei* subsp*. glabra* over *Maireana sedifolia, Eremophila scoparia, Senna artemisioides* subsp*. filifolia* and other mixed shrubs.
- A12: Low Woodland of *Acacia ayersiana, Acacia ramulosa* var. *linophylla, Acacia aneura* over *Acacia burkittii, Acacia tetragonophylla,* over *Sida calyxhymenia, Maireana sedifolia, Eremophila latrobei* subsp*. glabra, Dodonaea lobulata, Maireana pyramidata* over *Scaevola spinecens*.
- C1: Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia aneura* var*. aneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay loam soils.
- C2: Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp*. microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* in clay loam soils
- E1: Low Open Woodland of *Eucalyptus horistes, Brachychiton gregorii, Acacia aneura* var*. aneura, Acacia aneura* var. *conifera, Acacia tetragonophylla* over *Duboisia hopwoodii, Eremophila longifolia, Eremophila margarethae* over *Maireana* spp.*, Ptilotus obovatus.*

Table 1 shows the area of vegetation communities within the application area, and the total area surveyed.

Table 1: Vegetation Communities in Application Area

Vegetation Community	Area in application area (ha)	Representation in total surveyed area (ha)
A2	234.07	4,569.05
A3	31.09	205.22
A12	7.19	60.59
C1	155.22	2466.09
C2	19.78	469.90
E1	6.45	136.14

No Threatened Ecological Communities (TECs) pursuant to the WA Biodiversity Conservation Act 2016 (BC Act) or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) occur at SDGM. No Priority Ecological Communities (PECs) listed by the Department of Biodiversity, Conservation and Attractions (DBCA) occur at SDGM (Mattiske Consulting Pty Ltd 2022).

Vegetation associations at SDGM are well represented within the Austin Botanical District and therefore not considered to be significant on a regional scale. Associations with values such as priority flora or otherwise have relative local significance include:

- Acacia woodland A5 may have relative significance due to its association with the dunes that form a locally unique landform. This woodland is characterised by *Eucalyptus striaticalyx* and *Casuarina pauper* on gypsiferous dunes and appears in small, isolated populations.
- *Melaleuca* woodlands M1 and M2 may have relative significance because *Melaleuca* woodlands and shrublands are uncommon throughout the region. M2 may also be considered to be of local significance as it contains *Melaleuca apostiba* (Priority 3).
- Chenopod associations C3, C5 and C9 have some local significance due to the prevalence of *Tecticornia mellarium* (Priority 1) in these associations, immediately adjacent to Lake Carey. However, further work by AGAA across Lake Carey suggests *T. mellarium* is widespread along the Lake Carey riparian zone.

None of these vegetation associations have been recorded within the application area.

The condition of the vegetation surveyed within SDGM in 2022 was assessed at each survey site using the condition rating scale of Trudgen (1988). Overall, the condition of the vegetation ranged from completely degraded (mining activities, transport, and cattle degradation) to good (areas bordering tracks and drill lines) to excellent (no exploration or drill tracks encroach, typically at least 20 m distance from tracks.

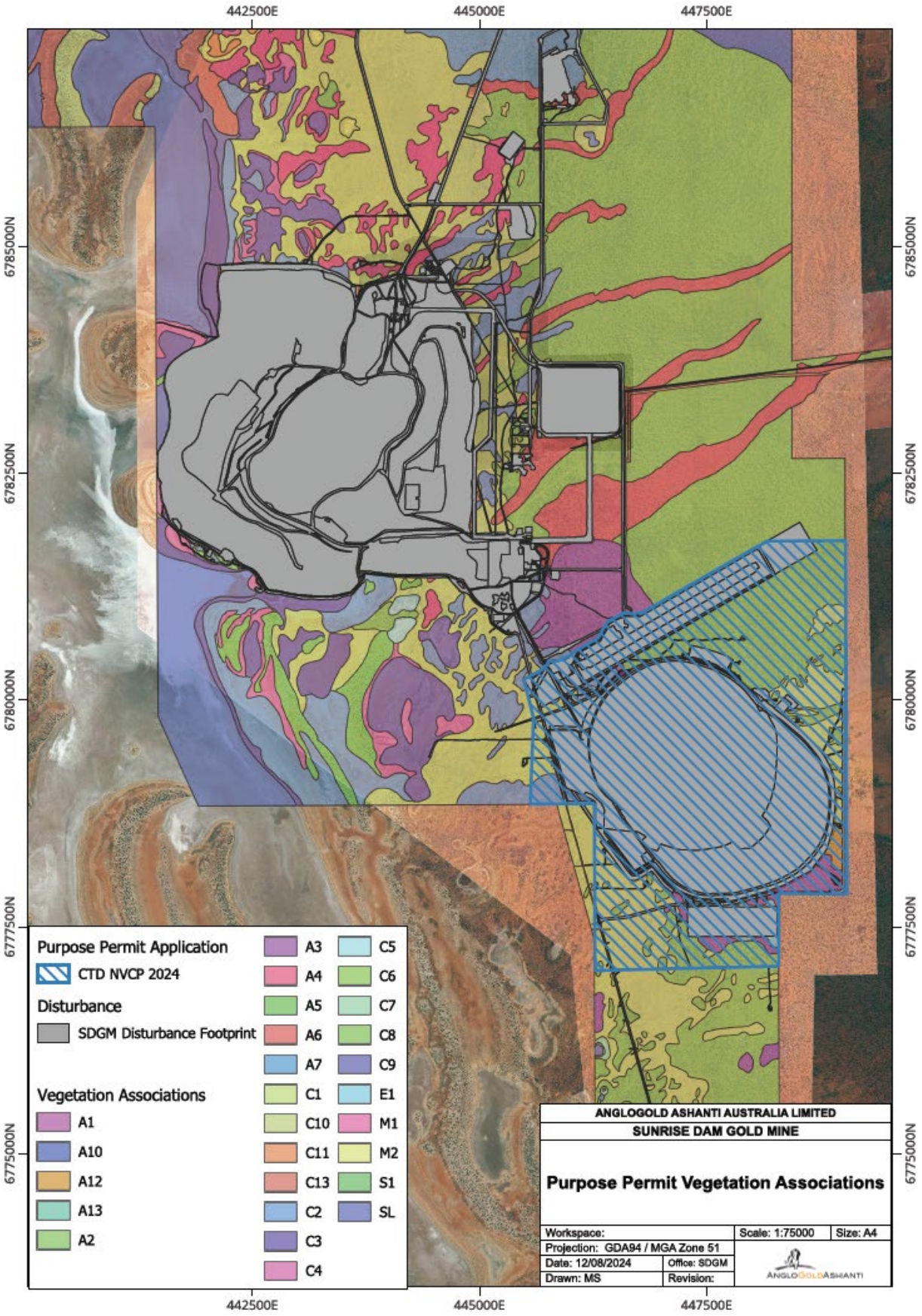

Figure 2: Vegetation Associations Present in the Application Area

1.7 Fauna

Three major (Level 2 equivalent) vertebrate fauna studies have been conducted at SDGM, two by Ninox in 1994 and 2005, and one in September 2022 by Kingfisher Environmental Consulting (Kingfisher; 2022).

Kingfisher surveyed the entirety of SDGM in 2022 and identified a potential for 272 vertebrate fauna species to occur. From the 2022 study, a total of 193 vertebrate fauna taxa is expected, consisting of 105 bird species, 20 native mammal species, 9 introduced mammal species, 4 amphibian species and 55 reptile species.

No species listed as critically endangered or endangered were recorded or are expected to occur within the application area. Table 2 lists conservation significant species recorded near the SDGM and provides a brief assessment of likely impact.

The Peregrine Falcon (*Falco peregrinus*), which is listed as Other Specially Protected fauna under the Biodiversity Conservation Act 2016 (Wildlife Conservation (Specially Protected Fauna) Notice 2018) has been recorded at SDGM. This is a highly mobile species with a large range which can accommodate high levels of disturbance. It is unlikely to breed in the application area due to the lack of suitable nesting sites (tall trees or rocky outcrops).

The Malleefowl (*Leipoa ocellata*), is classified as vulnerable under the *Biodiversity Conservation Act* 2016 (Wildlife Conservation (Specially Protected Fauna) Notice 2018). The species was recorded approximately 12 km southeast of the application area, in the vicinity of the Fuji-Wilga borefield. No suitable breeding habitat was found within the survey area and the evidence of Malleefowl (tracks) was recorded outside breeding season when Malleefowl forage widely across a range of habitat areas.

Priority 4 listed species Brush Tailed Mulgara and Long-tailed Dunnart were recorded at SDGM during the 2022 survey. A small area of Brush Tailed Mulgara habitat occurs within the application area at the southern end of the CTD TSF, whilst a larger area of habitat was excluded from the application area to minimise impacts on Brush Tailed Mulgara habitat (Figure 3). The Brush Tailed Mulgara habitat primarily coincides with the A3 vegetation association and Kirgella land system. There is an extensive area of Kirgella land system east of the CTD TSF, although this is outside of the survey area.

For completeness, two migratory waterbird species, Red-necked Stint (*Calidris ruficollis*) and Wood Sandpiper (*Tringa glareola*), were recorded outside of the application area at Lake Carey. Both species have a conservation status of Least Concern and are noted to have stable populations. It was noted by Kingfisher (2022) that very few waterbirds were recorded at Lake Carey and that their populations are much higher at other large inland salt lakes as Lake Carey is only suitable habitat during irregular flooding events. The application area does not include any of Lake Carey or other suitable habitat for waterbirds.

A consistent theme throughout past fauna studies has been that there are no habitats of regional significance occur within the project area, due to widespread common vegetation communities being present. Kingfisher Environmental Consulting identified five habitats to be of relative importance within the total survey area.

- *Casuarina* Woodland on gypsiferous rises. These occur on gypsiferous dunes fringing Lake Carey and on islands. This habitat supports southern temperate adapted reptile species at the arid extreme of their range. The habitat also contains tree hollows proving breeding opportunities for parrots, bats and raptors.
- Hills and rocky rises with *Acacia* shrublands. This habitat occurs in the borefields ~10 km east of SDGM in the Leonora land system in vegetation associations C12, A15, A16, S2 and parts of A2. Long-tailed Dunnarts, Wooley's Pseudantechinus and Goldfield's Crevice-skink are supported by this habitat.
- Samphire shrubland fringing Lake Carey. This habitat comprising dense mature samphire shrublands provides habitat for the Slender-billed thornbill.
- Salt Lakes (Lake Carey) as habitat to EPBC Act migratory birds and other bird species; and
- Sandplains supporting *Triodia basedowii* hummock grasslands. Sandplains occur between the process plant and aerodrome, south of the CTD TSF and in the Fuji Wilga borefield. The fauna assemblage present includes the Brush Tailed Mulgara.

Of these habitats, the 'Sandplains supporting hummock grasslands' is the only habitat present within the application area.

Table 2: Likelihood of Conservation Significant Fauna being Present within the Application Area

Species	Conservation Status			Habitat	Recorded in application area (Kingfisher 2022)	Assessment
	EPBC Act	BC Act	Other			
Birds						
Malleefowl (*Leipoa ocellata*)	VU	VU		Scrubland and woodland dominated by mallee and wattle species (DotEE 2019).	No	No suitable breeding habitat was found within the survey area and the evidence of Malleefowl (tracks) was recorded outside breeding season when Malleefowl forage widely across a range of habitat areas. No Malleefowl mounds have been observed during multiple fauna assessments at SDGM.
Peregrine Falcon (*Falco peregrinus*)	-	S		Found in most habitats, from rainforests to the arid zone, and at most altitudes, from the coast to alpine areas (Birdlife Australia 2019).	No	Highly mobile species with a large home range that are not likely to be significantly impacted by the proposed clearing.
Mammals						
Brush Tailed Mulgara	-	-	P4	This species occupies spinifex (*Triodia* spp.) grasslands, and burrows in flats between sand dunes. It is generally a solitary species that hunts at night, although it is not strictly nocturnal (Woolley 2008).	Yes	Suitable habitat present within the application area. A large area of Brush Tailed Mulgara habitat has been excluded from the application area.

Species	Conservation Status			Habitat	Recorded in application area (Kingfisher 2022)	Assessment
	EPBC Act	BC Act	Other			
Long-tailed Dunnart			P4	DBCA P4 species with fragmented and restricted regional distribution. Prefers rocky outcrops.	No	Unlikely to occur within application area as preferred habitat is absent.

Conservation Status: *VU: Vulnerable*
EN: Endangered
S: Other specially protected fauna
P4: Priority 4

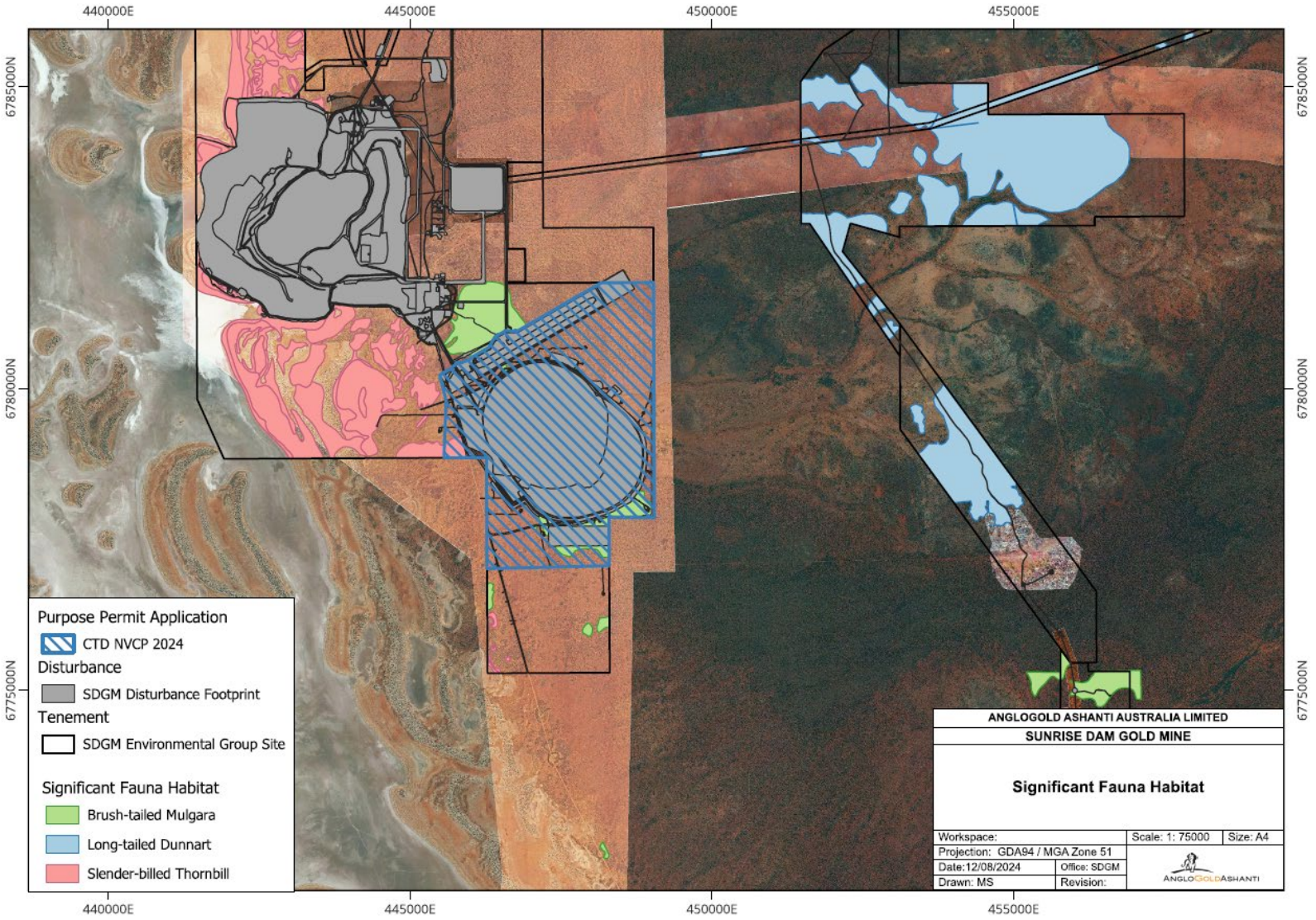

Figure 3: Conservation Significant Fauna Habitat at SDGM

2 PROPOSED CLEARING

2.1 Proposed Development

SDGM is an open pit and underground mining operation. Originally established as an open pit mine in 1994 (at the Sunrise pit). The underground mining operations, which commenced in 2003, are ongoing. Ore processed at SDGM is transferred to the CTD TSF for storage.

The CTD TSF has been in operation since 2000, undergoing several stages of expansion/development. The primary proposed development under this application is to undertake stage 12 of the CTD TSF. In addition to clearing for raising of the CTD TSF, clearing has been included for other supporting disturbance for mining activities within the application area.

2.2 Proposed Clearing

This application requests approval for clearing up to 125 ha of native vegetation within a total application area of 1,259.39 ha for mining related purposes. The permit application area is shown in Figure 4.

Proposed clearing area includes clearing for borrow pits, roads, and support infrastructure development.

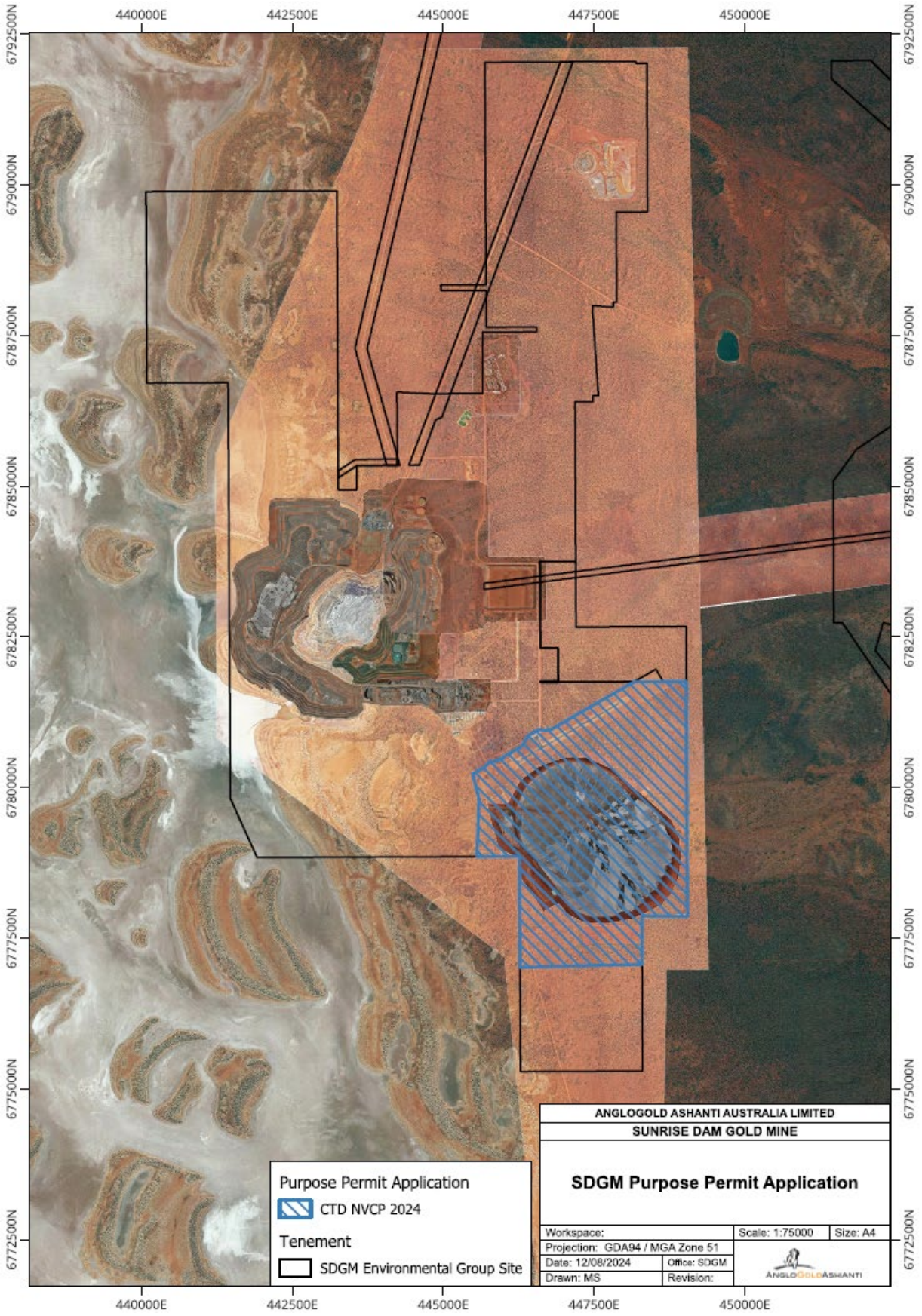

Figure 4: Permit Application Area

3 ASSESSMENT OF CLEARING PRINCIPLES

3.1 Overview

Clearing applications are assessed against the 10 clearing principles outlined in Schedule 5 of the *Environmental Protection Act* 1986 (EP Act). These principles aim to ensure potential impacts resulting from removal of native vegetation can be assessed in an integrated way and apply to all lands throughout Western Australia.

The following sections provide an assessment of the impacts of the proposed clearing against the clearing principles. Where relevant, reference is made to the *Biodiversity Conservation Act* 2016 (BC Act) and the federal *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act). A summary of the outcomes of the assessment against the 10 Clearing Principles are provided in Table 3.

Table 3: Assessment of Clearing Principles

Principle Number	Clearing Principle	Outcome
a	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Not at variance with this principle
b	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Not at variance with this principle
c	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	Not at variance with this principle
d	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a Threatened Ecological Community (TEC).	Not at variance with this principle
e	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Not at variance with this principle
f	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	Not at variance with this principle
g	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Not at variance with this principle
h	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation areas.	Not at variance with this principle
i	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	Not at variance with this principle
j	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	Not at variance with this principle

3.2 Biodiversity Significance

Clearing Principle (a): Native vegetation should not be cleared if it comprises of a high level, of biological diversity.

Assessment: Not at variance with this principle.

The application area is located within the Austin Botanical District and the East Murchison subregion of the Murchison IBRA bioregion. The East Murchison subregion represents a total area of approximately 7.8 million ha. The subregion is rich and diverse in both its flora and fauna; however, most species are wide ranging and usually occur in at least one, and often several subregions (Cowan 2001). Vegetation in the subregion is dominated by mulga woodlands, often rich in ephemerals, hummock grasslands, saltbush shrublands, and samphires (Cowan 2001). Species include those from the *Acacia aneura* complex, *Acacia tetragonophylla, Olearia muelleri,* Chenopod and *Eremophila* species.

The application area has previously been subject to CPS 5898 for clearing related to the CTD TSF (approved in 2013 and expired in 2022). The current application is over a similar area as CPS 5898 related to expansion of the storage capacity of the CTD TSF. In addition, the application area is adjacent to previously disturbed areas including the Sunrise Dam main mining area, process plant, and aerodrome. Vegetation proposed to be cleared is unlikely to represent a higher level of biodiversity than surrounding undisturbed area.

No Threatened or Priority Flora or Threatened or Priority Ecological Communities have been recorded within the application area.

The vegetation types present (see Table 1) are well represented within the Austin Botanical District and therefore not considered to be significant at a local or regional scale. Therefore, the proposed clearing is not likely to be at variance to clearing principle (a).

Clearing Principle (b): Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Assessment: Not at variance with this principle

A consistent theme throughout past fauna studies has been that there are no habitats of regional significance occur within the project area, due to widespread common vegetation communities being present. Kingfisher Environmental Consulting identified five habitats to be of relative importance in a local context within the total SDGM survey area:

- *Casuarina* Woodland on gypsiferous rises. These occur on gypsiferous dunes fringing Lake Carey and on islands. This habitat supports southern temperate adapted reptile species at the arid extreme of their range. The habitat also contains tree hollows proving breeding opportunities for parrots, bats and raptors.
- Hills and rocky rises with *Acacia* shrublands. This habitat occurs in the borefields ~10 km east of SDGM in the Leonora land system in vegetation associations C12, A15, A16, S2 and parts of A2. Long-tailed Dunnarts, Wooley's Pseudantechinus and Goldfield's Crevice-skink are supported by this habitat.

- Samphire shrubland fringing Lake Carey. This habitat comprising dense mature samphire shrublands provides habitat for the Slender-billed thornbill.
- Salt Lakes (Lake Carey) as habitat to EPBC Act migratory birds and other bird species. and
- Sandplains supporting *Triodia basedowii* hummock grasslands. Sandplains occur between the process plant and aerodrome, at the southern end of the CTD and in the Fuji Wilga borefield. The fauna assemblage present includes Brush Tailed Mulgara.

Of these habitats, only the Sandplains supporting *Triodia basedowii* hummock grassland habitat occurs within the application area. This habitat also coincides with the Kirgella land system, which extends to the southeast outside of the application area through to the Fuji Wilga Borefield some 7.5 km to the southeast. The largest area of Sandplains supporting *Triodia basedowii* hummock grassland habitat at SDGM occurs near the aerodrome and has been excised from this clearing permit application. Therefore, the vegetation within the application area is not considered necessary for the maintenance of a significant habitat for fauna indigenous to Western Australia.

Clearing Principle (c): Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Assessment: Not at variance with this principle.

No Threatened plant taxa pursuant to the BC Act or the EPBC Act have been recorded within the application area at SDGM.

Clearing Principle (d): Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a Threatened Ecological Community (TEC).

Assessment: Not at variance with this principle.

No TECs pursuant to the BC Act or the EPBC Act occur within the application area at SDGM.

Clearing Principle (e): Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Assessment: Not at variance with this principle.

The application area falls within the Murchison Bioregion. About 99.7% of the Pre-European vegetation remains in the Murchison bioregion within which the application area is located (Government of Western Australia 2019).

Surveys conducted by Mattiske Consulting Pty Ltd have been used to determine the application area is typical of the vegetation throughout the region. As such, the area under application is not considered a significant stand of remnant native vegetation.

Clearing Principle (f): Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Assessment: Not at variance with this principle.

Other than Lake Carey, there are no defined watercourses or wetlands other scattered minor ephemeral drainage lines which are dry for most of the year, only flowing briefly following significant rainfall events.

3.3 Land Degradation

Clearing Principle (g): Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Assessment: Not at variance with this principle.

Gradients of the application area are low (typically 0.5 to 0.7%) and is thus not likely to be susceptible to erosion. The proposed clearing of vegetation will result in no significant long-term changes to salinity, nutrient export, soil acidity, flooding potential, or soil erosion.

3.4 Conservation Estate

Clearing Principle (h): Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation areas.

Assessment: Not at variance with this principle

No conservation areas occur within 100 km of the application area.

3.5 Ground and Surface Water Quality

Clearing Principle (i): Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Assessment: Not at variance with this principle

There are no permanent waterbodies or water courses within the application area. The ephemeral drainage lines within the application area rarely flow after heavy rainfall, at which times shallow sheet flow would be common throughout surrounding areas. The nearest waterbody downstream is Lake Carey, a large naturally occurring salt lake. Water quality in Lake Carey is unlikely to be affected by the proposed clearing.

There are no public drinking water source areas within or in close proximity to the application area. Groundwater in the area is saline to hypersaline and unlikely to be affected by the proposed clearing. The proposed clearing is unlikely to cause deterioration in the quality of underground water.

Clearing Principle (j): Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Assessment: Not at variance with this principle.

The application area occurs in a semi-arid region on a flat, undulating landscape where flooding occurs only rarely following heavy rainfall, typically from cyclonic systems. There are no major water courses present within the vicinity of the application area. Minor ephemeral drainage lines in the area are dry for most of the year, only flowing briefly following significant rainfall events.

4 MANAGEMENT AND MITIGATION MEASURES

The proposal to clear up to 125 ha of vegetation, within a total application area of approximately 1259.39 ha will not result in any impacts that are at variance with the ten Clearing Principles. The application area has previously had CPS 5898 approved when AGAA was undertaking the stage 10 CTD TSF expansion. A range of environmental management and mitigation measures are in place to ensure clearing will be managed to minimise any potential adverse impacts.

SDGM uses an internal Ground Disturbance Procedure and Clearing Permit to manage disturbance on the ground. This system ensures that land clearing activities only take place after environmental, land tenure, heritage, and safety values are assessed and signed off by relevant authorities.

The following existing measures will be implemented to manage and mitigate the impacts of clearing:

- The larger area of the A3 vegetation association has been removed from the application area to minimise the potential impact to Brush Tailed Mulgara habitat.
- Project land disturbance will be kept to the minimum necessary for the project.
- Existing disturbed areas will be used wherever possible to minimise total ground disturbance.
- SDGM internal Ground Disturbance Procedure will be implemented.
- Areas of disturbance will be marked out prior to clearing activities.
- Given the CTD TSF raise is a vertical raise, the main disturbance activity will be borrow pits for embankment material. Borrow pits can be rehabilitated once their use has been completed.
- Site inductions will include training personnel in SDGM internal ground disturbance procedures.
- Vehicles and equipment hygiene procedure will be implemented during construction to minimise the risk of introducing weed species.
- All clearing undertaken will be recorded.
- During land clearing, topsoil will be stripped and stockpiled for future use.
- During rehabilitation, topsoil will be respread to act as a seed source.

5 REFERENCES

Beard, J.S. 1990. Plant Life of Western Australia. Kangaroo Press, Kenthurst NSW.
Birdlife Australia 2019. Bird Profile. Available from: http://www.birdlife.org.au/ (accessed 12 September 2019).

Cowan, M. 2001. Murchison 1 (MUR1 – East Murchison Subregion). Perth: Department of Conservation and Land Management.
Department of Agriculture, Water and the Environment (DAWE). 2022. Weeds Australia. Available from: https://weeds.org.au/ (accessed September 2022).

Department of Primary Industries and Regional Development 2022. Western Australian Organism List.

Department of the Environment and Energy (DotEE). 2019. Species Profile and Threats Database. Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat (accessed 12 September 2019).

Government of Western Australia. 2019. 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

John Consulting Services. 1995. Sunrise Dam Project – Soil Salinity Study. Unpublished report prepared for Acacia Resources Limited, October 1995.

Kingfisher Environmental. 2022. Sunrise Dam 2022 Fauna Assessment. Unpublished report prepared for AngloGold Ashanti Australia Ltd

Mattiske Consulting Pty Ltd. 2018. Flora and Vegetation Assessment Sunrise Dam Gold Mine Lake Carey and Bindah Road Project. Unpublished report prepared for AngloGold Ashanti Australia Ltd.

Mattiske Consulting Pty Ltd. 2022. Flora and Vegetation Assessment Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Ltd.

Ninox Wildlife Consulting. 1994. Survey Report - A Vertebrate Fauna Assessment of the Sunrise Dam Project Area. Unpublished report prepared for AngloGold Ashanti Australia Ltd.

Ninox Wildlife Consulting. 2005. Vertebrate Fauna Survey Results 2004 Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Ltd.

Thackway, R. and Cresswell, I.D. (Eds) 1995. An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0 Australian Nature Conservation Agency, Canberra.

Trudgen, M.E. 1988. A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report.

Van Vreeswyk, A.M.E., Payne, A.L., Leighton, K.A. and Hennig, P. 1994 Technical Bulletin - An Inventory and Condition Survey of the North-eastern Goldfields, Western Australia, No. 87. Department of Agriculture, Government of Western Australia, Perth, Western Australia.

Woolley. 2008. Targeted species survey guidelines: Brush-tailed mulgara Dasycercus blythi. Available from: https://www.qld.gov.au/__data/assets/pdf_file/0039/67989/brushtailed-mulgara.pdf (accessed 17 September 2019).

6 APPENDICES

6.1 Flora and Vegetation Assessment Sunrise Dam Gold Mine – Mattiske Consulting Pty Ltd 2022

FLORA & VEGETATION ASSESSMENT

SUNRISE DAM GOLD MINE

Prepared By

Mattiske Consulting Pty Ltd

Prepared For

AngloGold Ashanti Australia Limited

September 2022

DOCUMENT STATUS				
DOCUMENT REFERENCE: AGA2201				
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FINAL	Final report	D. Rubick	E. Mattiske	6/09/2022

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LIST OF ABBREVIATIONS

AngloGold	AngloGold Ashanti Australia Limited
BAM Act:	*Biosecurity and Agriculture Management Act 2007* (WA)
BC Act:	*Biodiversity Conservation Act 2016* (WA)
BoM:	Bureau of Meteorology
CLUSTER:	Hierarchical clustering
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW:	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
EP Act:	*Environmental Protection Act 1986* (WA)
EPA:	Environmental Protection Authority
EPBC Act:	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
IBRA:	Interim Biogeographical Regionalisation for Australia
Mattiske Consulting	Mattiske Consulting Pty Ltd
NVIS	National Vegetation Information System
PEC:	Priority ecological community
PRIMER:	Plymouth Routines in Multivariate Ecological Research
SIMPER:	Similarity percentages
SIMPROF:	Similarity profile
TEC:	Threatened ecological community
WAH:	Western Australian Herbarium (PERTH)

EXECUTIVE SUMMARY

AngloGold Ashanti Australia Limited operates the Sunrise Dam Gold Mine in Western Australia's Goldfield region. Mattiske Consulting Pty Ltd was commissioned in April 2022 by AngloGold Ashanti Australia Limited to undertake a flora and vegetation survey for some additional survey areas at the Sunrise Dam Gold Mine and to undertake detailed targeted searches for significant flora species at the Sunrise Dam Gold Mine. The Sunrise Dam gold mine is located approximately 60 kilometres to the south of Laverton (Figure 1).

A total of 132 vascular plant species were recorded across 65 survey quadrats in June 2022. A total number of 51 genera and 28 families were represented within the 132 vascular plant species across the survey areas. The majority of taxa recorded were represented in Chenopodiaceae (28 taxa), Fabaceae (26 taxa) and Scrophulariaceae (19 taxa) families. Annual species represented 0.85% of all recorded plant species within the survey areas.

No threatened flora taxon pursuant to the *Biodiversity Conservation Act* 2016 (WA) and as listed by the Department of Biodiversity, Conservation and Attractions, or pursuant to section 179 of the *Environmental Protection and Biodiversity Conservation Act 1999* or listed by the Department of Climate Change, Energy, the Environment and Water, were recorded within the survey areas.

Two priority flora were identified during the 2022 survey. *Tecticornia mellarium* P1 was recorded along the eastern edge of Lake Carey in high numbers and *Melaleuca apostiba* P3 was situated in yellow sand dunes in one population to the south of the active mining area.

Two introduced (weed) species were recorded in the 2022 within the survey areas. The introduced weed species were **Erodium aureum* and **Sonchus oleraceus.* Both species were listed as Permitted (s11) pursuant to the Biosecurity and Agriculture Management Act 2007 according to the Department of Primary industries and regional development. The **Erodium aureum* was only found in three locations and the **Sonchus oleraceus* was only found in one which is relatively low for the size of the tenements and the amount of mining disturbance over many decades.

Similarity Profile Analysis of the 65 vegetation quadrats identified 15 vegetation communities. Based on the statistical analysis of the 15 vegetation communities, *Acacia* and *Chenopod* were the dominant dividing factors between the vegetation communities. Overall, the vegetation communities mapped and species recorded in the additional survey areas were consistent with both the historical regional mapping by Beard (1976) and the more recent localised surveys in the immediate area by Mattiske Consulting Pty Ltd (1994-2022). The majority of the survey areas are situated on sand, sandy clay or saline clay/loam flats and gentle slopes supporting *Acacia* low woodlands over chenopod shrublands and *Tecticornia* shrublands. Given the number of previous surveys executed within close proximity to the Sunrise Dam Mine, the survey effort over multiple years exceeds the current EPA standards (EPA 2016b).

1. INTRODUCTION

The Sunrise Dam Gold Mine is operated by AngloGold Ashanti Australia Limited and is located in Western Australia's Goldfields region, 55 km south of Laverton (Figure 1). Mattiske Consulting Pty Ltd (Mattiske Consulting) was commissioned in April 2022 by AngloGold Ashanti Australia Limited to undertake a flora and vegetation survey for five additional survey areas (blue areas as designated on Figure 2) and to undertake detailed targeted searches for significant flora species at the Sunrise Dam Gold Mine on previously mapped areas (Figure 2). This survey expands on earlier efforts at the Sunrise Dam lease and operational areas to the east of Lake Carey by Mattiske Consulting (1994-2022).

1.1 Location and Scope of Project

The additional survey areas occupied 976.75ha of the wider 16,796.60 hectares as assessed between (1994-2022) and are located approximately 60km south of Laverton on the eastern side of Lake Carey (Figure 1). The survey areas intersect AngloGold Ashanti Australia tenements M39/1116, L39/59, L39/209, L39/228, E39/1729, L39/71, L38/176, E38/3103, E39/1771, E39/1802, L39/74, L39/210, M39/1117, L38/68, L38/172 (Figure 2).

1.2 Environmental Legislation and Guidelines

The following key Commonwealth (federal) legislation relevant to this survey is the:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

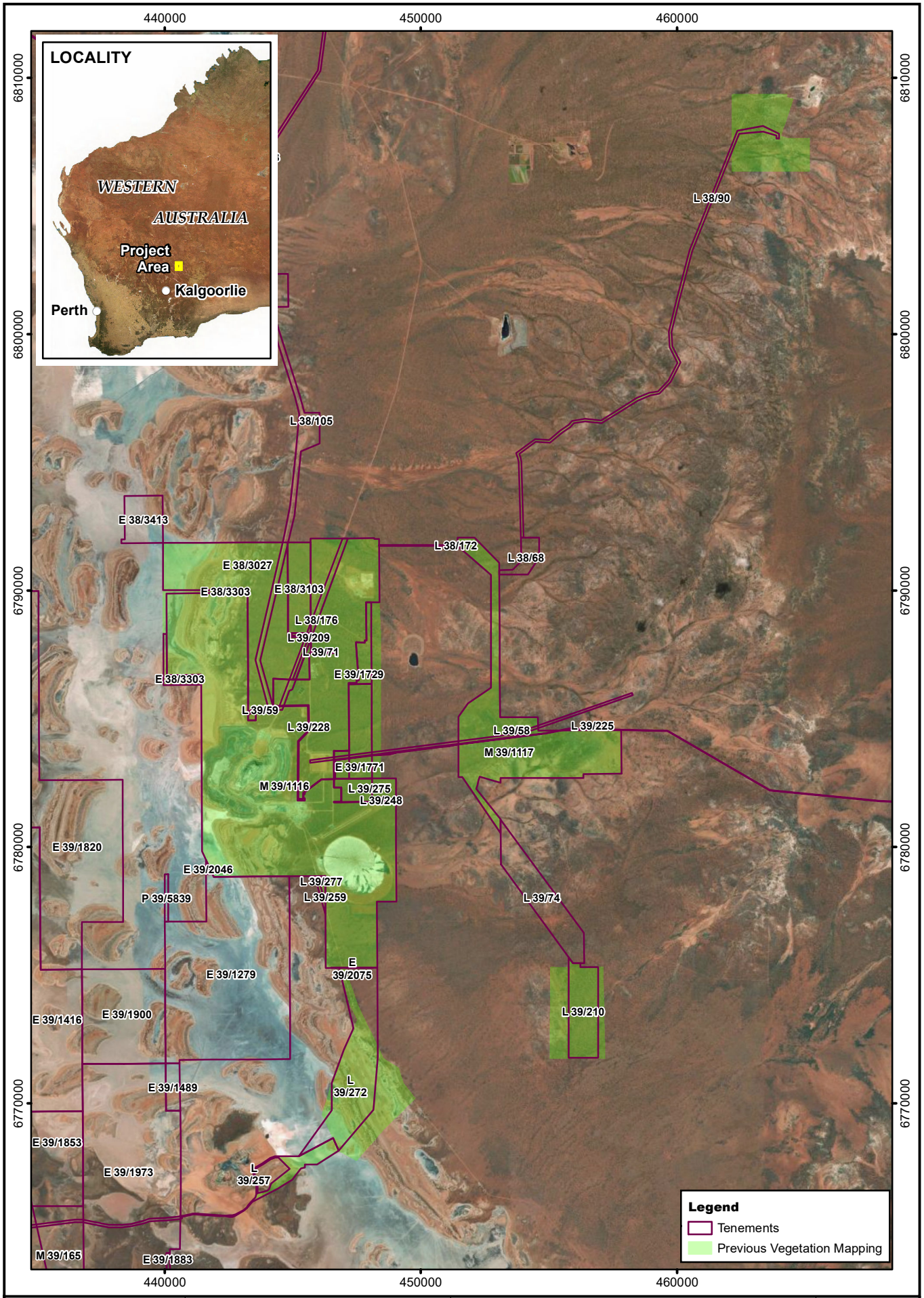
The following key Western Australian (state) legislation relevant to this survey include the:

- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- *Environmental Protection Act 1986* (EP Act).

Furthermore, key Western Australian guidelines relevant to this survey are the:

- *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority [EPA] 2016a); and
- *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b).

Definitions of flora and vegetation terminology commonly used throughout this report are provided in Appendix A1-5.



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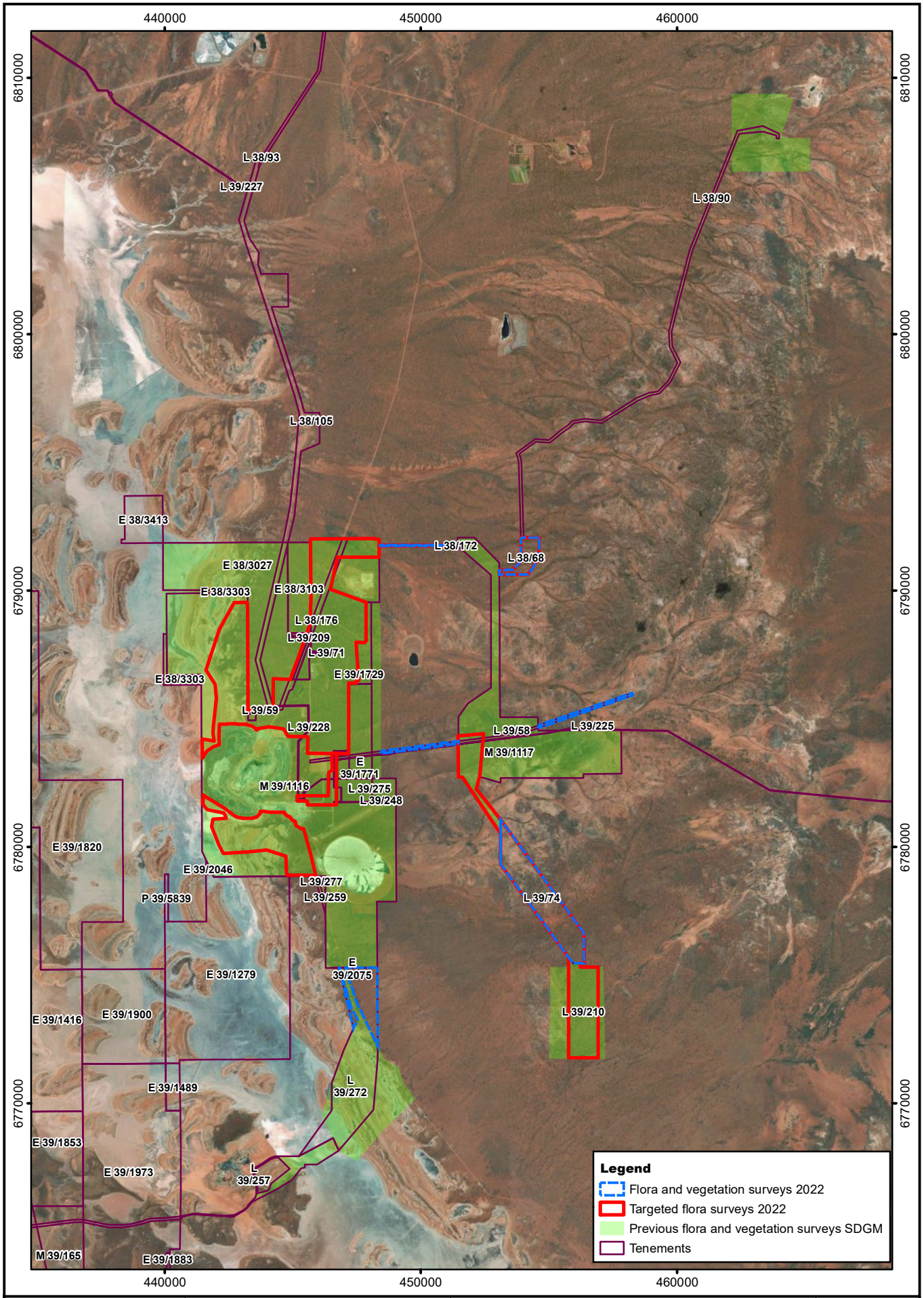
Sunrise Dam Gold Mine
Locality

Figure: **1**



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Sunrise Dam Gold Mine

Flora & Vegetation Surveys

Figure: **2**

2. BACKGROUND

2.1 Climate

The Sunrise Dam mine site is situated within the arid climate zone of the Austin Botanical District, which is characterised by cool winters and hot summers. The Sunrise Dam region receives roughly 280mm of rainfall annually predominantly in summer Beard 1990). During the summer months a majority of the rainfall for the inland areas of the Austin Botanical District is produced by tropical lows or previous cyclonic events from the Pilbara coast in the north (Beard 1990). During the winter months, strong frontal systems flow in from the south west coast producing strong winds and scattered light rain (Beard 1976). The maximum temperature ranges between 18 degrees in the winter months to 35 degrees in summer; with minimum temperatures of 7 degrees in the winter and 22 degrees in the summer (BoM 2022). In the 12 months prior to the survey the Laverton Aero site received 119mm of rain with the long-term average being 276mm. In the 3 months prior to the survey the Laverton aero site received 23.8mm, less than half of the long-term average (69.9mm) for Autumn (Figure 3).

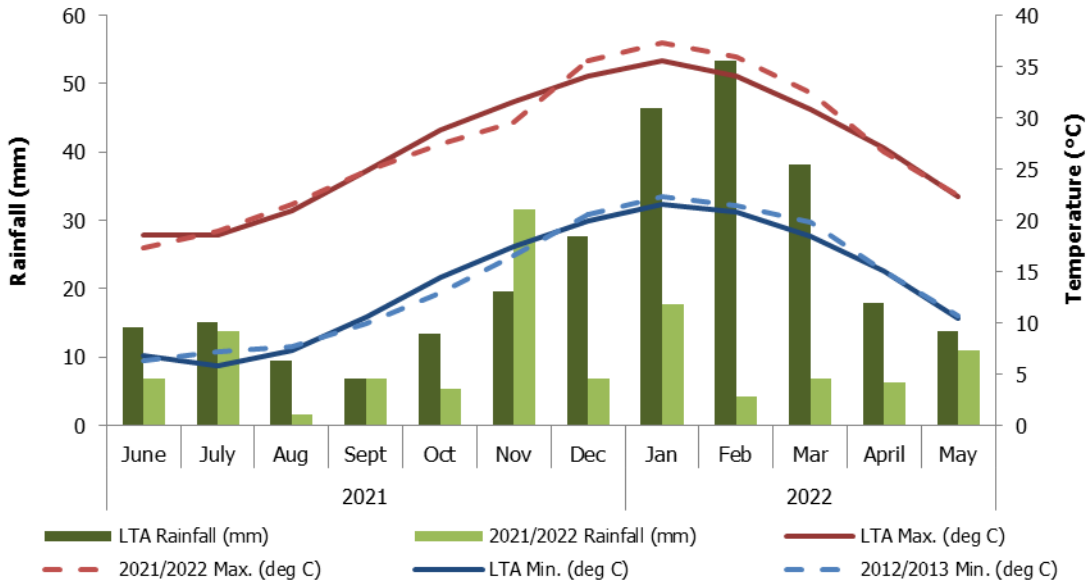


Figure 3: Rainfall and temperature data for Laverton Aero

Rainfall data from July 2021 to June 2022 recorded at the Laverton Aero (BoM 2022) site 12305 situated 61.7km north of Sunrise dam.

2.2 Geology, Soils and Topography

The Sunrise Dam Mine Area is situated within Beard's (1990) Austin Botanical District. Beard (1990) described the geology, soils and topography of the district as consisting of Archaean granites with infolded volcanic and meta-sediments (greenstones), forming the Yilgarn Block. Topographically it is predominantly flat and undulating with occasional ranges of low hills and extensive sandplains in the eastern half. The soil is comprised commonly with shallow earthy loams and overlying red-brown hardpans; shallow stony loams on hills and red earthy sands on the plains (Beard 1990).

In recent years the mapping of soils and landscapes have become more detailed and advanced technologically through the aid of satellites and GIS (DPIRD). The Department of Primary Industries and

Regional Development (DPIRD) has described a range of soil/landscape mapping units in its 'Soil-landscapes of Western Australia's Rangelands and Arid Interior' that characterise differences in the landscape based on underlying geology (Tille 2006). The Sunrise Dam Gold Mine is located on the border of the Helms botanical district (WHE) and the Austin botanical district (WAU) with recent satellite imagery possibly displacing some of the borders established by Beard in the 1990's (See Plate 1). As the flora and vegetation patterns are dependent on underlying site parameters such as landforms and soils this updated information assists in placing the flora and vegetation values into a regional context.

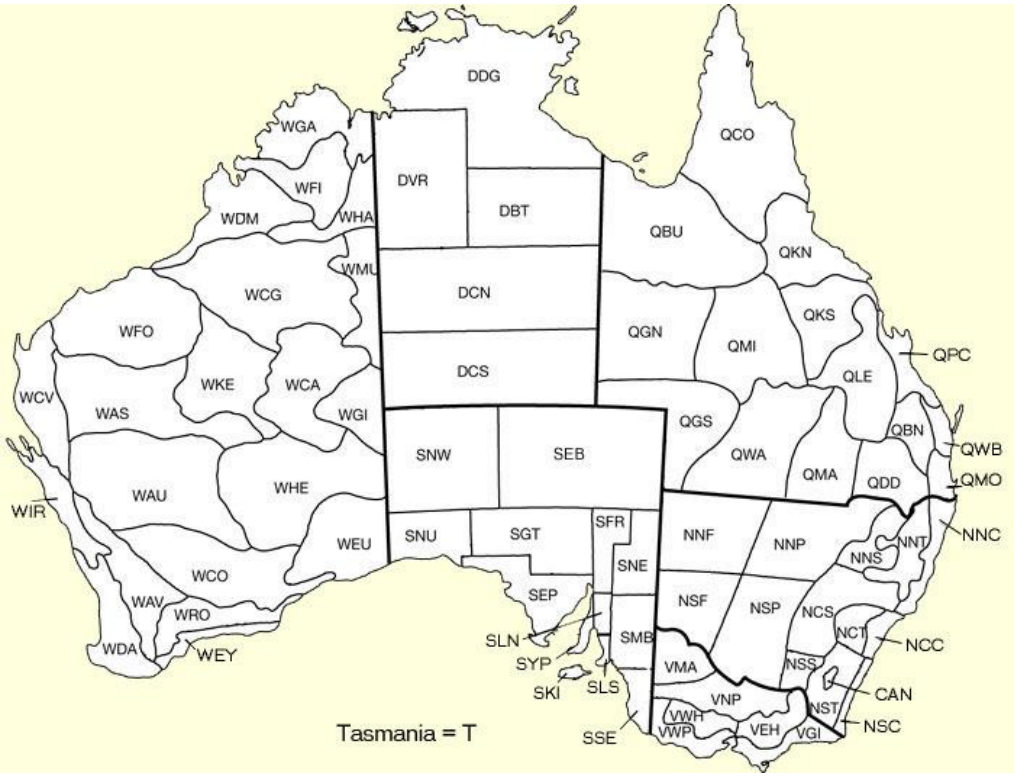


PLATE 1: Botanical Districts of Australia. Austin botanical district (WAU) is located in the central west district of Western Australia (ANBG 2022)

2.3 Land Systems

Land system mapping of the North-Eastern Goldfields, including the survey area, has been prepared by the Western Australia Department of Agriculture (now the Agriculture and Food division of the Department of Primary Industries and Regional Development) (Pringle *et al.* 2004). This mapping of the North-Eastern Goldfields was designed to define the topographic characteristics of the North-Eastern Goldfields. Land systems are grouped into land types according to a combination of landforms, soils, vegetation and drainage patterns. Pringle *et al.* (2004) observed that the boundaries between plant communities are often defined sharply and mostly associated with boundaries between landforms and their soils along and in association with the slope of the land. Greater diversity in plant communities is often found on higher topographies in the landscape where variance in weathering and erosion occurs. Across the flat and lower slopes, changes are usually more subtle.

The Austin Botanical District is the largest of the Eremaean regions and is essentially comprised of mulga (*Acacia aneura*) woodlands associated with red loams over siliceous hardpans on the plains reducing to scrub on the rises and hills (Pringle *et al.* 1994). This botanical district is also comprised of mulga and

Eremophila shrublands that dominate stony plains, and chenopod communities more often associated with duplex soils (Pringle *et al.* 1994). Seven land systems intersect the survey area (Table 1; Figure 4). A description of the 16 land systems within the Sunrise Dam survey areas has been summarised from Pringle *et al.* (2004) and is presented following Table 1.

Table 1: Extent of Land Systems intersecting the Sunrise Dam Gold Mine (SDGM) survey areas

Land System	Mapping Unit	Total Extent (ha)	Area (ha) within the Total SDGM survey areas	Proportion of Current Land Extent (%)
Deadman System	274De	85015.78	14.80	0.02
Kirgella System	274Ki	663347.96	839.10	0.13
Carnegie System	279Ca	1166365.52	8672.47	0.74
Gransal System	279Gr	319767.69	53.50	0.02
Gundockerta System	274Gu	2619.94	80.95	3.09
Gundockerta System	279Gu	190253.65	1023.85	0.54
Jundee System	279Ju	408820.11	0.89	0.00
Leonora System	274Le	460.27	180.16	39.14
Leonora System	279Le	102875.05	641.72	0.62
Monk System	279Mk	996413.35	574.36	0.06
Mindura System	279Mn	65794.86	29.26	0.04
Nubev System	279Nu	146298.56	11.97	0.01
Rainbow System	279Rb	231793.23	3747.90	1.62
Sherwood System	279Sh	822458.61	63.86	0.01
Sunrise System	279Su	36264.23	307.34	0.85
Violet System	279Vi	329295.32	671.21	0.20

Deadman System

Calcareous plains supporting acacia, black oak (*Casuarina pauper*) and mallee shrubland/woodlands adjacent to the salt lakes. The geology is quartenary alluvium with occasional tertiary calcrete with level to gently undulating plains with little defined drainage apart from sparse broad tracts and occasional drainage and a few patches of sandplain.

Gundockerta System

Extensive, gently undulating plains generally with abundant stony mantles, and less extensive, lower alluvial plains with narrow central zones receiving more concentrated run-on.

Kirgella System

Extensive sandplains with scattered granite outcrops supporting mulga/mallee shrublands and hummock grasslands. The geology is comprised of quaternary sand and cemented alluviums with scattered Archean granite exposures. The geomorphology is of extensive, gently undulating sandplains with variably stripped exposures of weathered granite.

Leonora System
Low greenstone hills and stoney plains, supporting mixed stoney chenopod shrublands. The larger proportion in the current land extent is associated with the Leonora systems supporting the mixed chenopod shrublands.

Carnegie System
Salt lakes with fringing saline alluvial plains, kopi dunes and sandy banks, supporting halophytic shrublands and *Acacia* tall shrublands.

Gransal System
Stony plains and low rises based on granite supporting mainly halophytic low shrublands.

Jundee System
Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.

Monk System
Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.

Mindura System
Low hills, ridges and outcrops of granite, gneiss and quartz above convex, quartz-strewn interfluves and lower plains supporting sparse acacia shrublands becoming denser in drainage floors.

Nubev System
Gently undulating stony plains, minor limonitic low rises and drainage floors supporting mulga and halophytic shrublands.

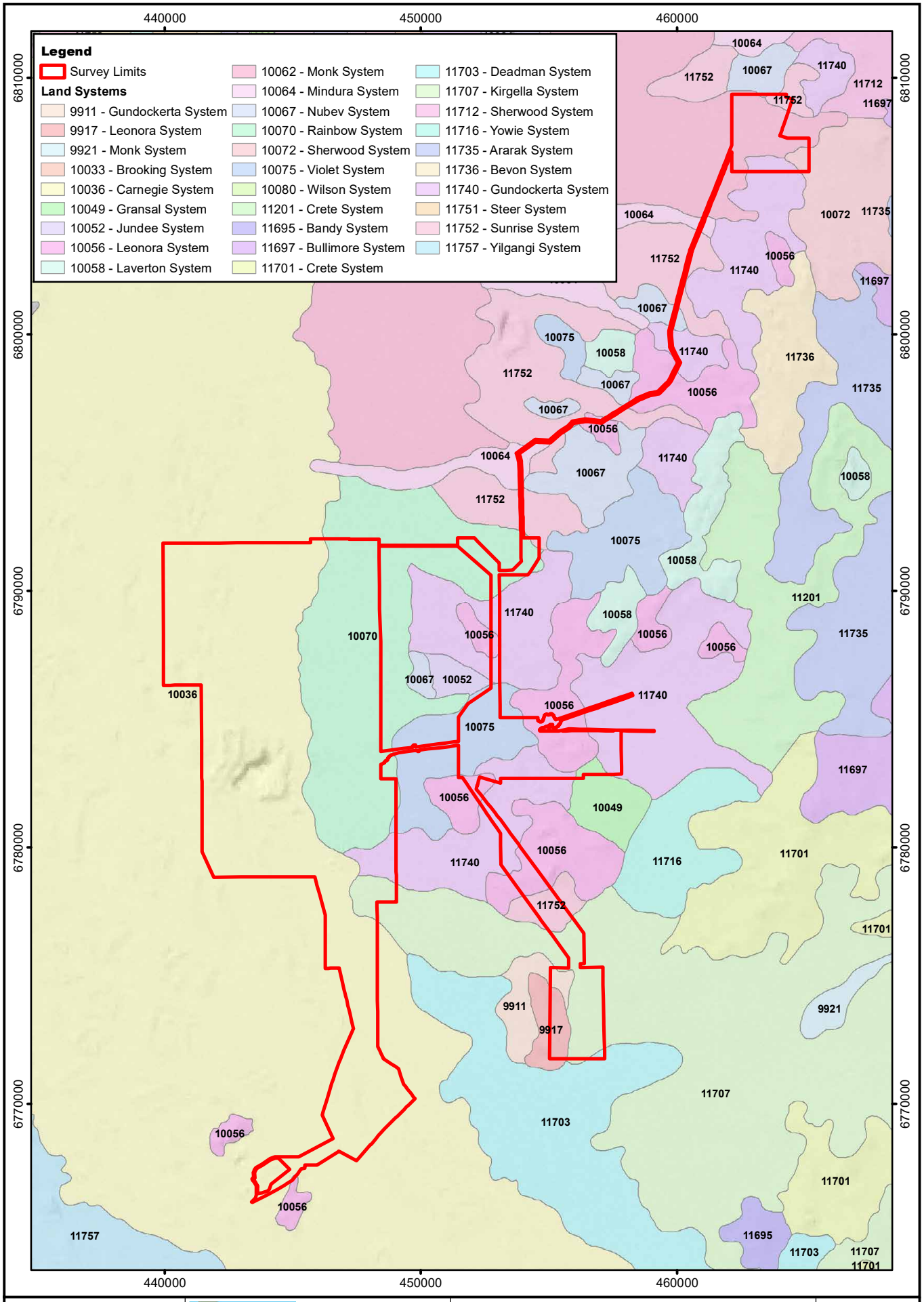
Rainbow System
Alluvial plains subject to sheet flow; often with fine ironstone gravel mantles over hardpans.

Sherwood System
Breakaways, kaolinised foot slopes and extensive gently sloping plains on granite supporting mulga shrublands and minor halophytic shrublands.

Sunrise System
Stony plains supporting mulga shrublands with quaternary colluvium and cemented alluvium and minor greenstone. The geomorphology is very gently undulating interfluves with abundant mantles of large ironstone, quartz and greenstone pebbles.

Violet System

Extensive gently undulating to level plains and low rises with mantles of ironstone pebbles and level to very gently inclined plains subject to sheet flow.



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Sunrise Dam
Land Systems

Figure: **4**

2.4 Beard's Vegetation Mapping

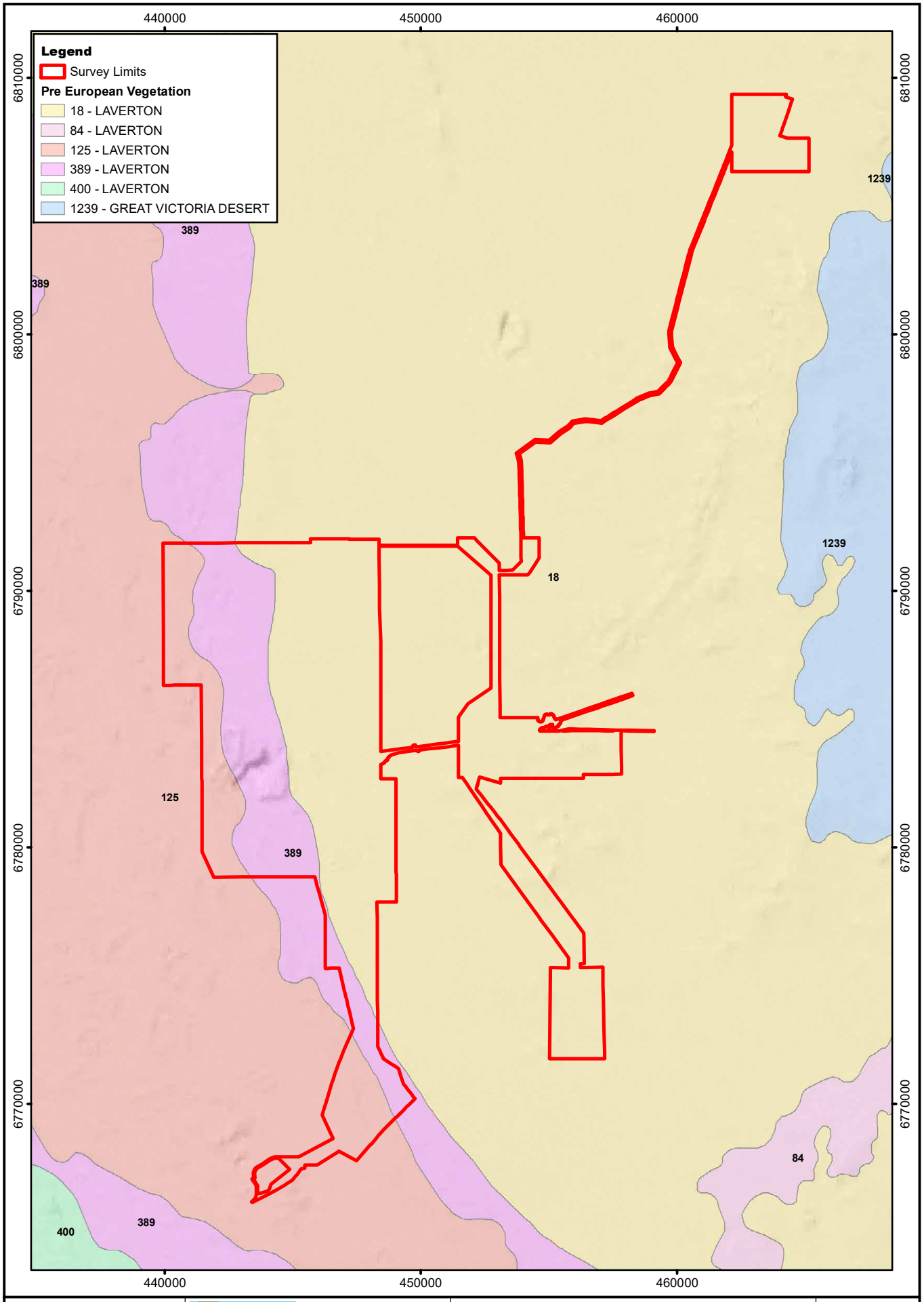
The Sunrise Dam survey areas are situated within the Austin Botanical District (Beard 1990). Beard (1976; 1990) described the different vegetation types according to the dominant soil type and topographical features. *Acacia aneura* (Mulga) is the dominant or a significant component of the most extensive vegetation communities within the district. *Acacia aneura* takes the form of a tree in more favorable red loam soils overlying a siliceous hardpan forming low woodlands, and the form of a shrub on less favorable soils and across hills. *Acacia aneura* often occurs in low numbers or is absent on sandplains and on heavy alkaline and saline soils. The vegetation consists of an open low tree or tall shrub layer, >3 m high, a sparse low shrub layer of 1 - 2 m height and a ground layer of ephemeral herbs (may be a closed layer in favorable seasons or absent in unfavorable times). Sparse perennial and annual grasses may also be present in years of favorable rainfall.

Regarding the layer of small trees or large shrubs >3 m high, in addition to the abundant *Acacia aneura*, a variety of additional *Acacia* species, as well as *Psydrax latifolia*, *Hakea lorea*, *Eucalyptus kingsmillii* and *Eucalyptus lucasii*, are present in more localized areas. Shrubs 1 - 2 m in height include mixed *Eremophila* species, *Ptilotus obovatus*, *Solanum lasiophyllum* and *Senna artemisioides* subsp. *x sturtii.* The understorey is comprised of perennial herbs; *Ptilotus drummondii*, perennial grasses; *Monachather paradoxus*, *Eriachne helmsii* and *Eragrostis eriopoda*, annual grasses; *Aristida contorta*, *Eriachne pulchella*; and ephemeral herbs; *Roebuckiella ciliocarpa*, *Brunonia australis*, *Cephalipterum drummondii*, *Peplidium muelleri* and *Ptilotus polystachyus.* Areas of *Tecticornia mallerium* and Tecticornia sp. Denny's Crossing shrublands are also associated with highly saline environments on the fringes of the salt lakes.

The hills on granite and gneiss are normally covered with *Acacia aneura* in shrub form, with mixed *Acacia* and *Eremophila* species over ephemerals. Sandplains have a cover of *Acacia* shrub of mainly *Acacia ramulosa* var. *linophylla* with some *Acacia aneura*, over *Thryptomene decussata* and typical mulga undershrubs and *Triodia basedowii* in the eastern section. Laterite breakaways generally feature shrubby *Acacia aneura*, *Acacia grasbyi* and *Acacia quadrimarginea*, sometimes with *Callitris columellaris* and *Eucalyptus carnei*. Salt affected areas feature mulga woodland with other *Acacia* species, *Maireana* species and *Melaleuca uncinata*, with *Tecticornia* replacing *Maireana* with increasing salinity. Closer to the rivers and along drainage channels, *Eucalyptus camaldulensis* and *Casuarina obesa* appear with *Acacia aneura* (Beard (1976; 1990).

2.5 Pre-European Vegetation

The pre-European vegetation dataset, prepared through the National Land and Water Resources Audit, describes vegetation in relation to natural resource boundaries commonly used for environmental reporting (Shepherd *et al.* 2002). The pre-European vegetation dataset builds on the vegetation map database developed by G R Beeston and A J M Hopkins, based on 1:250,000 scale mapping. A total of 819 vegetation types were recognised in Western Australia, ranging from tall forests, through to a wide variety of forests and woodlands, shrublands and grasslands, mostly with an overstorey of trees. The identification of the original pre-European and current extent of each of the vegetation types assist in providing baselines for managing issues such as land clearing. Although the extent of native vegetation remains largely intact within the inland areas of Western Australia, the structure and floristic composition have been altered since European settlement through grazing by introduced animals such as sheep, cattle, goats and rabbits, mining activities and by altered fire regimes (Shepherd *et al*. 2002). In more recent years Hopkins *et al.* (2001) delineated a series of vegetation maps based primarily in this region on the previous work of Beard (1976). The pre-European vegetation associations occurring within the vicinity of the Sunrise Dam survey areas are illustrated in Figure 5. The area of pre-European vegetation associations intersecting the Sunrise Dam survey areas is set out in Table 2, and are based on the pre-European Vegetation spatial dataset (Department of Primary Industries and Regional Development 2012).



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Sunrise Dam
Pre European Vegetation

Figure: **5**

Imagery: ESRI, DigitalGlobe (Feb 2016)

Table 2: Extent of pre-European vegetation associations intersecting the Sunrise Dam Gold Mine (SDGM) survey areas

Vegetation Association	Structure	State-wide Pre-European Extent (ha)	Pre-European vegetation in the Total SDGM survey area (ha)	Proportion of Current pre-European vegetation within survey areas statewide (%)
Laverton 18	Low woodland, open low woodland or sparse woodland	2,363,368.51	2615.57	0.11
Laverton 125	Salt lake, lagoon, clay pan	165,280.97	10353.73	6.26
Laverton 389	Saltbush and/or bluebush with scattered low trees	105,547.19	3944.02	3.74

Laverton 18
Low woodland, open low woodland or sparse woodland; Mulga (*Acacia aneura*) and associated species (Hopkins *et al.* 2001 and Beard (1976).

Laverton 125
Salt lake, lagoon and clay pan (mostly no or minimal vegetation) (Hopkins et al. (2001) & Beard (1976).

Laverton 389
Mulga (*Acacia aneura*), *Acacia papyrocarpa*, *Allocasuarina cristata, Atriplex* spp. and *Maireana* spp.. Saltbush and/or bluebush with scattered low trees; (Hopkins et al. (2001) & Beard (1976).

2.6 IBRA Biogeographical Sub-regions

The Interim Biogeographic Regionalisation for Australia (IBRA) delineated 85 bioregions across Australia, based on a range of biotic and abiotic factors, including climate, vegetation, fauna, geology and landform (Thackway and Cresswell 1995; DotEE 2018). IBRA Version 7 refined the original 85 bioregions and 403 sub-regions described in IBRA 6.1, by expanding the number of regions to 89 and the number of sub-regions to 419. The sub-regions represent more localised and homogenous geomorphological units in each bioregion. The survey areas are situated within the Murchison 1 (MUR1-Eastern Murchison) sub-region.

Cowan (2001) described the Eastern Murchison sub-region as being characterised by its internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. It also has salt lake systems associated with the occluded Paleodrainage system, broad plains of red-brown soils, breakaway complexes and red sandplains. Vegetation of the sub-region is predominantly mulga woodlands often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands. The survey areas occupy 0.08 % of the Eastern Murchison sub-region (Table 3).

Table 3: Extent of IBRA sub-region intersecting the Sunrise Dam Gold Mine (SDGM) survey areas

IBRA Sub-region	Current State-wide Extent (ha)	Area Intersecting with SDGM survey areas (ha)	Proportion of Current Extent within survey areas (%)
MUR1 (East Murchison)	21,135,040.28	16796.60	0.08

2.7 Previous Surveys

Fifteen previous flora and vegetation surveys have been conducted at the Sunrise Dam Gold Mine by Mattiske Consulting (1994; 1999; 2000; 2001a; 2001b; 2002a; 2002b; 2003a; 2003b; 2003c; 2004; 2005a; 2005b; 2005c; 2007; 2010; 2012; 2013; 2016; 2017 and 2018 [Mattiske Consulting 1994-2022]).

The combined vegetation mapping of these reports has resulted in the delineation of 27 vegetation communities (excluding cleared land, clay pans and salt lakes). The vegetation communities include thirteen *Acacia* woodlands, two eucalypt woodlands, two *Melaleuca* woodlands, one shrubland dominated by *Hakea preissii*, *Acacia tysonii* and *Eremophila miniata*, and ten chenopod shrublands. The *Acacia* woodlands were dominated by *Acacia aneura* (mulga), *Acacia ayersiana* and *Acacia ramulosa*, with an understorey of *Eremophila* and *Ptilotus* species. The eucalypt woodlands consisted of *Eucalyptus striaticalyx* and *Casuarina pauper*, with an understorey dominated by *Eremophila* and *Atriplex* species, or a *Eucalyptus horistes* woodland with an understorey dominated by mixed *Acacia* species. The chenopod shrublands were dominated by *Atriplex* or *Tecticornia* species.

The previous surveys completed by Mattiske Consulting (1994-2018) have recorded a total of 393 taxa which were representative of 179 genera and 60 families. The most commonly represented families were the Chenopodiaceae (85 taxa), Fabaceae (64 taxa), Asteraceae (58 taxa), Poaceae (44 taxa) and Scrophulariaceae (37 taxa).

3. OBJECTIVES

The aim of this assessment was to undertake a detailed flora and vegetation survey of the additional areas and targeted flora searches within the priority areas as delineated by site environmental team members, this included:

- Undertaking a desktop assessment of the flora and vegetation for the Sunrise Dam survey areas, with a focus on threatened and priority flora and priority ecological communities;
- Reviewing literature and databases associated with the Sunrise Dam gold mine;
- Identify the vascular plant species and undertake a detailed surveys of the additional survey areas;
- Assess the overall health of the of the vegetation by observing fire regime, grazing damage by visual observation;
- Record and identify any pests located within the survey areas;
- Update any priority status taxa and record any name changes by referring to current literature and current listings by the Department of Biodiversity, Conservation and Attractions (DBCA 2018a, 2018b) and plant collections held at the Western Australian Herbarium ([WAH] 1998 -), and plants listed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act;
- Map the vegetation communities and integrate with previous survey datasets;
- Map the location of any threatened and priority flora located within the survey area;
- Assess the condition of the vegetation communities;
- Review the regional significance of the vegetation; and
- Prepare a report summarising the findings.

4. METHODS

4.1 Desktop Survey

A desktop assessment was undertaken using Florabase (WAH 1998-) and NatureMap (Department of Parks and Wildlife 2007) databases, to identify the possible occurrence of threatened and priority flora and threatened and priority ecological communities within the survey areas. The NatureMap search parameters used were a 40 km radius 'by circle' at 29° 05' 38" S, 122° 26' 26" E. The EPBC Act Protected Matters Search Tool (DCCEEW 2022b) was also used centred on the aforementioned co-ordinates. In addition, the recent flora and vegetation survey completed by Mattiske Consulting (2018), was reviewed.

4.2 Field Survey

The detailed flora and vegetation assessment of the survey areas was undertaken by four botanists from Mattiske Consulting, from the 8th to 15th June 2022, in accordance with methods outlined in *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). All botanists held valid collection licences to collect flora for scientific purposes, issued under the BC Act.

The geographic co-ordinates delineating the boundaries of the survey areas for both detailed flora and vegetation field studies and the targeted flora studies were supplied by AngloGold Ashanti (Appendix B). Aerial photographic maps at a 1:10,000 scale of the survey areas, based on high resolution aerial data (0.05m) supplied by Anglogold Ashanti, were supplied by CAD Resources. To sample all the apparent vegetation types across the additional survey areas, the location of vegetation survey quadrats was selected primarily on the basis of aerial photographic maps. Additional sites were selected *in situ*, based on observations of vegetation communities during the field survey. Wherever possible, replicate vegetation survey quadrats (a minimum of three) were established in the same but discontinuous vegetation community types. In addition to data recorded from vegetation survey quadrats, a more comprehensive species inventory of the survey areas was achieved using supplementary survey techniques - opportunistic collections, relevés and traverses.

A total of 65 vegetation survey quadrats were selected and surveyed across the survey areas in June 2022. All vegetation survey quadrats measured 20 m x 20 m in size. In situations where vegetation community shape (e.g. drainage channels) did not display the appropriate dimensions of the vegetation community, an area of equivalent size (i.e. 400 m^2) was surveyed to capture the suitable plants.

The flora and vegetation were sampled and described systematically at each vegetation survey quadrat, and additional opportunistic collections were undertaken wherever previously unrecorded plants were observed. At each vegetation quadrat, the following floristic and environmental parameters were recorded:

- GPS location (GDA94 datum, zone 51J);
- soil type, colour and any additional observations;
- local site topography;
- presence of any outcropping rocks and their type;
- percentage of litter cover (logs, twigs and/or leaves);
- percentage of bare ground;
- approximate time since fire;
- condition of the vegetation, based on Trudgen's (1988) condition ratings (Appendix A5); and
- percentage of foliage cover (of both alive and dead material) and average height for each vascular plant species recorded, over the survey area.

All plant specimens collected during the field survey were dried and processed in accordance with the requirements of the West Australian Herbarium (WAH). All plant specimens were identified through comparisons with pressed specimens housed at the Mattiske Consulting herbarium and the WAH. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded is in accordance with the WAH (1998-).

4.3 Survey timing

The primary survey timing for the Murchison (IBRA) region should be undertaken should be undertaken 6 to 8 weeks post wet season (May to June) or after winter rainfall according to Table 4 in the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b).

The field work was conducted in June over 8 field days (8th June – 15th June) when a majority of species start to flower. The rainfall received in the 12 months prior to the survey (totalling 119mm) was severely below the long-term average (totalling 276.1mm; BoM 2022) which has been recorded between 1994 and 2021. In the 3 months prior to the survey the Laverton aero site received 23.8mm, less than half of the long-term average (69.9mm) for Autumn (Figure 3).

4.4 Statistical Analysis of Data and Vegetation Mapping

A species accumulation curve, based on accumulated species versus number of quadrats surveyed was prepared, to evaluate the level of adequacy of the survey effort (*EstimateS* – Colwell 2006). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness (Chao 2004). When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered to be adequate.

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate sites on the basis of their species composition (Clarke and Gorley 2015). To down-weight the relative contributions of quantitatively dominant species a presence-absence (4TH root) transformation was applied to the data set. Introduced species, singletons (species recorded at only one site) and specimens that were not identified down to the species level were excluded from the analysis. Annuals were excluded from data analysis due to the likelihood of substantial differences between years based on seasonality of local rainfall events and as such exhibit high inter-annual variation in distribution and abundance (Mott 1972; 1973). The omission of annual species from the statistical analysis allows for comparison of data from surveys undertaken in different seasons or survey years. Additionally, taxa which were identified to the subspecies and variety levels were revised to the specific level to reduce the tendency for this to create further statistical variation in analysis which was considered unwarranted. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Transformed data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER), Similarity Profile (SIMPROF) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual vegetation communities.

4.5 Vegetation Descriptions

Vegetation descriptions were based on Aplin's (1979) modification of the vegetation classification system of Specht (1970), to align with the National Vegetation Information System (NVIS). Vegetation communities were described at the association level of the NVIS classification framework, as defined by the Executive Steering Committee for Australian Vegetation Information (ESCAVI 2003; Appendix A6).

4.6 Survey Limitations

There were a range of factors that had the potential to impact the vegetation survey, the vegetation communities and the outcome of the survey (Table 4). Based on the summary in Table 4 it is unlikely that the assessment of vegetation at Sunrise Dam has been compromised through the constraints naturally imposed with botanical surveys.

Table 4: Potential limitations affecting the conclusions made in this report

POTENTIAL SURVEY LIMITATION	IMPACT ON CURRENT SURVEY
Availability of contextual information at a regional and local scale	**Not a limitation:** Reference resources such as Beard's mapping, historical survey data in both the vicinity of the survey area (Consultant's reports), together with online flora and vegetation information, has provided an appropriate level of information for the current survey.
Competency/experience of team carrying out survey; experience in the bioregion surveyed	**Not a limitation:** The survey was undertaken thoroughly, with previous surveys around the Sunrise Dam Mine area conducted by Mattiske Consulting. Two botanists had extensive experience working in a range of botanical districts across the state, all botanists had experience working in the Goldfields region.
Proportion of flora collected and identification issues	**Potential limitation:** Based on the survey quadrat data, it was estimated that 71.46% % of the potential flora species that may be present were recorded (refer to Section 6.1 of this report). There were some issues in accurately identifying some *Acacia* species collected within the *Acacia* shrubland areas. This is likely to have had some impact on the division between vegetation communities within these specific areas. However, given that the areas consisted of mostly *Acacia* spp., which was well represented throughout the survey areas were considered to be a minor issue.
Effort and extent of survey	**Not a limitation:** The intensity of the survey effort was considered to be adequate.
Access restrictions within survey area	**Not a limitation:** Vehicle access to the survey areas was via a range of tracks that traversed the length and width of the tenure. These provided excellent access to the entirety of the survey area.
Survey timing, rainfall, season of survey	**Potential limitation:** The EPA (2016a) recommends that flora and vegetation surveys in the Murchison region should be undertaken 6 to 8 weeks post wet season (May to June) or after winter rainfall. Rainfall in the three months preceding the June 2022 survey was much lower than average (Figure 3). Despite the lower rainfalls, the majority of the plant samples collected and observed were in flower or fruiting at the time of the survey in 2022. This was particularly important for the *Acacia* species which is an important group to have flowering for identification and community differentiation purposes. The main impact of the lower rainfalls prior to the survey was reflected in the low range of recorded annuals. The implications of the lower range of annuals is relevant for the Priority flora species – *Caladrinia* sp. Menzies (F. Hort et al. FH4100) and *Goodenia lyrata* which both are considered to have a medium potential of occurring in the survey areas.

POTENTIAL SURVEY LIMITATION	IMPACT ON CURRENT SURVEY
Disturbances (fire/flood/clearing)	**Not a limitation:** The survey areas exhibited moderate to high levels of disturbance from past mining and pastural activities. Old mine pits and waste deposits are present, together with old roads and exploration tracks for pastural and mining activities. The entirety of the mining lease is in conjunction with the Mount Weld pastural lease and has caused varied degradation across the tenure. The aerial photographic maps used for the present survey were based on imagery captured with high resolution.
Data and statistical analysis	**Potential limitation:** Data collected within the survey areas met the standards and survey area were well represented and matched moderately well with the previous mapping done in the past. Statistical analysis shows 15 significant different communities (Appendix H) that aligns with previous surveys undertaken between (1994 – 2017) by Mattiske Consulting, see description of all communities (Appendix I).

5. DESKTOP ASSESSMENT

5.1 Potential Flora

A total of 95 plant taxa were identified in the desktop assessment as having the potential to occur within 30 km of the survey areas (based on NatureMap search results, included in Appendix D).

These 95 taxa are representative of 28 families and 49 genera. The most commonly represented families were the Chenopodiaceae (19 taxa), Fabaceae (10 taxa), Scrophulariaceae (11 taxa), Myrtaceae (8 taxa), and Poaceae (8 taxa). The most commonly represented genera were *Eremophila* (10 taxa), *Acacia* (6 taxa), *Eucalyptus* (6 taxa) and *Tecticornia* (6 taxa).

5.1.1 Potential Threatened and Priority Flora

No threatened flora species pursuant to the *Biodiversity Conservation Act* 2016 (WA) and as listed by the DBCA (2018a), or pursuant to section 179 of the EPBC Act or listed by the DCCEEW (2022a), have been recorded previously near the survey areas.

A total of 13 priority flora taxa as listed by the WAH have the potential to occur within the survey areas, comprising of four priority 1, eight priority 3 and one priority 4 (DPaW 2007-; WAH 1998-; Table 5) taxa.

An assessment of the likelihood of recording any of the listed priority taxa within the survey areas, based on factors including known soil type, topography and distribution, is set out in Appendix D. Based on this assessment, two taxon, *Tecticornia mellarium* (P1) and *Melaleuca apostiiba* (P3) were ranked as being highly likely to be recorded within the survey area. These taxa have previously been recorded by Mattiske Consulting during recent surveys of the Sunrise Dam Gold Mine (Mattiske Consulting 2018), and the species were previously found on the edges of Lake Carey.

Eremophila sp. Lake Carey (P1), *Calandrinia quartzitica* (P1) and *Tecticornia* sp. Lake Way (P. Armstrong 05/961) was ranked as medium likelihood of being recorded in the survey areas near Lake Carey based on previous studies to the west of Lake Carey (Mattiske Consulting 2019). The remaining taxa were ranked as low or medium and due to their site preferences are unlikely to occur in the Sunrise Dam survey areas (Appendix D).

Table 5: Priority flora taxa with potential to occur within the Sunrise Dam survey areas

Species	SCC[1]	Family	Likelihood to Record	Previously Identified within SDGM survey area
Tecticornia mellarium	P1	Chenopodiaceae	High	Yes
Tecticornia sp. Lake Way (P. Armstrong 05/961)	P1	Chenopodiaceae	Medium	No
Calandrinia quartzitica	P1	Portulacaceae	Medium	No
Eremophila sp. Lake Carey (E. Mattiske LM 197)	P1	Scrophulariaceae	Medium	No
Bossiaea eremaea	P3	Fabaceae	Low	No
Calandrinia sp. Menzies (F. Hort et al. FH 4100)	P3	Portulacaceae	Medium	No
Calytrix praecipua	P3	Myrtaceae	Low	No
Goodenia lyrata	P3	Goodeniaceae	Medium	No
Hybanthus floribundus subsp. *chloroxanthus*	P3	Violaceae	Medium	No
Melaleuca apostiba	P3	Myrtaceae	High	Yes
Olearia mucronata	P3	Asteraceae	Low	No
Lysiandra baeckeoides	P3	Phyllanthaceae	Low	No
Hemigenia exilis	P4	Lamiaceae	Medium	No

1 - State Conservation Code (refer Appendix A) and Summary of Species (Appendix D).

5.1.2 Potential Introduced (Weed) Species and Declared Pest (Plant) Organisms

Twenty introduced plant species have the potential to occur within the survey areas based on NatureMap search results and previous surveys by Mattiske Consulting (1994-2022; Table 6). One of these, **Tamarix aphylla*, is listed as declared pest organism pursuant to Section 22 of the BAM Act and is permitted under section 11 of the BAM Act (DPIRD 2022). **Tamarix aphylla* has a declared pest organism category of exempt, requiring no permit of conditions for keeping (DPIRD 2018). **Tamarix aphylla* is also listed as a Weed of National Significance (WONS; DCCEEW 2022c).

Whilst local records reflect the presence of Ruby Dock (**Rumex vesicarius*) on the lease areas (as supplied by site personnel), this species was not recorded in 2022.

Table 6: Introduced plant species with the potential to occur within the Sunrise Dam survey areas

Note: POT refers to species identified by NatureMap as having the potential to occur in the survey areas that have not been previously recorded by Mattiske Consulting (1994-2022), REC refers to species recorded previously by Mattiske Consulting (1994-2022).

Introduced Species	Common Name	Family	Potential /Recorded
* *Brassica tournefortii*	Mediterranean Turnip	Brassicaceae	REC
* *Carpobrotus aequilaterus*	Sea Fig	Aizoaceae	POT
* *Cenchrus ciliaris*	Buffel Grass	Poaceae	REC
* *Chenopodium murale*	Nettle-leaf Goosefoot	Chenopodiaceae	REC
* *Citrullus lanatus*	Pie Melon	Cucurbitaceae	REC
* *Cucumis melo*	Ulcardo melon	Cucurbitaceae	REC
* *Cucumis myriocarpus*	Prickly Paddy Melon	Cucurbitaceae	REC
* *Cuscuta planiflora*	-	Convolvulaceae	REC
* *Dittrichia graveolens*	Stinkwort	Asteraceae	REC
* *Erodium aureum*	-	Geraniaceae	REC
* *Hypericum perforatum*	St John's Wort	Hypericaceae	POT
* *Lysimachia arvensis*	Scarlet Pimpernel	Primulaceae	REC
* *Malvastrum americanum*	Spiked Malvastrum	Malvaceae	REC
* *Mesembryanthemum crystallinum*	Ice Plant	Aizoaceae	REC
* *Rostraria cristata*	-	Poaceae	POT
* *Schinus molle*	Peppertree	Anacardiaceae	REC
* *Silene nocturna*	Mediterranean Catchfly	Caryophyllaceae	REC
* *Solanum nigrum*	Black Berry Nightshade	Solanaceae	POT
* *Sonchus oleraceus*	Sowthistle	Asteraceae	REC
* *Tamarix aphylla*	Athel Tree	Tamaricaceae	REC

5.2 Potential Threatened and Priority Ecological Communities

No threatened ecological communities (TECs), pursuant to the BC Act 2016 (WA) and as listed by the DBCA (2018b), occur within the survey areas. No TECs, pursuant to the EPBC Act and as listed by the DCCEEW (2022d), were identified within the vicinity of the survey areas.

In the Goldfields region there are currently 63 priority ecological communities (PECs) prescribed between Priority 1 and Priority 3 (DBCA 2022b). Three of these priority ecological communities (PECs) occur on the edge of the 30km buffer. These PECs are the Mount Morgan calcrete groundwater assemblage type on the Carey palaeodrainage on Mount Weld Station (P1), the Mount Linden Range banded ironstone ridge vegetation complex (P3), and the Mount Jumbo Range vegetation complex (P3). All three of the PEC's are located on the boundary of the 30km buffer and none of these intersect the survey areas.

5.3 Other Matters

In addition to the items reviewed in the preceding paragraphs of this desktop assessment (sections 5.1 through 5.2), the EPBC Act Protected Matters Report (DCCEEW 2022b) reveals that within 40 km of the survey areas 'by circle' at 29° 05' 38" S, 122° 26' 26" E, the following applies:

World Heritage Properties	none
National Heritage Places	none
Wetlands of International Importance	none
Listed Threatened Ecological Communities	none
Commonwealth Heritage Places	none
Critical Habitats	none
Commonwealth Terrestrial Reserves	none
Regional Forest Agreements	none
Nationally Important Wetlands	none

6. FIELD SURVEY RESULTS

A total of 65 survey quadrats were used to assess the flora and vegetation of the additional survey areas for vegetation mapping and flora studies. Refer to Appendix B for a list of the geographic locations for each of the survey quadrats.

6.1 Proportion of Flora Surveyed

A species accumulation curve was used to evaluate the sampling adequacy and is presented in Figure 6. The incidence-based coverage estimator (ICE) of species richness was calculated to be 184.72. Based on this value, and the total of 132 species recorded (in the 65 survey quadrats), 71.46% of the flora species potentially present within the survey area were recorded. A reading of 71.46% is a reasonable number for potentially present with an intermediate size of land surveyed and seasonal climatic conditions.

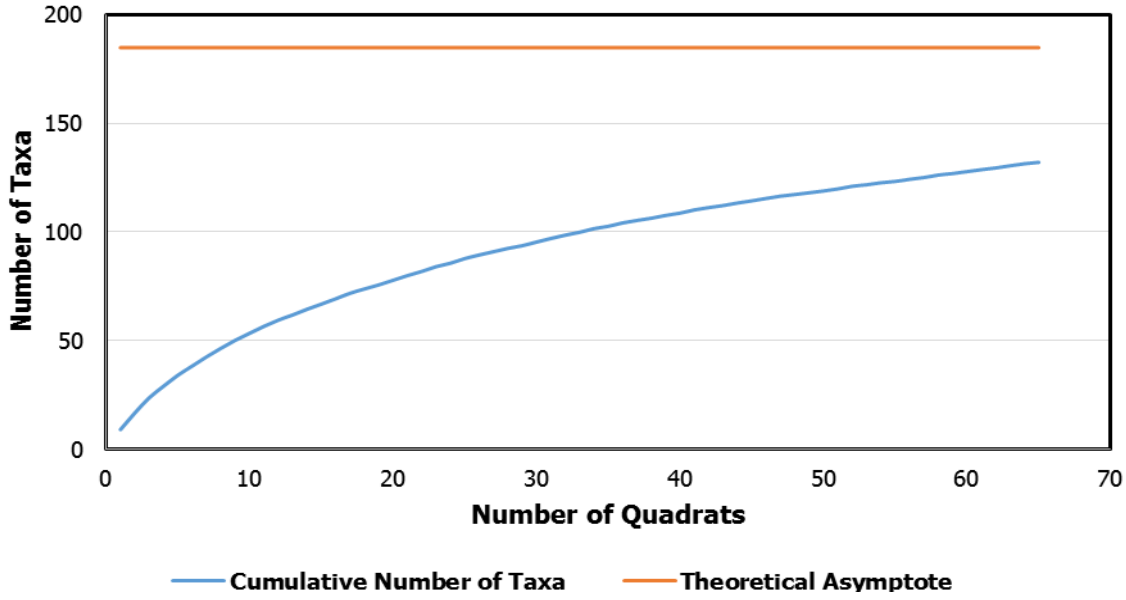


Figure 6: Average randomised species accumulation curve

6.2 Flora

A total of 132 vascular plant species were recorded across 65 survey quadrats in 2022. A total of 51 genera and 28 families were represented within the 132 vascular plant species across the survey areas. The majority of taxa recorded were represented in Chenopodiaceae (28 taxa), Fabaceae (26 taxa) and Scrophulariaceae (19 taxa) families. Annual species represented 0.85% of all recorded plant species within the survey areas. This percentage of annual reflects the lack of rains prior to the survey. The previous surveys completed by Mattiske Consulting (1994-2018) have recorded a total of 393 taxa which were representative of 179 genera and 60 families. The most commonly represented families were the Chenopodiaceae (85 taxa), Fabaceae (64 taxa), Asteraceae (58 taxa), Poaceae (44 taxa) and Scrophulariaceae (37 taxa).

The taxa recorded during the 2022 survey are presented in Appendix C and from 1994 surveys to 2022 in Appendix E. The 2022 data included some 31 species not recorded previously (1994 to 2018) on the Sunrise Dam survey areas. The 2022 survey was dominant with *Acacia* shrublands to the east of the tenements and *Chenopod* flats towards to west. Across all the survey sites *Eremophila* and *Ptilotus* species were common with higher diversity of vegetation communities towards Lake Carey in the

western tenements due to increased soil diversity. Only two introduced species (**Erodium aureum* and **Sonchus oleraceus*) were recorded in 2022 compared to five species in 2018.

A small number of species collected could not be properly determined due to a lack of identifiable and distinguishable factors like flowering or fruiting material at the time of the survey in June 2022. If a plant could not be accurately placed into an identifiable species it was recorded at genus or family level, for example, *Tecticornia* sp.

The average species richness for the 65 survey quadrats in the additional survey areas was 9.89 ± (species/quadrat), with a range of 4 to 16 species per quadrat across Sunrise Dam.

6.3 Threatened and Priority Flora

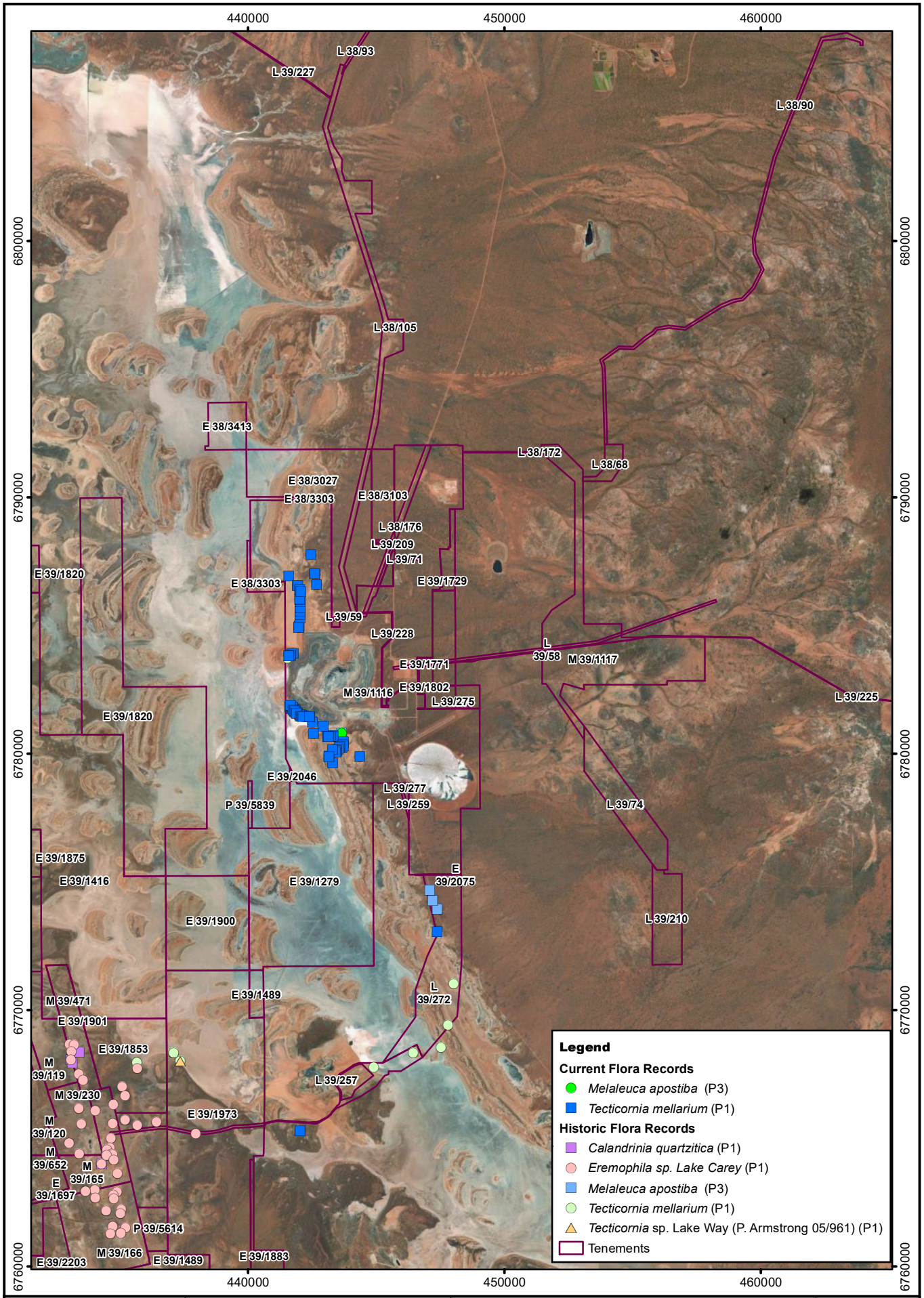
No threatened flora species pursuant to the Biodiversity Conservation Act 2016 (WA) and as listed by the DBCA (2018a), or pursuant to section 179 of the EPBC Act or listed by the DCCEEW (2022a), were recorded within the survey areas.

There were two priority species recorded in the 2022 survey along the edge of Lake Carey, Table 7, Figure 7. *Melaleuca apostiba* (P3) was located in the yellow sand dunes close to Lake Carey to the south of the open pit. *Tecticornia mellarium* (P1) was identified close to mining operations in the C9 vegetation community to the north and south of the pit on the edge of the Lake Carey. *Tecticornia mellarium* (P1) and *Melaleuca apostiba* (P3) were identified and confirmed by the Western Australian Herbarium (WAH).

- *Tecticornia mellarium* (P1) – Is a Chenopodiaceae plant that often fringes salt lakes with a succulent appearance. It has small, glandular beads that form tendrils up to 50cm high (WAH 2022).

- *Melaleuca apostiba* (P3) - Is a spreading shrub or small tree that grows up to 2 m high and has grey fissured bark and dull green leaves. It flowers red in June (WAH 2022).

Figure 7 includes the records of Priority species from this survey and from previous nearby surveys and as such includes coverage of the latter two species outside the current Sunrise Dam survey area and west of Lake Carey to the Butcher Well and Mt Minnie areas as undertaken for AngloGold Ashanti (Mattiske Consulting 2019). *Tecticornia* sp. *Lake Way* (P. Armstrong 05/961) (P1)*, Calandrinia quartzitica* (P1) and *Eremophila sp. Lake Carey* (P1) were found previously by Mattiske Consulting on the adjacent Butcher Well site for AngloGold Ashanti to the west of the Sunrise Dam Gold Mine but were not identified during the present 2022 survey on the eastern side of the Lake.



Imagery: ESRI, DigitalGlobe (Feb 2016)

N

0 1.5 3 km

Scale: 1:200,000
MGA94 (Zone 50)

CAD Ref: a2328_f21_03

Date: September 2022 | Rev: A | A4

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Sunrise Dam Gold Mine
Threatened and Priority Flora

Figure: **3**

Table 7: Priority taxa recorded within the survey areas in 2022 with GPS locations

Family Name	Confirmed Name	GPS Easting	GPS Northing	Collection #	POPN #	AREA (m)	Priority Status
Myrtaceae	*Melaleuca apostiba*	443651	6780788	LR28	20	50x20	P3
Chenopodiaceae	*Tecticornia mellarium*	443330	6780701	DR523	1	1x1	P1
Chenopodiaceae	*Tecticornia mellarium*	442397	6781441	DR523	1	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442157	6781466	DR523	17	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	442103	6781495	DR523	25	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	442276	6781448	DR523	3	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442347	6781436	DR523	3	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442207	6781468	DR523	5	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442550	6780782	DR523	1	1x1	P1
Chenopodiaceae	*Tecticornia mellarium*	443278	6780673	DR523	2	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443179	6780681	DR523	25	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443206	6780672	DR523	25	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443112	6780666	DR523	5	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443143	6780654	DR523	5	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	442944	6781067	DR523	5	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	442043	6781507	DR523	6	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	442005	6781525	DR523	4	1x1	P1
Chenopodiaceae	*Tecticornia mellarium*	441885	6781597	DR523	4	1x1	P1
Chenopodiaceae	*Tecticornia mellarium*	441931	6781569	DR523	4	1x1	P1
Chenopodiaceae	*Tecticornia mellarium*	442443	6787755	DR523	50	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	443470	6780098	ZG104	11	60x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443444	6780056	ZG104	5	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443421	6780070	ZG104	21	60x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441979	6784931	ZG104	1	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	442029	6785413	ZG104	9	60x60	P1
Chenopodiaceae	*Tecticornia mellarium*	442034	6785569	ZG104	2	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	442048	6785680	ZG104	4	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	442036	6785931	ZG104	4	50x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443661	6780243	ZG104	29	90x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443713	6780301	ZG104	7	30x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443593	6780276	ZG104	12	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	441641	6781831	ZG104	17	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441670	6781817	ZG104	~70	50x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441702	6781748	ZG104	~80	50x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441782	6781748	ZG104	1	2x2	P1
Chenopodiaceae	*Tecticornia mellarium*	441805	6781695	ZG104	4	10x5	P1
Chenopodiaceae	*Tecticornia mellarium*	441861	6781696	ZG104	1	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441734	6781807	ZG104	30	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	441646	6781899	ZG104	5	20x5	P1
Chenopodiaceae	*Tecticornia mellarium*	443727	6780448	ZG104	22	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	443679	6780342	ZG104	8	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442034	6786009	ZG104	2	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	442010	6786048	ZG104	4	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	441531	6783723	ZG104	~300	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	441772	6783912	ZG104	4	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441726	6783907	ZG104	7	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	441678	6783844	ZG104	7	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	441641	6783838	ZG104	8	15x5	P1
Chenopodiaceae	*Tecticornia mellarium*	441591	6783818	ZG104	18	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	442526	6781219	ZG104	5	2x2	P1
Chenopodiaceae	*Tecticornia mellarium*	441641	6781831	ZG104	17	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443564	6780228	ZG104	11	50x10	P1

Table 7: Priority taxa recorded within the survey areas in 2022 with GPS locations (continued)

Family Name	Confirmed Name	GPS Easting	GPS Northing	Collection #	POPN #	AREA (m)	Priority Status
Chenopodiaceae	*Tecticornia mellarium*	443509	6780160	ZG104	6	30x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443581	6780280	ZG104	20	30x30	P1
Chenopodiaceae	*Tecticornia mellarium*	444359	6779887	ZG104	25	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	441832	6781639	ZG87	10	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	441756	6781699	ZG87	10	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	441799	6781666	ZG87	20	40x40	P1
Chenopodiaceae	*Tecticornia mellarium*	441839	6781601	ZG87	5	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442598	6787009	ZS2096	40	50x50	P1
Chenopodiaceae	*Tecticornia mellarium*	441885	6781569	ZS2098	14	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442041	6781474	ZS2098	4	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442084	6781464	ZS2098	4	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442116	6781453	ZS2098	6	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442146	6781445	ZS2098	3	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442394	6781441	ZS2098	1	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	443163	6779894	ZS2098	1	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443291	6779631	ZS2098	3	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443296	6780150	ZS2098	1	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	443154	6779858	ZS2098	1	10x10	P1
Chenopodiaceae	*Tecticornia mellarium*	441934	6786542	ZS2098	5	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442008	6786408	ZS2098	2	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442063	6786320	ZS2098	3	20x20	P1
Chenopodiaceae	*Tecticornia mellarium*	442671	6786579	ZS2098	45	20x20	P1

6.4 Introduced (Weed) Plant Species

Two introduced (weed) species were recorded in the 2022 survey areas and both of these species have been recorded previously. The introduced weed species were **Erodium aureum* and **Sonchus oleraceus*. Both species were listed as Permitted (s11) pursuant to the Biosecurity and Agriculture Management Act 2007 according to the Department of Primary Industries and Regional Development.

The *Erodium aureum* was only found in three locations and the *Sonchrus oleraceus* was only found in one which is relatively low for the size of the tenements and the amount of mining disturbance over many decades. **Sonchus oleraceus* was recorded at the S19 site and **Erodium aureum* was recorded at S44, S40 and S41. Recorded locations are presented in Appendix F, and a brief description of each species is presented below.

- **Sonchus oleraceus* (ASTERACEAE) is an upright herb that can grow up to 1.5m tall. It produces yellow flowers all year and is often found in disturbed sites (WAH 1998-).

- **Erodium aureum* is a spreading, short lived perennial herb that grows up to 20 cm high with pink to purple flowers in spring. It is often recorded in sandy clay or clay loams (WAH 1998-).

6.5 Statistical Analysis

SIMPROF analysis identified 11 significantly associated groups of quadrats, from the 65 quadrats analysed. Where appropriate, outliers and small groupings were assigned to broader comparative vegetation units based on factors including species composition and site descriptions; this is particularly relevant where survey quadrats were established on ecotones. For the purposes of vegetation mapping, i.e., extrapolating quadrat data to generalised vegetation communities over broad areas, an inclusive rather than exclusive approach was adopted for outliers. Based on this statistical analysis, 11

significantly dissimilar vegetation communities were delineated within the survey areas (Global R = 0.714; p<0.001). The dendrogram representing the results of the CLUSTER analysis, and the corresponding 11 vegetation communities is illustrated in Appendix H. There were an additional 4 more vegetation communities separated from vegetation similarity and aerial photography to total 15 vegetation communities in the 2022 surveys.

6.6 Vegetation

Based on the statistical analysis in Primer, 11 vegetation communities were defined and mapped for 2022 survey areas. In addition to the statistical analysis, survey quadrat physical data, previous Mattiske mapping and aerial photographic maps were used to delineate the boundaries of 15 vegetation communities in the survey areas. The descriptions of the vegetation communities were based on Aplin's (1979) modification of the vegetation classification system of Specht (1970), to align with the NVIS. Vegetation communities were described at the association level of the NVIS classification framework, as defined by the ESCAVI (2003; Appendix A6), and are summarised below. The vegetation mapped is presented in Figure 8. A listing of species recorded within each vegetation community is set out in Appendix F. Vegetation community descriptions, topographic and edaphic information and representative photos for the communities in the additional survey areas are shown in Appendix G. A summary of the vegetation communities defined in 2022 for the recent survey areas is presented below.

Note: the descriptions of the communities have been updated to reflect the taxonomic review by *Acacia* specialists of the *Acacia aneura* group, and as such the following descriptions differ slightly from the former ones used by Mattiske Consulting (2013). Descriptions of the vegetation communities for the 2022 survey are outlined below including the additional vegetation sites. A full list of the vegetation communities for all Sunrise Dam survey areas are displayed in Appendix I (Mattiske Consulting 1994 - 2017).

A2 *Acacia ayersiana*, *Acacia ramulosa* var. *linophylla*, *Acacia craspedocarpa* mid open shrubland over *Ptilotus obovatus*, *Eremophila* spp., *Senna artemisioides* subsp. *filifolia* low sparse shrubland over *Rhagodia eremaea*, *Maireana* spp., *Atriplex* spp. sparse chenopod shrubland on red-brown sandy-loam on flats and mid slopes.

A3 Low mixed Woodland of *Acacia aneura, Acacia tetragonophylla, Exocarpos aphyllus, Hakea preissii, Pittosporum angustifolium, Santalum spicatum over Eremophila ?metallicorum, Cratystylis subspinescens, Eremophila latrobei subsp. glabra* over *Maireana sedifolia, Eremophila scoparia, Senna artemisioides subsp. filifolia* and other mixed shrubs.

A6 *Acacia ayersiana*, *Acacia* sp. Section Juliflorae, *Acacia tetragonophylla* mid open shrubland over *Eremophila margarethae*, *Ptilotus obovatus*, *Rhagodia* spp. low sparse shrubland over Poaceae spp. open grassland on red clay, occasionally with quartz and iron pebbles, on flats and mid slopes.

A7 *Acacia* sp. Section Juliflorae, *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla* mid open shrubland over *Eremophila forrestii*, *Maireana sedifolia*, *Ptilotus obovatus* low sparse shrubland over *Maireana triptera*, *Maireana pyramidata*, *Rhagodia drummondii* sparse chenopod shrubland on red sandy-loam soils.

A10 *Acacia aneura* var. *intermedia*, *Acacia aneura* var. *aneura*, *Acacia ramulosa* var. *ramulosa* mid open shrubland over *Ptilotus obovatus*, *Eremophila metallicorum*, *and Scaevola spinescens* low sparse shrubland over *Solanum lasiophyllum*, *Maireana pentatropis*, *and Maireana triptera* mixed shrubland on red clay-loam flats.

A13 Low Woodland of *Acacia minyura* over *Acacia tetragonophylla* over *Dodonaea viscosa, Solanum orbiculatum, Senna artemisioides subsp. filifolia, Cratystylis subspinescens, Eremophila miniata*

over Lawrencia squamata, Eragrostis eriopoda and denser patches of Triodia spp. in sandy-loam soils.

A15 *Acacia* sp. Section Juliflorae, *Acacia kempeana*, *Acacia tetragonophylla* mid semi-open shrubland over *Dodonaea lobulata*, *Senna artemisioides*, *Eremophila scoparia* low shrubland over *Ptilotus obovatus*, *Maireana carnosa*, *Solanum lasiophyllum* sparse shrubland on red clay, occasionally with quartz, on flats and mid slopes.

A16 *Acacia tysonii*, *Acacia* sp. Section Juliflorae, *Acacia* spp. open shrubland over *Dodonaea lobulata*, *Eremophila oldfieldii* subsp. *angustifolia*, *Psydrax rigidula* low sparse shrubland over *Ptilotus obovatus*, *Senna cardiosperma*, *Solanum lasiophyllum* sparse shrubland on red clay, with occasional quartz pebbles on flats and mid slopes.

C1 *Acacia fuscaneura*, *Hakea preissii*, *Acacia kalgoorliensis* mid open sparse shrubland over *Cratystylis subspinescens*, *Eremophila longifolia*, *Senna artemisioides* shrubland over *Maireana pyramidata*, *Atriplex* spp., *Solanum* spp. sparse shrubland on clay-loam flats.

C2 *Pittosporum angustifolium*, *Acacia tysonii*, *Hakea preissii* open shrubland over *Exocarpos aphyllus*, *Eremophila miniata*, *Cratystylis subspinescens* low shrubland over *Atriplex vesicaria*, *Maireana aphylla*, *Rhagodia drummondii* low sparse chenopod shrubland on clay-loam flats.

C9 *Tecticornia pruinosa*, *Frankenia fecunda*, *Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English 552) closed chenopod shrubland over *Lawrencia* spp., *Atriplex* spp., *Solanum nummularium* low sparse shrubland over *Sclerolaena fimbriolata*, *Asteridea chaetopoda*, *Maireana glomerifolia* low shrubland on red clay, with occasional salt crust formation.

C12 *Casuarina pauper* woodland over *Acacia kempeana*, *Acacia* sp. Section Juliflorae, *Eremophila scoparia* sparse shrubland over *Maireana sedifolia*, *Senna artemisioides*, *Ptilotus obovatus* low sparse shrubland on orange clay flats with occasional quartz pebbles.

C14 *Maireana pyramidata*, *Maireana triptera*, *Atriplex vesicaria* open chenopod shrubland over *Ptilotus obovatus*, *Frankenia* spp., *Solanum lasiophyllum* sparse chenopod shrubland over *Enneapogon* spp. sparse grassland on red clay flats with ironstone and quartz pebbles.

M2 *Melaleuca hamata*, *Duma florulenta*, *Hakea preissii* closed shrubland over *Eragrostis pergracilis*, *Eragrostis lacunaria* isolated clumps of grasses on orange-brown clay to loamy clay on flats.

S2 *Eremophila scoparia*, *Senna artemisioides*, *Maireana pyramidata* open shrubland over *Maireana carnosa*, *Atriplex vesicaria*, *Cratystylis subspinescens* low sparse shrubland on red clay flats with occasional quartz pebbles.

CL Cleared

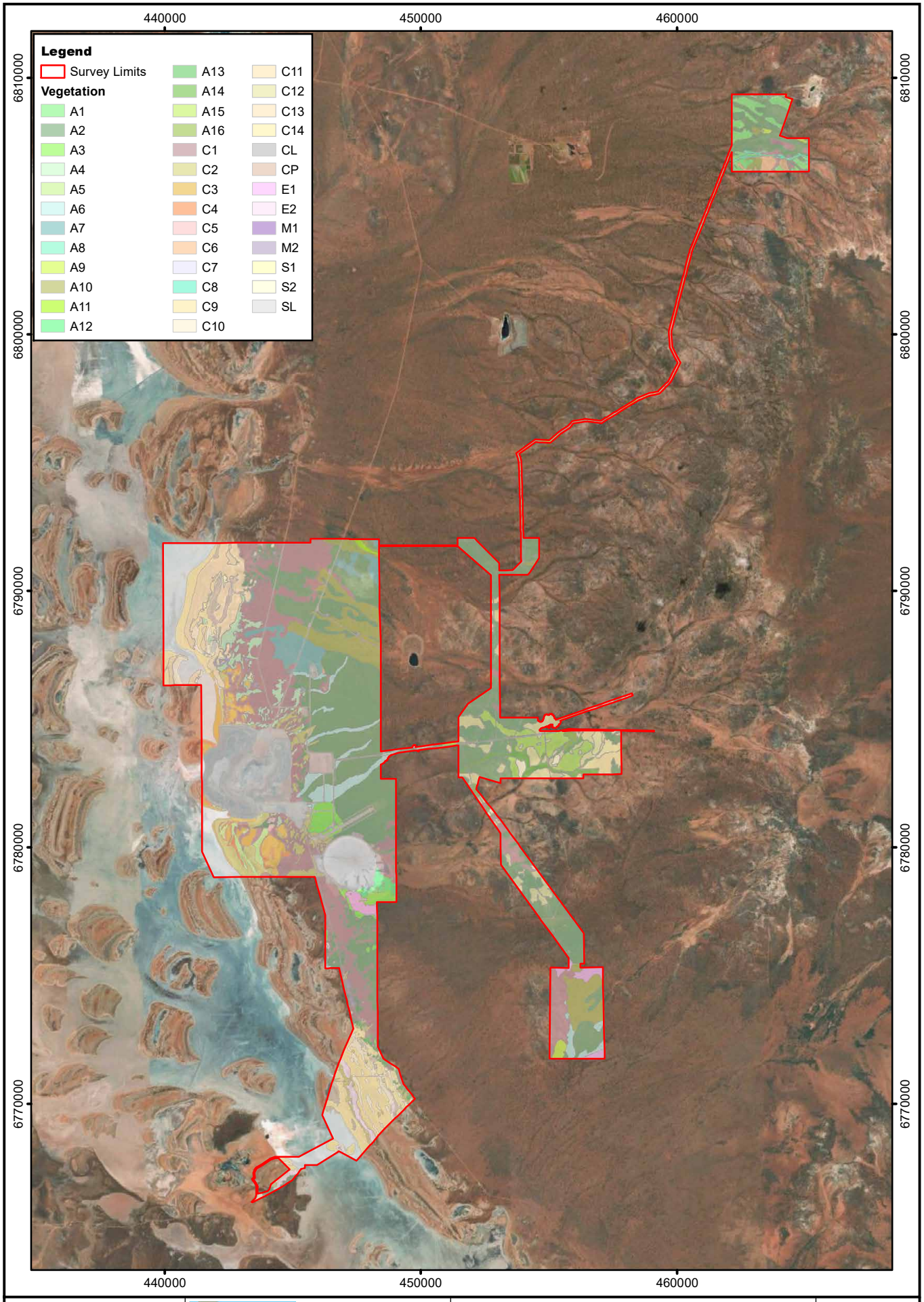
CP Clay Pan

SL Salt Lake

The total area of each vegetation community mapped within the 2022 survey areas and the corresponding percentage of the Total SDGM Survey Areas is presented in Table 8. The A2 community (*Acacia ayersiana*, *Acacia ramulosa* var. *linophylla*, *Acacia craspedocarpa* mid open shrubland over *Ptilotus obovatus*, *Eremophila* spp., *Senna artemisioides* subsp. *filifolia* low sparse shrubland over *Rhagodia eremaea*, *Maireana* spp., *Atriplex* spp. sparse chenopod shrubland on red-brown sandy-loam on flats and mid slopes) was the most common community mapped in the Sunrise Dam survey areas, comprising of 27.20% of the area (Figure 8). Cleared land occupied 11.03% of the survey areas.

Table 8: Area coverage of each vegetation community within the Sunrise Dam Gold Mine (SDGM) survey areas (see detailed description in Appendix I of all communities)

VEGETATION COMMUNITY	TOTAL AREA MAPPED on SDGM (ha)	PERCENTAGE OF TOTAL AREAS MAPPED (%)	ADDITIONAL AREAS MAPPED IN 2022 (ha)	PERCENTAGE OF TOTAL AREA (%)
A1	267.42	1.59	-	-
A2	4569.05	27.20	601.25	13.16
A3	205.22	1.22	1.24	0.60
A4	270.55	1.61	-	-
A5	89.48	0.53	-	-
A6	339.68	2.02	3.83	1.13
A7	352.25	2.10	-	-
A8	53.74	0.32	-	-
A9	42.87	0.26	-	-
A10	866.47	5.16	8.27	0.95
A11	35.80	0.21	4.62	12.91
A12	60.59	0.36	-	-
A13	41.48	0.25	2.22	5.35
A14	150.81	0.90	-	-
A15	294.34	1.75	-	-
A16	36.48	0.22	-	-
C1	2466.09	14.68	208.19	8.44
C2	469.90	2.80	2.23	0.47
C3	304.38	1.81	-	-
C4	103.02	0.61	-	-
C5	10.78	0.06	-	-
C6	83.26	0.50	-	-
C7	3.98	0.02	-	-
C8	1.88	0.01	-	-
C9	848.88	5.05	2.48	0.29
C10	204.62	1.22	-	-
C11	56.15	0.33	-	-
C12	382.72	2.28	102.24	26.71
C13	523.92	3.12	-	-
C14	159.18	0.95	10.07	6.33
CL	1897.91	11.30	15.88	0.84
CP	144.66	0.86	-	-
E1	136.14	0.81	0.0002	0.00
E2	96.56	0.57	-	-
M1	0.34	0.00	-	-
M2	44.31	0.26	0.45	1.02
S1	81.38	0.48	-	-
S2	36.43	0.22	3.13	8.59
TOTAL	**15732.72**	**93.64**	**966.10**	**86.79**



Imagery: ESRI, DigitalGlobe (Feb 2016)

N

0 1.5 3 km

Scale: 1:200,000
MGA94 (Zone 50)

CAD Ref: a2328_f20_05

Date: August 2022 | Rev: A | A4

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Sunrise Dam

Vegetation Mapping

Figure: **8**

6.7 Condition of the Vegetation

The condition of the vegetation within the survey areas ranged from completely degraded to very good to excellent, according to the Trudgen (1988; Appendix A5) scale. Within the survey areas these areas can be delineated as follows:

Very Good to Excellent: Areas of vegetation where no exploration or drill tracks encroach, typically at least 20 m distant from tracks.

Good: Areas bordering tracks and drill lines.

Degraded: Old waste mounds from drilling, old abandoned features and old tracks which have had some past attempts at rehabilitation.

Completely Degraded: Mining activities, transport and cattle degradation.

Considering the extent of past mining operations and the degree of impacts associated with tracks and drill lines, the absence of weed species was noteworthy and majority of the survey areas was very good to excellent.

6.8 Threatened and Priority Ecological Communities

No TECs, pursuant to the BC Act 2016 (WA) and as listed by the DBCA (2018b) were recorded within the survey areas or the wider survey areas.

No PECs as listed by the DBCA (2022b) were recorded within the survey areas.

7. DISCUSSION

A total of 132 vascular plant species were recorded across 65 survey quadrats in 2022 in comparison to the 191 vascular plant species recorded across 145 survey quadrats in 2018. If one compares with the wider Sunrise Dam survey areas the numbers are slightly lower than the 393 taxa which were representative of 179 genera and 60 families in the surveys undertaken between 1994 and 2018 by Mattiske Consulting; although an additional 31 species were recorded in the 2022 survey which were not recorded previously, see Appendix E. The majority of taxa recorded in 2022 were represented in Chenopodiaceae (28 taxa), Fabaceae (26 taxa) and Scrophulariaceae (19 taxa) families. This is similar to the most commonly recorded families in the surveys between 1994 and 2018 by Mattiske Consulting.

Two Priority flora species, *Tecticornia mellarium* (P1) and *Melaleuca apostiba* (P3) have been recorded on the Sunrise Dam tenements previously and were recorded again near the Lake Carey edge during the threatened and priority search in 2022. *Tecticornia* sp. *Lake Way* (P. Armstrong 05/961) (P1), *Calandrinia quartzitica* (P1) and *Eremophila sp. Lake Carey* (P1) were found previously by Mattiske Consulting on the adjacent Butcher Well site for Anglogold Ashanti to the west of the Sunrise Dam Gold Mine.

There have been 14 records of the *Tecticornia mellarium* (P1) from the Western Australian Herbarium and is located in the Coolgardie and Murchison IBRA regions. The *Tecticornia mellarium* (P1) has been identified at three geographical locations in Western Australia. The first location is 5 km West of Jandy Rock at the edge of Lake Barlee, Perrinvale Station in 1988, Lake Lefroy, Widgiemooltha, in the Eastern Goldfields sub-region collected on the 14th of September 2016 and around Lake Carey first collected in July 1998. The Lake Carey site has the largest population of *Tecticornia mellarium* (P1) mostly populated on the western side of the Lake. *Tecticornia mellarium* (P1) is common and dominant in a north/south orientation along the eastern side and western sides of Lake Carey. The *Tecticornia mellarium* (P1) does appear to have a greater prevalence to the south of Lake Carey and nearby salt lakes could be further surveyed into the future to better understand the geographical range. The *Tecticornia mellarium* (P1) is well documented on the southern shore lines of Lake Carey from surveys recorded since 1994 by Mattiske Consulting and the population may extend further north. The *Tecticornia mellarium* (P1) only inhibits a thin strip of land along the eastern side of Lake Carey in relatively low numbers in comparison to southern populations and removal of some *Tecticornia mellarium* (P1) near the mining expansion of the Cleo pit or waste dump would not affect overall percentages greatly.

There have been 13 records of *Melaleuca apostiba* (P3) from the Western Australian Herbarium and is located in the Great Victoria Desert and Murchison IBRA regions. It has been identified as far north as Lake Wells in the Laverton District to just south of Lake Carey often along the edge of salt lakes in sandy soil. The *Melaleuca apostiba* (P3) has a range of approximately 250km from the south of Lake Wells to the south of Lake Carey.

Two introduced (weed) species were recorded in the 2022 survey areas. The introduced weed species were **Erodium aureum* and **Sonchus oleraceus*. The **Erodium aureum* was only found in three locations in the 2022 survey and has a wide distribution from Denham, Western Australia to Alice Springs in the Northern Territory. The **Sonchus oleraceus* was only found in one location which is relatively low for the size of the tenements surveyed and the amount of cattle and mining disturbance. **Sonchus oleraceus* is a very common weed that inhabits most regions of Australia and has a strong seed dispersal of up to 8000 seeds in good rainfall and nutritious soil (WAH 2022).

Sixteen species of weed have been previously recorded at the Sunrise Dam Gold Mine between 2004 and 2018 (**Brassica tournefortii, *Cenchrus ciliaris, *Chenopodium murale, *Citrullus lanatus, *Cucumis melo, *Cucumis myriocarpus, *Cuscuta planiflora, *Dittrichia graveolens, *Erodium aureum, *Lysimachia arvensis, *Malvastrum americanum, *Mesembryanthemum crystallinum, *Schinus molle, *Silene nocturna, *Sonchus oleraceus, *Tamarix aphylla*). In general, the occurrence of these introduced

species was more restricted in 2022 which appears to relate to the decreased rainfall in recent years (Table 6).

The vegetation communities were consistent with previous vegetation mapping identified by Mattiske Consulting with *Acacia aneura* dominant on the sandy flats towards the east of the Sunrise Dam Gold Mine and *Chenopod* shrublands dominant near Lake Carey. The saline C9 community supported the *Tecticornia mellarium* (P1) and there were a few quartz ridges with C12 communities (with *Casuarina pauper* as the dominant species).

The dominant vegetation community in 2022 and in previous Mattiske Mapping jobs has been the A2 community (*Acacia ayersiana, Acacia ramulosa var. linophylla, Acacia craspedocarpa mid open shrubland over Ptilotus obovatus, Eremophila spp.* and *Senna artemisioides).*

8. CONCLUSIONS

In April 2022, AngloGold Ashanti Australia Limited commissioned Mattiske Consulting to undertake a flora and vegetation survey for some additional survey areas at the Sunrise Dam Gold Mine and to undertake detailed targeted searches for significant flora species at the Sunrise Dam Gold Mine. The total area of the Sunrise Dam survey areas is 16,796.60ha. This area included the recent area of 976.75ha in the additional survey areas.

The flora collected in 2022 was similar is diversity and composition compared to previous surveys undertaken by Mattiske Consulting from 2010 to 2018. The vegetation communities matched previous communities constructed in previous reports adjacent to areas surveyed in 2022 although a reduced vegetation health rating was noted with decreased rainfall in the years prior. Thirty-one species were collected in 2022 that have not been previously collected (Appendix E).

No threatened flora species pursuant to the Biodiversity Conservation Act 2016 (WA) and as listed by the DBCA (2018a), or pursuant to section 179 of the EPBC Act or listed by the DCCEEW, were recorded within the survey areas.

Within the survey area the *Tecticornia mellarium* (P1) only inhibits a thin strip of land along the eastern side of Lake Carey in relatively low numbers in comparison to southern populations. The species has also been identified on large expanses of the overall shoreline outside of AGAA tenure. Removal of some *Tecticornia mellarium* (P1) in the vicinity of the mining operations would not affect overall percentages greatly. The *Melaleuca apostiba* (P3) was localised to one location on a yellow sand dune close to the southern side of the open pit at Sunrise Dam. There are many locations of the *Melaleuca apostiba* (P3) outside of the AngloGold tenements.

Two introduced (weed) species were recorded in the 2022 survey areas. The introduced weed species were **Erodium aureum* and **Sonchus oleraceus*. Both species were listed as Permitted (s11) pursuant to the Biosecurity and Agriculture Management Act 2007 according to the Department of Primary Industries and Regional Development. The **Erodium aureum* was only found in three locations and the **Sonchus oleraceus* was only found in one which is relatively low for the size of the tenements and the amount of mining disturbance over many decades.

Fifteen vegetation communities were defined and mapped within the 2022 survey area. The majority of sites were situated on sandy clay or clay loam flats with low rocky break aways towards the east. Low *Acacia* woodlands formed a majority of the communities with *Chenopod* and *Tecticornia* shrublands dominant towards Lake Carey.

9. ACKNOWLEDGEMENTS

The authors would like to thank Matthew Stingemore and Nicolle Britland from AngloGold Ashanti Australia Limited for their assistance with this project. The authors would also like to thank taxonomists from the Western Australian Herbarium for their plant identification support.

10. LIST OF PERSONNEL

The following Mattiske Consulting personnel were involved in this project:

NAME	POSITION	SURVEY INVOLVEMENT	FLORA COLLECTION PERMIT
Dr E. M. Mattiske	Managing Director & Principal Ecologist	Planning, management & reporting	N/A
Mr L Rowles	Senior Botanist	Management, fieldwork and data analysis	FB62000020-4
Mr Z Sims	Experienced Botanist	Fieldwork and Data Collation and Plant Ids	FB62000025-4
Mr D Rubick	Botanist	Fieldwork and reporting	FB62000328-2
Mr J C Mooney	Botanist	Plant Ids	FB62000416
Mr Z Gates	Botanist	Fieldwork and Plant Ids	FB62000426
Ms K Lambert	Senior Botanist	Report review	FB62000023-4

11. REFERENCES

Aplin, T.E.H. (1979)
The Flora. In Environment and Science. Editor B.J. O'Brien, University of Western Australia Press, Perth, Western Australia.

ANBG (2022)
Botanical Districts of Australia. Austin botanical district (WAU) is located in central west in Western Australia, [Internet] retrieved from: https://www.anbg.gov.au/cpbr/anhsir/anhsir-manual/botanical-districts.html.

Beard J.S. (1976)
Vegetation Survey of Western Australia; Murchison, University of Western Australia Press, Nedlands, Western Australia.

Beard, J.S. (1990)
Plant Life of Western Australia. Kangaroo Press, Kenthurst NSW.

Biodiversity Conservation Act 2016 (WA)

Biosecurity and Agriculture Management Act 2007 (WA)

Biosecurity and Agriculture Management Regulations 2013 (WA)

Bureau of Meteorology (2022)
Climate averages for specific sites. http://www.bom.gov.au/climate/data/

Chao, A. (2004)
'Species richness estimation' in *Encyclopaedia of statistical sciences*, eds. N Balakrishnan, CB Read & B Vidakovic, Wiley, New York.

Clarke, K.R. & Gorley, R.N. (2015)
PRIMER v7: User manual/tutorial, PRIMER-E Ltd, Plymouth.

Colwell, R.K. (2006)
EstimateS: Statistical estimation of species richness and shared species from samples, version 8, computer software. Available from: <purl.oclc.org/estimates>.

Cowan, M. (2001)
'Murchison 1 (MUR1-East Murchison subregion)', in A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, eds. JE May & NL McKenzie, Department of Conservation and Land Management, Western Australia, pp. [466-479].

Department of Environment and Conservation (2013)
Definitions, categories and criteria for threatened and priority ecological communities. Accessed 10th December 2018. <http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities>

Department of Biodiversity, Conservation and Attractions (2018a)
Wildlife conservation (rare flora) notice 2018, *11 September 2018*, Minister for the Environment under section 23F (2) of the WC Act. <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants>

Department of Biodiversity, Conservation and Attractions (2018b)
List of Threatened Ecological Communities endorsed by the Western Australian Minister for the Environment, 28th June 2018. <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities>

Department of Biodiversity, Conservation and Attractions (2022a)
Threatened and Priority Flora List. <http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants>

Department of Biodiversity, Conservation and Attractions (2022b)
Priority Ecological Communities for Western Australia version 33 June 2022.
https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20Ecological%20Communities%20list.pdf

Department of Parks and Wildlife (2007-)
NatureMap, Mapping Western Australia's Biodiversity. <http://naturemap.dec.wa.gov.au>

Department of Parks and Wildlife (2017)
Conservation codes for Western Australian flora and fauna, May 2017.
<https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>

Department of Primary Industries and Regional Development (2012)
Western Australian Landform and Soil Mapping Data. Available from: Department of Primary Industries and Regional Development (formerly Department of Agriculture and Food).

Department of Primary Industries and Regional Development (2022)
Western Australian Organism List. http://www.biosecurity.wa.gov.au/>

Department of the Environment and Energy (2018)
Australia's bioregions (IBRA). <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra>

Department of Climate Change, Energy, the Environment and Water (2022a)
Environment Protection and Biodiversity Conservation Act 1999 List of Threatened Flora.
<http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora>

Department of Climate Change, Energy, the Environment and Water (2022b)
Protected Matters Search Tool. <https://www.environment.gov.au/epbc/protected-matters-search-tool>

Department of Climate Change, Energy, the Environment and Water (2022c)
Weeds of National Significance.
<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>

Department of Climate Change, Energy, the Environment and Water (2022d)
Environment Protection Biodiversity Conservation Act 1999 List of Threatened Ecological Communities. <http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>

Environmental Protection Authority (2016a)
Environmental Factor Guideline: Flora and Vegetation. EPA, Western Australia.

Environmental Protection Authority (2016b)
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. EPA, Western Australia.

Environmental Protection Act 1986 (WA)

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

Environmental Protection (Clearing of Native Vegetation) Regulations 2004

Executive Steering Committee for Australian Vegetation Information (2003)
Australian vegetation attribute manual: National vegetation information system, version 6.0, Department of the Environment and Heritage, Canberra.

Hopkins, A.J.M., Beeston, G.R. & Shepherd, D.P. (2001)
A database on the vegetation of Western Australia, stage 1, Technical Report No 251 (in press). Department of Agriculture.

Mattiske Consulting Pty Ltd (1994)
Flora and vegetation. Sunrise Dam – CTD Area. Unpublished report prepared for AngloGold Ashanti Australia Limited, December 1994.

Mattiske Consulting Pty Ltd (1999)
Flora and vegetation. Sunrise Dam – CTD Area. Unpublished report prepared for AngloGold Ashanti Australia Limited, March 1999.

Mattiske Consulting Pty Ltd (2000)
Flora and vegetation survey of a proposed waste dump extension at Sunrise Dam, Laverton. Unpublished report prepared for AngloGold Ashanti Australia Limited, February 2000.

Mattiske Consulting Pty Ltd (2001a)
Declared rare and priority flora search of proposed gas pipeline and transmission line route between Murrin and Sunrise Dam North Eastern Goldfields. Unpublished report prepared for AngloGold Ashanti Australia Limited, January 2001.

Mattiske Consulting Pty Ltd (2001b)
Declared rare and priority flora search proposed road survey, Sunrise Dam. Unpublished report prepared for AngloGold Ashanti Australia Limited, October 2001.

Mattiske Consulting Pty Ltd (2002a)
Flora and vegetation survey of mining leases at Sunrise Dam, Laverton. Unpublished report prepared for AngloGold Ashanti Australia Limited, February 2002.

Mattiske Consulting Pty Ltd (2002b)
Review of condition of vegetation near CTD Tailings Dam Sunrise Dam. Unpublished report prepared for AngloGold Ashanti Australia Limited, September 2002.

Mattiske Consulting Pty Ltd (2003a)
Flora and vegetation survey of the camp compound and services corridor, Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Limited, February 2003.

Mattiske Consulting Pty Ltd (2003b)
Flora and vegetation survey of the camp compound and services corridor, Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Limited, May 2003.

Mattiske Consulting Pty Ltd (2003c)
Summary of 1999, 2001 and 2003 flora and vegetation surveys of mining leases at Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Limited, May 2003.

Mattiske Consulting Pty Ltd (2004)
Flora and vegetation survey of the HiEarly lease area (M39/379) Sunrise Dam. Unpublished report prepared for AngloGold Ashanti Australia Limited, June 2004.

Mattiske Consulting Pty Ltd (2005a)
Flora and vegetation survey L38/90 Lease Area and Sunrise Dam Mining Area. Unpublished report prepared for AngloGold Ashanti Australia Limited, March 2005.

Mattiske Consulting Pty Ltd (2005b)
Review of condition of vegetation near CTD Tailings Dam Sunrise Dam. Unpublished report prepared for AngloGold Ashanti Australia Limited, June 2005.

Mattiske Consulting Pty Ltd (2005c)
Floristic survey of rocky ridges near Sunrise Dam and Islands within Lake Carey. Unpublished report prepared for AngloGold Ashanti Australia Limited, August 2005.

Mattiske Consulting Pty Ltd (2007)
Flora and vegetation survey Sunrise Dam Mining Area. Unpublished report prepared for AngloGold Ashanti Australia Limited, August 2007.

Mattiske Consulting Pty Ltd (2010)
Flora and vegetation survey of Sunrise Dam Mining Area. Unpublished report prepared for AngloGold Ashanti Australia Limited, December 2010.

Mattiske Consulting Pty Ltd (2012)
Threatened and priority flora survey for proposed Neville North expansion at Sunrise Dam Gold Mine. Unpublished report prepared for AngloGold Ashanti Australia Limited.

Mattiske Consulting Pty Ltd (2013)
Flora and vegetation survey of Sunrise Dam Gold Mine proposed CTD expansion. Unpublished report prepared for AngloGold Ashanti Australia Limited.

Mattiske Consulting Pty Ltd (2016)
Flora and vegetation survey of Sunrise Dam Gold Mine proposed Box cut. Unpublished report prepared for AngloGold Ashanti Australia Limited.

Mattiske Consulting Pty Ltd (2017)
Flora and vegetation assessment Butcher Well and Mt Minnie Project. Unpublished report prepared for AngloGold Ashanti Australia Limited.

Mattiske Consulting Pty Ltd (2019)
Flora and vegetation assessment Sunrise Dam Gold Mine Lake Carey and Bindah Road Project. Unpublished report prepared for AngloGold Ashanti Australia Limited.

Mott, J.J. (1972)
Germination studies on some annual species from an arid region of Western Australia. Journal of Ecology 60, 293-304.

Mott, J.J. (1973)
Temporal and spatial distribution of an annual flora in an arid region of Western Australia. Tropical Grasslands 7, 89-97.

Pringle, H.J.R., van Vreeswyk, A.M.E. and Gilligan S.A. (1994)
An inventory and condition survey of rangelands in the north-eastern Goldfields, Western Australia, Western Australia Department of Agriculture Technical Bulletin no. 87, Perth.

Shepherd, D.P., Beeston, G.R., Hopkins, A.J.M. (2002)
Native Vegetation in Western Australia, Technical Report 249. Department of Agriculture, Western Australia, South Perth.

Specht, RL (1970),
Vegetation' in *Australian Environment*, 4th edn., ed. GW Leeper, Melbourne University Press, Melbourne, pp. 44-67.

Thackway, R. and Cresswell, I. D. (1995)
An interim biogeographic regionalisation for Australia: a framework for establishing the national system of reserves. Australian Nature Conservation Agency, Canberra, Australian Capital Territory.

Tille, P. (2006)
Soil-landscapes of Western Australia's Rangelands and Arid Interior, Resource Management Technical Report 313. Department of Agriculture, Western Australia.

Trudgen, M.E. (1988)
A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Western Australian Herbarium (1998-)
FloraBase - the Western Australian Flora. Department of Parks and Wildlife. Accessed 1st February 2018. <https://florabase.dpaw.wa.gov.au/>

APPENDIX A1: THREATENED AND PRIORITY FLORA DEFINITIONS

Under section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), **threatened flora** are categorised as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent (Table A1.1).

Table A1.1 Federal definition of threatened flora species

Note: Adapted from section 179 of the EPBC Act.

CODE	CATEGORY	DEFINITION
Ex	**Extinct**	Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild**	Species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered**	Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered**	Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable**	Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent**	Species which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

The *Wildlife Conservation Act 1950* (WC Act) provides for (amongst other things) the protection of flora likely to become extinct or rare or otherwise in need of special protection in Western Australia under section 23F. **Threatened** (or **rare**) **flora** are listed in the *Wildlife Conservation (Rare Flora) Notice 2018* (under section 23F(2) of the WC Act; Department of Biodiversity, Conservation and Attractions 2018a) and are categorised under Schedules 1-4 as critically endangered, endangered, vulnerable or extinct, respectively. Threatened flora are defined as "likely to become extinct or is rare, or otherwise in need of special protection", pursuant to section 23F(2) of the WC Act. Threatened species are categorised as critically endangered, endangered, vulnerable and presumed extinct (Table A1.2).

Table A1.2 State definition of threatened flora species

Note: Adapted from Department of Parks and Wildlife (2017).

CODE	CATEGORY	DEFINITION
CR	**Critically endangered**	Species considered to be facing an extremely high risk of becoming extinct in the wild (listed under Schedule 1 of the *Wildlife Conservation (Rare Flora) Notice 2018*).
EN	**Endangered**	Species considered to be facing a very high risk of becoming extinct in the wild (listed under Schedule 2 of the *Wildlife Conservation (Rare Flora) Notice 2018*).
VU	**Vulnerable**	Species considered to be facing a high risk of becoming extinct in the wild (listed under Schedule 3 of the *Wildlife Conservation (Rare Flora) Notice 2018*).
EX	**Presumed extinct species**	Species that have been adequately searched for and there is no reasonable doubt that the last individual has died (listed under Schedule 4 of the *Wildlife Conservation (Rare Flora) Notice 2018*).

Priority flora species are defined as "possibly threatened species that do not meet the survey criteria, or are otherwise data deficient; or are adequately known, are rare but not threatened, meet criteria for near threatened or have recently been removed from the threatened species list for other than taxonomic reasons" (Department of Parks and Wildlife 2017). **Priority species are not afforded any protection under state or federal legislation**, however are considered significant under the Environmental Protection Authority's *Environmental Factor Guideline: Flora and Vegetation*. The Department of Parks and Wildlife categorises priority flora into four categories: Priority 1; Priority 2, Priority 3 and Priority 4 (Table A1.3).

Table A1.3: State definition of priority flora species

Note: Adapted from Department of Parks and Wildlife (2017).

CODE	CATEGORY	DEFINITION
P1	**Priority 1:** Poorly-known species	Known from one or a few locations (< 5) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation; or are otherwise under threat of habitat destruction or degradation. In urgent need of further survey.
P2	**Priority 2:** Poorly-known species	Known from one or a few locations (< 5). Some occurrences are on lands managed primarily for nature conservation. In urgent need of further survey.
P3	**Priority 3:** Poorly-known species	Known from several locations and the species does not appear to be under imminent threat; or from few but widespread locations with either a large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. In need of further survey.
P4	**Priority 4:** Rare, Near Threatened, and other species in need of monitoring	**a) 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. **b) Near Threatened -** Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. **c) Other -** Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX A2: THREATENED AND PRIORITY ECOLOGICAL COMMUNITY DEFINITIONS

Under section 181 of the EPBC Act, **threatened ecological communities** are categorised as critically endangered, endangered and vulnerable (Table A2.1).

Table A2.1 Federal definition of threatened ecological communities

Note: Adapted from section 181 and section 182 of the EPBC Act.

CATEGORY	DEFINITION
Critically Endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

Currently there is no Western Australian legislation covering the conservation of state listed **threatened ecological communities** (TECs), however, a non-statutory process is in place, whereby the Department of Parks and Wildlife have been identifying and informally listing TECs since 1994. Some of these TECs are endorsed by the Federal Minister as threatened, and some of these are also listed under the EPBC Act and therefore afforded legislative protection at the Commonwealth level.

Table A2.2 State definition of threatened ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
PD	**Presumed Totally Destroyed**	An ecological community will be listed as PD if there are no recent records of the community being extant **and either** of the following applies: **1.** Records within the last 50 years have not been confirmed despite thorough searches or known likely habitats; or **2.** All occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered**	An ecological community will be listed as CR when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting **any one or more of** the following criteria: **1.** The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; **2.** The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or **3.** The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	**Endangered**	An ecological community will be listed as EN when it has been adequately surveyed and is not CR, but is facing a very high risk of total destruction in the near future. The ecological community must meet **any one or more of** the following criteria: **1.** The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; **2.** The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or **3.** The ecological community is highly modified with potential of being rehabilitated in the short term future.
VU	**Vulnerable**	An ecological community will be listed as VU when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet **any one or more of** the following criteria: **1.** The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; **2.** The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; or **3.** The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.

Priority ecological communities (PECs) are defined as possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities, and are listed by the Department of Parks and Wildlife. Similarly to priority flora, PECs are not afforded legislative protection, however are considered significant under the Environmental Protection Authority's (2016a) *Environmental Factor Guideline: Flora and Vegetation*. The Department of Parks and Wildlife categorises priority ecological communities into five categories: Priority 1; Priority 2, Priority 3, Priority 4 and Priority 5 (Table A2.3).

Table A2.3 State definition of priority ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
P1	**Priority 1** (Poorly known ecological communities)	Ecological communities that are known from very few, restricted occurrences (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Most of these occurrences are not actively managed for conservation (e.g. located within agricultural or pastoral lands, urban areas, or active mineral leases) and for which immediate threats exist.
P2	**Priority 2** (Poorly known ecological communities)	Communities that are known from few small occurrences (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation.
P3	**Priority 3** (Poorly known ecological communities)	**1.** Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation; **2.** Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat; or **3.** Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Priority 4** (Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring)	**1.** Rare – Communities known from few occurrences that are considered to have been adequately surveyed, sufficient knowledge is available, and are considered not to be currently threatened. **2.** Near Threatened – Communities considered to have been adequately surveyed and do not qualify for Conservation Dependent, but are close to qualifying for Vulnerable. **3.** Communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority 5** (Conservation Dependent ecological communities)	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX A3: CATEGORIES AND CONTROL MEASURES OF DECLARED PEST (PLANT) ORGANISMS IN WESTERN AUSTRALIA

Section 22 of Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act) makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (section 12), or an organism for which a declaration under section 22 (2) of the Act is in force. Under the *Biosecurity and Agriculture Management Regulations 2013* (WA), declared pest plants are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (Table A4.1). The current listing of declared pest organisms and their control category is through the Western Australian Organism List (Department of Primary Industries and Regional Development 2018).

Table A3.1 Categories and control measures of declared pest (plant) organisms

Note: Adapted from *Biosecurity and Agriculture Management Regulations 2013*.

CONTROL CATEGORY	CONTROL MEASURES
C1 (Exclusion) '(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented.' Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.	In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C2 (Eradication) '(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible.' Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.	In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C3 (Management) '(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to: **(i)** alleviate the harmful impact of the declared pest in the area; or **(ii)** reduce the number or distribution of the declared pest in the area; or **(iii)** prevent or contain the spread of the declared pest in the area.' Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.	In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to: **(a)** alleviate the harmful impact of the declared pest in the area for which it is declared; or **(b)** reduce the number or distribution of the declared pest in the area for which it is declared; or **(c)** prevent or contain the spread of the declared pest in the area for which it is declared.

APPENDIX A4: OTHER DEFINITIONS

Environmentally sensitive areas

Environmentally sensitive areas are declared by the State Minister under section 51B of the *Environmental Protection Act 1986* (EP Act) and are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, gazetted 8 April 2005. Specific environmentally sensitive areas relevant to this report include: a defined wetland and the area within 50 metres of the wetland; the area covered by vegetation within 50 metres of rare flora; the area covered by a threatened ecological community; a Bush Forever site – further areas and information are described in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

Conservation significant flora

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), flora may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority species;
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Conservation significant vegetation

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), vegetation may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority ecological communities;
- restricted distribution;
- degree of historical impact from threatening processes;
- a role as a refuge; or
- providing an important function required to maintain ecological integrity of a significant ecosystem.

APPENDIX A5: DEFINITION OF VEGETATION CONDITION SCALE FOR THE EREMAEAN AND NORTHERN BOTANICAL PROVINCES

Vegetation condition ratings relate to vegetation structure, level of disturbance at each structural layer and the ability of the vegetation unit to regenerate (Table A5.1). Vegetation condition provides complementary information for assessing the significance of potential impacts.

Table A5.1 Definition of vegetation condition categories

Note: Adapted from Trudgen (1988).

CATEGORY	DEFINITION
Pristine	Pristine or nearly so, no obvious sign of damage caused by human activities since European settlement.
Excellent	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Very Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Good	Still retains basic vegetation structure or ability to regenerate after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely of almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

APPENDIX A6: NVIS STRUCTURAL FORMATION TERMINOLOGY

Note: Adapted from ESCAVI (2003).

COVER CHARACTERISTICS							
Foliage cover*	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover**	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% cover***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

GROWTH FORM	HEIGHT RANGES (m)	STRUCTURAL FORMATION CLASSES						
tree, palm	<10, 10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
shrub, cycad, grass-tree, tree-fern	<1, 1-2, >2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
heath shrub	<1, 1-2, >2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
chenopod shrub	<1, 1-2, >2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
samphire shrub	<0.5, >0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	spare samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
hummock grass	<2, >2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
tussock grass	<0.5, >0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grassland	isolated clumps of tussock grasses	tussock grasses
other grass	<0.5, >0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
sedge	<0.5, >0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
rush	<0.5, >0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
forb	<0.5, >0.5	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
fern	<1, 1-2, >2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
bryophyte	<0.5	closed bryophytelan d	bryophytelan d	open bryophytela nd	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	<10, 10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
aquatic	0-0.5, <1	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
seagrass	0-0.5, <1	closed seagrass bed	seagrass bed	open seagrass bed	sparse seagrasses	isolated seagrasses	isolated clumps of seagrasses	seagrasses

APPENDIX B: LOCATION OF VEGETATION SURVEY QUADRATS ESTABLISHED IN THE SURVEY AREAS, 2022

Site	Location (GDA94 Zone51J)	
	EASTING (mE)	Northing (mN)
S01	453951	6778931
S02	448693	6783730
S03	449006	6783760
S04	449352	6783797
S05	448709	6783731
S06	453841	6779513
S07	456050	6775742
S08	456128	6776383
S09	455713	6776417
S10	455859	6776895
S11	455346	6776934
S12	455057	6777148
S13	455564	6777383
S14	454869	6778225
S15	454501	6777950
S16	449778	6783890
S17	449976	6783890
S18	450669	6783860
S19	451218	6784041
S20	447370	6773039
S21	447443	6773352
S22	447295	6773564
S23	447143	6773968
S24	447004	6774590
S25	446990	6774724
S26	446878	6775126
S27	453898	6790778
S28	453303	6790729
S29	454243	6791072
S30	453883	6778657
S31	453928	6778362
S32	453658	6778682
S33	454452	6779541
S34	454633	6778885
S35	454301	6778291
S36	455172	6777842
S37	454811	6777820
S38	454630	6784705
S39	455116	6784852
S40	455537	6785027
S41	456988	6785496

APPENDIX B: LOCATION OF VEGETATION SURVEY QUADRATS ESTABLISHED IN THE SURVEY AREAS, 2022

Site	Location (GDA94 Zone51J)	
	EASTING (mE)	Northing (mN)
S42	447709	6774387
S43	447924	6773607
S44	456795	6785484
S45	457375	6785674
S46	457729	6785760
S47	449551	6791731
S48	449067	6791776
S49	448711	6791768
S50	453321	6780561
S51	453575	6779766
S52	453443	6779571
S53	447993	6773359
S54	447198	6775124
S55	447582	6774884
S56	448091	6774977
S57	448188	6774162
S58	447551	6773970
S59	450172	6791764
S60	456077	6785208
S61	456437	6785321
S62	454214	6791680
S63	454249	6791453
S64	450599	6791770
S65	451279	6791763

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family		Species	NatureMap	MCPL 2022
Acanthaceae		*Harnieria kempeana* subsp. *muelleri*	X	
Aizoaceae	*	*Carpobrotus aequilaterus*	X	
		Gunniopsis quadrifida	X	
		Sarcozona praecox	X	
	*	*Aizoaceae* sp.		X
Amaranthaceae		*Ptilotus divaricatus*	X	
		Ptilotus exaltatus	X	
		Ptilotus obovatus	X	X
		Ptilotus polystachyus	X	
		Ptilotus roei	X	
		Ptilotus schwartzii	X	
		Ptilotus ?*schwartzii* var. *schwartzii*		X
		Ptilotus sp.		X
		Surreya diandra	X	
Apocynaceae		*Leichhardtia australis*		X
		Marsdenia australis	X	
		Vincetoxicum lineare		X
Araliaceae		*Trachymene glaucifolia*	X	
Asparagaceae		*Arthropodium* sp. Goldfields (H. Pringle 2188)	X	
		Dichopogon fimbriatus	X	
Asteraceae		*Brachyscome ciliaris*		X
		Calotis sp.	X	
		Centipeda pleiocephala	X	
		Cratystylis subspinescens		X
		Dichromochlamys dentatifolia	X	
		Erodiophyllum acanthocephalum	X	
		Erymophyllum ramosum	X	
		Erymophyllum ramosum subsp. *ramosum*	X	
		Gnephosis arachnoidea	X	
		Gnephosis brevifolia	X	
		Gnephosis macrocephala	X	
		Helipterum craspedioides	X	
		Lemooria burkittii	X	
		Olearia mucronata	X	
		Podolepis aristata subsp. *affinis*	X	
		Podolepis capillaris	X	
		Podolepis kendallii	X	
		Rhodanthe charsleyae	X	
		Rhodanthe propinqua	X	
		?*Schoenia cassiniana*		X
	*	*Sonchus oleraceus*		X
		Streptoglossa cylindriceps	X	
		Waitzia acuminata var. *acuminata*	X	
Boraginaceae		*Halgania cyanea*	X	
Brassicaceae		*Arabidella trisecta*	X	
		Lepidium platypetalum	X	X
Campanulaceae		*Isotoma petraea*		X
		Lobelia heterophylla	X	
		Lobelia winfridae	X	

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family	*Species*	NatureMap	MCPL 2022
Casuarinaceae	*Casuarina pauper*	X	X
	Casuarina sp.		X
Celastraceae	*Stackhousia muricata* subsp. *annual (W.R. Barker 2172)*	X	
	Stackhousia sp. Mt Keith (G. Cockerton & G. O'Keefe 11017)	X	
Chenopodiaceae	*Atriplex codonocarpa*		X
	Atriplex nana	X	X
	Atriplex quinii	X	
	Atriplex vesicaria		X
	Dysphania glomulifera subsp. *eremaea*	X	
	Dysphania kalpari	X	
	Enchylaena lanata		X
	Enchylaena tomentosa var. *tomentosa*		X
	Halosarcia undulata	X	
	Maireana amoena		X
	Maireana carnosa	X	
	Maireana eriosphaera	X	
	Maireana georgei	X	
	Maireana glomerifolia		X
	Maireana lobiflora		X
	Maireana pentatropis	X	
	Maireana planifolia	X	
	Maireana pyramidata		X
	Maireana sedifolia	X	
	Maireana sp.		X
	Maireana suaedifolia		X
	Maireana thesioides	X	
	Maireana tomentosa	X	
	Maireana trichoptera	X	
	Maireana triptera	X	X
	Maireana villosa	X	X
	Maireana sedifolia		X
	Mariaena sp.		X
	Rhagodia drummondii		X
	Rhagodia eremaea		X
	Roycea divaricata	X	
	Salsola australis	X	X
	Sclerolaena cuneata	X	
	Sclerolaena densiflora	X	
	Sclerolaena deserticola	X	
	Sclerolaena eriacantha	X	
	Sclerolaena hybrid	X	
	Sclerolaena tetragona	X	
	Tecticornia calyptrata	X	
	Tecticornia disarticulata	X	
	Tecticornia indica subsp. *bidens*		X
	Tecticornia laevigata	X	
	Tecticornia pergranulata subsp. *elongata*	X	
	Tecticornia sp. Lake Way (P. Armstrong 05/961)	X	
	Tecticornia mellarium (P1)	X	X
	Tecticornia undulata	X	
	Tecticornia verrucosa	X	
	Tecticornia sp.	X	X
	Sclerolaena diacantha		X
	Sclerolaena eurotioides		X
	Sclerolaena fimbriolata		X
	Chenopodiaceae sp.		X

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family		*Species*	NatureMap	MCPL 2022
Convolvulaceae		*Convolvulus clementii*	X	
	*	*Cuscuta planiflora*	X	
		Duperreya commixta	X	X
Cucurbitaceae		*Cucumis* sp.		X
Euphorbiaceae		*Euphorbia australis*	X	X
Exocarpos		*Exocarpos aphyllus*		X
Fabaceae		*Acacia aneura group*	X	
		Acacia aneura		X
		Acacia aptaneura		X
		Acacia ayersiana		X
		Acacia burkittii	X	X
		Acacia caesaneura	X	
		Acacia ?caesaneura (narrow phyllode variant)		X
		Acacia calcarata	X	
		Acacia coolgardiensis	X	
		Acacia craspedocarpa	X	X
		Acacia craspedocarpa hybrid	X	
		Acacia ?donaldsonii		X
		Acacia doreta	X	
		Acacia effusifolia		X
		Acacia incurvaneura	X	
		Acacia heteroneura var. *jutsonii*		X
		Acacia kalgoorliensis	X	X
		Acacia kempeana	X	
		Acacia masliniana	X	
		Acacia papyrocarpa	X	
		Acacia pteraneura	X	X
		Acacia quadrimarginea	X	
		Acacia ramulosa hybrid	X	
		Acacia ramulosa var. *ramulosa*	X	X
		Acacia sp. Wondinong (A.A. Mitchell 917)	X	
		Acacia tetragonophylla		X
		Acacia tysonii	X	
		Acacia mulganeura		X
		Acacia oswaldii		X
		Acacia sp.		X
		Glycine canescens	X	
		Indigofera georgei	X	
		Mirbelia microphylla	X	
		Senna artemisioides		X
		Senna artemisioides subsp. *x artemisioides*	X	X
		Senna artemisioides subsp. *x artemisioides x artemisioides* subsp. *filifolia*	X	
		Senna artemisioides subsp. *x coriacea*	X	
		Senna artemisioides subsp. *helmsii*	X	
		Senna artemisioides subsp. *filifolia*		X
		Senna artemisioides subsp. *×sturtii*		X
		Senna cardiosperma	X	
		Senna pleurocarpa	X	
		Senna ?glutinosa subsp. *chatelainiana*		X
		Senna sp.	X	X
		Swainsona beasleyana	X	
		Swainsona formosa	X	
		Swainsona halophila	X	
		Swainsona oroboides	X	

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family		*Species*	NatureMap	MCPL 2022
Fabaceae		*Swainsona purpurea*	X	
(continued)		*Swainsona* sp.	X	
		Templetonia ?*incrassata*		X
		Fabaceae sp.		X
Frankeniaceae		*Frankenia cordata*	X	
		Frankenia fecunda	X	X
		Frankenia interioris	X	
		Frankenia laxiflora	X	
		Frankenia setosa	X	X
		Frankenia sp.	X	
Gentianaceae		*Schenkia clementii*	X	
Geraniaceae	*	*Erodium aureum*		X
Goodeniaceae		*Goodenia gypsicola*	X	
		Goodenia havilandii	X	
		Goodenia lyrata	X	
		Goodenia macroplectra	X	
		Goodenia mimuloides	X	
		Goodenia quasilibera	X	
		Scaevola spinescens		X
		Velleia glabrata	X	
		Velleia rosea	X	
Lamiaceae		*Hemigenia botryphylla*	X	
		Hemigenia exilis	X	
		Prostanthera althoferi subsp. *althoferi*	X	
		Teucrium teucriiflorum		X
Loranthaceae		*Amyema fitzgeraldii*	X	
		Amyema gibberula var. *tatei*	X	
		Amyema miraculosa subsp. *boormanii*	X	
		Amyema preissii	X	
		Lysiana murrayi	X	
Malvaceae		*Brachychiton gregorii*		X
		Corchorus sp.		X
		Lawrencia chrysoderma		X
		Lawrencia glomerata	X	
		Lawrencia helmsii	X	
		Lawrencia squamata		X
		Malvaceae sp.		X
		Sida calyxhymenia	X	X
		Sida ? *ectogama*		X
		Sida fibulifera		X
		Sida sp.		X
		Sida sp. L (A.M. Ashby 4202)	X	
		Sida sp. tiny glabrous fruit (A.A. Mitchell PRP1152)	X	
Myrtaceae		*Calytrix desolata*	X	
		Eucalyptus celastroides subsp. *virella*	X	
		Eucalyptus celastroides x yilgarnensis	X	
		Eucalyptus comitae-vallis	X	
		Eucalyptus ewartiana	X	
		Eucalyptus horistes		X
		Eucalyptus lesouefii	X	

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family		*Species*	NatureMap	MCPL 2022
Myrtaceae		*Eucalyptus longissima*	X	
(Continued)		*Eucalyptus lucasii*	X	
		Eucalyptus oleosa	X	
		Eucalyptus oleosa subsp. *oleosa*		X
		Eucalyptus rigidula	X	
		Eucalyptus salubris	X	
		Melaleuca apostiba (P3)	X	
		Melaleuca interioris	X	
		Verticordia interioris	X	
Phyllanthaceae		*Phyllanthus baeckeoides*	X	
Poaceae		*Aristida contorta*	X	
		Aristida obscura	X	
		Austrostipa eremophila	X	
		Austrostipa elegantissima		X
		Cymbopogon obtectus	X	
		Enneapogon caerulescens	X	X
		Enneapogon cylindricus	X	
		Eragrostis lacunaria	X	
		Eragrostis lanipes	X	
		Eragrostis leptocarpa	X	
		Eragrostis pergracilis	X	
		Eriachne flaccida	X	
		Iseilema membranaceum	X	
		Monachather paradoxus	X	
		Paspalidium clementii	X	X
	*	*Rostraria cristata*	X	
		Themeda avenacea	X	
		Triodia ?basedowii		X
		Triodia sp.		X
Polygonaceae		*Duma florulenta*	X	
Portulacaceae		*Calandrinia eremaea*	X	
		Calandrinia polyandra	X	
		Calandrinia sp. Menzies (F. Hort et al. FH 4100)	X	
	*	*Portulaca* sp.		X
Proteaceae		*Grevillea deflexa*	X	
		Grevillea sarissa subsp. *bicolor*	X	
		Grevillea sarissa subsp. *sarissa*	X	
		Grevillea ?didymobotrya		X
		Grevillea nematophylla subsp. *supraplana*		X
		Grevillea berryana		X
		Grevillea sp.		X
		Hakea preissii		X
Pteridaceae		*Cheilanthes lasiophylla*		X
		Cheilanthes sieberi		X
		Cheilanthes sieberi subsp. *sieberi*		X
Rubiaceae		*Pomax* sp. Sand dunes (P.G. Wilson 752)	X	
		Psydrax latifolia	X	
		Psydrax rigidula	X	
		Psydrax suaveolens		X

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family	*Species*	NatureMap	MCPL 2022
Rutaceae	*Philotheca brucei* subsp. *brucei*	X	
Santalaceae	*Santalum lanceolatum*	X	X
	Santalum sp.		X
Sapindaceae	*Alectryon oleifolius* subsp. *canescens*	X	X
	Dodonaea lobulata	X	X
	Dodonaea rigida		X
	Dodonaea viscosa ?subsp. *angustissima*		X
	Dodonaea viscosa subsp. *mucronata*	X	
	?*Dodonaeae* sp.		X
Scrophulariaceae	*Eremophila clarkei*	X	
	Eremophila compacta subsp. *fecunda*	X	
	Eremophila eriocalyx		X
	Eremophila exilifolia	X	
	Eremophila falcata	X	
	Eremophila foliosissima	X	
	Eremophila forrestii subsp. *forrestii*	X	
	Eremophila galeata	X	
	Eremophila georgei		X
	Eremophila gilesii ?subsp. *variabilis*		X
	Eremophila glabra subsp. *glabra*	X	
	Eremophila glabra subsp. *tomentosa*	X	
	Eremophila granitica		X
	Eremophila homoplastica	X	
	Eremophila interstans	X	
	Eremophila latrobei	X	
	Eremophila latrobei subsp. *glabra*	X	X
	Eremophila latrobei subsp. *latrobei*	X	X
	Eremophila longifolia	X	X
	Eremophila margarethae		X
	Eremophila metallicorum	X	
	Eremophila miniata	X	X
	Eremophila oldfieldii subsp. *angustifolia*		X
	Eremophila oldfieldii subsp. ?*oldfieldii*		X
	Eremophila platycalyx		X
	Eremophila platycalyx subsp. *platycalyx*		X
	Eremophila punctata	X	
	Eremophila scoparia	X	X
	Eremophila spectabilis subsp. *brevis*	X	
	Eremophila youngii subsp. *youngii*		X
	Eremophila sp.	X	
	Myoporum sp.		X
	Scrophulariaceae sp.		X
Solanaceae	*Crenidium spinescens*	X	
	Lycium australe		X
	Solanum ashbyae	X	
	Solanum austropiceum	X	
	Solanum lasiophyllum	X	X
	Solanum nummularium	X	X
	Solanum orbiculatum subsp. *orbiculatum*	X	
	Solanum sturtianum	X	
Thymelaeaceae	*Pimelea microcephala* subsp. *microcephala*	X	

APPENDIX C: VASCULAR PLANT SPECIES RECORDED FROM THE DESKTOP ASSESSMENT AND WITHIN THE SUNRISE DAM SURVEY AREAS, 2022

Note: * denotes introduced species; P1-P5 denote priority flora species (WAH 1998-).

Family	*Species*	NatureMap	MCPL 2022
Violaceae	*Hybanthus floribundus* subsp. *chloroxanthus*	X	
	Hybanthus floribundus subsp. *curvifolius*	X	
Zygophyllaceae	*Zygophyllum compressum*	X	
	Zygophyllum iodocarpum		

APPENDIX D: ASSESSMENT OF PRIORITY FLORA POTENTIALLY PRESENT IN THE SUNRISE DAM SURVEY AREAS, 2022

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains MAL – Mallee; MUR – Murchison

TAXON	FAMILY	SCC	DESCRIPTION AND HABITAT		POTENTIAL TO OCCUR IN SURVEY AREA
Bossiaea eremaea	Fabaceae	P3	Habit: Flowers: Flowering period: Soils: IBRA Distribution: Florabase records:	Divaricately-branched, spreading shrub, to 1.2 m high. Red-yellow-purple-brown July to September Deep red sand. GVD, MUR 17	Low Specimens have been found less than 200km from the survey area. However preferred habitat is unlikely and species is considered uncommon. This species has not been recorded on previous surveys between 1999 and 2016.
Calandrinia quartzitica	Montiaceae	P1	Habit: Flowers: Flowering period: Soils: IBRA Distribution: Florabase records:	Scrambling erect perennial herb, height 12-25 cm, very succulent basal leaves, petals 5, creamy white blushed with pink, stigmas 3 and numerous stamens. White to pink September, October Flat plains, clay, loam with some gravels and quartz stones. MUR 10	Medium Specimens have previously been identified 60 Km away on the western side of Lake Raeside to the west of Sunrise Dam. The soil and proximity to the SDGM is similar.
Calandrinia sp. Menzies (F. Hort et al. FH 4100)	Montiaceae	P3	Habit: Flowers: Flowering period: Soils: IBRA Distribution: Florabase records:	Semi-erect to erect annual herb, 3-6.5 cm high. Pink/ Purple/ Blue April, August and October Flat plains, soil red-brown clayey sand with some gravels and quartz stones. MUR 5	Medium Specimens have been found within 40km of the survey area. Total collection number is low; however, habitat type is likely to occur throughout most of the survey. This species has not been recorded on previous surveys between 1999 and 2017.
Calytrix praecipua	Myrtaceae	P3	Habit: Flowers: Flowering period: Soils: IBRA Distribution: Florabase records:	Shrub, 0.3-0.7 m high. Pink-white. June-July or September-November Skeletal sandy soils over granite or laterite. Breakaways, outcrops. GAS, GID, GVD, LSD, MUR 28	Low Specimens have been found less than 100km from the survey area. Preferred habitat is unlikely to occur in the survey area. This species has not been recorded on previous surveys between 1999 and 2016.

APPENDIX D: ASSESSMENT OF PRIORITY FLORA POTENTIALLY PRESENT IN THE FIVE PROPOSED PROJECT AREAS

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains MAL – Mallee; MUR – Murchison

TAXON	FAMILY	SCC	DESCRIPTION AND HABITAT	POTENTIAL TO OCCUR IN SURVEY AREA
Eremophila sp. Lake Carey (E. Mattiske LM197)	Scrophulariaceae	P1	Habit: Shrub, 1.2 m high. Flowers: White to mauve. Flowering period: October Soils: On slopes, rocky and pebbly soils IBRA Distribution: MUR Florabase records: 5	Medium Specimens have been found south of the survey areas and west of Lake Carey. Preferred habitat is unlikely to occur in the survey area; although recorded to west and south on small rises with rocky and pebbly soils.
Goodenia lyrata	Goodeniaceae	P3	Habit: Prostrate herb, with lyrate leaves. Flowers: Yellow Flowering period: August Soils: Red sandy loam. Near claypan. IBRA Distribution: GAS, GVD, MUR, PIL Florabase records: 18	Medium Specimens have been found less than 100km from the survey area. Preferred habitat is likely however this species has not been recorded on previous surveys between 1999 and 2016.
Hemigenia exilis	Lamiaceae	P4	Habit: Erect, multi-stemmed shrub, 0.5-2 m high. Flowers: Blue-purple/white Flowering period: April or September-November Soils: Normally grows on laterite breakaways or red-brown clay slopes. IBRA Distribution: MUR Florabase records: 41	Medium Specimens have been found less than 200km north-west of the survey area. Preferred habitat is likely to occur however this species has not been recorded in previous nearby surveys between 1999 and 2016.
Hybanthus floribundus subsp. *chloroxanthus*	Violaceae	P3	Habit: Multi-stemmed shrub, to 0.7 m high. Flowers: Blue & white Flowering period: August-October Soils: Normally grows in dark red-brown soil, never sandy, rich in iron oxide and laterite. Usually in rocky areas, creek banks and along drainage lines. IBRA Distribution: MUR Florabase records: 23	Medium Species has been recorded less than 50 km from survey area. Preferred soils are expected in the survey area, however rocky areas and creeklines are not likely. This species has not been recorded within nearby survey areas in 1999 and 2000.

APPENDIX D: ASSESSMENT OF PRIORITY FLORA POTENTIALLY PRESENT IN THE SUNRISE DAM PROJECT AREA

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains MAL – Mallee; MUR – Murchison

TAXON	FAMILY	SCC	DESCRIPTION AND HABITAT	POTENTIAL TO OCCUR IN SURVEY AREA
Melaleuca apostiba	Myrtaceae	P3	Habit: Spreading shrub, to 2 m high, with grey fissured bark and dull green leaves. Flowers: Red Flowering period: June Soils: Red sandy soil on dunes and the edge of salt lakes/ Clay pans. IBRA Distribution: GVD, MUR Florabase records: 11	High Preferred habitat is very likely within survey area. Specimens recorded less than 200 km from the survey area.
Lysiandra baeckeoides (formerly *Phyllanthus baeckeoides*)	Phyllanthaceae	P3	Habit: Shrub, 0.5-1.5 m high Flowers: White-yellow/green-yellow Flowering period: July to September Soils: Red lateritic & sandy clay soils and Granite outcrops IBRA Distribution: GVD, MUR Florabase records: 31	Low Specimens have been found within 100km of the survey area. Preferred habitat is not likely to be found on the survey area and it has not been found on previous nearby surveys.
Olearia mucronata	Asteraceae	P3	Habit: Densely branched, unpleasantly aromatic shrub, 0.6-1 m high. Flowers: White & yellow Flowering period: Aug-Dec or Jan Soils: Schistose hills, along drainage channels IBRA Distribution: MUR, PIL Florabase records: 13	Low Specimens have been found within 100km of the survey area. However preferred habit is not likely to be found. This species has not been recorded on previous nearby surveys between 1999 and 2016.
Tecticornia sp. Lake Way (P. Armstrong 05/961)	Chenopodiaceae	P1	Habit: Small upright shrub 30 to 40 cm tall with a spread to 10 cm. Foliage yellow and green. Flowers: Three flowered clusters forming a spike. Flowering period: September to October Soils: Lake bed, occasionally be inundated. Grey loamy clay sand. IBRA Distribution: MUR Florabase records: 8	Medium Specimens have been recorded less than 50km from survey area. Preferred habitat is likely; however, this species has not been recorded on previous surveys between 1994 and 2016.

APPENDIX D: ASSESSMENT OF PRIORITY FLORA POTENTIALLY PRESENT IN THE SUNRISE DAM PROJECT AREA

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains MAL – Mallee; MUR – Murchison

TAXON	FAMILY	SCC	DESCRIPTION AND HABITAT		POTENTIAL TO OCCUR IN SURVEY AREA
Tecticornia mellarium	Chenopodiaceae	P1	Habit: Flowers: Flowering period: Soils: IBRA Distribution: Florabase records:	Rounded 30 cm high shrub. Fleshy, pea-shaped segments ranging red-green in colour. Three flowered clusters forming a spike. September to October brown sand clay on gypsum dunes and the edge of salt lakes. MUR 9	High Species has been recorded within nearby survey areas in 1999 and 2000. Specimens have been recorded less than 50 km from the current survey area.

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
ACANTHACEAE	*Harnieria kempeana* subsp. *muelleri*	X											
AIZOACEAE	* *Carpobrotus aequilaterus*	X									X	X	
	Carpobrotus sp.		X			X							
	Gunniopsis propinqua							X					
	Gunniopsis quadrifida	X	X			X		X			X	X	
	* *Mesembryanthemum crystallinum*								X				
	Sarcozona praecox	X											
	Tetragonia cristata					X		X					
	Aizoaceae sp.												X
AMARANTHACEAE	*Alternanthera denticulata*											X	
	Ptilotus aervoides							X					
	Ptilotus calostachyus							X					
	Ptilotus chamaecladus								X			X	
	Ptilotus divaricatus	X											
	Ptilotus exaltatus	X											
	Ptilotus gaudichaudii subsp. *gaudichaudii*					X		X					
	Ptilotus helipteroides							X	X			X	
	Ptilotus macrocephalus							X					
	Ptilotus nobilis					X		X	X				
	Ptilotus obovatus	X						X			X		X
	Ptilotus obovatus var. *obovatus*		X	X	X	X	X	X	X	X		X	
	Ptilotus polystachyus	X						X					
	Ptilotus roei	X											
	Ptilotus schwartzii	X											
	Ptilotus schwartzii var. *schwartzii*			X		X							X
	Ptilotus sp.										X	X	X
	Surreya diandra	X						X			X		
ANACARDIACEAE	* *Schinus molle*							X					
APIACEAE	*Daucus glochidiatus*								X				
APOCYNACEAE	*Leichhardtia australis*												X
	Marsdenia australis	X	X	X	X	X	X	X	X	X	X	X	
	Rhyncharrhena linearis			X		X	X	X		X		X	
	Vincetoxicum lineare												X
ARALIACEAE	*Trachymene glaucifolia*	X											
ASPARAGACEAE	*Arthropodium* sp. Goldfields (H. Pringle 2188)	X											
	Dichopogon fimbriatus	X											
ASPHODELACEAE	*Bulbine semibarbata*							X	X				
ASTERACEAE	*Angianthus tomentosus*								X				
	Angianthus sp.								X				
	Asteridea chaetopoda		X		X	X	X				X	X	

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
ASTERACEAE (Continued)	*Brachyscome ciliaris*							X	X		X	X	X
	Brachyscome sp.								X	X			
	Calotis hispidula							X				X	
	Calotis sp.	X											
	Centipeda pleiocephala	X									X		
	Centipeda thespidioides							X				X	
	Cephalipterum drummondii								X				
	?*Chondropyxis halophila*					X	X						
	Chrysocephalum puteale							X					
	Chthonocephalus pseudevax							X					
	Cratystylis subspinescens		X	X	X	X	X	X	X	X	X	X	X
	Dichromochlamys dentatifolia	X											
*	*Dittrichia graveolens*							X					
	Erodiophyllum acanthocephalum	X						X	X	X		X	
	Erymophyllum ramosum	X						X					
	Erymophyllum ramosum subsp. *ramosum*	X											
	Gnephosis arachnoidea	X							X		X		
	Gnephosis brevifolia	X											
	Gnephosis macrocephala	X											
	Gnephosis tenuissima							X			X		
	Helipterum craspedioides	X							X				
	Kippistia suaedifolia											X	
	Lemooria burkittii	X											
	Minuria cunninghamii							X				X	
	Minuria gardneri										X	X	
	Myriocephalus pygmaeus							X					
	Olearia decurrens							X					
	Olearia incana					X							
	Olearia mucronata	X											
	Olearia pimeleoides								X				
	Podolepis aristata subsp. *affinis*	X											
	Podolepis canescens		X		X	X							
	Podolepis capillaris	X		X		X	X	X	X	X	X	X	
	Podolepis kendallii	X											
	Podolepis lessonii				X	X			X				
	Pogonolepis sp.									X			
	Pseudognaphalium luteoalbum										X	X	
	Rhodanthe charsleyae	X										X	
	Rhodanthe chlorocephala subsp. *splendida*								X			X	
	Rhodanthe floribunda											X	
	Rhodanthe maryonii							X	X				
	Rhodanthe propinqua	X						X					
	Rhodanthe stricta											X	
	Roebuckiella ciliocarpa							X	X				
	Roebuckiella oncocarpa							X					
	Schoenia cassiniana							X					X
	Senecio glossanthus							X					
	Senecio gregorii							X				X	
	Senecio pinnatifolius var. *pinnatifolius*											X	

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
ASTERACEAE	* *Sonchus oleraceus*							X				X	X
(Continued)	* *Sonchus* sp.								X				
	Streptoglossa cylindriceps	X											
	Streptoglossa liatroides							X				X	
	Vittadinia dissecta var. *hirta*											X	
	Waitzia acuminata			X									
	Waitzia acuminata var. *acuminata*	X							X				
	Waitzia acuminata var. *albicans*					X		X					
	Asteraceae sp.			X		X		X	X		X	X	
BORAGINACEAE	*Halgania cyanea*	X											
	Heliotropium curassavicum										X	X	
BRASSICACEAE	*Arabidella trisecta*	X											
	* *Brassica tournefortii*							X					
	Cuphonotus andraeanus							X					
	Lepidium platypetalum	X									X		X
CAMPANULACEAE	*Isotoma petraea*												X
	Lobelia gibbosa										X		
	Lobelia heterophylla	X											
	Lobelia winfridae	X											
	Wahlenbergia gracilenta							X	X				
	Wahlenbergia sp.										X		
CARYOPHYLLACEAE	* *Silene nocturna*					X							
CASUARINACEAE	*Casuarina obesa*										X	X	
	Casuarina pauper	X	X		X	X		X				X	X
	Casuarina sp.												X
CELASTRACEAE	*Stackhousia muricata* subsp. *annual (W.R. Barker 2172)*	X											
	Stackhousia sp. Mt Keith (G. Cockerton & G. O'Keefe 11017)	X											
CHENOPODIACEAE	*Atriplex bunburyana*			X		X	X						
	Atriplex codonocarpa							X					X
	Atriplex holocarpa							X					
	Atriplex nana	X	X		X	X		X			X		X
	Atriplex nummularia											X	
	Atriplex nummularia subsp. *spathulata*		X	X	X	X	X	X		X			
	Atriplex ?paludosa							X					
	Atriplex quadrivalvata var. *quadrivalvata*							X					
	Atriplex quinii	X						X					
	Atriplex vesicaria		X	X	X	X	X	X		X		X	X
	Atriplex sp.								X	X	X	X	
	Chenopodium curvispicatum											X	
	* *Chenopodium murale*							X				X	
	Didymanthus roei							X					
	Dissocarpus paradoxus											X	

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Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
CHENOPODIACEAE (Continued)	*Dysphania cristata*											X	
	Dysphania glandulosa							X					
	Dysphania glomulifera subsp. *eremaea*	X				X							
	Dysphania kalpari	X						X	X		X	X	
	Dysphania melanocarpa							X					
	Dysphania melanocarpa forma leucocarpa					X							
	Dysphania simulans												
	Dysphania sp.										X		
	Enchylaena lanata								X				X
	Enchylaena tomentosa										X		
	Enchylaena tomentosa var. *tomentosa*		X	X	X	X	X	X	X	X		X	X
	Enchylaena sp.									X			
	Halosarcia undulata	X											
	Maireana amoena												X
	Maireana aphylla		X		X	X		X					
	Maireana appressa			X		X		X					
	Maireana atkinsiana			X		X	X	X		X		X	
	Maireana carnosa	X						X	X	X		X	
	Maireana convexa							X	X				
	Maireana eriosphaera	X			X	X							
	Maireana georgei	X		X		X	X	X	X		X		
	Maireana glomerifolia			X	X	X	X	X	X	X	X	X	X
	Maireana lobiflora												X
	Maireana ?luehmannii											X	
	Maireana oppositifolia		X			X							
	Maireana pentatropis	X	X		X	X			X			X	
	Maireana planifolia	X						X	X			X	
	Maireana pyramidata			X		X	X	X	X	X		X	X
	Maireana sedifolia	X	X	X	X	X	X	X	X	X	X	X	X
	Maireana suaedifolia												X
	Maireana thesioides	X			X	X	X						
	Maireana tomentosa	X											
	Maireana tomentosa subsp. *tomentosa*					X	X	X	X	X			
	Maireana trichoptera	X											
	Maireana triptera	X		X		X		X	X	X	X	X	X
	Maireana villosa	X								X			X
	Maireana sp.				X	X				X		X	X
	Rhagodia drummondii			X	X	X	X	X		X		X	X
	Rhagodia eremaea		X			X		X	X	X	X		
	Rhagodia spinescens				X	X			X				
	Rhagodia eremaea												X
	Rhagodia sp.											X	
	Roycea divaricata	X											
	Salsola australis	X			X	X		X				X	X
	Sclerolaena bicornis var. *bicornis*				X	X		X					
	Sclerolaena cuneata	X		X		X	X	X	X	X	X	X	
	Sclerolaena densiflora	X						X					
	Sclerolaena deserticola	X						X				X	
	Sclerolaena diacantha						X	X	X				

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Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
CHENOPODIACEAE (Continued)	*Sclerolaena eriacantha*	X						X	X		X		
	Sclerolaena fimbriolata		X			X		X			X	X	
	Sclerolaena fusiformis		X			X		X			X	X	
	Sclerolaena hybrid	X											
	Sclerolaena lanicuspis							X				X	
	Sclerolaena obliquicuspis				X	X		X				X	
	Sclerolaena tetragona	X											
	Sclerolaena sp.									X		X	
	Tecticornia calyptrata	X	X			X							
	Tecticornia disarticulata	X		X		X							
	Tecticornia halocnemoides subsp. *caudata*		X			X							
	Tecticornia halocnemoides subsp. *halocnemoides*				X	X		X					
	Tecticornia indica subsp. *bidens*							X			X		X
	Tecticornia laevigata	X											
	Tecticornia mellarium (P1)	X			X	X					X		X
	Tecticornia pergranulata subsp. *elongata*	X											
	Tecticornia pergranulata subsp. *pergranulata*		X		X	X		X				X	
	Tecticornia pruinosa		X			X					X	X	
	Tecticornia sp.	X	X								X	X	X
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English 552)											X	
	Tecticornia sp. Lake Way (P. Armstrong 05/961)	X											
	Tecticornia undulata	X	X			X						X	
	Tecticornia verrucosa	X											
	Sclerolaena diacantha												X
	Sclerolaena eurotioides												X
	Sclerolaena fimbriolata												X
	Chenopodiaceae sp.										X	X	X
COLCHICACEAE	*Wurmbea tenella*									X			
CONVOLVULACEAE	*Convolvulus angustissimus* subsp. *angustissimus*							X					
	Convolvulus clementii	X											
	Convolvulus remotus											X	
	Cuscuta planiflora	X											
	Duperreya commixta	X										X	X
	Duperreya sericea				X	X		X	X				
CRASSULACEAE	*Crassula colorata* var. *acuminata*								X				
CUCURBITACEAE	* *Citrullus lanatus*							X					
	* *Cucumis melo*			X		X		X					
	* *Cucumis myriocarpus*							X					
	Cucumis sp.												X
CYPERACEAE	*Cyperus squarrosus*							X					
	Isolepis congrua							X					
	Isolepis sp.							X					
ELATINACEAE	*Bergia trimera*												

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Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
EUPHORBIACEAE	*Euphorbia australis*	X	X			X		X					X
	Euphorbia drummondii			X		X		X	X	X	X		
	Euphorbia sp.											X	
FABACEAE	*Acacia aneura*		X	X		X	X	X	X	X			X
	Acacia aneura sect.	X											
	Acacia aptaneura										X	X	X
	Acacia ayersiana		X	X	X	X	X	X	X	X	X		X
	Acacia burkittii	X		X		X		X	X	X	X	X	X
	Acacia ?caesaneura (narrow phyllode variant)												X
	Acacia caesaneura	X											
	Acacia calcarata	X											
	Acacia coolgardiensis	X	X			X							
	Acacia craspedocarpa		X	X		X	X	X	X	X		X	X
	Acacia craspedocarpa (hybrid)	X									X	X	
	Acacia ?donaldsonii												X
	Acacia doreta	X											
	Acacia effusifolia												X
	Acacia ?fuscaneura												
	Acacia heteroneura var. *jutsonii*		X			X							X
	Acacia incurvaneura	X					X			X			
	Acacia kalgoorliensis	X		X		X	X		X	X	X	X	X
	Acacia kempeana	X										X	
	Acacia ?ligulata									X			
	Acacia macraneura		X			X	X		X				
	Acacia masliniana	X						X	X				
	Acacia minyura							X			X		
	Acacia mulganeura							X	X				X
	Acacia oswaldii		X	X		X							X
	Acacia papyrocarpa	X											
	Acacia pteraneura	X						X	X				X
	Acacia quadrimarginea	X						X					
	Acacia ramulosa	X											
	Acacia ramulosa var. *linophylla*		X			X		X	X	X			
	Acacia ramulosa var. *ramulosa*	X		X		X	X	X			X	X	X
	Acacia ?rigens					X							
	Acacia ?sibirica								X				
	Acacia steedmanii							X					
	Acacia tetragonophylla		X	X	X	X	X	X	X	X		X	X
	Acacia tysonii	X	X		X	X					X	X	
	Acacia victoriae							X					
	Acacia sp.			X		X			X			X	X
	Acacia sp. Wondinong (A.A. Mitchell 917)	X											
	Glycine canescens	X											
	Indigofera georgei	X						X					
	Jacksonia arida					X		X					
	Mirbelia microphylla												
	Senna artemisioides												X
	Senna artemisioides subsp. *x artemisioides*	X			X	X	X	X	X	X	X		X

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Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
FABACEAE (Continued)	*Senna artemisioides* subsp. *x artemisioides x* subsp. *filifolia*	X										X	
	Senna artemisioides subsp. *x coriacea*												
	Senna artemisioides subsp. *filifolia*		X	X	X	X	X	X	X	X	X	X	X
	Senna artemisioides subsp. *helmsii*	X					X	X				X	X
	Senna artemisioides subsp. *oligophylla*								X				
	Senna artemisioides subsp. *petiolaris*											X	
	Senna artemisioides subsp. *x sturtii*			X		X	X					X	X
	Senna cardiosperma	X					X	X	X		X	X	
	Senna glutinosa subsp. *chatelainiana*							X				X	X
	Senna pleurocarpa	X											
	Senna stowardii						X	X	X			X	
	Senna sp.	X	X			X						X	X
	Swainsona affinis							X					
	Swainsona beasleyana	X											
	Swainsona formosa	X						X					
	Swainsona halophila	X										X	
	Swainsona kingii							X					
	Swainsona oroboides	X											
	Swainsona phacoides							X					
	Swainsona purpurea	X									X	X	
	Swainsona rostellata							X					
	Swainsona sp.	X										X	
	Templetonia incrassata											X	X
	Templetonia egena		X			X			X				
	Fabaceae sp.											X	X
FRANKENIACEAE	*Frankenia cinerea*		X			X	X	X					
	Frankenia cordata	X											
	Frankenia fecunda	X						X		X		X	X
	Frankenia interioris	X											
	Frankenia interioris var. *interioris*							X	X				
	Frankenia laxiflora	X											
	Frankenia pauciflora		X					X	X				
	Frankenia pauciflora var. *pauciflora*										X		
	Frankenia setosa	X	X	X		X	X	X	X	X	X	X	X
	Frankenia sp.	X			X	X				X		X	
GENTIANACEAE	*Schenkia australis*											X	
	Schenkia clementii	X									X		
GERANIACEAE	* *Erodium aureum*							X					X
	Erodium crinitum											X	
	Erodium cygnorum							X	X				
	Erodium sp.								X				
GOODENIACEAE	*Brunonia australis*							X	X				
	Goodenia gypsicola	X									X		
	Goodenia havilandii	X				X		X					
	Goodenia lyrata	X											

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
GOODENIACEAE (Continued)	*Goodenia macroplectra*	X											
	Goodenia maideniana											X	
	Goodenia mimuloides	X						X	X		X	X	
	Goodenia quasilibera	X											
	Goodenia triodiophila							X					
	Goodenia sp.											X	
	Scaevola collaris											X	
	Scaevola spinescens		X	X	X	X	X	X	X		X	X	X
	Velleia glabrata	X											
	Velleia rosea	X						X	X				
	Goodeniaceae sp.							X					
HALORAGACEAE	*Haloragis odontocarpa*								X				
	Haloragis odontocarpa ?*forma rugosa*											X	
HEMEROCALLIDACEAE	*Dianella revoluta*								X			X	
	Dianella revoluta var. *divaricata*							X					
JUNCAGINACEAE	*Triglochin hexagona*										X	X	
	Triglochin nana							X					
LAMIACEAE	*Hemigenia botryphylla*	X											
	Hemigenia exilis	X											
	Prostanthera althoferi subsp. *althoferi*	X						X					
	Prostanthera laricoides								X				
	Prostanthera ?*wilkieana*								X				
	Spartothamnella teucriiflora			X		X	X	X	X	X			
	Teucrium teucriiflorum											X	X
LAURACEAE	*Cassytha* sp. (ARL2.12)			X		X							
LORANTHACEAE	*Amyema fitzgeraldii*	X	X			X		X	X			X	
	Amyema gibberula var. *tatei*	X											
	Amyema maidenii subsp. *maidenii*							X					
	Amyema miquelii								X				
	Amyema miraculosa subsp. *boormanii*	X											
	Amyema preissii	X		X		X							
	Amyema sp.											X	
	Lysiana casuarinae								X			X	
	Lysiana murrayi	X	X			X		X					
MALVACEAE	*Abutilon cryptopetalum*					X		X			X		
	Abutilon malvifolium								X				
	Abutilon oxycarpum subsp. *Prostrate (A.A. Mitchell PRP 1266)*							X	X	X			
	Abutilon sp.								X		X	X	
	Brachychiton gregorii							X	X		X		X
	Corchorus sp.												X
	Hibiscus burtonii							X					
	Hibiscus sturtii var. ?*grandiflorus*							X					

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
MALVACEAE	*Lawrencia chrysoderma*		X			X	X	X			X		X
(Continued)	*Lawrencia glomerata*	X			X	X							
	Lawrencia helmsii	X			X	X							
	Lawrencia squamata		X		X	X		X		X	X		X
	Lawrencia sp.											X	
	* *Malvastrum americanum*							X					
	Sida calyxhymenia	X		X	X	X	X	X	X	X	X		X
	Sida ?ectogama												X
	Sida fibulifera							X					X
	Sida sp.		X			X			X	X	X	X	X
	Sida sp. Dark green fruits (S. van Leeuwen 2260)							X					
	Sida sp. Excedentifolia (J.L. Egan 1925)				X	X		X					
	Sida sp. L (A.M. Ashby 4202)	X											
	Sida sp. tiny glabrous fruit (A.A. Mitchell PRP1152)	X											
	Malvaceae sp.											X	X
MARSILEACEAE	*Marsilea exarata*							X					
MOLLUGINACEAE	*Hypertelis cerviana*							X					
MYRTACEAE	*Calytrix desolata*	X											
	Eucalyptus celastroides subsp. *virella*	X											
	Eucalyptus celastroides x yilgarnensis	X											
	Eucalyptus clelandiorum										X		
	Eucalyptus comitae-vallis	X											
	Eucalyptus ewartiana	X											
	Eucalyptus horistes							X	X	X			X
	Eucalyptus lesouefii	X											
	Eucalyptus longissima	X											
	Eucalyptus lucasii	X											
	Eucalyptus oleosa	X											
	Eucalyptus oleosa subsp. *oleosa*												X
	Eucalyptus rigidula	X											
	Eucalyptus salubris	X											
	Eucalyptus striaticalyx				X	X							
	Melaleuca apostiba (P3)	X									X		
	Melaleuca hamata										X	X	
	Melaleuca interioris	X											
	Melaleuca uncinata		X		X	X		X					
	Thryptomene sp.				X	X							
	Verticordia interioris	X											
	Melaleuca sp.		X										
NYCTAGINACEAE	*Boerhavia coccinea*							X					
	Boerhavia sp.										X		
OXALIDACEAE	*Oxalis* sp.											X	
PHYLLANTHACEAE	*Phyllanthus baeckeoides*	X											

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
PITTOSPORACEAE	*Pittosporum angustifolium*		X	X	X	X		X	X	X	X	X	
PLANTAGINACEAE	*Stemodia florulenta*		X										
POACEAE	*Aristida contorta*	X			X	X		X		X	X	X	
	Aristida holathera										X	X	
	Aristida holathera var. *holathera*		X		X	X		X		X			
	Aristida latifolia										X		
	Aristida obscura	X											
	Aristida sp.											X	
	Austrostipa elegantissima			X		X		X			X		
	Austrostipa eremophila	X											
	Austrostipa nodosa							X					
	Austrostipa ?scabra											X	
	Austrostipa scabra subsp. *scabra*					X			X				
	Austrostipa elegantissima												X
	Austrostipa sp.											X	
	* *Cenchrus ciliaris*							X		X			
	Chloris truncata											X	
	Cymbopogon obtectus	X										X	
	Dactyloctenium radulans							X					
	Digitaria brownii							X					
	?*Diplachne fusca*											X	
	Enneapogon avenaceus							X				X	
	Enneapogon caerulescens	X		X		X		X		X	X	X	X
	Enneapogon cylindricus	X											
	Enneapogon ?polyphyllus											X	
	Enneapogon sp.						X	X				X	
	Enteropogon ramosus							X		X	X	X	
	Eragrostis dielsii					X		X	X	X	X	X	
	Eragrostis eriopoda			X	X	X		X			X	X	
	Eragrostis falcata							X					
	Eragrostis lacunaria	X									X	X	
	Eragrostis laniflora				X	X	X	X				X	
	Eragrostis lanipes	X										X	
	Eragrostis leptocarpa	X											
	Eragrostis pergracilis	X						X				X	
	Eragrostis sp.											X	
	Eriachne flaccida	X											
	Eriachne helmsii							X					
	Eriachne mucronata											X	
	Eriachne pulchella subsp. *pulchella*					X	X	X					
	Eriachne sp.									X	X	X	
	Iseilema membranaceum	X											
	Monachather paradoxus	X				X		X			X		
	Paspalidium basicladum							X		X			
	Paspalidium clementii	X											X
	Rostraria cristata	X											
	Sporobolus actinocladus							X					

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
POACEAE (Continued)	*Themeda avenacea*	X											
	Tragus australianus							X					
	Triodia basedowii		X	X		X	X	X	X	X	X	X	X
	Triodia ?scariosa									X			
	Triodia sp.												X
	Triraphis mollis							X				X	
	* *Vulpia ?myuros*											X	
	Poaceae sp.						X		X		X	X	
POLYGONACEAE	*Duma florulenta*	X	X			X						X	
PORTULACACEAE	*Calandrinia eremaea*	X							X			X	
	Calandrinia pleiopetala							X					
	Calandrinia polyandra	X						X					
	Calandrinia ptychosperma							X	X			X	
	Calandrinia ?stagnensis							X					
	Calandrinia sp.								X		X	X	
	Calandrinia sp. Menzies (F. Hort et al. FH 4100)	X											
	* *Portulaca oleracea*							X		X		X	
	Portulaca sp.									X			X
	Portulacaceae sp.											X	
PRIMULACEAE	* *Lysimachia arvensis*							X					
PROTEACEAE	*Grevillea berryana*			X		X		X	X			X	X
	Grevillea deflexa	X											
	Grevillea ?didymobotrya												X
	Grevillea ?juncifolia subsp. *juncifolia*							X					
	Grevillea nematophylla		X										
	Grevillea ?nematophylla subsp. *supraplana*					X			X				
	Grevillea sarissa		X		X						X	X	
	Grevillea sarissa subsp. *bicolor*	X									X		
	Grevillea sarissa subsp. *?rectitepala*			X		X							
	Grevillea sarissa subsp. *sarissa*	X				X	X	X	X	X			
	Grevillea nematophylla subsp. *supraplana*												X
	Grevillea sp.											X	X
	Hakea preissii		X	X	X	X	X	X	X	X	X	X	X
PTERIDACEAE	*Cheilanthes austrotenuifolia*							X					
	Cheilanthes brownii							X					
	Cheilanthes lasiophylla					X	X					X	X
	Cheilanthes sieberi												X
	Cheilanthes sieberi subsp. *sieberi*					X	X	X	X	X		X	X
	Cheilanthes sp.											X	
RUBIACEAE	*Pomax* sp. Sand dunes (P.G. Wilson 752)	X											
	Psydrax attenuata var. *tenella*		X			X							
	Psydrax latifolia	X						X	X				

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
RUBIACEAE	*Psydrax rigidula*	X						X	X			X	
(Continued)	*Psydrax suaveolens*		X	X		X		X					X
	Synaptantha tillaeacea var. *tillaeacea*							X					
	?*Rubiaceae* sp.											X	
RUTACEAE	*Philotheca brucei* subsp. *brucei*	X											
SANTALACEAE	*Anthobolus leptomerioides*		X			X							
	Exocarpos aphyllus		X	X	X	X	X	X	X	X	X	X	X
	Leptomeria preissiana								X				
	Santalum acuminatum							X	X	X		X	
	Santalum lanceolatum	X										X	X
	Santalum spicatum		X	X	X	X	X	X	X	X	X	X	
	Santalum sp.												X
SAPINDACEAE	*Alectryon oleifolius* subsp. *canescens*	X							X				X
	Dodonaea lobulata	X						X	X	X	X	X	X
	Dodonaea rigida					X	X	X	X			X	X
	Dodonaea viscosa subsp. *angustissima*				X	X		X			X		X
	Dodonaea viscosa subsp. *mucronata*	X											
	?*Dodonaeae* sp.												X
SCROPHULARIACEAE	*Eremophila alternifolia*							X		X			
	Eremophila clarkei	X											
	Eremophila compacta subsp. *fecunda*	X											
	Eremophila eriocalyx							X	X				X
	Eremophila exilifolia	X											
	Eremophila falcata	X		X		X		X	X		X		
	Eremophila foliosissima	X											
	Eremophila forrestii										X		
	Eremophila forrestii subsp. *forrestii*	X	X			X	X	X	X			X	
	Eremophila galeata	X											
	Eremophila georgei							X	X				X
	Eremophila gilesii subsp. *variabilis*						X						X
	Eremophila glabra subsp. *glabra*	X			X	X		X				X	
	Eremophila glabra subsp. *tomentosa*	X											
	Eremophila granitica		X			X		X	X				X
	Eremophila homoplastica	X										X	
	Eremophila interstans	X											
	Eremophila latrobei	X							X		X	X	
	Eremophila latrobei subsp. *filiformis*							X					
	Eremophila latrobei subsp. *glabra*	X								X			X
	Eremophila latrobei subsp. *latrobei*	X		X		X	X	X					X
	Eremophila longifolia	X	X			X		X	X	X	X	X	X
	Eremophila maculata								X		X		
	Eremophila maculata subsp. *brevifolia*							X				X	
	Eremophila margarethae		X			X	X	X	X	X	X	X	X
	Eremophila metallicorum	X						X	X	X	X	X	
	Eremophila miniata	X	X	X	X	X		X			X	X	X

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED WITHIN SUNRISE DAM OPERATIONAL AREAS, 1994 TO 2022

Note: * denotes introduced species, P1, P2, P3, P4, and P5 denote Priority Flora Species (WAH 1998-)

Family	Species	Mattiske Consulting Pty Ltd											
		Naturemap	1994	1999	2000	2001	2003	2004	2010	2013	2017	2018	2022
SCROPHULARIACEAE (Continued)	*Eremophila oldfieldii* subsp. *angustifolia*		X			X	X	X	X	X		X	X
	Eremophila oldfieldii subsp. ?*oldfieldii*												X
	Eremophila oppositifolia subsp. *angustifolia*											X	
	Eremophila platycalyx		X										X
	Eremophila platycalyx subsp. *platycalyx*												X
	Eremophila punctata	X											
	Eremophila scoparia	X		X	X	X	X	X	X	X	X	X	X
	Eremophila serrulata					X						X	
	Eremophila spectabilis subsp. *brevis*	X											
	Eremophila youngii subsp. *youngii*			X		X		X		X		X	X
	Eremophila sp.	X								X		X	
	Myoporum sp.												X
	Scrophulariaceae sp.												X
SOLANACEAE	*Crenidium spinescens*	X											
	Duboisia hopwoodii								X				
	Lycium australe			X	X	X							X
	Nicotiana occidentalis										X		
	Nicotiana rosulata subsp. *rosulata*								X				
	Nicotiana rotundifolia							X					
	Solanum ashbyae	X											
	Solanum austropiceum	X											
	Solanum lasiophyllum	X	X	X	X	X	X	X	X	X	X	X	X
	* *Solanum nigrum*			X		X		X			X		
	Solanum nummularium	X		X		X	X	X	X	X	X	X	X
	Solanum orbiculatum										X		
	Solanum orbiculatum subsp. *orbiculatum*	X	X		X	X		X	X				
	Solanum plicatile								X				
	Solanum sturtianum	X											
TAMARICACEAE	* *Tamarix aphylla*							X					
THYMELAEACEAE	*Pimelea microcephala* subsp. *microcephala*	X	X		X	X		X				X	
	?*Pimelea* sp.											X	
VIOLACEAE	*Hybanthus floribundus* subsp. *chloroxanthus*	X											
	Hybanthus floribundus subsp. *curvifolius*	X											
ZYGOPHYLLACEAE	*Roepera compressa*											X	
	Roepera eremaea											X	
	Tribulus astrocarpus							X		X			
	Zygophyllum aurantiacum				X	X					X		
	Zygophyllum compressum	X											
	Zygophyllum eichleri							X					
	Zygophyllum eremaeum										X		
	Zygophyllum fruticulosum							X					
	Zygophyllum iodocarpum	X						X					
	Zygophyllum simile							X					
	Zygophyllum sp.										X		

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A2																															A6	A10	
	S01	S02	S04	S05	S07	S08	S09	S10	S11	S12	S13	S18	S27	S28	S36	S41	S46	S47	S49	S50	S54	S56	S57	S58	S59	S61	S62	S63	S64	S65	S03	S29	S48
Acacia aneura					X		X	X	X	X	X	X	X	X																		X	
Acacia aptaneura		X	X									X						X	X	X													X
Acacia ayersiana																																	
Acacia burkittii																																	
Acacia ?*caesaneura* (narrow phyllode variant)	X	X		X	X	X		X	X	X	X			X	X	X	X	X	X					X	X	X	X	X	X	X			X
Acacia craspedocarpa										X	X																				X		
Acacia ?*donaldsonii*					X	X						X												X	X								
Acacia effusifolia																																	
Acacia heteroneura var. *jutsonii*					X																												
Acacia kalgoorliensis																						X											
Acacia mulganeura		X		X										X	X		X	X	X	X	X		X			X			X	X			X
Acacia oswaldii																																	
Acacia pteraneura								X			X												X		X			X					X
Acacia ?*ramulosa* var. *ramulosa*		X	X	X	X	X		X		X			X	X	X			X	X						X			X					X
Acacia tetragonophylla	X		X	X				X		X	X		X	X		X	X		X	X			X				X	X			X	X	
Acacia sp.															X																			
Aizoaceae sp.																								X									
Alectryon oleifolius subsp. *canescens*																													X				
Atriplex codonocarpa			X																														
Atriplex ?*nana*																																	
Atriplex vesicaria																					X	X		X									
Austrostipa elegantissima																																	
Brachychiton gregorii									X															X									
Brachyscome ciliaris																																	
Casuarina pauper																		X	X									X					X
Casuarina sp.																																	
Cheilanthes lasiophylla																																	
Cheilanthes sieberi	X																																
Cheilanthes sieberi subsp. *sieberi*																															X		
Chenopodiaceae sp.																																	
Corchorus sp.																																	
Cratystylis subspinescens			X	X																	X	X											
Cucumis sp.																X																	
Dodonaea lobulata	X																																
Dodonaea rigida		X															X											X					
Dodonaea viscosa ?subsp. *angustissima*																																	
?*Dodonaeae* sp.																																	
Duperreya commixta	X														X		X	X					X				X						
Enchylaena lanata				X																													

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A2																																A6	A10	
	S01	S02	S04	S05	S07	S08	S09	S10	S11	S12	S13	S18	S27	S28	S36	S41	S46	S47	S49	S50	S54	S56	S57	S58	S59	S61	S62	S63	S64	S65	S03	S29	S48
Enchylaena tomentosa var. *tomentosa*			X																			X		X										
Enneapogon caerulescens																																			
Eremophila eriocalyx																					X			X										
Eremophila georgei																																			
Eremophila gilesii ?subsp. *variabilis*																X						X				X								
Eremophila granitica																																			
Eremophila latrobei ?subsp. *glabra*																																			
Eremophila latrobei subsp. *latrobei*	X													X																					
Eremophila longifolia																																			
Eremophila margarethae					X																				X				X	X				
Eremophila miniata																																			
Eremophila oldfieldii subsp. *angustifolia*																												X							
Eremophila oldfieldii subsp. ?*oldfieldii*																																			
Eremophila platycalyx			X																												X				
Eremophila platycalyx subsp. *platycalyx*																					X			X											
Eremophila scoparia																						X													
Eremophila youngii subsp. *youngii*			X															X	X														X	X
* *Erodium aureum*																X																			
Eucalyptus horistes						X																													
Eucalyptus oleosa subsp. *oleosa*																										X									
Euphorbia australis																																			
Exocarpos aphyllus																					X														
Fabaceae sp.																																			
Frankenia fecunda																					X			X											
Frankenia setosa																																			
Grevillea ?*didymobotrya*																													X	X					
Grevillea nematophylla subsp. *supraplana*					X		X											X																	
Grevillea berryana																											X				X				
Grevillea sp.																		X	X																
Hakea preissii			X																	X	X		X	X										
Isotoma petraea																																			
Lawrencia chrysoderma																																			
Lawrencia squamata																																			
Leichhardtia australis			X							X			X															X				X		
Lepidium platypetalum	X																																		
Lycium australe																																			
Maireana amoena																																			
Maireana glomerifolia			X																																
Maireana lobiflora																																			
Maireana pyramidata		X	X																							X									
Maireana sedifolia																				X		X	X												
Maireana suaedifolia																																			

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A2																																A6	A10	
	S01	S02	S04	S05	S07	S08	S09	S10	S11	S12	S13	S18	S27	S28	S36	S41	S46	S47	S49	S50	S54	S56	S57	S58	S59	S61	S62	S63	S64	S65	S03	S29	S48
Maireana triptera																				X		X	X											
Maireana villosa																																			
Maireana sp.																			X				X												
Malvaceae sp.																											X								
Mariaena sp.																																			
Myoporum sp.																							X												
Paspalidium clementii																X																			
Portulaca sp.																X										X									
Psydrax suaveolens																													X	X		X			
Ptilotus obovatus	X	X	X	X	X							X		X	X	X	X	X	X	X			X	X			X	X				X			
Ptilotus ?*schwartzii* var. *schwartzii*																X												X						
Ptilotus sp.																																			
Rhagodia drummondii	X												X																						
Rhagodia eremaea					X	X			X	X		X	X				X	X	X	X	X	X		X	X	X	X								X
Salsola australis																																			
Santalum lanceolatum			X										X									X													
Santalum sp.																			X																
Scaevola spinescens								X					X		X		X			X	X	X	X	X				X				X			
?*Schoenia cassiniana*																															X				
Sclerolaena diacantha																																			
Sclerolaena eurotioides																																			
Sclerolaena fimbriolata																																			
Scrophulariaceae sp.																																			
Senna artemisioides																																			
Senna artemisioides subsp. *artemisioides*																																			
Senna artemisioides subsp. *filifolia*																					X	X	X												
Senna ?*artemisioides* subsp. *helmsii*	X																																		
Senna artemisioides subsp. *×sturtii*																				X															
Senna ?*glutinosa* subsp. *chatelainiana*																																			
Senna sp.														X																					
Sida calyxhymenia		X										X																							
Sida ?*ectogama*	X														X													X							
Sida fibulifera																				X															
Sida sp.				X											X		X														X				
Solanum lasiophyllum														X		X				X															
Solanum nummularium																																			
* *Sonchus oleraceus*																																			
Tecticornia indica subsp. *bidens*																																			
Tecticornia mellarium (P1)																																			
Tecticornia sp.																																			
Templetonia ?*incrassata*																			X																

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A2																														A6	A10	
	S01	S02	S04	S05	S07	S08	S09	S10	S11	S12	S13	S18	S27	S28	S36	S41	S46	S47	S49	S50	S54	S56	S57	S58	S59	S61	S62	S63	S64	S65	S03	S29	S48
Teucrium teucriiflorum		X					X					X	X	X	X	X			X						X	X	X		X	X		X	X
Triodia ?*basedowii*					X	X	X	X																									
Triodia sp.																			X														
Vincetoxicum lineare																																	

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A11	A13		A15		C1										C9		C12													C14	S2	
	S19	S23	S24	S40	S60	S06	S21	S25	S26	S42	S43	S51	S53	S55	S20	S22	S14	S15	S17	S30	S31	S32	S34	S35	S37	S38	S39	S45	S52	S44	S16	S33
Acacia aneura																	X															
Acacia aptaneura																		X	X			X	X	X				X				
Acacia ayersiana		X	X																													
Acacia burkittii	X																										X					
Acacia ?*caesaneura* (narrow phyllode variant)	X			X	X												X	X		X			X		X	X	X		X			X
Acacia craspedocarpa																		X														
Acacia ?*donaldsonii*																		X	X						X							
Acacia effusifolia																			X													
Acacia heteroneura var. *jutsonii*																																
Acacia kalgoorliensis																																
Acacia mulganeura			X																			X	X		X							
Acacia oswaldii																							X	X								
Acacia pteraneura																																
Acacia ?*ramulosa* var. *ramulosa*			X															X	X			X	X	X								
Acacia tetragonophylla											X						X						X	X								
Acacia sp.																																
Aizoaceae sp.													X																			
Alectryon oleifolius subsp. *canescens*																																
Atriplex codonocarpa																														X		
Atriplex ?*nana*															X																	
Atriplex vesicaria			X					X	X	X	X		X	X																		
Austrostipa elegantissima												X																				
Brachychiton gregorii																																
Brachyscome ciliaris																														X		
Casuarina pauper																												X	X	X		
Casuarina sp.																	X		X	X	X				X	X						
Cheilanthes lasiophylla																													X			
Cheilanthes sieberi																																
Cheilanthes sieberi subsp. *sieberi*																																
Chenopodiaceae sp.					X																											
Corchorus sp.																											X					
Cratystylis subspinescens			X				X	X	X	X	X		X	X		X																
Cucumis sp.																																
Dodonaea lobulata				X	X		X					X						X		X	X											X
Dodonaea rigida																																
Dodonaea viscosa ?subsp. *angustissima*							X				X					X																
?*Dodonaeae* sp.																									X							
Duperreya commixta				X																X			X	X		X	X	X	X			
Enchylaena lanata				X	X						X						X									X	X	X				

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

	SPECIES	A11	A13		A15		C1									C9		C12														C14	S2	
		S19	S23	S24	S40	S60	S06	S21	S25	S26	S42	S43	S51	S53	S55	S20	S22	S14	S15	S17	S30	S31	S32	S34	S35	S37	S38	S39	S45	S52	S44	S16	S33
	Enchylaena tomentosa var. *tomentosa*		X	X																										X			
	Enneapogon caerulescens				X																													
	Eremophila eriocalyx																											X						
	Eremophila georgei																	X							X									
	Eremophila gilesii ?subsp. *variabilis*														X																			
	Eremophila granitica																															X		
	Eremophila latrobei ?subsp. *glabra*		X						X																									
	Eremophila latrobei subsp. *latrobei*																																	
	Eremophila longifolia								X																									
	Eremophila margarethae																																	
	Eremophila miniata		X					X																										
	Eremophila oldfieldii subsp. *angustifolia*																		X		X		X	X	X	X	X							
	Eremophila oldfieldii subsp. ?*oldfieldii*						X																										X	X
	Eremophila platycalyx																																	
	Eremophila platycalyx subsp. *platycalyx*								X					X																					
	Eremophila scoparia												X									X										X	X
	Eremophila youngii subsp. *youngii*																															X		
*	*Erodium aureum*				X																										X			
	Eucalyptus horistes																																	
	Eucalyptus oleosa subsp. *oleosa*																																	
	Euphorbia australis				X																													
	Exocarpos aphyllus																																	
	Fabaceae sp.													X																				X
	Frankenia fecunda										X	X		X	X		X																	
	Frankenia setosa			X				X		X				X		X																		
	Grevillea ?*didymobotrya*																																	
	Grevillea nematophylla subsp. *supraplana*																																	
	Grevillea berryana																																	
	Grevillea sp.																																	
	Hakea preissii		X	X				X			X	X		X	X								X											
	Isotoma petraea																													X				
	Lawrencia chrysoderma															X																		
	Lawrencia squamata			X						X	X	X		X	X																			
	Leichhardtia australis				X																												X	
	Lepidium platypetalum																																	
	Lycium australe			X																														
	Maireana amoena															X	X																	
	Maireana glomerifolia														X																			
	Maireana lobiflora										X																							
	Maireana pyramidata	X	X				X						X					X		X						X		X	X		X	X	
	Maireana sedifolia		X	X	X	X	X	X	X	X			X		X							X							X	X		X	X
	Maireana suaedifolia		X					X				X		X																				

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

	SPECIES	A11	A13		A15		C1									C9		C12													C14	S2	
		S19	S23	S24	S40	S60	S06	S21	S25	S26	S42	S43	S51	S53	S55	S20	S22	S14	S15	S17	S30	S31	S32	S34	S35	S37	S38	S39	S45	S52	S44	S16	S33
	Maireana triptera												X														X	X					
	Maireana villosa								X	X	X			X	X																		
	Maireana sp.				X			X		X	X	X							X		X	X	X	X							X		
	Malvaceae sp.																													X			
	Mariaena sp.																																
	Myoporum sp.												X																				
	Paspalidium clementii				X																												
	Portulaca sp.																																
	Psydrax suaveolens																																
	Ptilotus obovatus		X	X	X	X	X	X	X	X			X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Ptilotus ?*schwartzii* var. *schwartzii*																																
	Ptilotus sp.				X																												
	Rhagodia drummondii																																
	Rhagodia eremaea		X												X									X		X	X	X			X		
	Salsola australis																										X		X		X		
	Santalum lanceolatum																		X														
	Santalum sp.																																
	Scaevola spinescens				X													X	X		X		X	X	X	X	X	X			X		X
	?*Schoenia cassiniana*																																
	Sclerolaena diacantha									X							X																
	Sclerolaena eurotioides	X																															
	Sclerolaena fimbriolata							X								X																	
	Scrophulariaceae sp.							X																									
	Senna artemisioides																																X
	Senna artemisioides subsp. *artemisioides*	X											X						X											X			
	Senna artemisioides subsp. *filifolia*		X		X	X	X		X	X	X	X	X		X						X	X	X	X	X		X	X	X		X	X	X
	Senna ?*artemisioides* subsp. *helmsii*																																
	Senna artemisioides subsp. *×sturtii*																							X									X
	Senna ?*glutinosa* subsp. *chatelainiana*																		X							X							
	Senna sp.																																X
	Sida calyxhymenia																																
	Sida ?*ectogama*																									X							
	Sida fibulifera												X																				
	Sida sp.												X							X				X									
	Solanum lasiophyllum																X											X			X		
	Solanum nummularium																X																
*	*Sonchus oleraceus*	X																															
	Tecticornia indica subsp. *bidens*															X	X																
	Tecticornia mellarium (P1)															X																	
	Tecticornia sp.															X																	
	Templetonia ?*incrassata*																																

APPENDIX F: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN EACH SURVEY QUADRAT IN THE SUNRISE DAM PROJECT AREA

**Denotes introduced (exotic) species*

SPECIES	A11	A13		A15		C1									C9		C12												C14	S2	
	S19	S23	S24	S40	S60	S06	S21	S25	S26	S42	S43	S51	S53	S55	S20	S22	S14	S15	S17	S30	S31	S32	S34	S35	S37	S38	S39	S45	S52	S44	S16	S33
Teucrium teucriiflorum																							X									
Triodia ?*basedowii*																																
Triodia sp.		X																														
Vincetoxicum lineare		X																														

APPENDIX G: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE ADDITIONAL SURVEY AREAS, 2022 G1.

Mapping Code	Vegetation Community Description	Representative Plate of Community
A2	*Acacia ayersiana*, *Acacia ramulosa* var. *linophylla*, *Acacia craspedocarpa* mid open shrubland over *Ptilotus obovatus*, *Eremophila* spp., *Senna artemisioides* subsp. *filifolia* low sparse shrubland over *Rhagodia eremaea*, *Maireana* spp., *Atriplex* spp., sparse chenopod shrubland on red-brown sandy-loam on flats and mid slopes. **Soils and Landforms:** Red clay on flats **Vegetation condition:** Good **Plate details:** Survey quadrat S64	
A3	Low mixed Woodland of *Acacia aneura, Acacia tetragonophylla, Exocarpos aphyllus, Hakea preissii, Pittosporum angustifolium, Santalum spicatum* over *Eremophila ?metallicorum, Cratystylis subspinescens, Eremophila latrobei* subsp. *glabra* over *Maireana sedifolia, Eremophila scoparia, Senna artemisioides* subsp. *filifolia* and other mixed shrubs. **Soils and Landforms:** Reddish orange clayey sand on flats **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S089 (2018)	

Mapping Code	Vegetation Community Description	Representative Plate of Community
A6	Forest to Woodland of *Acacia ayersiana* and *Acacia aneura var. aneura over Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles. **Soils and Landforms:** Clay with quartz **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S03	
A7	*Acacia* sp. Section Juliflorae, *Acacia ramulosa* var. *ramulosa*, and *Acacia tetragonophylla* mid open shrubland over *Eremophila forrestii*, *Maireana sedifolia*, *Ptilotus obovatus* low sparse shrubland over *Maireana triptera*, *Maireana pyramidata*, *Rhagodia drummondii* sparse chenopod shrubland on red sandy-loam soils. **Soils and Landforms:** Orange clayey sand on flats **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S49	

Mapping Code	Vegetation Community Description	Representative Plate of Community
A10	*Acacia aneura* var. *intermedia*, *Acacia aneura* var. *aneura*, and *Acacia ramulosa* var. *ramulosa* mid open shrubland over *Ptilotus obovatus*, *Eremophila metallicorum*, *Scaevola spinescens* low sparse shrubland over *Solanum lasiophyllum*, *Maireana pentatropis*, *Maireana triptera* mixed shrubland on red clay-loam flats. **Soils and Landforms:** Red sandy clay on flats **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S29	
A13	Low Woodland of *Acacia minyura* over *Acacia tetragonophylla* over *Dodonaea viscosa, Solanum orbiculatum, Senna artemisioides subsp. filifolia, Cratystylis subspinescens, Eremophila miniata* over *Lawrencia squamata, Eragrostis eriopoda* and denser patches of *Triodia* spp. in sandy-loam soils. **Soils and Landforms:** Sandy loam soils **Vegetation condition:** Good **Plate details:** S23	

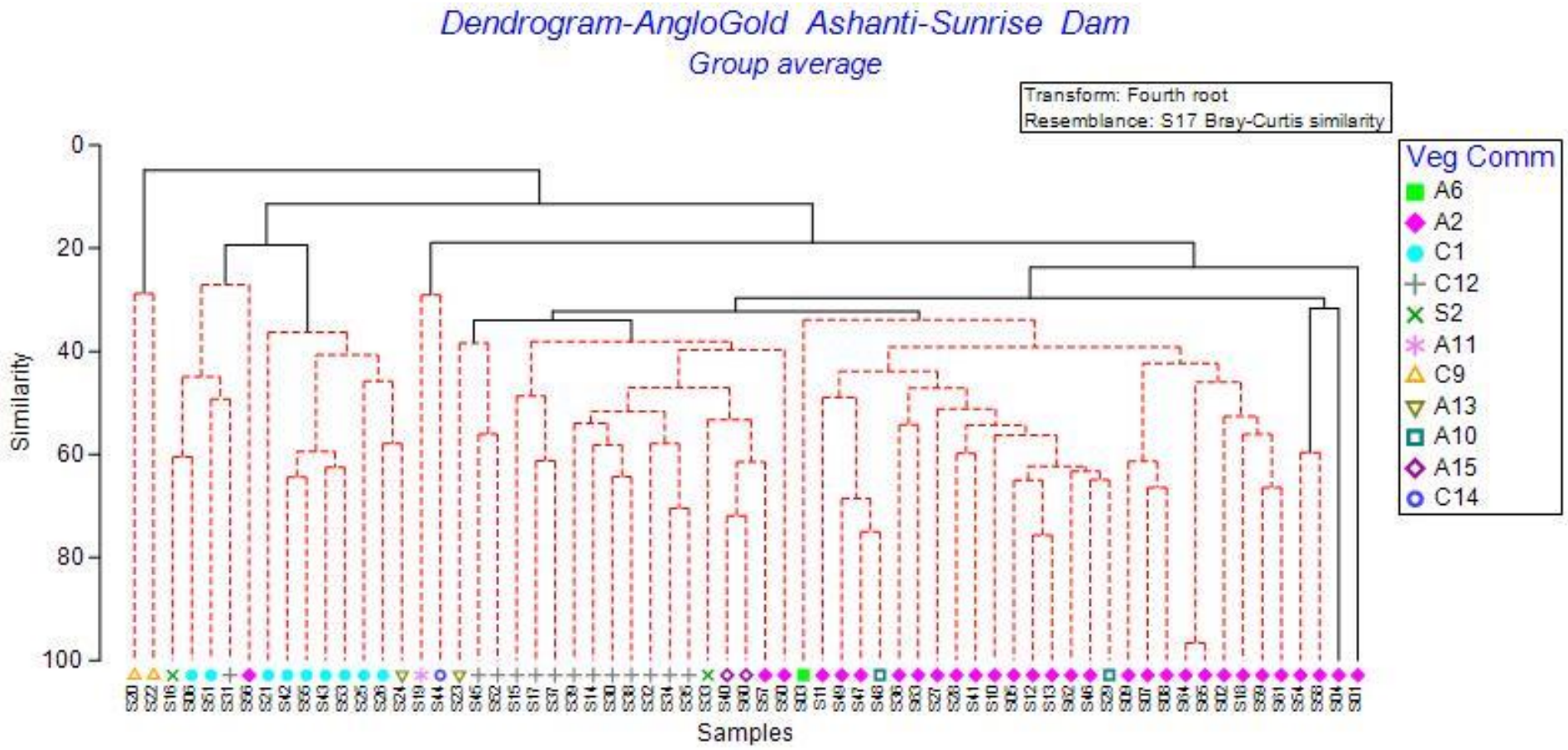
Mapping Code	Vegetation Community Description	Representative Plate of Community
A15	*Acacia* sp. Section Juliflorae, *Acacia kempeana*, *Acacia tetragonophylla* mid semi-open shrubland over *Dodonaea lobulata*, *Senna artemisioides*, and *Eremophila scoparia* low shrubland over *Ptilotus obovatus*, *Maireana carnosa* and *Solanum lasiophyllum* sparse shrubland on red clay, occasionally with quartz, on flats and mid slopes. **Soils and Landforms:** Orange sandy loam on flats and slopes **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S39	
A16	*Acacia tysonii*, *Acacia* sp. Section Juliflorae, and *Acacia* spp. open shrubland over *Dodonaea lobulata*, *Eremophila oldfieldii* subsp. *angustifolia*, and *Psydrax rigidula* low sparse shrubland over *Ptilotus obovatus*, *Senna cardiosperma* and *Solanum lasiophyllum* sparse shrubland on red clay, with occasional quartz pebbles on flats and mid slopes. **Soils and Landforms:** Red clay interspersed with quartz and ironstone rocks on flats and mid slopes **Vegetation condition:** Degraded **Plate details:** Survey quadrat S12	

Mapping Code	Vegetation Community Description	Representative Plate of Community
C1	*Acacia fuscaneura*, *Hakea preissii*, *Acacia kalgoorliensis* mid open sparse shrubland over *Cratystylis subspinescens*, *Eremophila longifolia*, and *Senna artemisioides* shrubland over *Maireana pyramidata*, *Atriplex* spp., and *Solanum* spp. sparse shrubland on Clay- loam flats. **Soils and Landforms:** Red to orange clay, sometimes cracking, on flats **Vegetation condition:** Pristine to Excellent **Plate details:** Survey quadrat S06	
C2	Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala subsp. microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna spp.* **Soils and Landforms:** Sandy clay/clay loam **Vegetation condition:** Good **Plate details:** N/A	**No image**

Mapping Code	Vegetation Community Description	Representative Plate of Community
C9	*Tecticornia pruinosa*, *Frankenia fecunda*, *Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English 552) closed chenopod shrubland over *Lawrencia* spp., *Atriplex* spp., *Solanum nummularium* low sparse shrubland over *Sclerolaena fimbriolata*, *Asteridea chaetopoda*, *Maireana glomerifolia* low shrubland on red clay, with occasional salt crust formation. **Soils and Landforms:** Red to orange sandy clay, sometimes with duricrust, on flat playa lake edges **Vegetation condition:** Excellent **Plate details:** Survey quadrat S20	
C12	*Casuarina pauper* woodland over *Acacia kempeana*, *Acacia* sp. Section Juliflorae, *Eremophila scoparia* sparse shrubland over *Maireana sedifolia*, *Senna artemisioides*, *Ptilotus obovatus* low sparse shrubland on orange clay flats with occasional quartz pebbles **Soils and Landforms:** Red clay interspersed with quarts and ironstone rocks on flats and slopes **Vegetation condition:** Excellent **Plate details:** Survey quadrat S14	

Mapping Code	Vegetation Community Description	Representative Plate of Community
C14	*Maireana pyramidata*, *Maireana triptera*, *Atriplex vesicaria* open chenopod shrubland over *Ptilotus obovatus*, *Frankenia* spp., and *Solanum lasiophyllum* sparse chenopod shrubland over *Enneapogon* spp., sparse grassland on red clay flats with ironstone and quartz pebbles. **Soils and Landforms:** Red clay interspersed with quartz and ironstone rocks on flats **Vegetation condition:** Excellent **Plate details:** Survey quadrat S44	
M2	*Melaleuca hamata*, *Duma florulenta*, *Hakea preissii* closed shrubland over *Eragrostis pergracilis*, *Eragrostis lacunaria* isolated clumps of grasses on orange-brown clay to loamy clay on flats. **Soils and Landforms:** Red to orange sandy clay on flats **Vegetation condition:** Excellent **Plate details:** Survey quadrat S008 (2018)	

Mapping Code	Vegetation Community Description	Representative Plate of Community
S2	*Eremophila scoparia*, *Senna artemisioides*, *Maireana pyramidata* open shrubland over *Maireana carnosa*, *Atriplex vesicaria*, *Cratystylis subspinescens* low sparse shrubland on red clay flats with occasional quartz pebbles. **Soils and Landforms:** Red clay, sometimes interspersed with calcrete rocks, on flats **Vegetation condition:** Excellent **Plate details:** Survey quadrat S16	


Dendrogram-AngloGold Ashanti-Sunrise Dam
Group average
Transform: Fourth root
Resemblance: S17 Bray-Curtis similarity
Veg Comm
A6
A2
C1
C12
S2
A11
C9
A13
A10
A15
C14
Similarity
0
20
40
60
80
100
Samples

APPENDIX I: SUNRISE DAM GOLD MINE VEGETATION COMMUNITIES

VEGETATION CODE	DESCRIPTIONS
A1	Low Woodland of *Acacia aneura* var. *aneura* and *Acacia ayersiana* over *Acacia tetragonophylla*, *Acacia burkittii* and *Ptilotus obovatus* var. *obovatus* in sandy-loam soils.
A2	Open Low Woodland to Woodland of *Acacia aneura* var. *aneura*, *Acacia aneura* var. *intermedia* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila* spp., *Maireana triptera*, *Solanum lasiophyllum.*
A3	Open Low Woodland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils.
A4	Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata*, *Cratystylis subspinescens*, *Hakea preissii*, *Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges.
A5	Woodland of *Eucalyptus striaticalyx*, *Casuarina pauper* and *Pittosporum angustifolium* over *Acacia tysonii*, *Grevillea sarissa* subsp. *sarissa*, *Eremophila miniata*, *Eremophila scoparia*, *Exocarpos aphyllus* and *Atriplex vesicaria* over *Eragrostis eriopoda* on gypsum.
A6	Forest to Woodland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles.
A7	Open Woodland of *Acacia aneura* var. *intermedia* with *Acacia aneura* var. *aneura*, *Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa*, *Eremophila forrestii* subsp. *forrestii*, *Eremophila margarethae*, *Maireana triptera* and Eragrostis falcata.
A8	Open Woodland of *Acacia kalgoorliensis* and *Acacia aneura* var. *aneura* over *Eremophila latrobei* subsp. *latrobei*, *Senna stowardii*, *Ptilotus obovatus* var. *obovatus*, *Solanum lasiophyllum*, *Maireana georgei*, *Maireana tomentosa* and *Maireana triptera* in red loam.
A9	Low Open Woodland to Shrubland of *Acacia burkittii*, *Acacia tetragonophylla*, *Acacia aneura* var. *aneura*, *Acacia ramulosa* var. *ramulosa* over *Dodonaea rigida*, *Eremophila metallicorum*, *Eremophila georgei*, *Senna cardiosperma*, *Solanum lasiophyllum* over *Maireana triptera*.
A10	Woodland of *Acacia aneura* var. *intermedia*, *Acacia aneura* var. *aneura* over *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla* over *Eremophila granitica*, *Eremophila longifolia*, *Eremophila margarethae*, *Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus.*
A11	Low Open Woodland of *Acacia aneura* var. *aneura*, *Acacia burkittii*, *Acacia tetragonophylla* over *Maireana triptera*, *Maireana pyramidata* and *Senna artemisioides* subsp. *artemisioides* on red clay-loam soils.
A12	Low Woodland of *Acacia ayersiana*, *Acacia ramulosa* var. *linophylla*, *Acacia aneura* over *Acacia burkittii*, *Acacia tetragonophylla*, over *Sida calyxhymenia*, *Maireana sedifolia*, *Eremophila latrobei* subsp. *glabra*, *Dodonaea lobulata*, *Maireana pyramidata* over *Scaevola spinecens*.
A13	Low Woodland of *Acacia minyura* over *Acacia tetragonophylla* over *Dodonaea viscosa*, *Solanum orbiculatum*, *Senna artemisioides* subsp. *filifolia*, *Cratystylis subspinescens*, *Eremophila miniata* over *Lawrencia squamata*, *Eragrostis eriopoda* and denser patches of *Triodia* spp. in sandy-loam soils.
C1	Shrubland of *Chenopod* species with occasional emergent *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Acacia* ?*kalgoorliensis* and *Hakea preissii* in clay loam soils.
C2	Shrubland of *Hakea preissii*, *Acacia tysonii*, *Eremophila miniata*, *Pimelea microcephala* subsp. *microcephala*, *Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria*, *Maireana aphylla*, *Rhagodia drummondii*, *Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia*.
C3	Low Open Shrubland of *Atriplex vesicaria*, *Atriplex nana*, *Tecticornia pergranulata* subsp. *pergranulata* and *Tecticornia mellarium* (P1) over *Eragrostis eriopoda* and *Frankenia* species.

APPENDIX I: SUNRISE DAM GOLD MINE VEGETATION COMMUNITIES

VEGETATION CODE	DESCRIPTIONS
C4	Low Open Shrubland of *Atriplex vesicaria*, *Atriplex nummularia* subsp. *spathulata*, *Lawrencia glomerata*, *Solanum lasiophyllum* and *Tecticornia pergranulata* subsp. *pergranulata* over *Eragrostis eriopoda*, *Frankenia* spp. and *Asteridea chaetopoda* with emergent *Chenopod* spp.
C5	Low Open Shrubland of *Lawrencia glomerata*, *Tecticornia halocnemoides* subsp. *halocnemoides* and *Tecticornia mellarium* (P1) over *Aristida holathera* var. *holathera*, *Frankenia* sp. and *Podolepis capillaris*, surrounded by a fringe of *Melaleuca uncinata*.
C6	Low Open Shrubland of *Atriplex bunburyana*, *Atriplex nummularia* subsp. *spathulata*, *Frankenia setosa*, *Lawrencia chrysoderma*, *Maireana georgei*, *Sclerolaena cuneata*, *Solanum lasiophyllum* and *Poaceae* spp. in orange clay.
C7	Low Shrubland of *Atriplex vesicaria*, *Frankenia pauciflora* with emergent *Eremophila miniata*, *Pimelea microcephala* subsp. *microcephala*, *Dodonaea viscosa* subsp. *angustissima*, *Acacia ramulosa* var. *ramulosa*, *Senna artemisioides* subsp. *filifolia*, *Eragrostis fulcata*.
C8	Low Shrubland of *Tecticornia halocnemoides* subsp. *halocnemoides*, *Atriplex nana*, *Frankenia pauciflora*, *Lawrencia chrysoderma*, *Hemichroa diandra*, *Sclerolaena fimbriolata* and *Eragrostis falcata*.
C9	Low Shrubland of *Tecticornia pruinosa*, *Tecticornia mellarium* (P1), *Tecticornia indica* and *Tecticornia* spp., *Lawrencia chrysoderma*, *Frankenia* species, *Atriplex* spp. and *Eragrostis* species.
C10	Low Open Shrubland of *Grevillea sarissa*, *Acacia tysonii*, *Lawrencia chrysoderma*, *Solanum orbiculatum*, *Sclerolaena fimbriolata* over *Tecticornia* spp., *Zygophyllum aurantiacum*, *Swainsona purpurea* and *Maireana georgei* over *Atriplex* sp. with emergent *Casuarina obesa* on foredunes.
E1	Low Open Woodland of *Eucalyptus horistes*, *Brachychiton gregorii*, *Acacia aneura* var. *aneura*, *Acacia aneura* var. *conifera*, *Acacia tetragonophylla* over *Duboisia hopwoodii*, *Eremophila longifolia*, *Eremophila margarethae* over *Maireana* spp., *Ptilotus obovatus.*
E2	Low Open Woodland of *Eucalyptus clelandiorum*, *Casuarina obesa* and *Acacia tysonii* over *Eremophila scoparia*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* over *Tecticornia* spp., *Lawrencia chrysoderma*, *Ptilotus obovatus*, *Frankenia pauciflora* and *Sclerolaena fimbriolata* in red clay loams.
M1	Low Open Woodland of *Melaleuca uncinata* over mixed annuals.
M2	Low Open Woodland of *Melaleuca apostiba* (P3), *Melaleuca hamata*, *Cratystylis subspinescens*, *Pittosporum angustifolium* and *Exocarpos aphyllus* over Poaceae spp. and mixed annuals.
CL	Cleared Land
CP	Clay Pan
SL	Salt Lake

6.2 Sunrise Dam 2022 Fauna Assessment - Kingfisher Environmental 2022

Sunrise Dam 2022
Fauna Assessment

Top: Vegetation fringing the existing mine. Bottom: Chenopod Shrublands, Mulgara burrow, Black Swan Nest.

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September 2022

EXECUTIVE SUMMARY

AngloGold Ashanti Australia Limited (AGAA) currently operates the Sunrise Dam Gold Mine (SDGM), located on the eastern margins of Lake Carey, 55 km south of Laverton, Western Australia. The site is situated within the Murchison Bioregion (Eastern Murchison Subregion), described as having "native vegetation dominated by Mulga Woodlands, that is largely contiguous but is used for commercial grazing" (EPA, 2004). A number of fauna studies have been undertaken across portions of SDGM tenure at various times over the life of the operation.However many of these date to 2004 or earlier. To support upcoming and future environmental risk assessments associated with approval applications, AGAA commissioned Kingfisher Environmental to provide an updated fauna assessment across all applicable tenure to meet current regulatory guidance. As most existing fauna studies are greater than five years old and survey coverage is incomplete across the SDGM tenure, a fauna assessment was required to update and extend the current knowledge base. This document summarises the results of a fauna survey conducted during March 2022.

The fauna assessment comprised a desktop review, field survey and an assessment of the fauna habitats and assemblage present. The desktop review identified 272 fauna species potentially occurring within the survey area, based on the results of the database searches, the habitats present and literature reviews. A total of 122 fauna species were recorded during the field survey, comprising two frog, 31 reptile, 62 bird, 18 native mammal and nine introduced mammal species. This compares favourably with previous surveys completed in the area. Five species of conservation significance were recorded, most for the first time locally. These were:

1. Malleefowl (EPBC Act Vulnerable, BC Act Vulnerable; tracks recorded in three locations from mixed *Acacia* shrubland in the south-east of the survey area);
2. Long-tailed Dunnart (DBCA Priority 4, recorded from one rocky ridge);
3. Brush-tailed Mulgara (DBCA Priority 4, recorded to the south of the CTD Tailings Storage Facility);
4. Slender-billed Thornbill (locally significant, recorded from the margins of Lake Carey);
5. Woolley's Pseudantechinus (locally significant, recorded from two rocky ridges);
6. Additionally, old nesting sites of the Black Swan were located near the margins of Lake Carey, revealing a previous and significant breeding event.

Disturbances to habitats supporting restricted fauna (e.g., rocky hills, low shrublands fringing Lake Carey and low gypsiferous rises) are recommended to be avoided where possible. The presence of the Long-tailed Dunnart requires consideration as it has the potential to occur across a wider area. Environmental inspections are recommended to be undertaken prior to development within areas of important fauna habitat.

Document Status				
Revision	**Author**	**Review**	**Approved for Issue to**	**Date**
1.	J. Turpin	J. Riley	N. Britland, M. Stingemore	26.06.22
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3.	J. Turpin	N. Britland, M. Stingemore	AGAA	16.09.22

CONTENTS

1. INTRODUCTION

1.1 Project Background

AngloGold Ashanti Australia Limited (AGAA) currently operates the Sunrise Dam Gold Mine (SDGM), located on the eastern margins of Lake Carey, 55 km south of Laverton, Western Australia. The site is situated within the Murchison Bioregion (Eastern Murchison Subregion), described as having "native vegetation dominated by Mulga Woodlands, that is largely contiguous but is used for commercial grazing" (EPA, 2004). A number of fauna studies have been undertaken across portions of SDGM tenure at various times over the life of the operation, however many of these date to 2004 or earlier. To support upcoming and future environmental risk assessments associated with approval applications, AGAA commissioned Kingfisher Environmental to provide an updated fauna assessment across active mining and miscellaneous tenure to meet current regulatory guidance. As detailed fauna studies were undertaken in the early stages of operation at Sunrise Dam (2004 or earlier, and survey coverage is incomplete) a fauna assessment was required to update and extend the current knowledge base. This document presents the results of a fauna survey conducted at Sunrise Dam during March 2022.

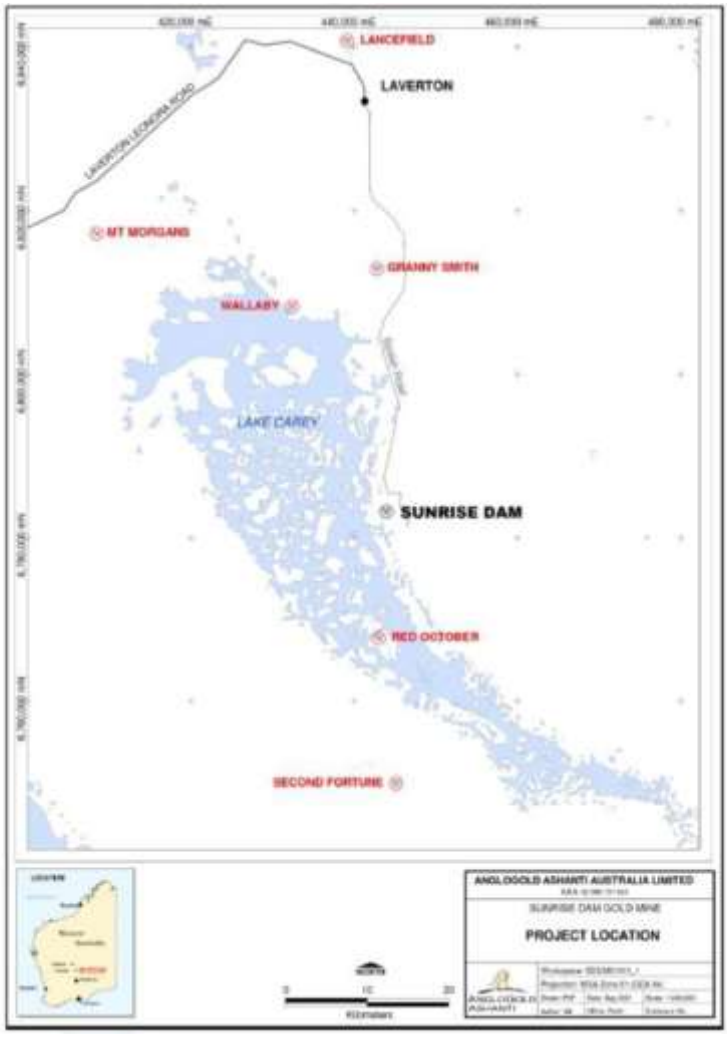

Figure 1: Sunrise Dam Survey Area - Regional Location.

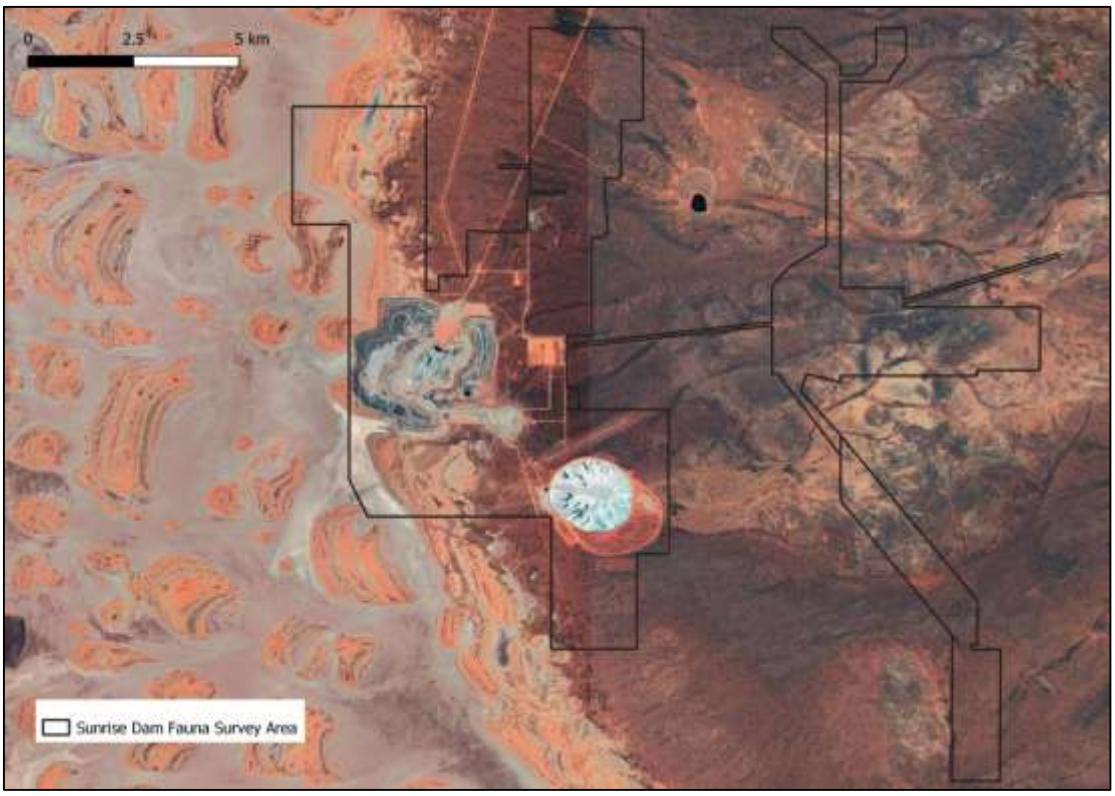

Figure 2: Sunrise Dam Fauna Survey Area

1.2 Survey Area

The Sunrise Dam fauna survey area is encompassed within SDGM tenure associated with the existing mine and is shown in Figures 1 and 2. The survey area covered all tenements depicted, including both those surrounding the existing mine and a series approximately 10 km east. As the survey area lies adjacent to Lake Carey, a major inland salt lake of Western Australia, a range of environments and vegetation types are present.

1.3 Scoping Requirements

The report was developed in consideration of the following:

1. Technical Guidance: Terrestrial Vertebrate fauna surveys for environmental impact assessment (EPA, 2020);
2. Environmental Protection Authority: Statement of Environmental Principles, Factors and Objectives (EPA, 2018);
3. Environmental Protection Authority: Technical Guidance: Sampling methods for Terrestrial vertebrate fauna (EPA, 2016a);
4. Environmental Protection Authority: Technical Guidance: Terrestrial Fauna Surveys (EPA 2016b);
5. Environmental Protection Authority: Environmental Factor Guideline: Terrestrial Fauna (EPA 2016c);
6. Survey Guidelines for Australia's Threatened Reptiles, Bats, Birds and Mammals (Department of Environment, Water, Heritage and the Arts, 2011);

7. Conservation Advice for species listed under the EPBC Act (Department of Environment and Energy, 2016);
8. State and Federal biodiversity legislation (*Biodiversity Conservation Act 2016, Environment Protection and Biodiversity Conservation Act 1999*, conservation codes relating to relevant legislation are listed in Appendix 1); and
9. Previous fauna assessments of the local area (Ninox 1995, 2005, 2010; Kingfisher 2014; 2016; 2018).

1.4 Fauna Assessment Objectives

The fauna assessment was conducted with attention to regulatory requirements and guidance. These are documented in the Western Australian Environmental Protection Authority (EPA) Guidance including Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2016b) and Technical Guide: Sampling methods for Terrestrial vertebrate fauna (EPA 2020). Key objectives for environmental impact assessment include:

1. A review of background information (a search of all sources for literature, data and map-based information);
2. An inventory of vertebrate fauna present or expected to occur (regarding the fauna habitats present);
3. The identification of species of conservation significance at an international, national, state, regional and local level;
4. The identification of significant fauna habitats or areas of particular importance for fauna;
5. The identification of potential impacts to fauna and recommendations to minimise impacts.

The Sunrise Dam fauna assessment therefore included a desktop review, field survey and an assessment of the fauna and habitats present. This document outlines the approach and methodology employed, details the survey results and discusses the fauna of the Sunrise Dam area. The document has been prepared with reference to previous fauna surveys conducted in the region and draws upon the local experience of the field personnel.

2. BACKGROUND

2.1 Regional Description

The Interim Biogeographic Regionalisation of Australia (IBRA) has identified 26 bioregions in Western Australia. Bioregions are classified on the basis of climate, geology, landforms, vegetation and fauna (Thackway and Cresswell, 1995). IBRA Bioregions are affected by a range of different threatening processes and have varying levels of sensitivity to impact (EPA, 2016a).

Murchison Bioregion

The Sunrise Dam survey area lies within the Murchison Bioregion, described as having "native vegetation that is largely contiguous but is used for commercial grazing" (EPA, 2016). The Murchison Bioregion contains low hills and mesas separated by flat colluvium and alluvial plains with vegetation dominated by low Mulga (*Acacia aneura* complex) woodlands. Other types of vegetation present include saltbush shrubland on calcareous soils, saline areas with samphire, and hummock grassland on red sandplain (Bastin *et. al*., 2008).

The Murchison Bioregion is further split into subregions. The survey area lies within the Eastern Murchison Subregion, described by McKenzie *et al.* (2003) as "characterised by its internal drainage, broad plains of red-brown soils (hardpan plains) and elevated red desert sandplains with minimal dune development. Other land systems include salt lake systems and breakaway complexes. Vegetation is dominated by Mulga woodlands often rich in ephemerals" (McKenzie *et al.,* 2003).

McKenzie *et al.* (2003) identify several significant vertebrate fauna species occurring from the Eastern Murchison Subregion, including:

- Malleefowl (*Leipoa ocellata*);
- Princess Parrot (*Polytelis alexandrae*);
- Slender-billed Thornbill (*Acanthiza iredalei iredalei*);
- Brush-tailed Mulgara (*Dasycercus blythi*);
- Australian Bustard (*Ardeotis australis*);
- Bush Stone-curlew (*Burhinus grallarius*);
- Grey Falcon (*Falco hypoleucos*);
- Peregrine Falcon (*Falco peregrinus*); and
- Major Mitchell's Cockatoo (*Cacatua leadbeateri*).

The survey area lies near the boundary of the Great Victoria Desert located approximately 10 km to the east. Due to distinctions in the flora and fauna of both regions, several species are expected to occur in the area near range extremes.

Lake Carey

Lake Carey lies within the north-west to south-east trending belts of greenstones which are highly prospective for gold and other minerals (Dunlop and Payne, 1999). A number of goldmines operate close to the lake or on its shores, including Sunrise Dam, Granny Smith, Red October, Fortitude and (formerly) Butcher Well.

Lake Carey is a large inland salina and the most northerly of three extensive, roughly parallel, south-east trending palaeodrainage systems. The Lake Carey system, as delimited by the hypersaline lake sediments, covers an area of around 1000 km^2 (Dunlop and Payne, 1999). The lake bed itself is mostly unvegetated and is composed of fine sediments often with a salt crust layer.

Lake Carey contains an extensive array of islands composed of outcrop and/or aeolian deposits of powdery gypsum or red siliceous sands. Gypsiferous (Kopi) dunes, occur up to 10 m in height and support a sparse vegetation cover, characterised by the presence of *Casuarina pauper* (Brearley *et al*. 1997). Dunes composed of either gypsum or quartz sands also fringe the lake shoreline and define the terrestrial margins of the lake system. The vegetation of Lake Carey is described by Brearley *et al*. (1997) and includes:

1. Mulga (*Acacia aneura* complex) woodland over mixed scrub and chenopod dwarf scrub, over *Aristida contorta* open low grass;
2. Mulga low woodland over *Frankenia sp. /Gunniopsis quadrifida* / chenopod dwarf scrub over *Aristida contorta* open low grass;
3. *Eucalyptus clelandiorum* low woodland over open scrub above dwarf scrub;
4. Mulga / *Casuarina obesa* low woodland over open low scrub (on kopi dunes);
5. Mulga open low woodland over Acacia / *Eremophila sp.* / *Dodonaea sp.* open low scrub (on low rocky, ridges);
6. Pearl Bluebush (*Maireana sedifolia*) low scrub over *Enneapogon caerulescens* open low grass;
7. Samphire (*Tecticornia spp.*) dwarf scrub on lake margins and saltpan;
8. *Frankenia sp.* /chenopod low heath; and
9. *Eragrostis eriopoda* tall grass.

2.2 Landforms

Pringle *et al.* (1994) classified and mapped the landforms of the north-eastern Goldfields region, including the survey area. Landforms are grouped into “Land Types”, which are classified according to similarities in landform, soil, vegetation, geology and geomorphology. The survey area contains eight Land Types (Table 1).

Table 1. Major Land Types present in the survey area.

Land Type	Description
9	Low hills with eucalypt or acacia woodlands with halophytic undershrubs
10	Low hills and stony plains with acacia shrublands

Land Type	Description
17	Stony plains with acacia shrublands and halophytic shrublands
28	Sandplains and occasional dunes with shrubby spinifex grasslands or pindan woodlands
30	Plains with eucalypt woodlands with non-halophytic undershrubs
31	Wash plains on hardpan with mulga shrublands
43	Salt lakes and fringing alluvial plains with halophytic shrublands
47	Salt lake bed – sparsely vegetated or devoid of vegetation

Note: very minor occurrence of Land Type 30 within survey area

Land Types are further divided into "Land Systems" based on similarities of vegetation, landform and soil. Ten Land Systems are present in the survey area and are listed below (Table 2). These provide a broad indication of the fauna habitats present (Figure 3).

Table 2. Land Systems present in the survey area.

Land System	Landform
Leonora	Low greenstone hills and stony plains supporting mixed stony chenopod shrublands.
Kirgella	Extensive sandplain, with scattered granite outcrop supporting mainly spinifex hummock grasslands and mulga and mallee shrublands.
Gundockerta	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.
Gransal	Stony plains and low rises based on granite supporting mainly halophytic shrublands.
Sunrise	Stony plains supporting mulga shrublands.
Violet	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and patchy halophytic shrublands.
Deadman	Calcareous plains supporting acacia, black oak and mallee shrublands/woodlands adjacent to salt lake systems.
Rainbow	Hardpan plains supporting mulga shrublands.
Carnegie	Salt lakes with extensively fringing saline plains, dunes and sandy banks, supporting low halophytic shrublands, scattered acacia shrublands
Lake Bed	Bare lake beds (mainly unvegetated) inundated for short periods after rain

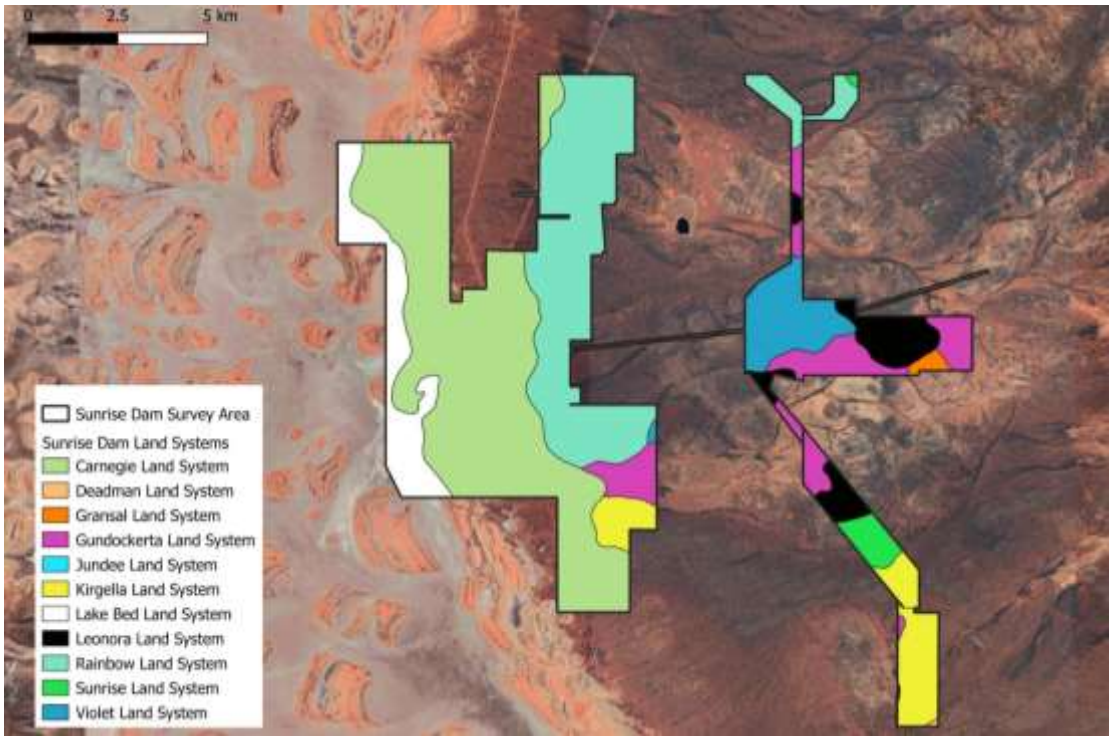

Figure 3: Land Systems within the Survey Area.

2.3 Previous Survey Work

Previous biological studies conducted in a local and regional context can serve to inform and direct desktop assessments and field surveys. Fauna surveys associated with the region's salt lakes have been conducted at Lake Carey, Lake Way and Lake Irwin (Brearley *et al*. 1997; Dunlop and Payne 1999). Brearley *et al*. (1997) suggested Lake Carey supports a distinctively different fauna assemblage including species or populations with more southerly arid and semi-arid distributions (including *Diplodactylus maini*, *Cyclodomorphus melanops*, *Underwoodisaurus milii*, *Ctenophorus fordi*, *Anilios bituberculatus* and *Pseudomys bolami*).

Fauna surveys associated with environmental impact assessment have previously been conducted at Sunrise Dam Gold Mine (Ninox 1995, 2005, 2010; Kingfisher 2016; 2018;), Butcher Well (Kingfisher 2018), Granny Smith Gold Mine (Terrestrial Ecosystems 2011a; 2011b) and the Murrin Murrin Nickel Mine (70 km north-west of Butcher Well; DBCA, 2021). Kingfisher has also conducted fauna assessments for pipelines along the eastern margins of Lake Carey and from Murrin Murrin to Leonora (Kingfisher 2014; 2018) and on the north-western side of Lake Carey (Cleveland Project Area; Kingfisher 2021). Farther afield, AngloGold has previously supported fauna surveys for infrastructure corridors from Pinjin to Tropicana Gold Mine (Turpin, 2008; Ninox, 2009), and Carosue Dam to Pinjin (Turpin, 2010).

During a fauna survey at Granny Smith Mine, a total of 97 fauna species were recorded, comprising 21 reptile, four amphibian, 60 bird and 12 mammal species (Terrestrial Ecosystems, 2011a). The conservation significant Long-tailed Dunnart (*Sminthopsis longicaudata*, DBCA Priority 4) was recorded at the southern extent of its range, as were a high number of Kultarr (*Antechinomys laniger*). A targeted survey was subsequently undertaken to determine the local distribution, abundance and habitat preferences of the Long-tailed Dunnart (Terrestrial Ecosystems, 2011b).

At Sunrise Dam, a total of 96 species were recorded during the 1995 fauna assessment (comprising 25 reptile, three amphibian, 63 bird, one native mammal and four introduced mammal species; Ninox 1995). Kingfisher recorded 70 species during a Level 1 survey conducted in 2016 (Kingfisher 2016) and 94 species on the eastern side of Lake Carey in 2017 (Kingfisher 2018). Significant fauna recorded during the Sunrise Dam surveys included the Peregrine Falcon, Slender-billed Thornbill, Banded Stilt, Bush Stone-curlew and a number of reptiles recorded at range extremes.

At Butcher Well on the western side of Lake Carey, a total of 120 fauna species were recorded during the 2018 field survey, comprising five frog, 40 reptile, 53 bird, 15 native mammal and seven introduced mammal species. Significant fauna recorded included the Peregrine Falcon, Slender-billed Thornbill, Banded Stilt, Long-tailed Dunnart and a number of species occurring at range extremes (such as *Lerista picturata* and the Desert Mouse).

These surveys provide background information relevant to the survey area, in particular the local distribution of conservation significant fauna and their associated habitat types. Table 3 lists previous reports utilised during the desktop and field assessments. The results of these surveys are included in the desktop assessment (Section 3.4) and are detailed in Appendix 2.

Table 3. Relevant local and regional fauna surveys.

Survey	Comments	Year
The Biological Survey of the Eastern Goldfields	Part 10: Sandstone-Sir Samuel and Laverton-Leonora study areas (McKenzie *et al.,* 1994)	1994
A vertebrate Fauna Assessment of the Sunrise Dam Project Area	Level 2 survey conducted at Sunrise Dam (Ninox 1995)	1995
Lake Carey Terrestrial Fauna and Flora Survey	Survey conducted at Lake Carey including several islands by Curtin University (Brearley *et al*., 1997)	1997
A Vertebrate Fauna Survey of the North Lake Carey Region	Survey conducted at the Hillside, Wallaby, Just In Time / Just In Case and Teatree Dam Areas (Dunlop and Payne 1999, 25 km north of Sunrise Dam)	1999
Vertebrate Fauna Survey ResultsSunrise Dam Gold Mine	Detailed fauna surveys conducted in autumn, winter, spring 2004 at Sunrise Dam Gold Mine (Ninox 2005)	2004
Leonora Fauna Assessment	Fauna surveys conducted in the Leonora area, 100 km west of project (Turpin and Bamford, 2010)	2008-2010
Pinjin Haul Road Fauna Assessments	Fauna surveys conducted along AngloGold's Pinjin Infrastructure Corridor (Turpin 2008; Ninox 2009, 120 km south-west of Sunrise Dam)	2008, 2009
Golden Delicious Level 1 Fauna Assessment	A level 1 reconnaissance survey at Golden Delicious prospect, Sunrise Dam Gold Mine (Ninox 2010)	2010
Granny Smith Level 2 Fauna Survey	Level 2 Fauna Risk Assessment for the Granny Deeps Project Area (Terrestrial Ecosystems 2011a)	2011
Targeted Survey for Long-tailed Dunnarts at Granny Smith	Targeted Long-tailed Dunnart Survey for the Granny Deeps Project Area (Terrestrial Ecosystems 2011b)	2011
Sunrise Dam Tailings Storage Facility Assessment	Assessment of risk to wildlifeat the tailings storage facilities: Sunrise Dam Gold Mine (Donato Environmental Services 2020)	2012
Eastern Goldfields Pipeline Fauna Assessment	Fauna surveys and ongoing monitoring along the Eastern Goldfields Pipeline from Murrin Murrin to Tropicana Gold Mine (Kingfisher 2014a; 2014b, 2018b)	2014-2018
Sunrise Dam Boxcut Survey	Level 1 Survey within the Sunrise Dam operational mining lease (Kingfisher 2016)	2016
Sunrise Dam Level 1 Survey	Level 1 Survey on the eastern margin of Lake Carey, south of Sunrise Dam (Kingfisher 2018a)	2017
Murrin Murrin Looping Project Level 1 Fauna Assessment	Level 1 Fauna Assessment from Murrin Murrin to Leonora (Kingfisher 2018c)	2018
Mt Morgans Level 1 Fauna Assessment	Mt Morgans Gold Level 1 fauna assessment for Dacian Gold Limited, by Western Wildlife, July 2016. Western Wildlife (2016, 45 km north of Sunrise Dam)	2016
Butcher Well Fauna Assessment	Level 2 Fauna Assessment for the Butcher Well and Mount Minnie Area, conducted by Kingfisher (2018)	2018
Sunrise Dam Bat Assessment	Bat activity at Sunrise Dam Gold Mine: 2019 annual report (Donato Environmental Services 2020)	2019
Cleveland Fauna Assessment	Level 2 Fauna Assessment for the Cleveland Project, on the north-west side of Lake Carey (Kingfisher 2021)	2021

2.4 Conservation Significance

Biodiversity in Western Australia is protected, managed and assessed under international, national and state agreements, legislation and policy. Fauna of conservation significance include those species listed under federal or state legislation (*Environment Protection and Biodiversity Conservation Act 1999*; and the Western Australian *Biodiversity Conservation Act 2016*) species listed as Priority Fauna by the Department of Biodiversity Conservation and Attractions (DBCA), species listed as threatened or declining in biodiversity publications and species considered locally significant (due to restrictions in range or sensitivities to threatening processes; Woinarski *et al.* 2017). Categories of conservation significance are described in detail in Appendix 1.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Schedule 1 of the Commonwealth EPBC Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent. These categories are described in Appendix 1. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN). Under the provisions of the EPBC Act, proposed actions which have the potential to have a significant impact on a matter of national environmental significance must be referred to the Department of Climate Change, Energy, the Environment and Water for a decision as to whether an assessment is required under the provisions of that Act (EPA, 2004). The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals).

Biodiversity Conservation Act 2016 (BC Act)

Threatened and specially protected fauna are listed under Part 2 of the *Biodiversity Conservation Act 2016*. Similar to the EPBC Act, fauna are listed as Critically Endangered, Endangered, Extinct or Extinct in the Wild under the category of Threatened Fauna. Fauna can also be listed as Specially Protected Fauna, including those species listed under international agreements (such as CAMBA and JAMBA), or species listed as migratory, of special conservation interest or species otherwise in need of special protection. Threatened fauna listings are updated under the Specially Protected Fauna Notice, formally listed under the *Western Australia Wildlife Conservation Act 1950* (last updated: 11/09/2018). On 1 January 2019 the Specially Protected Fauna Notice published under the Wildlife Conservation Act 1950 transitioned to be the Threatened Fauna and Specially Protected Fauna Notice listed under Part 2 of the Biodiversity Conservation Act 2016.Categories of conservation significance are described in detail in Appendix 1.

Priority Fauna

In Western Australia, the DBCA has produced a supplementary list of Priority Fauna for species that are possibly threatened but do not meet the criteria for listing under the *Biodiversity Conservation Act2016* or are otherwise data deficient. These species are added to the Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists, are placed in Priority 4. These species are considered to require regular monitoring. Categories of Priority fauna are described in detail in Appendix 1.

Other Conservation Significant Fauna

The EPA's objective for protection of terrestrial fauna is to maintain representation, diversity, viability and ecological function at the species, population and assemblage level (2016). The preservation of biodiversity at the genetic level is also highlighted as a key ecological value (EPA, 2002). As a result, species that are at their limit of distribution and/or occur in restricted, outlying or relictual populations, are considered to be of conservation significance. Additionally, some species listed as threatened or declining in biodiversity publications may not be listed under legislation or considered Priority by DBCA. Therefore, an additional category of conservation significance is listed here, covering those species considered locally significant (due to restrictions in range, published declines or sensitivities to threatening processes; Woinarski *et al.* 2017). Species that are sensitive to impacts such as habitat fragmentation, may also be classed as conservation significant.

3. SURVEY METHODS

3.1 Approach

The Sunrise Dam fauna assessment was conducted with reference to guidelines and technical guidance published by the Western Australian EPA on fauna surveys and environmental protection, and commonwealth biodiversity legislation (e.g., EPA 2016a; 2016b; 2018, 2020). The assessment comprised a desktop review, followed by a subsequent field survey to document the fauna assemblage of the survey area.

3.2 Personnel and Survey Timing

The field assessment was conducted under DBCA Regulation 17 (Licence to take Fauna for Scientific Purposes), licensed to J.M. Turpin, licence number FO25000057-6. Field work was conducted from 23rd March to the 1st April 2022 by the following personnel:

- Jeff Turpin (Supervising Zoologist, B.Sc. Zoology);
- Ray Lloyd (Senior Zoologist, B.Sc. Hons. Zoology); and
- Wes Bancroft (Senior Zoologist, PhD B.Sc. Hons. Zoology).

3.3 Nomenclature and taxonomy

As per the recommendations of the EPA (2016b, 2020), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum's *Checklist of the Vertebrates of Western Australia* (Western Australian Museum, 2022).

3.4 Desktop Review

A desktop review was undertaken using information from the sources outlined in Table 4 and the results of fauna surveys conducted in the region (Table 3).

Table 4. Sources of information used for the desktop review (see also Table 3).

Title	Comments	Area Searched / Year
NatureMap	Records of specimens held in the WA Museum and DBCA database records. Includes historical data (DBCA 2021).	Survey area with a 40 km buffer.
Birds Australia Atlas Database	Records of bird observations in Australia, 1998 – 2022 (Birdlife Australia 2022).	Species list for the 1-degree grid cell containing the survey area.
Atlas of Living Australia	Species records for the SDGM region, Atlas of Living Australia website at http://www.ala.org.au (ALA 2022)	Survey area with a 10 km buffer.
EPBC Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and conservation estate (DAWE 2022).	Survey area (plus 50 km buffer).

Title	Comments	Area Searched / Year
Local Fauna Surveys	Conducted at Sunrise Dam (Kingfisher 2016, 2018, Ninox 1995, 2005, 2010), Granny Smith (Terrestrial Ecosystems 2011a; 2011b), Lake Carey (Brearley et al. 1997, Dunlop and Payne 1999) and Butcher Well (Kingfisher 2018)	Sunrise Dam (1995, 2004, 2010, 2018), Granny Smith (2011), Lake Carey (1997, 1999, 2018)
Regional Fauna Studies	Conducted at Leonora, Laverton, Murrin Murrin, Lake Carey, Pinjin, Carosue Dam (Table 3).	1997 – 2018.

3.5 Field Survey

3.5.1 Survey Design

The detailed field assessment was conducted during March 2022 (Appendices 2 - 5). During the field survey, the survey area was visually inspected by vehicle and on foot. Fauna were sampled and recorded during systematic sampling, targeted searches, opportunistically, using motion-activated cameras and via acoustic detection. All major fauna habitats present were sampled and assessed for the likelihood of supporting conservation significant fauna. Those habitats deemed suitable to support significant fauna were subject to more intensive targeted surveying. While surveying focused on locating evidence of conservation significant fauna, all fauna species observed were recorded. Potential future project areas under consideration at the time of commencement of the study were targeted to ensure maximum useabilty of the data for future environmental approvals.

The survey included the following components:

- Identification of major fauna habitats;
- Systematic sampling;
- Targeted searches for species of conservation significance;
- Motion-activated cameras;
- Acoustic detection;
- Bird census;
- Targeted herpetofauna searches;
- Opportunistic observations; and
- Fauna habitat assessment – the suitability of vegetation communities to support species of conservation significance.

3.5.2 Vegetation and Fauna Habitats

Fauna habitats throughout the survey area were assessed during the field survey. All major vegetation types were identified and sampled for fauna. Those deemed suitable to support conservation significant fauna were subject to further targeted searches.

3.5.3 Systematic Sampling

To document the fauna assemblage of the survey area in detail, five systematic sampling (trapping) sites were established (Table 5). Sites were situated to sample the range of major fauna habitats present and were located within or adjacent to areas of proposed disturbances (Figure 2). At each sampling site, a combination of pitfall traps (10 per site; Appendix 5) and funnel traps (20 per site) were installed in addition to one motion-activated camera and an acoustic recorder (Figures 4 – 7). In accordance with EPA and DBCA guidelines (EPA, 2016a), sampling was conducted over seven consecutive nights. The sampling design comprised:

- Pitfall Traps (20 L buckets): ten pitfall traps spaced approximately 20 m apart in a linear arrangement through representative habitat. Each trap was assisted with a 6 m drift fence, with the pitfall located centrally along the fence line;
- Funnel Traps: two funnel traps established at each pitfall trap along the drift fence line (totalling 20 per site);
- Motion-activated camera: one camera installed at each site to supplement capture data. Each camera baited with "universal bait"; and
- Audio recorder: one Audiomoth or Song Meter SM2 installed at each site.
- Overall, 300 individual traps were established (Table 5).
- Systematic sampling supplemented by additional survey sites (Section 3.5.4).

Table 5. Survey effort at systematic sampling sites (Zone 51J).

Site	Easting	Northing	Habitat	Traps		Audio	Camera	Trap Nights
				Pit	Funnel			
1	454835	6784302	Acacia shrubland on stony rise	10	20	1	1	7
2	446580	6783712	Mulga shrubland on hardpan	10	20	1	1	7
3	442696	6788333	Mulga sandplain fringing claypan	10	20	1	1	7
4	443752	6779668	*Casuarina pauper* gypsum rise	10	20	1	1	7
5	448668	6778025	Mulga over *Triodia* plain	10	20	1	1	7
6	446936	6775514	Mulga sandplain	10	20			7
A1	455247	6777271	Mulga plain with cattle trough			1		6
A2	444463	6779441	Samphire shrubland			1		6
A3	447241	6791876	Dense Acacia drainage			1		6
F7	445272	6785986	Sewage Ponds within Mulga			1		6
F9	443001	6788355	Mixed Chenopod Shrubland			1		6
A1	448679	6777873	Spinifex hummock grassland				1	8
R2	448767	6777551	Spinifex hummock grassland				1	12
C1	454945	6784245	Rocky ridge				1	9
C2	455427	6784174	Rocky ridge				1	9
A3	455247	6784123	Rocky ridge				1	9
B75	455867	6783713	Rocky ridge				1	9
A10	454657	6778697	Rocky ridge				1	9
A11	454111	6778806	Rocky ridge				1	9
A4	443752	6779669	*Casuarina pauper* gypsum rise				1	9
991	455986	6775832	Spinifex hummock grassland				1	9
R1	454796	6778733	Rocky ridge				1	9
SC	453958	6778923	Rocky ridge				1	9
B18	453706	6782811	Rocky ridge				1	9
N	455187	6784075	Rocky ridge				1	9
Total							19	200

Figure 4: Systematic sampling site (pitfall and funnel traps) in mulga shrubland.

Figure 5: Motion-activated camera installed on a stony rise within the survey area.

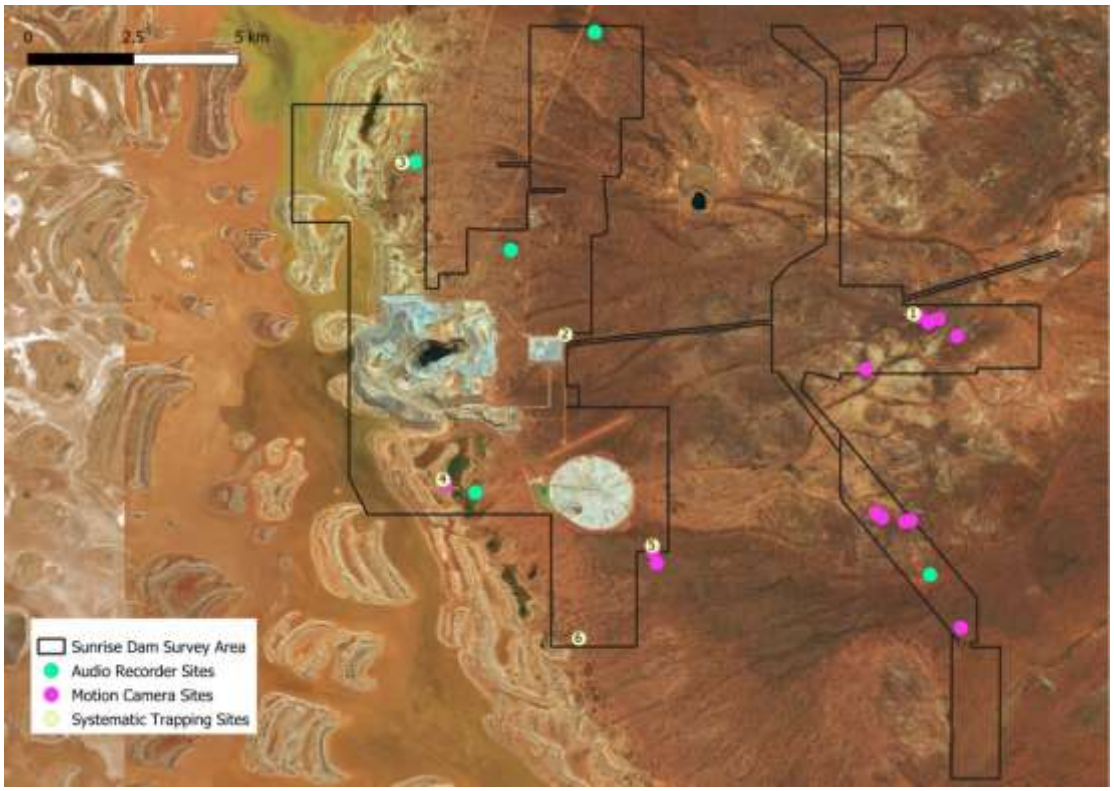

Figure 6: Fauna sampling sites established within the survey area (systematic sampling site numbers included).

3.5.4 Targeted Searching for Conservation Significant Fauna

Many fauna species can be confirmed in an area by searching for evidence of their presence, including foraging (e.g., diggings, tracks and scats), sheltering (e.g., burrows) and breeding signs (e.g., nests). As several significant species have been recorded locally (Section 2.1andTable 6), the field survey employed a combination of survey techniques to maximise the potential for their detection. Targeted searches for significant fauna were undertaken by traversing through areas of suitable habitat on foot.

Table 6. Survey methods used to detect conservation significant fauna.

Common Name	Conservation Status				Local Records	Habitat	Survey Technique
	EPBC	BC	P	Local			
Malleefowl	V	V			Linden	Mallee shrubland	Targeted search
Peregrine Falcon		OS			Sunrise Dam	Woodland	Targeted search
Grey Falcon	V	V			Murrin Murrin	Open plains	Targeted search
Fork-tailed Swift	M	IA			Menangina	Aerial	Targeted search
Night Parrot	CE	CE			None	Spinifex, chenopod	Targeted search
Migratory Waders	M	IA			Lake Carey	Salt lakes	Targeted search
Wood Sandpiper	M	IA			Lake Carey	Wetlands, salt lakes	Targeted search
Red-necked Stint	M	IA			Lake Carey	Wetlands, salt lakes	Targeted search
Brush-tailed Mulgara			P4		Laverton	Sandplain	Targeted search, cameras
Hooded Plover			P4		Goongarrie	Salk lakes	Targeted search
Central Long-eared Bat			P3		Lake Minigwal	Woodland	Bat detectors

Common Name	Conservation Status				Local Records	Habitat	Survey Technique
	EPBC	BC	P	Local			
Princess Parrot	V		P4		Laverton	Woodland	Bird census
Long-tailed Dunnart			P4		Granny Smith	Rocky hills	Motion cameras
Aprasia picturata				L	Minara	Rocky hills	Targeted search
Slender-billed Thornbill				L	Sunrise Dam	Samphire	Targeted search
Bush Stone-Curlew				L	Laverton	Mulga	Targeted search

Note: status includes fauna listed under the EPBC, BC Acts, DBCA Priority (P) and locally significant fauna (Local).

3.5.5 Bird Census

Bird surveys consisted of 20-minute meandering transects within each habitat type and were also conducted at each fauna survey site. Birds were also recorded opportunistically throughout the survey area and during targeted searches. Surveys for the Slender-billed Thornbill were conducted by traversing through areas of suitable habitat, including dense areas of samphire shrublands adjacent to Lake Carey.

3.5.6 Targeted Herpetofauna Searches

Foraging for herpetofauna (e.g., raking, turning over rocks, logs and bark) was undertaken throughout the survey area. Searches for fossorial reptiles were conducted in a range of habitats and rocky hills and ridges were actively searched for *Aprasia picturata*.

3.5.7 Motion-activated Cameras

Motion-activated cameras (Browning Strikeforce HD Pro, Bushnell Trophy Cam HD or Reconyx Hyperfire) were placed at each of the fauna survey sites plus an additional 14 sampling locations within the survey area (Table 5, Figures 4 - 7). Cameras were installed to maximise the detection of conservation significant fauna (e.g., the Long-tailed Dunnart) and also located to sample the range of habitats present (including rocky hills, outcrops, woodland, shrublandsand sandplains). The optimum deployment time for motion-activated cameras varies, depending on the available habitats and the target species involved (Meek *et al.* 2012; Turpin 2014; Turpin *et al*. 2015; Turpin *et al*. 2018). The EPA (2016a) recommends a minimum sampling duration of seven days for fauna inventory surveys. Longer survey periods are recommended to detect rare or threatened fauna if they are considered likely to be present (Meek *et al.* 2012). Consequently, cameras were installed to maximise the detection of locally occurring fauna and operated over a sufficient time to sample the resident assemblage expected. Cameras were baited with universal bait (sardines, peanut butter, rolled oats) and sampled a total of 200 camera nights (Table 5).

Figure 7: An example of a motion-activated camera installed during the survey.

3.5.8 Acoustic Detection

To acoustically sample for fauna (particularly bats and birds) a Song Meter SM2 or Audiomoth detector was placed at five survey sites within the survey area. As a result, detectors surveyed a range of habitats to sample the range of bat and avian species that could potentially occur. All recordings were "continuous" (EPA 2016a) made using full spectrum ultrasonic SM2BAT+ SongMeter (Wildlife Acoustics Inc., USA) or Audiomoth v1.2.0 (Open Acoustic Devices, United Kingdom) detectors. Kaleidoscope Pro 5 (Wildlife Acoustics Inc., USA) was used to display each call sequence recorded for identification. Ultrasonic recordings were identified manually, using high quality call sequences, the Kingfisher reference collection and surveys published in previous fauna assessments (see Table 2).Representative sonographs from all putative species recorded (birds and frogs, displayed in Kaleidoscope Pro 5) were also verified aurally.

3.5.10 Opportunistic Observations

At all times, observations of fauna were noted when they contributed to the accumulation of information on the local fauna assemblage.

3.5.11 Habitat Assessment

All fauna habitats present were inspected and assessed for the suitability of supporting conservation significant fauna, particularly the Malleefowl, Brush-tailed Mulgara and Slender-billed Thornbill.

3.6 Limitations

The Environmental Protection Authority Technical Guidance: Terrestrial Fauna Surveys (EPA, 2016b) outlines a number of limitations that may arise during surveying. Those applicable to the survey are discussed below in Table 7.

Table 7. Survey limitations

Limitation	Comment
Level of survey.	Fauna was sampled and recorded during systematic sampling (pitfall, funnel traps, avian census), targeted searches, opportunistically, using motion-activated cameras and via acoustic detection. Systematic sampling was conducted to collect information on the fauna assemblage of the survey area. Targeted searching was conducted across all lease areas and adjacent habitats.All major fauna habitats present were sampled and assessed for the likelihood of supporting conservation significant fauna. Those habitats deemed suitable to support significant fauna were subject to more intensive targeted surveying. While surveying focused on locating evidence of conservation significant fauna, all fauna species observed were recorded.
Competency / experience of the consultant(s) carrying out the survey.	The field personnel/authors have extensive fauna experience in the region (e.g., Turpin 2010; Kingfisher 2014a, 2014b, 2016, 2018a, 2018b, 2018c) and have published scientific papers on the region's fauna (e.g., Turpin and Johnstone 2017) and threatened fauna in Western Australia (Turpin 2015, Turpin *et al.* 2015; Turpin *et al.* 2018).
Scope. (What faunal groups were sampled and were some sampling methods not able to be employed because of constraints?)	All vertebrate fauna groups were sampled via systematic methods (pitfall traps, funnel traps, motion-activated cameras, acoustic recording) and targeted searches were conducted for species of conservation significance. The combination of survey techniques utilized allowed for a high number of bird, reptile, and native mammal species to be detected (Appendix 2). Several species were recorded in the area for the first time and a number of rare or cryptic species were also detected. Field results compare favourably with previous surveys (e.g., at Butcher Well, Sunrise Dam, Granny Smith and Lake Carey) with a comparably large assemblage recorded (Ninox 1995; Brearley et al. 1997; Terrestrial Ecosystems 2011, Kingfisher 2021).
Proportion of fauna identified, recorded and / or collected.	All vertebrate fauna trapped or observed were identified.
Sources of information e.g., previously available information (whether historic or recent) as distinct from new data.	Sources include previous reports on the fauna of the region (Kingfisher 2014a, 2016, 2018, 2021; Ninox 1995, 2005, 2010; Brearley *et al.* 1997; Dunlop and Payne 1999; Terrestrial Ecosystems 2011), databases (ALA, GBIF, BirdLife Australia, DBCA, DAWE). Table 3 lists the relevant sources of information used.
The proportion of the task achieved and further work which might be needed.	Potential future project areas under consideration at the time of commencement of the study were targeted to ensure maximum useabilty of the data for future environmental approvals.All major habitats present within the survey area were sampled and all lease areas were subject to sampling. Surveying also focussed on areas of proposed disturbance and those habitats deemed suitable to support conservation significantfauna.Survey coverage was comprehensive and a wide range of sampling techniques was utilised to successfully document the assemblage present in detail.The assemblage recorded compares favourably with

Limitation	Comment
	previous surveys conducted in the nearby area (e.g., at Sunrise Dam and Granny Smith mines) with a comparably large mammal assemblage recorded (exceeding the assemblage totals previously recorded; Figure 9, Table 10).The presence of the DBCA Priority Long-tailed Dunnart requires consideration as the species has the potential to occur across a wider area. Similar to surveys conducted at Granny Smith Mine (Terrestrial Ecosystems 2011b), subsequent survey effort for the Long-tailed Dunnart would likely reveal the species presence across a wider area and refine the species local distribution and habitat preferences.
Timing / weather / season / cycle.	The trapping survey was conducted during March 2022 and undertaken at a favourable time of year to sample the project's fauna (EPA 2016a, conditions ranged from warm to mild).
Disturbances (e.g., fire, flood, etc.) which affected results of survey.	No disturbances affected the survey results.
Intensity (i.e., in retrospect, was the intensity adequate?)	The survey effort (survey locations, techniques employed, sampling period) was extensive and conducted over a sufficient extent and time to successfully document the site's fauna assemblage in detail. The combination of survey techniques utilized allowed for a high number of bird, reptile and native mammal species to be detected (Appendix 2). Several species were recorded in the area for the first time and a number of rare or cryptic species were also detected. Field results compare favourably with previous surveys (e.g., at Butcher Well, Sunrise Dam, Granny Smith and Lake Carey, Ninox 1995, 2004, 2010; Terrestrial Ecosystems 2011, Kingfisher 2018). In accordance with DBCA guidelines, sampling was undertaken over a minimum of seven consecutive nights.
Completeness (e.g., was relevant area fully surveyed?)	The survey area contained many small sites of archaeological or anthropological significance (heritage sites) and so these were avoided during survey site selection. Therefore, some rocky sites such as Wilga Hill were excluded from the survey. However, as saxicoline (rock inhabiting) fauna were successfully surveyed at rocky sites elsewhere, such limitations did not impact the survey results. All major habitats present were assessed. Habitats likely to support conservation significant fauna were subject to further intensive sampling. In accordance with DBCA guidelines, sampling was undertaken over a minimum of seven consecutive nights. Potential future project areas under consideration at the time of commencement of the study were targeted to ensure maximum usability of the data for future environmental approvals. As such, some sampling sites (systematic survey sites, motion-activated cameras and audio recorders) were located to sample for fauna within the areas of proposed development, influencing survey design and intensity (e.g. some sampling effort concentrated in areas under consideration for potential renewable energy projects).
Resources (e.g., degree of expertise available in animal identification to taxon level).	All species identified to taxon level.
Remoteness and/or access problems.	Not applicable.

Limitation	Comment
Availability of contextual (e.g., biogeographic) information on the region.	Regional information was available and was consulted (Table 3).

4. RESULTS

4.1 Fauna Habitats

Fifteen major fauna habitats were recognised from the survey area and grouped according to topography, soil type and the associated dominant vegetation (aligned with Land Systems and Mattiske 2018 Vegetation Mapping, Figure 8, Table 8). The major habitats present within the survey area include:

1. Salt Lake: Lake Carey and the associated smaller fringing salt lakes (sparsely vegetated lake bed);
2. Chenopod shrublands (Samphire dominated): Low chenopod shrublands on saline soils fringing Lake Carey including Tecticornia, Atriplex, Lawrencia, Roycea, Maireana and Frankenia species (e.g., *Tecticornia pruinosa, Tecticornia undulata, Frankenia fecunda*);
3. Chenopod shrubland (Atriplex / Maireana dominant): Chenopod shrublands (dominated by Atriplex or Maireana species) on clay or sandy plains (including *Maeriana pyramidata*, *Lycium australe)*;
4. Mixed shrublands (low plains, rises): Low sandy plains and rises fringing Lake Carey supporting mixed Acacia, Hakea, and chenopod shrublands (including *Acacia tysonii, Hakea preissii, Exocarpos aphyllus, Eremophila miniata, Cratystylis subspinescens, Atriplex vesicaria, Maireana aphylla, Maireana pyramidata, Rhagodia drummondii, Jacksonia arida*);
5. *Melaleuca* thickets (fringing depressions): *Melaleuca apostiba/ Melaleuca hamata* shrublands fringing drainage depressions;
6. *Eucalypt, Casuarina* Woodland (on gypsiferous rises): *Eucalypt striaticalyx* and / or *Casurina obesa* Woodland on gypsiferous rises with *Acacia tysonii*, *Grevillea sarissa*, *Eremophila miniata*, *Eremophila scoparia*, *Exocarpos aphyllus* and *Atriplex vesicaria*;
7. Mulga shrubland (on sandy-loam plains): Mulga shrubland on sandy-loam plains, supporting a mixed understorey dominated by *Acacia* and *Eremophila* species (including *Acacia sp. Section Juliflorae, Acacia ramulosa, Acacia tetragonophylla, Eremophila forrestii, Maireana sedifolia, Ptilotus obovatus, Rhagodia drummondii*);
8. Mulga shrubland (on clay-loam plains): Mulga shrubland on hardpan (clay soils, including *A. ayersiana, A. craspedocarpa, A. sp. Section Juliflorae, A.tysonii, A. tetragonophylla, S. artemisioides, A. craspedocarpa, Eremophila* spp. on red-brown flats);
9. Open Acacia shrublands (on stony plains): Open Acacia, Eremophila and Senna shrublands (e.g. *Eremophila scoparia*, *Senna artemisioides, A. ayersiana*, *A. burkittii*, *A. craspedocarpa, Scaevola spinescens*) on stony plains and rises;

10. Open Chenopod shrublands (on stony plains): Open Chenopod shrublands on stony plains (including *Maireana pyramidata, Maireana triptera, Atriplex vesicaria* over *Ptilotus obovatus, Frankenia* spp., *Solanum lasiophyllum* on red clay flats with ironstone and quartz pebbles);
11. Minor drainage lines (with dense fringing Acacia): Minor drainage lines with dense fringing Acacia shrubland (including *Acacia aneura, A. fuscaneura, Acacia ramulosa, Acacia aptaneura, Acacia tysonii, Ptilotus obovatus, Eremophila metallicorum* and *Scaevola spinescens*);
12. Rocky hills and ridges with outcropping: supporting mixed Acacia shrublands (including Acacia *sp. Section Juliflorae, Acacia kempeana, Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides, Eremophila scoparia, Solanum lasiophyllum*);
13. Stony rises and adjacent plains: supporting *Casuarina pauper* woodland over mixed Acacia shrublands (e.g. *Acacia kempeana, Acacia sp. Section Juliflorae,* and *Eremophila scoparia*) over mixed chenopods (*Maireana sedifolia*) and *Senna artemisioides*;
14. Sandy-loam plains: supporting mixed Acacia shrublands (including *Acacia ayersiana, Acacia aneura var. aneura, Grevillea berryana*) over *Triodia basedowii* (with open areas dominated by *Triodia basedowii*);
15. Sandy-loam plains: supporting Mallee (*Eucalyptus horistes*), *Brachychiton gregorii, Acacia aneura, Acacia tetragonophylla* and Eremophila species over *Ptilotus obovatus* and *Triodia basedowii.*

Table 8. Fauna habitats aligned with Mattiske Vegetation Codes and Land Systems.

Code	Fauna Habitat	Mattiske Vegetation Code	Land System
1	Salt lake (sparsely vegetated)	SL, CP	LAB
2	Chenopod shrublands (samphire dominated)	C3, C4, C5, C6, C7, C8, C9, C11, C13	CAR
3	Chenopod shrubland (Atriplex / Maireana dominant)	C1	CAR, RAI, GUN
4	Hakea / Acacia shrublands (low plains, rises)	C2	CAR
5	Melaleuca thickets(fringing depressions)	M1, M2	CAR
6	Eucalypt, Casuarina Woodland (on gypsiferous rises)	C10, E2, A5	CAR
7	Mulga shrubland (on sandy-loam plains)	A1, A7, A10, A12, A4	RAI, KIR
8	Mulga shrubland (on stony slopes and clay-loam plains)	A2, A6, A11, A4	RAI, CAR, GUN
9	Open Acacia shrublands (on stony plains)	S2	GUN, GRS, SUN
10	Open Chenopod shrublands (on stony plains)	S1, C14	GRS, GUN
11	Minor drainage lines (with dense fringing Acacia)	A10, A14	RAI, GUN, VIO
12	Mixed Acacia shrublands on rocky hills, ridges	A15, A16	LEO
13	*Casuarina,* mixed Acacia shrublands on stony rises, plains	C12	VIO, GUN
14	Sandy-loam plains, Mulga over *Triodia basedowii*	A3	KIR
15	Sandy-loam plains, Mallee over *Triodia basedowii*	E1	KIR

Note: A8, A9, A13 occur outside the mapped boundaries of the survey area

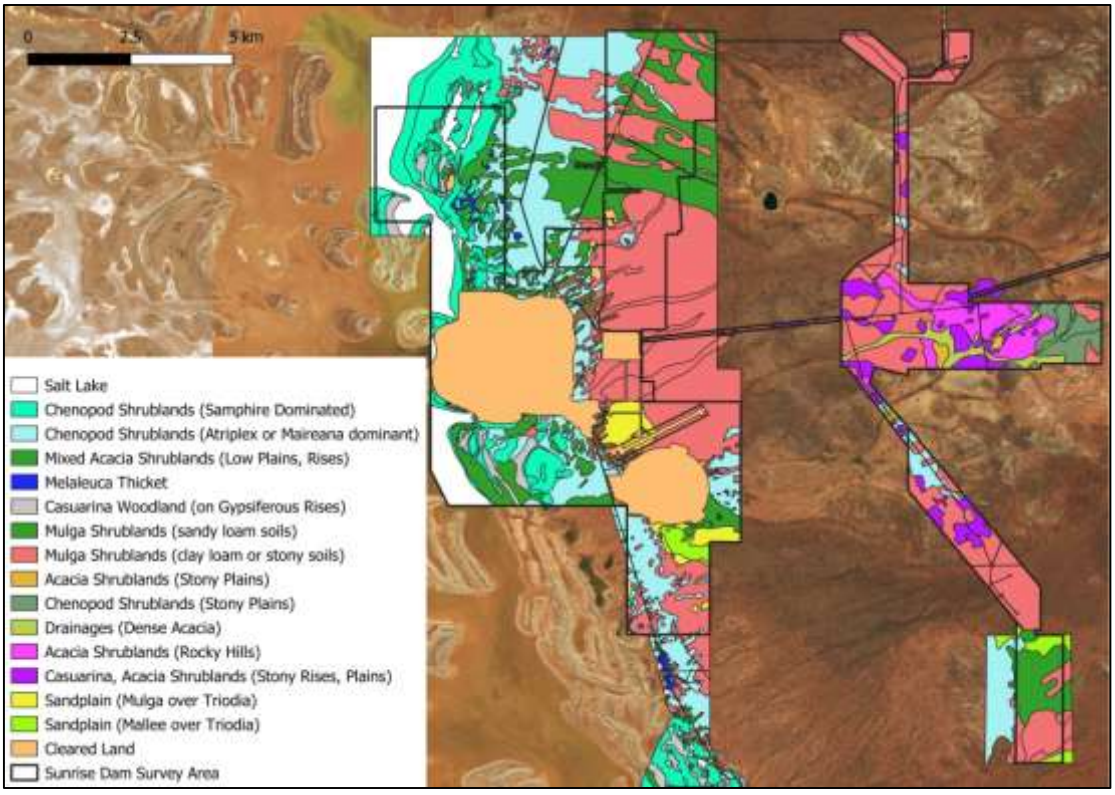

Figure 8: Sunrise Dam Major Fauna Habitats (aligned with Vegetation Mapping (Mattiske2022).

4.2 Vertebrate Fauna

The desktop review identified 272 fauna species potentially occurring in the region (Appendix 2). Based on the results of the database searches and literature reviews, nine frog, 80 reptile, 143 bird, 30 native mammal and 10 introduced mammal species may potentially occur (Table 9, Appendix 2). A total of 122 fauna species were recorded from the Sunrise Dam survey area, comprising two frog, 31 reptile, 62 bird, 18 native mammal and nine introduced mammal species (Appendices 2 - 5). The assemblage recorded compares favourably with previous surveys conducted in the nearby area (e.g., at Sunrise Dam and Granny Smith mines) with a comparably large mammal assemblage recorded (exceeding the assemblage totals previously recorded; Figure 9, Table 10).

Table 9. Vertebrate fauna assemblage expected in the survey area.

Taxon	Desktop Review	Species Recorded March 2022	Significant Fauna Expected			Significant Fauna Recorded at Sunrise Dam 2022		
			EPBC Act, BC Act	DBCA	Local	EPBC Act, BC Act	DBCA	Local
Frogs	9	2	0	0	0	0	0	0
Reptiles	80	31	0	0	4	0	0	1
Birds	143	62	5	1	3	2	0	2
Native Mammals	30	18	0	2	2	0	2	1
Introduced Mammals	10	9	-	-	-	-	-	-
Total	**272**	**122**	**5**	**3**	**9**	**2**	**2**	**4**

Table 10. The survey results compared with previous studies.

Taxon	1995	2004: 1	2004: 2	2004: 3	2004: 4	2018	2021	2022
Frogs	3	3	1	1	0	5	2	2
Reptiles	26	30	1	19	23	40	27	31
Birds	64	56	55	57	48	53	44	62
Native Mammals	1	4	6	8	4	15	17	18
Introduced Mammals	4	5	5	4	5	7	7	9
Total	98	98	68	89	80	120	97	122

Key: Previous surveys include Ninox (1995, 2004), Kingfisher 2018 and 2021.

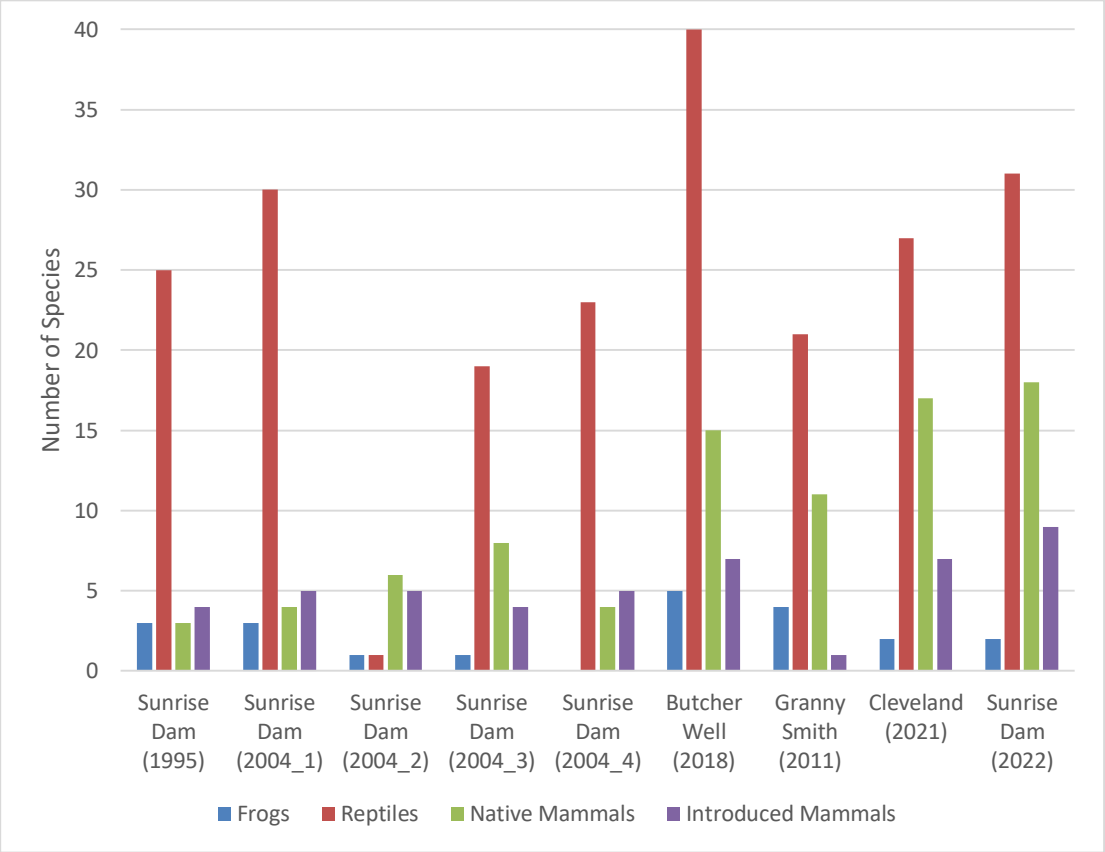

Figure 9: Fauna assemblage recorded at Sunrise Dam and at other nearby surveys.

4.2.1 Amphibians

Two frog species were recorded during the March survey. Main's Frog (*Cyclorana maini*) was recorded calling from a waterbody at the sewerage ponds and the Kunapalari Frog (*Neobatrachus kunapalari*), was recorded calling from the same area via an acoustic recorder. Six frog species have been previously recorded in the local area (from the Butcher Well and Cleveland surveys in 2018 and 2021 - the Kunapalari Frog (*Neobatrachus kunapalari*), Goldfield's Bullfrog (*Neobatrachus wilsmorei*), Shoemaker frog (*Neobatrachus sutor*), Main's Frog (*Cyclorana maini*), Western Water-holding Frog (*Cyclorana occidentalis*) and Desert Tree Frog (*Litoria rubella*), with a seventh species, *Platyplectrum spenceri* recorded from Katata Creek, near Murrin Murrin (Kingfisher 2018).No frog species expected to occur within the survey area are of conservation significance.

4.2.2 Reptiles

A total of 31reptile species were recorded from the survey area (Figure 10). This included 29 species recorded from the systematic survey sites, and a further two species recorded opportunistically or on motion cameras (*Egernia formosa* and *Ctenophorus fordi*). Species of note include the Mottled Ground Gecko (*Lucasium squarrosum*), of which the southern form was recorded, and the Goldfield's Crevice-skink (*Egernia formosa*), which has a restricted occurrence across the region. *Underwoodisaurus milli* is similarly restricted to rocky areas and kopi dunes, while *Diplodactylus conspicillatus*, *Ctenotus greeri* and *Ctenotus helenae* are restricted to sandplains supporting Triodia hummock grasslands.

Overall, 80 reptile species have the potential to occur within the Sunrise Dam survey area. Most reptile species recorded or expected to occur within the survey area are widespread across the Murchison Bioregion. However, as the project is located near the eastern edge of the bioregion, some reptiles are likely to occur near the extreme edge of their range. This includes *Lucasium squarrosum, Lerista picturata, Underwoodisaurus milii, Varanus caudolineatus* and *Varanus panoptes.*

Figure 10: Examples of reptiles recorded from the survey area (Barking Gecko, Bynoe's Gecko, Monk Snake and a Pygmy Spiny-tailed Skink in a tree hollow).

4.2.3 Birds

Sixty-two bird species were recorded from the Sunrise Dam survey area (Appendices 2 and 5). A total of 143 species have the potential to occur within the survey area. Most avian species expected to occur are widespread across the Murchison Bioregion. However, as the survey area is located near the south-eastern edge of the region (and adjacent to the Great Victoria Desert), some birds are likely to occur in the area near the extreme edge of their range. This includes the Western Bowerbird. Species of note recorded from the Sunrise Dam survey area include:

1. Malleefowl (*Leipoa ocellata*): several sets of tracks in the south-east;
2. Slender-billed Thornbill (*Acanthiza iredalei*; restricted, locally significant, recognized range decline): recorded from samphire shrubland;
3. White-fronted Chat (*Epthianura albifrons*): recorded from samphire shrubland;
4. Black Swan (*Cygnus atratus*): nests recorded from several sites surrounding a low depression fringing Lake Carey (Figure 11).

Figure 11: Black Swan nest and eggs recorded from the survey area.

As the survey area lies on the margins of Lake Carey, several species associated with lake or lake edge habitats have the potential to occur. This includes waterbirds and waders (using the lake after occasional periods of flooding) and species restricted to the low chenopod shrublands fringing the lake (such as the Slender-billed Thornbill and potentially the Rufous Fieldwren). Several birds of conservation significance occur in the region and have the potential to occur within the survey area. These are discussed in Section 5.

4.2.4 Mammals

Thirty native mammal species have the potential to occur within the survey area (Appendix 2). Eighteen native species (two macropods, seven dasyurids, two rodents, six bats and the echidna) and nine introduced species were recorded during the field survey. Evidence of the Echidna (*Tachyglossus aculeatus*), Rabbit (*Oryctolagus cuniculus*), Cattle (*Bos taurus*) and Euro (*Macropus robustus*) was extensive throughout the survey area and the species were also observed or recorded on motion camera. The Woolley's Pseudantechinus (*Pseudantechinus woolleyae*) was recorded from two rocky outcrops (via motion-activated camera and scat observations). The Long-tailed Dunnart (*Sminthopsis longicaudata*) another specialist of rugged, rocky habitats, was recorded on camera from one rocky hill near Wilga Hill. Overall, four Dunnart species (*Sminthopsis longicaudata, S. crassicaudata, S. dolichura and S. ooldea)* were recorded. The Wongai Ningaui (*Ningaui ridei*) was recorded from open shrubland on sandplain fringing Lake Carey. Six bat species were recorded via acoustic detection (Appendix 2). Old, abandoned burrow systems of the nationally extinct Boodie (*Bettongia lesueur*) were also recorded from several locations.

Several species were recorded in the Sunrise Dam area for the first time, including the Brush-tailed Mulgara, which was recorded via motion-activated camera, and several burrows were located on the sandplains supporting *Triodia* hummock grasslands on the southern fringe of the survey area.

4.2.5 Vertebrate fauna trapped during systematic sampling

Thirty three vertebrate species were trapped at the sites surveyed (Table 11). An additional two species were recorded from opportunistic observations (*Ctenophorus fordi*) or from motion-activated cameras (*Egernia formosa*). The assemblage recorded included 31 reptile and four mammal species (Table 12). The most commonly recorded fauna included several *Ctenotus* species, *Heteronotia binoeii* and *Egernia depressa* (with the species' scat latrines observed throughout the survey area and associated with Mulga). Captures reflected the habitats present with some specialist fauna restricted to particular habitat types (such as *Cryptoblepharus buchananii*, *Varanus caudolineatus* recorded at woodland sites and *Sminthopsis ooldea, Ctenotus helenae, Diplodactylus conspicillatus* and *Ctenotus greeri* recorded from spinifex sandplain). Species associated with habitats fringing Lake Carey included *Ctenophorus fordi* and *Underwoodisaurus milli* while *Egernia formosa, Diplodactylus pulcher* and *Ctenotus uber* were restricted to rocky habitats.

Table 11. Species recorded at the systematic and opportunistic (Opp) survey sites.

Species	Survey Sites						Opp	Total
	1	2	3	4	5	6		
Cryptoblepharus buchanani				3				3
Ctenophorus scutulatus		2					3	5
Ctenophorus fordi							2	2
Ctenotus greeri					4			4
Ctenotus helenae					3			3
Ctenotus leonhardii			2				3	2
Ctenotus pantherinus					5		2	7
Ctenotus schomburgkii		4			5		2	11
Ctenotus uber	18							18
Diplodactylus conspicillatus					1			1
Diplodactylus pulcher	2							2
Tachyglossus aculeatus	S						S	S
Egernia depressa		4			2		7	13
Egernia formosa							2	2
Gehyra variegata	1			2			1	4
Heteronotia binoeii	2			1	5	2	2	12
Lerista bipes						2		2
Lerista desertorum						1		1
Lucasium squarrosum			2					2
Menetia greyi				3			1	4
Moloch horridus					1		S	1
Morethia butleri	1		2	1				4
Nephrurus vertebralis			1					1
Ningaui ridei			1		4			5
Parasuta monachus			1					1
Pogona minor					2			2
Pygopus nigriceps						1		1
Rhynchodura ornata	4							4
Simoselaps bertholdi				1				1
Sminthopsis dolichura	1		2					3
Sminthopsis ooldea					1			1
Underwoodisaurus milli	1			2				3
Varanus caudolineatus				1				1
Varanus gouldi						1	1	2
Varanus panoptes	1				1		1	3
Total	31	10	11	14	34	6	29	128

Note the species listed above were recorded during trapping only with species recorded on camera listed below.

4.2.6 Fauna Recorded on Motion-activated Cameras

Twenty one species were recorded from the cameras installed, comprising five reptile, three bird, nine native mammal and four introduced mammal species (Table 12, Figures 12 - 14). The most commonly recorded taxa included the House Mouse (*Mus musculus*), Echidna (*Tachyglossus aculeatus*) and Rabbit (*Oryctolagus cuniculus*; Table 12). Smaller mammals were identified by a combination of ear length, head and body shape and tail characteristics. Several species of note were recorded:

- Brush-tailed Mulgara (*Dasycercus blythi*): a DBCA Priority species, and recorded from spinifex sandplain for the first time at Sunrise Dam;
- Long-tailed Dunnart (*Sminthopsis longicaudata*): a DBCA Priority species, restricted to rugged, rocky hills and occurs in the area at its southern extent;
- Woolley's Pseudantechinus (*Pseudantechinus woolleyae*): occurs in the Murchison and Pilbara regions and specialist of rocky habitats;
- Goldfield's Crevice-skink (*Egernia formosa*): occurring at its eastern range extent and favours rocky habitats.

Table 12. Fauna recorded on motion-activated camera from the survey area.

Species Recorded		**Area**		
Reptiles	**Total Sites**	**Lake Carey Margins**	**Rocky Hills (East)**	**Spinifex Sandplain**
Ctenophorus sp.	1		1	
Ctenotus uber	2		2	
Egernia formosa	2		2	
Varanus gouldii	1			1
Varanus panoptes	1		1	
Birds				
Torresian Crow	3		2	1
Crested Bellbird	1		1	
Chestnut-breasted Quail-thrush	1		1	
Mammals				
Tachyglossus aculeatus	1		1	
Dasycercus blythi (P4)	2			2
Pseudantechinus woolleyae	2		2	
Sminthopsis crassicaudata	1	1		
Sminthopsis dolichura	1		1	
Sminthopsis longicaudata (P4)	1		1	
Sminthopsis sp.	2			2
Macropus robustus	1		1	
Notomys alexis	2	1		1
Mus musculus	1	1		
Oryctolagus cuniculus	3	1	1	1
Felis catus	1	1		
Rodent species	1		1	

Figure 12: Brush-tailed Mulgara recorded from the survey area

Figure 13: The Long-tailed Dunnart recorded from the survey area.

Figure 14: *Egernia formosa*, Echidna and Woolley's Pseudantechinus recorded from the survey area.

4.2.6 Fauna Recorded via Acoustic Detection

Thirty two species were recorded from the acoustic recorders, comprising six bat species, one frog species, one introduced mammal (cattle) and 24 bird species (Table 13). No species of conservation significance were recorded.

Table 13. Fauna recorded via acoustic detection from the survey area.

Common Name	Species Name	Sites	Comments
Bats			
Hill's Sheathtail Bat	*Taphozous hilli*	1	Mulga with free standing water (trough)
Inland Freetail Bat	*Ozimops petersi*	3	Previously recorded by Donato (2020)
Gould's Wattled Bat	*Chalinolobus gouldii*	5	Previously recorded by Donato (2020)
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	4	Mulga with free standing water (trough)
Inland Broad-nosed Bat	*Scotorepens balstoni*	3	Previously recorded by Donato (2020)
Inland Cave Bat	*Vespadelus finlaysoni*	1	Mulga with free standing water (trough)
Other Mammals			
Cattle	*Bos Taurus*	1	Mulga with free standing water (trough)
Frogs			
Kunapalari Frog	*Neobatrachus kunapalari*	1	Recorded from Sewerage Ponds
Birds			
Australian Ringneck	*Barnardius zonarius*	1	Mulga with free standing water (trough)
Black-fronted Dotterel	*Elseyornis melanops*	1	Recorded from Sewerage Ponds
Western Bowerbird	*Ptilonorhynchus guttatus*	1	Mulga with free standing water (trough)
Common Bronzewing	*Phaps chalcoptera*	1	Mulga with free standing water (trough)
Crested Pigeon	*Ocyphap slophotes*	1	Recorded from Sewerage Ponds
Crested Bellbird	*Oreoica gutturalis*	1	Mulga with free standing water (trough)
Torresian Crow	*Corvus orru*	1	Mulga with free standing water (trough)
Grey Teal	*Anas gracilis*	1	Recorded from Sewerage Ponds
Galah	*Eolophus roseicapillus*	1	Mulga with free standing water (trough)
Grey Butcherbird	*Cracticus torquatus*	1	Mulga with free standing water (trough)
Grey Shrike-thrush	*Colluricincla harmonica*	2	Mulga with free standing water (trough)
Inland Thornbill	*Acanthiza apicalis*	2	Mulga with free standing water (trough)
Little Crow	*Corvus bennetti*	1	Mulga with free standing water (trough)
Mistletoebird	*Dicaeum hirundinaceum*	2	Drainage with Acacia shrubland
Australian Shelduck	*Tadorna tadornoides*	1	Recorded from Sewerage Ponds
Mulga Parrot	*Psephotus varius*	2	Drainage with Acacia shrubland
Pacific Black Duck	*Anas superciliosa*	1	Recorded from Sewerage Ponds
Pied Butcherbird	*Cracticus nigrogularis*	2	Mulga with free standing water (trough)
Rufous Whistler	*Pachycephala rufiventris*	1	Drainage with Acacia shrubland
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	1	Drainage with Acacia shrubland
Singing Honeyeater	*Lichenostomus virescens*	3	Drainage with Acacia shrubland
White-fronted Honeyeater	*Purnella albifrons*	1	Drainage with Acacia shrubland
Willie Wagtail	*Rhipidura leucophrys*	2	Drainage with Acacia shrubland
White-winged Fairy-wren	*Malurus leucopterus*	1	Recorded from chenopod shrubland

5. CONSERVATION SIGNIFICANT FAUNA

5.1 Conservation Significant Fauna Recorded from the Region

Conservation significant fauna are described in Section 2.4 and include species listed under Commonwealth or State legislation, species listed as Priority Fauna by DBCA, species listed as declining in biodiversity publications and species considered locally significant (due to restrictions in range or sensitivities to threatening processes; Woinarski *et al.* 2017).

Overall, 37 species of conservation significance have been recorded from the region (sourced from regional database searches and previous surveys). These species are outlined in Table 14 along with their conservation status and expected occurrence in the survey area. While a limited number of fauna surveys have been conducted in the local area, previous work (e.g., Ninox 1995, 2004; Kingfisher 2014 - 2018) has identified the presence of several conservation significant fauna species including:

- Malleefowl (EPBC Act and BC Act Vulnerable; recorded approximately 20 km east of Sunrise Dam along the Eastern Goldfields Pipeline, Kingfisher 2014);
- Peregrine Falcon (BC Act Specially protected; recorded from Sunrise Dam, Ninox 1995);
- Grey Falcon (EPBC Vulnerable, recorded 50 km north-west of Sunrise Dam);
- Long-tailed Dunnart (DBCA Priority 4, recorded near Granny Smith mine, Terrestrial Ecosystems 2011);
- Brush-tailed Mulgara (DBCA Priority 4, recorded 25 km east of Sunrise Dam, Kingfisher 2014);
- EPBC Migratory Waders (EPBC Migratory, several waders listed under the EPBC have been recorded at Lake Carey and surrounding wetlands including Wood Sandpiper and Red-necked Stint, ALA 2022);
- Slender-billed Thornbill (locally significant, recorded from Lake Carey, Kingfisher 2021);
- Bush Stone-curlew (locally significant, recorded from Laverton, ALA 2022);
- *Aprasia picturata* (locally significant; recorded from near Murrin Murrin, ALA 2022);
- Several locally significant reptiles, recorded at Lake Carey near the extreme of their range (ALA 2022).

Table 14 lists the likelihood of significant fauna occurring within the survey area. Fauna species are classified as:

- Recorded - either during the current survey or from previous observations;
- Likely Resident - recorded nearby, suitable habitat present;
- Seasonal Visitor - expected to occur within the survey area at least on a seasonal basis;
- Foraging Visitor - expected to forage within the survey area;
- Vagrant - rare/occasional visitor;
- Potential Resident - recorded in region, suitable habitat present; or
- Unlikely - suitable habitat absent.

Conservation significant fauna considered likely to occur at least periodically within the survey area are also detailed in Table 14.

Table 14. Conservation significant fauna recorded from the region.

Taxa	Conservation Status*			Local Records	Preferred Habitat Type	Status in Survey Area		
REPTILES	**CS1**	**CS2**	**CS3**			**Habitat Present**	**Expected Status**	**Species Recorded**
Aprasia picturata			L	Murrin Murrin	Stony hills	Yes	Potential Resident	
Ctenophorus infans			L	Laverton	Stony hills	Yes	Resident	<10km
Delma australis			L	Lake Carey	Eucalypt Woodland	Yes	Resident	<10km
Underwoodisaurus milii			L	Lake Carey	Casuarina Woodland	Yes	Resident	Recorded
Lerista picturata			L	Lake Carey	Eucalypt Woodland	Yes	Resident	<10km
BIRDS								
Malleefowl	V	V		Sunrise Dam	Acacia, rocky hills	Yes	Potential Resident	Recorded
Princess Parrot	V	P4		Laverton	Marble Gum woodland	Minimal	Vagrant	
Peregrine Falcon		OS		Laverton	Shrubland, woodland	Yes	Resident	Ninox 1995
Grey Falcon		V		Murrin Murrin	Open grasslands	Yes	Visitor	
Fork-tailed Swift	M	IA		Menangina	Aerial	Yes	Vagrant	
Night Parrot	CE	CE		None	Spinifex, chenopod	No	Unlikely	
Hooded Plover		P4		Leonora	Salt lakes	Yes	Visitor	
Major Mitchell's Cockatoo			L	Leonora	Woodland, mallee	Yes	Vagrant	
Slender-billed Thornbill			L	Lake Carey	Samphire, chenopods	Yes	Resident	Recorded
Regent Parrot			L	Laverton	Eucalypt woodlands	Minimal	Vagrant	
Bush Stone-curlew			L	Leonora, Laverton	Acacia shrublands, hills	Yes	Resident	
Scarlet-chested Parrot			L	Laverton	Eucalypt woodland	Minimal	Vagrant	
Rufous Treecreeper			L	Laverton	Eucalypt woodland	Minimal	Unlikely	
Western Chestnut Quail-thrush			L	Laverton	Eucalypt woodland	Yes	Unlikely	
Banded Stilt			L	Lake Carey	Salt lakes	Yes	Migrant	Recorded
EPBC Migratory birds	M	IA		Lake Carey	Wetlands, salt lakes	Yes	Migrant	
Wood Sandpiper	M	IA		Lake Carey, Mt Weld	Wetlands, salt lakes	Yes	Migrant	
Red-necked Stint	M	IA		Lake Carey	Wetlands, salt lakes	Yes	Migrant	<10km
MAMMALS								
Sandhill Dunnart	E	E		Tropicana	Sandplains, dunes	Minimal	Unlikely	
Brush-tailed Mulgara		P4		Laverton	Spinifex sandplains	Minimal	Resident	Recorded
Long-tailed Dunnart		P4		Lake Carey, Granny Smith	Stony hills and ridges	Yes	Resident	Recorded
Central Long-eared Bat		P3		Lake Minigwal	Woodlands	Yes	Potential Resident	
Kultarr			L	Granny Smith	Stony plains	Yes	Resident	<20km
Woolley's Pseudantechinus			L	Laverton, Leonora	Rocky ridges	Yes	Resident	Recorded

* Conservation Status Codes: CS1: EPBC Act listed species: E = Endangered, V = Vulnerable, M = Migratory, CE = Critically Endangered; CS2: BC Act listed species: OS = Other specially protected fauna, IA = listed under International Agreement; DBCA Priority Species: P1 - 4 = Priority 1 – 4; CS3: L = Locally significant, due to distribution or habitat limitations.

5.2 Significant Fauna Recorded or Expected within the Survey Area

Five species of conservation significance were recorded during the 2022 survey, most for the first time locally. These were:

1. Malleefowl (EPBC Act Vulnerable, BC Act Vulnerable; tracks recorded in three locations from mixed Acacia shrubland in the south-east of the survey area);
2. Long-tailed Dunnart (DBCA Priority 4, recorded on camera from one rocky ridge);
3. Brush-tailed Mulgara (DBCA Priority 4, burrows, tracks and camera imagery recorded to the south of the Tailings Storage Facility);
4. Slender-billed Thornbill (locally significant, recorded from the margins of Lake Carey); and
5. Woolley's Pseudantechinus (locally significant, recorded from two rocky ridges).

Additionally, old nesting sites of the Black Swan were located near the margins of Lake Carey, revealing a previous and significant breeding event.

Additional species have been previously recorded or are considered likely to occur within the survey area. These include species expected in resident populations, and wide-ranging species which may visit the survey area periodically, such as:

- Peregrine Falcon (BC Act Specially protected, previously recorded from Sunrise Dam, Ninox 1995);
- EPBC listed migratory waterbirds (e.g., Wood Sandpiper and Red-necked Stint previously recorded at Lake Carey): several species are likely to occasionally visit Lake Carey during periods of flooding;
- Banded Stilt (previously recorded at Lake Carey including at Sunrise Dam during periods of flooding, when the species breeds in large numbers);
- Bush Stone-curlew (locally significant with regional patterns of decline): regional records from Leonora, Kookynie, Laverton and near Tropicana. As suitable habitat is present there is potential for a resident population;
- Black-headed Worm-lizard (*Aprasia picturata*, locally significant and restricted): recorded from greenstone hills near Murrin Murrin and, as suitable habitat occurs in the survey area, there is potential for a resident population;
- Kultarr (locally significant): several records from Granny Smith Mine and near Murrin Murrin, there is potential for a resident or irruptive population;
- Grey Falcon (EPBC Vulnerable): recorded near Murrin Murrin. Likely to be a rare visitor (vagrant) to the area;
- Locally significant reptiles occurring in the Lake Carey area at the extremes of their range (e.g., *Delma australis, Lerista picturata*). Recorded from islands and habitat fringing Lake Carey.

Species of conservation significance occurring or considered likely to occur within the survey area are discussed below (see Figure 15).

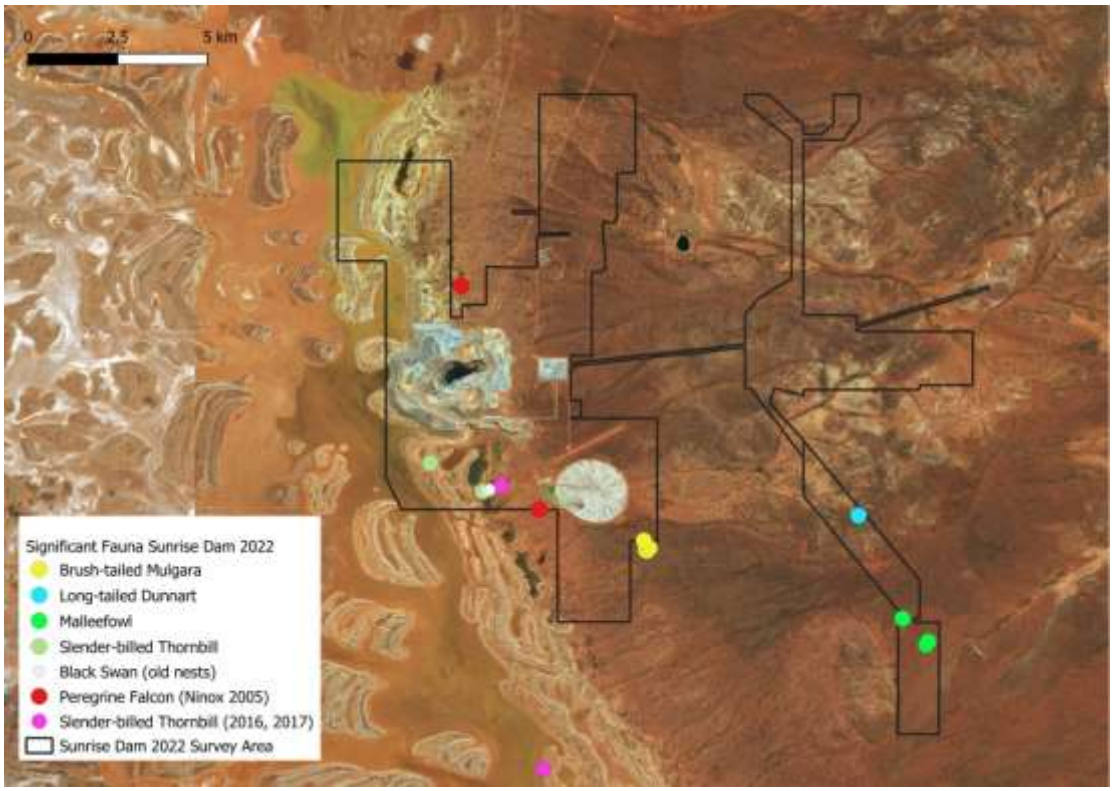

Figure 15: Significant fauna recorded from the survey area.

5.2.1 Long-tailed Dunnart (*Sminthopsis longicaudata*)

The Long-tailed Dunnart is listed as Priority 4 by DBCA as it is known from few scattered localities across arid western and central Australia. In Western Australia the species has been recorded from few widely separated populations, extending from the Pilbara south to the Murchison and Gibson Desert (DBCA, 2021). The Long-tailed Dunnart is a specialist of rugged, rocky landscapes, inhabiting rocky ridges, hills and breakaways (Pavey 2006; J Turpin pers. obs.). Across the Murchison the species is significantly dependant on the banded ironstone formation ranges scattered through the region (DEC, 2007; J. Turpin pers. obs.) resulting in its highly fragmented range. There are few records for the species in the southern Murchison. However, the species has been recorded at its southern extent from banded ironstone ridges at Mount Ida and Mount Forest (approximately 100km west of Leonora), Butcher Well and near Granny Smith mine (Kingfisher 2018, DBCA 2022). Throughout its range, the Long-tailed Dunnart occurs in rugged rocky landscapes that support a low open woodland or shrubland of Acacias (particularly Mulga, Pavey 2006). At Granny Smith, the species occurs on rocky ridges situated within the Brooking Land System, described as “prominent ridges of banded iron formation supporting mulga shrublands (Pringle *et al*., 1994)”.

The Long-tailed Dunnart was recorded within the Sunrise Dam survey area, from a rocky rise near Wilga Hill (Table 15, Figures 16 - 17). The species was detected via motion-activated camera and readily identified by a combination of size, body shape, tail length and tail position (an exceptionally long tail, held in a range of positions including almost vertically during movement). The Long-tailed Dunnart has

been previously recorded on hills adjacent to Lake Carey (Butcher Well, Cleveland and Granny Smith; Kingfisher 2018, 2021), which lies at the southern extreme of the species range. However, the occurrence at Sunrise Dam is the first known record of the Long-tailed Dunnart locally.

The Long-tailed Dunnart was recorded amongst rocky outcropping near the crest of a low rocky rise. Vegetation comprised mixed Acacia shrublands and is situated within vegetation unit A2 as mapped by Mattiske (2022). The vegetation unit is described as "Open Low Woodland to Woodland of *Acacia aneura* var. *aneura*, *Acacia aneura* var. *intermedia* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila* spp., *Maireana triptera* and *Solanum* (Mattiske 2022). The occurrence is also situated within the Leonora Land System (Land Type 9), described as "low greenstone hills and adjacent stony plains supporting mixed acacia woodlands with stony chenopod shrublands". Elsewhere across the survey area, similar habitats are mapped as Vegetation Unit A15 Acacia shrubland (*Acacia* sp. Section Juliflorae, *Acacia kempeana*, *Acacia tetragonophylla*) mid semi-open shrubland over *Dodonaea lobulata*, *Senna artemisioides*, *Eremophila scoparia* low shrubland over *Ptilotus obovatus*, *Maireana carnosa*, *Solanum lasiophyllum* sparse shrubland (Mattike 2018) and also unit C12 (*Casuarina pauper* woodland over mixed *Acacias* and *Eremophilas*, Mattiske 2022).

The Long-tailed Dunnart is likely to occur throughout the wider survey area, albeit restricted to the rocky hills and ridges present. Such habitat is associated with the Leonora Land System and a few additional rocky areas situated outside the mapped boundaries (Section 5.5). The species is also known from several rocky areas fringing Lake Carey. The capture of Long-tailed Dunnarts at Granny Smith Mine (25 km north of Sunrise Dam, Terrestrial Ecosystems 2011a) prompted a further targeted survey to determine the species' distribution across a wider area (Terrestrial Ecosystems 2011b). As such, further targeted surveys would likely reveal the species' presence across a wider area (although likely to be distal to current mining operations, as most habitat lies approximately 10 km or more east of Sunrise Dam). Habitat for the Long-tailed Dunnart is associated with Mattiske Vegetation Units A15, A16, S2, C12 and small parts of A2.

Table 15. Long-tailed Dunnart recorded from the survey area.

Record	Easting	Northing	Land System	Mattiske Code	Vegetation Description (Mattiske 2018)
Camera	454654	6778696	Leonora	A2	Open Low Woodland to Woodland of *Acacia aneura* var. *aneura*, *Acacia aneura* var. *intermedia* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila* spp., *Maireana triptera* and *Solanum sp.*

Figure 16: Long-tailed Dunnart recorded at Sunrise Dam.

Figure 17: Long-tailed Dunnart habitat, including the location of the species record (note the Woolley's Pseudantechinus in the image) and typical habitat nearby.

5.2.2 Malleefowl (*Leipoa ocellata*)

The Malleefowl is listed as Vulnerable under the EPBC and BC Acts. In Western Australia, Malleefowl occur mainly in scrub and thickets of Mallee (*Eucalyptus* spp.), Boree (*Melaleuca lanceolata*), Bowgada (*Acacia ramulosa*), and other dense litter-forming shrublands including Mulga (*Acacia aneura;* Johnstone and Storr, 2004). The species' distribution was once larger and less fragmented, but the widespread clearing of suitable habitat, coupled with the degradation of habitat by fire and livestock, and fox predation has reduced Malleefowl numbers considerably (Johnstone and Storr, 2004).

Malleefowl have developed a unique and sophisticated method of temperature control for egg incubation. They construct distinctive nests that comprise a large mound covering a central core of leaf litter. Eggs are laid within the mound, buried and left to incubate by the heat generated from decomposing leaf litter or radiant heat from the sun (Benshemesh, 2007).The mound is constructed out of sand, loam, pebbles or small rocks and as a result, a sandy or gravelly substrate, an abundance of leaf litter and winter rainfall are required for breeding (Benshemesh, 2016). A pair of Malleefowl will often use the same nest over subsequent seasons.However, nest fidelity is highly variable. Some Malleefowl pairs have been recorded using the same mound for up to nine years while others relocate seasonally between a cluster of two, three or four mounds (Priddel and Wheeler, 2003).

Malleefowl require large amounts of leaf litter for egg incubation and so breeding is generally restricted to areas of dense vegetation in late seral stages. In the Murchison, Malleefowl are often associated with densely vegetated Mulga shrublands on sandplain, or on gravelly rises. As mound construction and breeding rely heavily on rainfall, Malleefowl fail to breed and abandon mound construction during seasons of low rainfall (Priddel and Wheeler, 2003).

Searches for Malleefowl and its associated mounds were undertaken on foot by traversing through areas of suitable habitat and concentrated on areas of dense Mulga shrubland. Such vegetation was mostly located in the south-eastern parts of the survey area, but dense Mulga shrublands were also associated with the low rocky hills, and borefields areas in the east and also fringing the existing airstrip. While no mounds were located (a reflection of the lack of suitable breeding habitat) Malleefowl tracks were observed at three locations (Table 16; tracks recorded in three locations from mixed Acacia shrubland in the south-east of the survey area, Figure 18). The survey was conducted during March, outside of the species' breeding season. During this time, individuals can forage widely, away from breeding sites and across a range of habitats.

Table 16. Malleefowl track records located during the fauna survey (UTM Zone 51).

Record	Easting	Northing	Land System	Mattiske Code	Vegetation Description (Mattiske 2018)
Tracks	455892	6775432	Kirgella	E1	Low Open Woodland of *Eucalyptus horistes, Brachychiton gregorii, Acacia aneura var. aneura, Acacia aneura var. conifera, Acacia tetragonophylla over Duboisia hopwoodii, Eremophila*

Record	Easting	Northing	Land System	Mattiske Code	Vegetation Description (Mattiske 2018)
					longifolia, E. margarethae over *Maireana spp., Ptilotus obovatus*
Tracks	456557	6774604	Kirgella	A10	*Acacia aneura var. intermedia, Acacia aneura var. aneura, Acacia ramulosa mid open shrubland over Ptilotus obovatus, Eremophila metallicorum,* and *Scaevola spinescens* low sparse shrubland over *Solanum lasiophyllum, Maireana pentatropis*
Tracks	456615	6774704	Kirgella	A10	*Acacia aneura var. intermedia, Acacia aneura var. aneura, Acacia ramulosa* mid open shrubland over *Ptilotus obovatus, Eremophila metallicorum, and Scaevola spinescens* low sparse shrubland over *Solanum lasiophyllum, Maireana pentatropis*

Within the survey area, suitable Malleefowl breeding habitat is restricted to dense areas of Mulga shrubland, which occur as smaller thickets within expanses of open shrubland (Figure 19). As the species can forage widely across a range of habitats, foraging is likely to occur across much of the survey area, particularly outside of the breeding season. Radio-tracking studies (Booth, 1987; Benshemesh,2007) have shown that over the course of a year, birds may range over 1 km to several square kilometres and that home-ranges overlap considerably. The species has been previously recorded approximately 8 km east of the survey area where a number of mounds were located along the Eastern Goldfields Pipeline. However, no breeding sites have been recorded adjacent to Sunrise Dam. As a result, while some small areas of breeding habitat are potentially present, most of the survey area is considered unsuitable for the species to breed within.

Figure 18: Malleefowl tracks recorded from the survey area.

Figure 19: Malleefowl habitat, dense Acacia shrublands, within the survey area.

5.2.3 Brush-tailed Mulgara (*Dasycercus blythi*)

The Brush-tailed Mulgara is listed as Priority 4 by DBCA and has a scattered occurrence across the Murchison Bioregion (DBCA, 2021). The species inhabits spinifex dominated sandplains and has been recorded 35 km east of Lake Carey along the Eastern Goldfields Pipeline (DBCA 2021, Kingfisher 2014).

The Brush-tailed Mulgara was recorded from several locations within and adjacent to the survey area (Table 17; burrows, camera and foraging records). An active burrow with fresh tracks and scats was recorded immediately adjacent to the M39/1116 lease boundary and the species was recorded within the lease via motion-activated camera. Vegetation containing the species records is described as "Open Low Woodland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils" (Mattiske Vegetation Mapping Code A3). Burrows were located on broad spinifex dominated sandplains characterised by *T. basedowii* hummock grassland (Figures 20 and 21).The species records were also contained within the Kirgella Land System, described as extensive sandplain, supporting mainly spinifex hummock grasslands and mulga and mallee shrublands (Pringle *et al.*, 1994).

Table 17. Mulgara records located during the fauna survey (UTM Zone 51).

Record	Easting	Northing	Land System	Mattiske Code	Vegetation Description (Mattiske 2022)
Excavation	448763	6777552	Kirgella	A3	Open Low Woodland of *Acacia ayersiana*, *A. aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils
Camera	448724	6777574	Kirgella	A3	Open Low Woodland of *Acacia ayersiana*, *A. aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils
Burrow	448763	6777552	Kirgella	A3	Open Low Woodland of *Acacia ayersiana*, *A. aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils
Burrow	448831	6777641	Kirgella	A3	Open Low Woodland of *Acacia ayersiana*, *A. aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils
Camera	448674	6777873	Kirgella	A3	Open Low Woodland of *Acacia ayersiana*, *A. aneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils

Figure 20: Active Mulgara burrow with fresh scats and tracks recorded during the survey.

Figure 21: Mulgara burrow and habitat (Spinifex sandplain) recorded during the survey.

5.2.4 Slender-billed Thornbill (*Acanthiza iredalei iredalei*)

The Slender-billed Thornbill was formerly listed as Vulnerable under the EPBC Act and is considered threatened, declining and regionally significant (McKenzie *et al.* 2003, Johnstone and Storr, 2004; BirdLife International, 2021). It occurs in chenopod shrubland, typically in areas of saltmarsh dominated by Samphire (*Tecticornia* spp.), Bluebush (*Maireana* spp.) or Saltbush (*Atriplex* spp.) around salt lakes or low heath on sandplain (Pavey, 2002). The species is declining over much of its range due to the degradation of chenopod vegetation by livestock and rabbits (Johnstone and Storr, 2004). Across inland Western Australia the Slender-billed Thornbill occurs in several disjunct populations and is considered uncommon and in some areas locally extinct (such as Lake Way near Wiluna, Johnstone and Storr, 2004). In the Northern Territory, the species is classified as Regionally Extinct (Pavey, 2002).

The Slender-billed Thornbill was recorded within the survey area, from low chenopod shrublands adjacent to Lake Carey (Table 18, Figures 14 and 22). All records came from low shrubland with samphire, where mature samphire forms dense, low thickets (Figure 22). The Slender-billed Thornbill has been previously recorded from similar habitat from the margins of Lake Carey near Sunrise Dam, Butcher Well and at Cleveland (Kingfisher 2021).

The Slender-billed Thornbill is known from few locations, both locally and throughout the wider region (DBCA 2022; ALA 2022). Away from Lake Carey, the nearest records come from Lake Rason (180 km east), Lake Darlot (190 km north) or Lake Ballard (120 south-west) highlighting the species' fragmented occurrence and restriction to major salt lakes in inland Western Australia (ALA, 2022; DBCA 2021). Around Lake Carey, the Slender-billed Thornbill is likely to be sparsely and patchily

distributed within samphire shrubland. It is likely to be restricted to the taller areas of mature chenopod shrubland which provide habitat and protection. Degradation of such habitat by Camels and Cattle has been observed on the eastern margins of Lake Carey and as such, the lake's islands are likely to provide important refuge. The species appears to be mostly restricted to near the lake edge and so disturbances to areas fringing the margins of Lake Carey may require it's consideration.

Table 18. Slender-billed Thornbill records from the survey area (2022 and Kingfisher record from 2016).

Year	Easting	Northing	Birds	Vegetation from Mattiske Vegetation Mapping (Mattiske 2018)
2022	444162	6779414	2	*Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English 552), *Tecticornia pruinosa, Tecticornia undulata* closed chenopod shrubland on orange-brown clay flats.
2022	442704	6780315	2	*Lawrencia glomerata, Cratystylis subspinescens* shrubland over *Atriplex vesicaria, Atriplex nummularia* subsp. *spathulata, Tecticornia pergranulata* subsp. *pergranulata* closed chenopod shrubland over *Eragrostis eriopoda*, Poaceae spp. open grassland on orange clay flats
2016	444692	6779611	2	*Maireana pyramidata* dominated chenopod shrubland (*Atriplex vesicaria, Samphire spp.*)

Figure 22: Slender-billed Thornbill habitat: samphire shrublands fringing Lake Carey.

5.2.5 Woolley's Pseudantechinus (*Pseudantechinus woolleyae*)

Woolley's Pseudantechinus occurs in arid Western Australia, from the Pilbara south to the Goldfields. The species is restricted to rugged, rocky habitats and has been recorded through the Murchison and south to the Menzies area (DBCA 2021). Woolley's Pseudantechinus is listed as significantly dependent on rugged, rocky ranges in the region (DEC 2007), and due to its habitat restrictions and geographic range is considered locally significant. The species was recorded from the survey area and appears regionally widespread (DBCA 2021). Within the survey area, Woolley's Pseudantechinus is likely to be restricted to areas containing rocky outcrops, mostly associated with the rocky hills east of the existing mine (such as around Wilga Hill). Such habitat, while intermittent, is widespread in the local area and as such, the species is expected to occur across a wide area.

5.2.6 Banded Stilt (*Cladorhynchus leucocephalus*)

The Banded Stilt is a nomadic wader that breeds colonially on remote, inland salt lakes after infrequent rain events (Pedler *et al.* 2014). The species occurs mainly in saline and hypersaline (very salty) waters of southern, inland and coastal Australia. The species is highly nomadic and congregates in large colonies (often hundreds of thousands of individuals) after rainfall, where flooding transforms vast and normally dry, arid salt lakes into highly productive shallow water bodies (Pedler *et al*. 2014). There are few known breeding sites in Western Australia. However, breeding has been recorded on low islands within Lake Ballard, Lake Barlee and Lake Grace (Burbidge and Fuller, 1982) and has been reported previously from Italy Island within Lake Carey (Brearley *et al.* 1997). Mummified eggs and quantities of eggshell fragments were observed on a low bluebush and samphire island south-east of Italy Island, indicating the species nested on Lake Carey at the same time as breeding was recorded on Lakes Ballard and Marmion after cyclone Bobby in February1995 (Brearley *et al.* 1997). The species has been previously recorded at Sunrise Dam, with a large number of juvenile carcasses scattered along the shoreline of Lake Carey (Kingfisher 2018). This indicates the species does breed at Lake Carey and attempted to breed after a large and recent rainfall event.

5.2.7 Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is listed as Specially Protected under the Biodiversity Conservation Act. The species is found in a variety of habitats, including rocky hills, eucalypt woodland and along watercourses (Johnstone and Storr, 1998). The Peregrine Falcon lays its eggs in the recesses of cliff faces, tree hollows or on large, abandoned nests of other birds (Johnstone and Storr, 1998). The Peregrine Falcon mates for life with pairs maintaining a home range of about 20 - 30 km^2. Blakers *et al*. (1984) consider that Australia is one of the strongholds of the species since it has declined in many other parts of the world. The Peregrine Falcon was previously recorded from Sunrise Dam (Ninox 1995, 2005, Donato Environmental Services 2020) and Butcher Well (Kingfisher 2018). Due to a lack of precipitous rocky habitat (e.g., cliffs, escarpments, breakaways) or tall Eucalypt trees, potential nesting sites are minimal within the survey area.

5.2.8 Bush Stone-curlew (*Burhinus grallarius*)

The Bush Stone-curlew (considered locally significant in this report) was until recently classified as Priority 4 by DBCA and due to large scale declines over much of southern Australia, is considered threatened (listed in South Australia, Victoria and New South Wales although not listed in Western Australia). Bush Stone-curlews are ground dwelling birds (they roost, nest and forage at ground level) and are sensitive to predation and habitat fragmentation (Johnstone and Storr 1998; Woinarski *et. al*., 2017). The species has a scattered occurrence throughout the Murchison, where it is often associated with acacia shrublands (including mulga), banded ironstone ranges and ephemeral or permanent watercourses (J. Turpin, pers. obs.). The Bush Stone-curlew has been recorded near Leonora (J. Turpin pers. obs.) and Kookynie (DBCA, 2021) and has the potential to occur within the survey area.

5.2.9 Kultarr (*Antechinomys laniger*)

The Kultarr is often associated with stony plains dominated by acacia, eremophila and senna shrublands (Van Dyck and Strahan, 2008). The Kultarr is uncommon over most of its range and populations appear to fluctuate seasonally (Van Dyck and Strahan, 2008). This species is likely to occur as a resident within the survey area with several records near Granny Smith, Murrin Murrin and Safari Bore (DBCA, 2021). As suitable habitat (stony plains supporting acacia and eremophila) occurs within the survey area, the Kultarr has the potential to occur. However, such habitat is also widespread in the local area, and as such the species is unlikely to depend on habitats present within the survey area.

5.2.10 Hooded Plover (*Thinornis cucullatus*)

The Hooded Plover is listed as Priority 4 by DBCA. The species is a migratory visitor to inland Western Australia where it inhabits salt lakes and clay pans and has been previously recorded south of Lake Carey at Lake Goongarrie and Lake Ballard (DBCA, 2021). While the species is a potential visitor, it has not been recorded at Sunrise Dam during over 20 years of monitoring by Donato Environmental Services (2020).

5.2.11 Central Long-eared Bat (*Nyctophilus major tor*)

The central form of the Central Long-eared Bat is listed as Priority 3 by DBCA. This species is regarded as locally common in the Coolgardie Bioregion where it occurs in eucalypt woodlands with a tall shrub understorey and roosts in tree hollows. It also inhabits mallee and acacia shrublands and has been found to the fringes of the Nullarbor Plain (DBCA, 2021). The Central Long-eared Bat has been recorded south of the survey area from near Lake Minigwal and also from Tropicana Gold Mine (DBCA, 2021).While there are no local records of the Central Long-eared Bat near Sunrise Dam, the southern parts of Lake Carey fall within the species predicted occurrence (McKenzie 2020). Eucalypt woodland is present within the survey area and so the species has the potential to occur. However, distributional data is limited because audio recorders do not allow for accurate species identification and so the presence of the species in the Sunrise Dam Gold Mine locality is unknown (Donato Environmental Services 2022).

5.2.12 Grey Falcon (*Falco hypoleucos*)

The Grey Falcon is listed as Vulnerable under the BC Act. It inhabits grasslands on open plains, low acacia shrublands and occurs along eucalypt-lined drainage systems (J. Turpin, pers. obs.). Although it has an extremely large range across arid Australia, the Grey Falcon occurs at very low densities and its population has been estimated to number fewer than 1,000 mature individuals (BirdLife Australia, 2021). In central Western Australia, populations appear to be concentrated around inland drainage systems. There is one record of the Grey Falcon from near Murrin Murrin (DBCA, 2021) and the species may be a rare visitor (vagrant) to the Sunrise Dam area.

5.2.13 Black-headed Worm-lizard (*Aprasia picturata*)

The Black-headed Worm-lizard (*Aprasia picturata*) has a highly restricted range and is considered locally significant. It is known from only three locations in arid Western Australia (DBCA, 2021), two of which come from a series of hills at Minara, near Murrin Murrin, approximately 30 km west of the survey area. At Minara, the Black-headed Worm-lizard inhabits low greenstone hills supporting Acacia and Eremophila shrubs (Smith and Henry, 1999). Similar habitat occurs within the survey area, and so the species is considered to have the potential to occur. However, due to a lack of records, the species' distribution and habitat preferences are poorly known and so its status in the local area is uncertain. Due to its subterranean lifestyle, the species is highly cryptic and difficult to detect. The Black-headed Worm-lizard is unlikely to occur near the existing Sunrise Dam operational area, as suitable rocky habitat is restricted to the series of hills (including near Wilga Hill) approximately 10 km or more east of the mine. Such habitat supports the Priority 4 Long-tailed Dunnart and so is unlikely to be disturbed.

5.2.14 EPBC Migratory Waterbirds

Several waterbirds listed as Migratory under the EPBC Act are expected to occur at Lake Carey (and smaller fringing wetlands) during periods of flooding. Two species, the Wood Sandpiper and Red-necked Stint have been previously recorded at Lake Carey (DBCA 2021, Western Wildlife 2016). A further two species (Common Greenshank and Common Sandpiper) have been recorded within the greater region (Lake Irwin and Lake Raeside, DBCA 2021). Several additional species have been recorded farther afield (e.g., Rowles Lagoon DBCA 2021) and have the potential to occur at Lake Carey during periods of flooding.

5.2.15 Locally Significant Reptiles

Lake Carey supports a distinctive fauna assemblage including species or populations with more southerly arid and semi-arid distributions (Brearley *et al*., 1997). Several reptiles are considered locally significant due to restrictions in habitat or distribution. The Barking Gecko (*Underwoodisaurus milii)* was recorded during the survey, while *Delma australis* and *Lerista picturata* were recorded in nearby area during the Butcher Well survey (Kingfisher 2018). These species appear to be restricted to the gypsiferous rises and shrublands fringing Lake Carey (Kingfisher

2018). All species occur in southern and temperate Australia and occur at Lake Carey near the northern, arid extreme of their range (DBCA, 2021).

5.3 Conservation Significant Fauna Expected within the Nearby Area.

While not expected to occur within AGAA lease areas, additional species are expected to occur within the regional area (within 100 km of Sunrise Dam). These are discussed below.

5.3.1 Sandhill Dunnart (*Sminthopsis psammophila*)

The Sandhill Dunnart is listed as Endangered under the EPBC and Biodiversity Conservation Acts. In Western Australia, the species inhabits spinifex dominated sandplains with a complex, mature, shrubby overstorey and often in association with sand dunes (Riley *et al.* 2021). The species is known from a small area of the Great Victoria Desert (approximately 100 km east of Lake Carey). Spinifex dominated sandplains and dunes are absent from the survey area and so the Sandhill Dunnart is unlikely to occur at Sunrise Dam.

5.3.2 Other fauna

While additional species of significance have the potential to occur within the survey area, some are considered unlikely to occur, due to the limitations of habitat. This includes the Night Parrot (*Pezoporus occidentalis*), which has a poorly known distribution. However, recent sightings have been recorded in arid Western Australia. The DBCA has developed an interim guideline for Night Parrot survey in Western Australia (DPaW 2017) and Sunrise Dam falls within the high priority area for survey and assessment. The Night Parrot is primarily associated with old and large spinifex clumps (often >50 years unburnt), especially hummocks that are ring-forming (and is sometimes associated with other vegetation types, such as dense chenopod shrubs; DPaW 2017). Such habitat occurs across the Murchison Bioregion(e.g., Night Parrot habitat was recently recorded from the Carnegie region; J. Turpin, pers. obs.).However, it is mostly lacking throughout the Sunrise Dam survey area. A small area of sandplain supporting *Triodia basedowii* occurs on the survey area's southern margins. However, this supports open Mulga shrubland and the Triodia present is small and does not form the large rings that are suitable for cover. Additionally, chenopod habitats fringing Lake Carey have suffered some degradation due to the impacts of pastoralism and the increasing presence of Camels (*Camelus dromedarius*). Audio detectors placed within such habitat did not record the presence of any significantfauna.

Other species, such as the Princess Parrot (*Polytelis alexandrae*) and Fork-tailed Swift (*Apus pacificus*) are highly mobile and occur in the region very infrequently. They are not expected to depend on habitats present within the survey area.

Several temperate-woodland bird species are recognized as declining in Western Australia (Saunders and Ingram, 1995; Fox *et al.* 2016; BirdLife Australia, 2021) and sensitive to threatening processes (Johnstone and Storr 1998, 2004; Woinarski *et al.*

2017). Listed species include the Regent Parrot, Southern Scrub-robin, Gilbert's Whistler, Western Chestnut Quail-thrush, Rufous Tree-creeper and Major Mitchell's Cockatoo (Table 14). These species have lost considerable areas of habitat, and, as they are now increasingly absent or rare over much of their former range, their retention is of conservation significance (Duncan *et. al*., 2006). Several species occur in the greater Murchison region (e.g., Lenden 1968). However, due to a lack of suitable habitat (e.g., suitable Eucalypt Woodlands or densely vegetated shrublands) they are unlikely to occur at Sunrise Dam, which also lies near the northern range limit for several taxa.

5.4 Significant Fauna Habitats

Habitats of conservation significance tend to be those that are both rare across the landscape and that are important for significant fauna and/or for biodiversity (relictual habitats and refugia). For example, outlying mesic habitats (supporting restricted fauna) occur intermittently in the arid zone, and are often associated with elevated topography and moisture where runoff allows for the development of dense thickets of vegetation and water ponds in occasional gnamma (rock) holes. The disturbance of such habitat in a localised area can have significant impacts if restricted fauna is supported or if roosting or breeding habitats are disturbed.

Several uncommon or regionally restricted habitats occur within the survey area including some that support significant fauna. These are discussed below (Figures 23 - 26) and include:

- *Casuarina* Woodland on gypsiferous rises:
- Hills and rocky rises with acacia shrublands:
- Samphire shrubland fringing Lake Carey:
- Salt Lakes:
- Sandplains supporting *Triodia basedowii* hummock grasslands:

Casuarina Woodland on Gypsiferous Rises

Casuarina pauper and *Eucalyptus clelandiorum* Woodland occurs on the gypsiferous rises (Kopi dunes) fringing Lake Carey and on the islands within the lake itself. The woodland supports several southern, temperate adapted species at the arid extreme of their range (*Delma australis, Underwoodisaurus milii, Anilios bituberculatus* and *Lerista picturata*). The woodland also contains tree hollows, likely to provide breeding and roosting opportunities for several species including parrots, bats and raptors. Habitat within the AGAA lease area is mapped below (Figure 23).

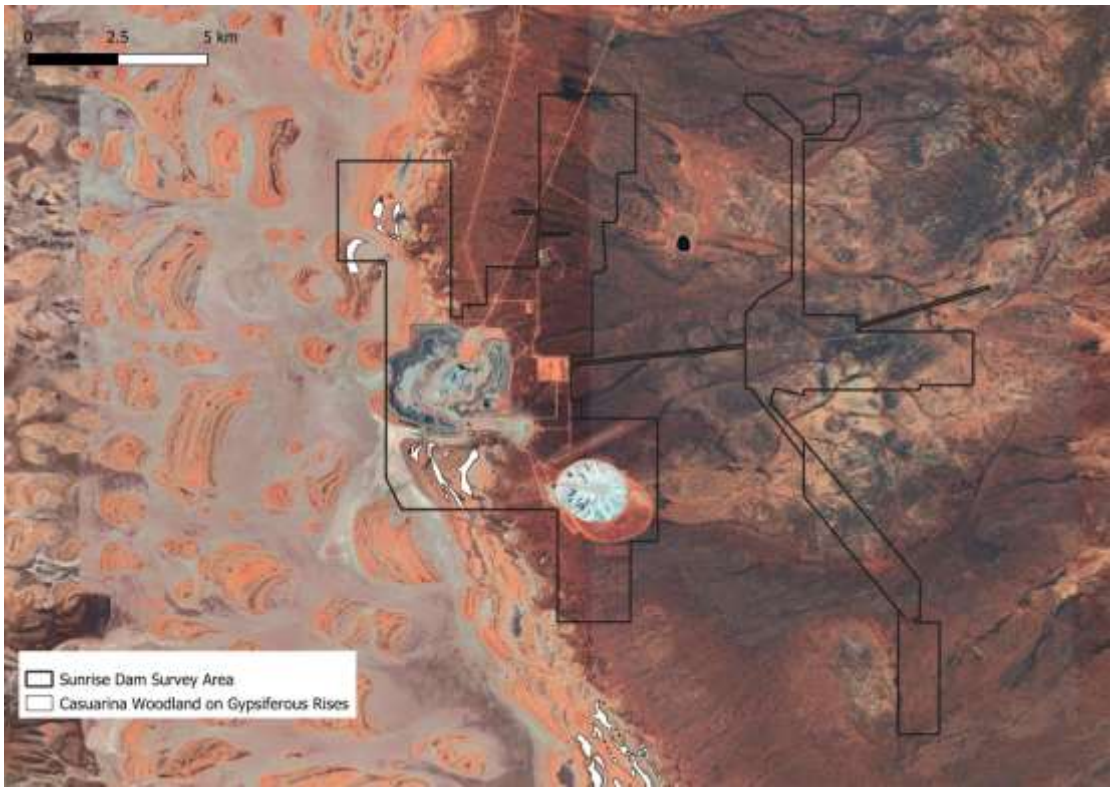

Figure 23: Casuarina Woodland on Gypsiferous Rises within the survey area.

Hills with Acacia shrublands

Rocky hills are an uncommon feature of the region and are predominantly composed of ironstone or greenstone. A series of low, liner, ironstone ridges and hills occur in the east of the survey area, associated with Wilga Hill (within the Leonora Land System). Areas of dissected, ironstone and quartz outcropping occur on the crests of hills with the scree slopes supporting mixed Acacia (e.g., *Acacia aptaneura*, *Acacia caesaneura, Acacia quadrimarginea* and *Acacia burkittii*). The hills are likely to support distinct shrublands and a restricted and specialist (saxicoline) fauna assemblage. This includes the DBCA Priority Long-tailed Dunnart (which was recorded on a small hill near Wilga Hill), the habitat restricted Woolley's Pseudantechinus and Goldfields Crevice-skink. The Bush Stone-curlew also has the potential to occur.

Restricted rocky habitats suitable to support the Long-tailed Dunnart have been classified (combining the Leonora Land System with Mattiske (2022) Vegetation mapping units C12, A15, A16, S2 and parts of A2) and mapped (Figures 24 and 25). While relatively small habitat patches occur within AGAA leases, they extend into adjacent areas (Figure 24). Disturbances to areas of outcropping and boulder piles are recommended to be avoided as these provide shelter sites to species such as Long-tailed Dunnart and Goldfield's Crevice-skink. Such sites are present in small areas scattered throughout the Leonora Land System (see Mattiske Vegetation Units C12, A15, A16 and S2).

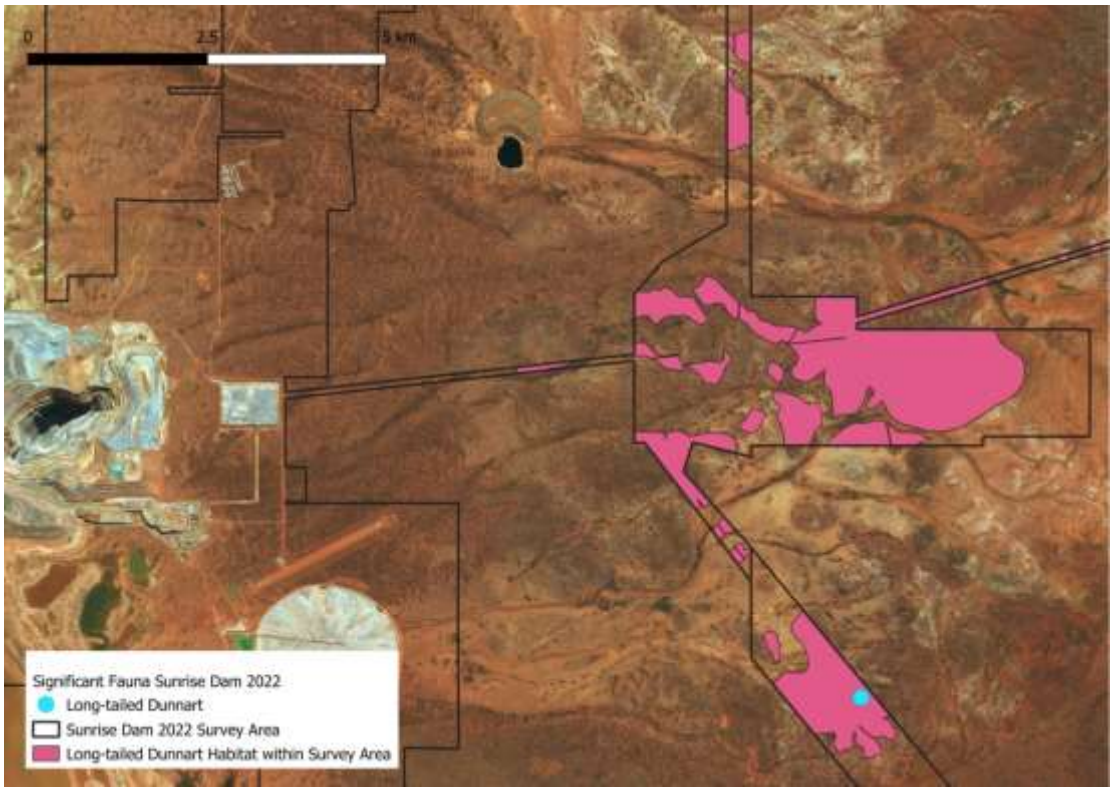

Figure 24: Rocky habitats suitable to support the Long-tailed Dunnart.

Figure 25: Long-tailed Dunnart habitat present within the survey area.

Samphire shrublands fringing Lake Carey

The low samphire shrublands fringing Lake Carey and its islands support a restricted fauna assemblage including the Slender-billed Thornbill, reptiles such as *Ctenophorus salinarum* and several restricted invertebrates (Alacran Environmental Science 2018). Dense, mature stands of samphire provide habitat for the Slender-billed Thornbill. As samphire is a slow growing and long-lived plant, it is sensitive to degradation by introduced herbivores such as cattle and camels. Extensive grazing and trampling have been recorded on the eastern margins of Lake Carey (particularly amongst the samphire and chenopod shrublands fringing the lake) and the destruction of such habitat has been implicated in the decline of the Slender-billed Thornbill (Johnstone and Storr 2004). As such, intact, mature habitat may provide important refuge. The Slender-billed Thornbill appears to be mostly restricted to habitats fringing the lake (Figure 26).

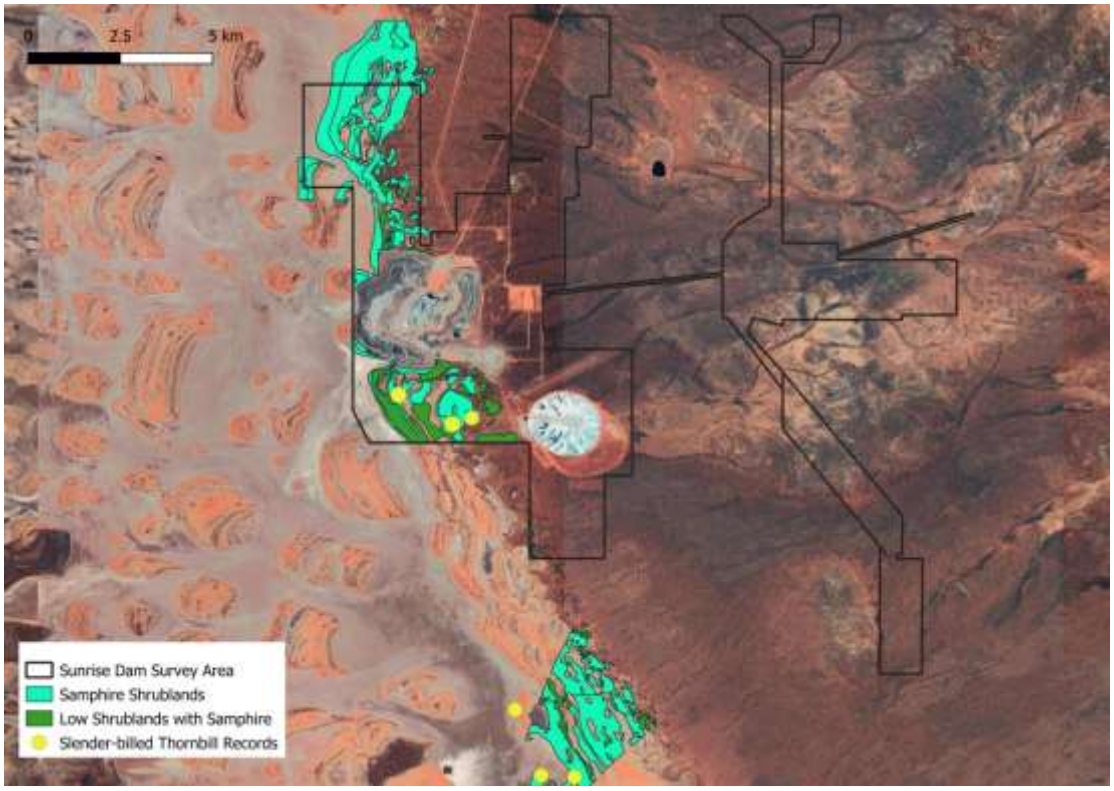

Figure 26: Slender-billed Thornbill habitat present within the survey area.

Lake Carey

The bare and occasionally flooded sediments forming the bed of Lake Carey provide habitat to some special fauna, including several restricted invertebrates (Alacran Environmental Science 2018). Additionally, the irregular flooding of the salt lakes may provide occasional (linkage) sites for migratory waterbirds.

Sandplains supporting *Triodia basedowii* hummock grasslands

Triodia basedowii hummock grasslands occur on sandplains and support a distinctive fauna assemblage. The fauna present includes species that inhabit spinifex hummocks or shelter within burrows, and some are restricted to such habitat in the

local area (e.g., *Ctenotus helenae*, *Ctenotus greeri*, *Sminthopsis ooldea*, *Diplodactylus conspicillatus, Dasycercus blythi*). The assemblage supported reflects that which is extensive across the adjacent Great Victoria Desert. However, *Triodia basedowii* hummock grasslands have a restricted occurrence around Lake Carey. Several small, isolated areas contain long-unburnt vegetation including dense hummock grasslands. Small areas of habitat occur adjacent to the CTD TSF and the airstrip and support a distinct assemblage including the DBCA Priority 4 Brush-tailed Mulgara (*D. blythi)*.

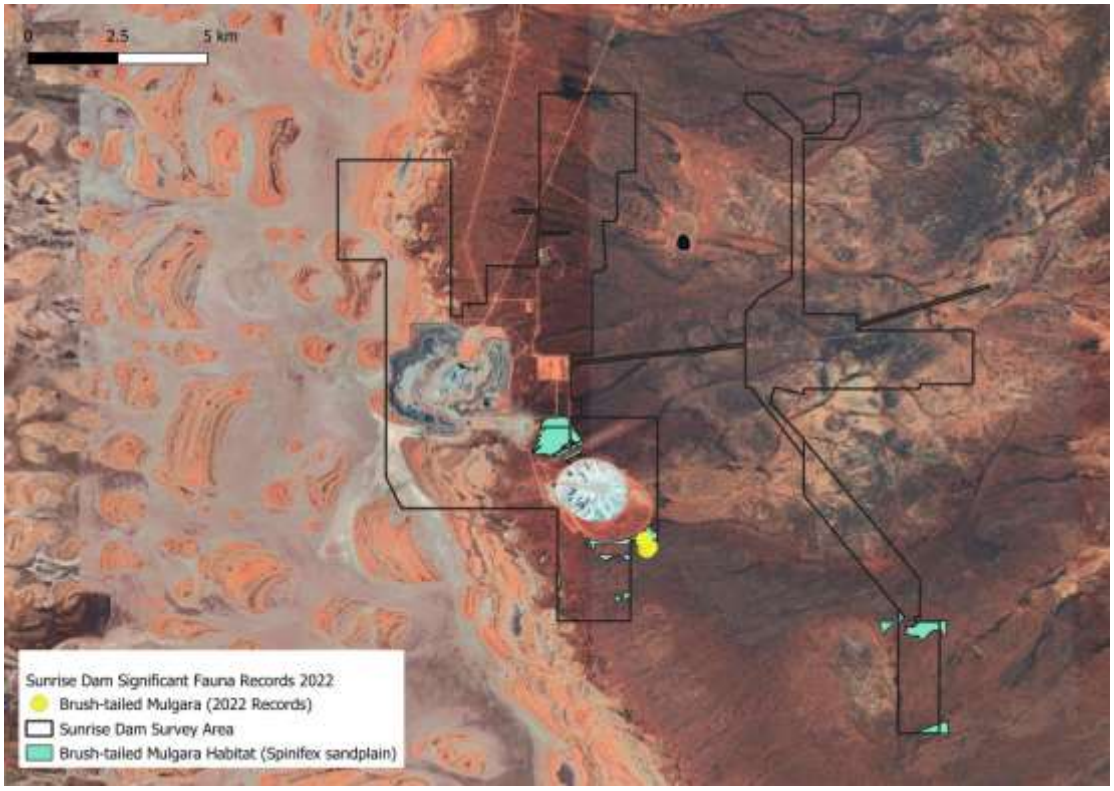

Figure 27: Spinifex sandplains suitable to support the Brush-tailed Mulgara.

5.5 EPBC Listed Fauna

When developments propose to undertake an action that has, will have or is likely to have a significant impact on a species listed under the EPBC Act the proposed development is required to be referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW). A significant impact is described as "an impact which is important, notable, or of consequence, having regard to its context or intensity" (DOTE, 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (DOTE, 2013). An action will require Commonwealth approval if the action has, will have, or is likely to have a significant impact on a species listed under the EPBC Act.

Critically Endangered and Endangered Species

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will:

- Reduce the area of occupancy of the species;
- Lead to a long-term decrease in the size of a population;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species (that are harmful to a listed species) becoming established in the listed species' habitat;
- Introduce disease that may cause the species to decline; and/or
- Interfere with the recovery of the species (DOTE, 2013).

No species listed as critically endangered or endangered were recorded or are expected to occur within the survey area.

Vulnerable Species

The same process applies for Vulnerable listed taxa however applies to important populations, rather than the species as a whole. An 'important population' is a population that is necessary for a species' long-term survival and recovery (DOTE, 2013). This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range (DOTE, 2013).

One species listed as Vulnerable, the Malleefowl, occurs in the local area. While the species tracks were recorded, the survey was conducted outside of the breeding season, when the species can forage widely and cover large distances. Malleefowl breeding is generally restricted to dense thickets of vegetation on a substrate suitable for mound construction (sandy or gravelly soils). Across the region,

Malleefowl typically breed within extensive areas of dense Mulga (*Acacia aneura* complex) shrublands, also with a densely vegetated understorey. The vegetation covering most of the Sunrise Dam survey area (and AGAA leases) comprises open Mulga shrublands with a sparse or chenopod dominated understorey on heavier soils, generally unsuitable for breeding and/or mound construction. Within the broad shrublands present at Sunrise Dam, some occasional densely vegetated thickets are potentially suitable for the species to breed within.However, all such areas encountered were inspected and no mounds were recorded. As a result, while some small areas of breeding habitat are potentially present, most of the survey area is unsuitable for the species to breed within and so an important Malleefowl population is unlikely to be present.

An additional species, the Slender-billed Thornbill, while considered regionally significant and threatened, was recently downgraded from Vulnerable under the EPBC Act, due to its distribution exceeding listed thresholds (DOTE, 2016).

Migratory Species

A similar process applies to EPBC listed Migratory species. An area of 'important habitat' for a listed migratory species is:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat within an area where the species is declining.

Two waterbirds listed as Migratory under the EPBC Act have been recorded at Lake Carey (Red-necked Stint and Wood Sandpiper). However, overall, there are few records of waterbirds at Lake Carey, compared to other large inland salt lakes. As such, migratory waterbirds are likely to use Lake Carey irregularly during times of flooding. The region does not support ecologically significant populations of waterbirds and is not at the limit of any migratory species range. While Lake Carey is not considered habitat critical to the importance of migratory waterbirds it may be used occasionally or periodically within life-cycle stages. For example, Black Swans and Banded Stilts occasionally use the lake for breeding. While there are no documented declines for the region, the status of migratory waterbirds in the area is unknown.

There are very few records for any EPBC listed waterbird at Lake Carey and as such the lake is expected to be used more as a stop-over point as birds move to important feeding areas. As such, habitat within the survey area is not considered to be "important" under the EPBC criteria.

6. SUMMARY OF FAUNA VALUES

The Sunrise Dam survey area contains a diverse fauna assemblage, composed mostly of widespread species. However, a small number of significant taxa are present (or are considered likely to occur). The survey area has the following notable values:

- A restricted population of the DBCA Priority 4 Long-tailed Dunnart: with few known populations in the southern Murchison Region, the species is a specialist of rugged, rocky habitats, locally associated with the Leonora Land System. The species has a highly fragmented distribution and occurs at Sunrise Dam at the southern extreme of its range. While recorded near Wilga Hill, it is likely to have a wider occurrence in the local area, although unlikely to occur on the clay-loam flats adjacent to the existing Sunrise Dam Mine operational area;
- The DBCA Priority 4 Brush-tailed Mulgara is restricted to spinifex dominated sandplains in the local area. Such habitat has a minor occurrence in the survey area and is associated with the Kirgella Land System present south of the airstrip and CTD TSF;
- Malleefowl tracks were recorded in the south-east of the survey area, indicative of the species widely foraging outside of the breeding season. The vegetation covering most of the Sunrise Dam survey area (and AGAA leases) comprises open Mulga shrublands with a sparse or chenopod dominated understorey on heavier soils, generally unsuitable for breeding and/or mound construction. Such habitat has also suffered somedegradation from pastoral grazing;
- The presence of several locally significant fauna species including the Slender-billed Thornbill;
- Restricted fauna associated with rocky habitats and salt lakes. For example, the Goldfield's Crevice-skink was recorded within the rocky habitats adjacent to Wilga Hill. While Lake Carey supports distinctive fauna, such an assemblage is not restricted to the Sunrise Dam area or even the lake itself, as many species are associated with the numerous salt lakes scattered throughout inland Western Australia. Some taxa occur at Lake Carey at range extremes (e.g. *Delma australis, Lerista picturata)* while migratory waterbirds only occur in the area during the infrequent periods of flooding;
- Eucalypt and Casuarina Woodlands supporting a concentration of fauna and providing habitat for species that are uncommon in the wider landscape. Mature trees contain roosting and nesting sites for specialist fauna;
- Some occasional breeding by waterbirds occurs at Lake Carey during irregular periods of flooding. While old nests of the Black Swan were noted within the survey area, breeding by the Banded Stilt is known only from the lakes islands (outside of the survey area);

Impacts are summarised in accordance with EPA Guidance in Table 19. Due to the presence of threatened and priority fauna within the survey area, pre-clearance inspections should be considered if such taxa are known to be present (or considered likely to be present) within areas of potential disturbance.

Table 19. Potential Impacts upon the fauna values of the survey area.

Species Name	Nature and significance of potential impact		
	PotentialImpact	Significance	Suggested Action
Malleefowl	Potential loss of habitat; roadkill	An EPBC listed species with a restricted occurrence in the local area	While breeding habitat is minimal within the survey area, and immediately surrounding it, some occasional thickets of mature dense mulga vegetation may be suitable for breeding. Conduct environmental inspections prior to disturbance to identify potential breeding habitat and presence of mounds.
Long-tailed Dunnart	Potential loss of habitat	DBCA Priority species with fragmented and restricted regional distribution.	Consider pre-clearance inspections if the Long-tailed Dunnart is present (or likely to be present) within areas of potential disturbance. Minimise disturbance to rocky outcrops (Long-tailed Dunnart habitat).
Brush-tailed Mulgara	Potential loss of habitat	DBCA Priority species with a restricted occurrence in the local area	Consider pre-clearance inspections if the Brush-tailed Mulgara is present (or likely to be present) within areas of potential disturbance.Minimise disturbance to Brush Tailed Mulgara habitat.
Banded Stilt	Changes to natural hydrological process; loss of breeding and feeding habitat	The species has been recorded nesting on the islands within Lake Carey however has not been recorded breeding within the survey area.	Consider pre-clearance inspections if the Banded Stilt is likely to be present within areas of potential disturbance.
Slender-billed Thornbill	Loss of habitat, however such habitat is extensive surrounding Lake Carey. Approximately 1150 ha mapped within the survey area but that present at Lake Carey is likely to excedd100,000 ha.	Suitable contiguous habitat is extensive in the greater area along the fringing margins of Lake Carey and therefore a relatively small proportion occurs within the survey area (less than 1% of regional habitat).	Minimise disturbance to Slender-billed Thornbill habitat.
Locally significant reptiles, birds	Loss of habitat	A small proportion of habitat occurs within the survey area.	Minimise disturbance to Eucalypt and Casuarina Woodlands where possible.
Peregrine Falcon	Loss of habitat	A small proportion of suitable habitat occurs within the survey area, although a highly mobile species	Minimise disturbance to Eucalypt and Casuarina Woodlands where possible.
EPBC Migratory Waterbirds	Changes to natural hydrological process; loss of feeding habitat	Lake Carey is not recognised as an important area for waterbirds. However, it may act as linkage for movement across the landscape. Flooding events that support waterbirds occur on a regional scale and therefore Lake Carey is unlikely to be impacted by SDGM during such events.	Minimise hydrological impacts and maintain natural hydrological flows / processes.

7. REFERENCES

Atlas of Living Australia (ALA) (2021). Atlas of Living Australia Database. Atlas of Living Australia. http://www.ala.org.au/page name. Accessed 11 April 2021.

Alacran Environmental Science (2018). Short-range Endemic Invertebrate Survey for the Butcher Well Haul Road. Unpublished report prepared for AngloGold Ashanti.

Bastin G. and ACRIS Management Committee (2008). Rangelands 2008 – taking the pulse. National Land and Water Resources Audit, Canberra.

BirdLife Australia (2021). BirdLife Australia Database. https://birdata.birdlife.org.au/ Accessed 11 April 2021.

Benshemesh, J. (2016). Malleefowl Monitoring Protocols for Use in the Great Victoria Desert. Produced for the Great Victoria Desert Biodiversity Trust.

BirdLife International (2018). Species factsheet: *Acanthiza iredalei*. Downloaded from http://www.birdlife.org on 10/04/2021

Blakers, M., Davies, S.J.J.F. and Reilly, P.N. (1984). The Atlas of Australian Birds. Royal Australasian Ornithologists Union. Melbourne University Press.

Brearley, D.R., Dunlop, J.N. & J.M. Osborne (1997). The terrestrial flora and fauna of Lake Carey. Curtin University of Technology, Mine Rehabilitation Group. Report prepared for the Placer Granny Smith Gold Mine.

Bureau of Meteorology (2018). Laverton, Western Australia November 2018 Daily Weather Observations. Commonwealth of Australia.

Cowan, M. (2001). Eastern Murchison Subregion (MUR1). In "A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions 2002".

Dell, J., How, R. A., Milewski, A. V., and Keighery, G. J. (1988). The Biological Survey of the Eastern Goldfields of Western Australia: Part 5 Edjudina-Menzies Study Area. Records of the Western Australian Museum, Supplement No. 31.

Department of Biodiversity, Conservation and Attractions (DBCA) (2021). NatureMap. Fauna database accessed 23 May 2021.

Department of Environment and Conservation (DEC) (2007). Banded Ironstone Formation Ranges of the Midwest and Goldfields. Interim Murchison River catchment, Western Australia. Technical Bulletin No.84, Department of Agriculture Status Report – Biodiversity Values and Conservation Requirement.

Department of the Environment (2013). Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment.

Department of the Environment (2016). EPBC Species Profiles: Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009). Assessment of Australia's Terrestrial Biodiversity 2008. Department of the Environment, Water, Heritage and the Arts, Canberra.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010). Survey Guidelines for Australia's Threatened Bats. Department of the Environment, Water, Heritage and the Arts, Canberra.

Department of Parks and Wildlife (DPaW) (2017). Interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia. Department of Parks and Wildlife, Kensington, WA. Available at: https://www.dpaw.wa.gov.au/images/documents/plantsanimals/animals/interim_guideline_for_night_parrot_survey.pdf.

Department of Sustainability, Environment, Water, Population and Communities. (2011). Survey Guidelines for Australia's Threatened Mammals, Birds and Reptiles.

Department of Sustainability, Environment, Water, Population and Communities (2012). Threatened Species Profiles. Available at:http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66699

Department of Sustainability, Environment, Water, Population and Communities (2011). Key threatening processes under the EPBC Act.

http://www.environment.gov.au/cgi-in/sprat/public/publicgetkeythreats.pl

Department of Agriculture, Water and the Environment - DAWE (2021). Protected Matters Database Search Tool. Accessed October 21 2021.

Duncan, A., Baker, G.B. and Montgomery, N. (1999). The Action Plan for Australian Bats. Environment Australia, Canberra.

Dunlop, J.N. and Payne, W. (1999). A Vertebrate Fauna Survey of the North Lake Carey Region, including the Hillside Prospect, Wallaby Prospect, Just In Time / Just In Case and Teatree Dam Area. School of Environmental Biology. Curtin University of Technology.

Environmental Protection Authority (2016a) Technical Guidance: Sampling methods for Terrestrial vertebrate fauna. EPA, Western Australia.

Environmental Protection Authority (2016b) Technical Guidance: Terrestrial Fauna Surveys. EPA, Western Australia.

Environmental Protection Authority (2016c). Environmental Factor Guideline: Terrestrial Fauna. EPA, Western Australia.

Environmental Protection Authority (2018) Statement of Environmental Principles, Factors and Objectives, EPA, Western Australia.

Fox, E., McNee, S., Douglas, T. (2016). Birds of the Great Western Woodlands. Report for The Nature Conservancy. BirdLife Australia, Melbourne.

Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds Vol 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth.

Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds. Vol 2: Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth.

Kingfisher Environmental Consulting (Kingfisher) (2014a). Murrin Murrin - Sunrise Dam Infrastructure Corridor Level 1 Fauna Survey. Unpublished report for AngloGold Ashanti.

Kingfisher Environmental Consulting (Kingfisher) (2014b). Sunrise Dam - Tropicana Infrastructure Corridor Fauna Survey. Unpublished report prepared for AngloGold Ashanti.

Kingfisher Environmental Consulting (Kingfisher) (2016). Sunrise Dam Boxcut Fauna Assessment. Unpublished report prepared for AngloGold Ashanti.

Kingfisher Environmental Consulting (Kingfisher) (2018a). Butcher Well Fauna Assessment. Unpublished report prepared for AngloGold Ashanti Australia.

Kingfisher Environmental Consulting (Kingfisher) (2018b). Sandhill Dunnart Monitoring. Unpublished report prepared for AngloGold Ashanti Australia.

Kingfisher Environmental Consulting (Kingfisher) (2018c). Murrin Murrin Looping Project Level 1 Fauna Assessment. Unpublished report prepared for APA Group Australia.

Kingfisher Environmental Consulting (Kingfisher) (2021). Cleveland Fauna Assessment. Unpublished report prepared for AngloGold Ashanti Australia.

Lenden, A. (1968). Distribution of Australian Psittacines (Order Psittaciformes: Parrots, Cockatoos).South Australian Ornithologist. Volume 25, Part 1. March 1968.

Mattiske(2018). Flora and Vegetation Assessment Sunrise Dam Gold Mine Five Proposed Project Areas. Unpublished report prepared for AngloGold Ashanti Australia.

Mattiske Consulting (2019). Flora and Vegetation Assessment of Butcher Well And Mt Minnie Project. Unpublished report prepared for AngloGold Ashanti Australia.

Mattiske Consulting (2022). Flora and Vegetation Assessment of Sunrise Dam. Unpublished report prepared for AngloGold Ashanti Australia.

McKenzie, N. (2020). "Nyctophilus major". IUCN Red List of Threatened Species. 2020: e.T85289614A85289618. doi:10.2305/IUCN.UK.2020-3.RLTS.T85289614A85289618.en.

McKenzie, N. L., Rolfe, J. K., and Youngson, W. K. (1994). Vertebrate fauna. In 'The Biological Survey of the Eastern Goldfields of Western Australia. Part 10. Sandstone–Sir Samuel and Laverton–Leonora Study Areas'. (Eds N. J. Hall, N. L. McKenzie and G. J. Keighery.) pp. 51–85 (Western Australian Museum: Perth).

McKenzie, N. L., May, J. E. and McKenna, S. (2003). Bioregional Summary of the 2002 Biodiversity Audit for Western Australia. The National Land and Water

Resources Audit and the Western Australian Department of Conservation and Land Management, Perth, Western Australia.

Mace, G. and Stuart, S. (1994). Draft IUCN Red List Categories, Version 2.2. Species; Newsletter of the Species Survival Commission. IUCN - The World Conservation Union. No. 21-22: 13-24.

Meek, P.D., Ballard, G. and Fleming, P. (2012). An Introduction to Camera Trapping for Wildlife Surveys in Australia. PestSmart Toolkit publication, Invasive Animals Cooperative Research Centre, Canberra, Australia.

Menkhorst, P. and Knight, F. (2010). A Field Guide to the Mammals of Australia. Oxford University Press, Melbourne.

Ninox Wildlife Consulting (1995). A Vertebrate Fauna Assessment of the Sunrise Dam Project Area. Unpublished report for John Consulting.

Ninox Wildlife Consulting (2009). A Level One Survey of the Vertebrate Fauna Infrastructure Corridor – Pinjin Option L31/57, L39/185, Pinjin, Tropicana Gold Project. Unpublished report for Tropicana Joint Venture.

Pavey, C. (2002). Threatened Species of The Northern Territory: Slender-Billed Thornbill (western subspecies) *Acanthiza iredalei iredalei*.

Pavey, C. (2006). Threatened Species of The Northern Territory: Long-tailed Dunnart *Sminthopsis longicaudata*.

Pringle, H.J.R. (1994). Vegetation, in: Pringle, H.J.R., van Vreeswyk, A.M.E. & Gilligan S.A. (eds) An inventory and condition survey of rangelands in the north-eastern Goldfields, Western Australia, Western Australia Department of Agriculture Technical Bulletin no. 87, Perth.

QGIS Development Team (2018). QGIS Geographic Information System. Open Source Geospatial Foundation Project. http://qgis.osgeo.org".

Riley, J., Heterick, B., Zeale, M.R., Turpin, J.M., Jayatilaka, B. and Jones, G., (2022). The ranging, habitat selection, and foraging ecology of an endangered small desert mammal, the sandhill dunnart Sminthopsis psammophila. Journal of Mammalogy. Volume 102, Issue 2, April 2021, Pages 588–602.

Saunders, D. and Ingram, J. (1995). Birds of south-western Australia. An atlas of changes in distribution and abundance of the wheatbelt fauna. Surrey Beatty, Sydney.

Smith, L.A. and Henry, J. (1999). *Aprasia picturata* (Squamata: Pygopodidae), a new legless lizard from the interior of Western Australia. Journal of the Royal Society of Western Australia 82: 75–77.

Terrestrial Ecosystems (2011a). Level 2 Fauna Risk Assessment for the Granny Deeps Project Area. Unpublished report prepared by Terrestrial Ecosystems for Barrick Gold Corporation dated May 2011.

Terrestrial Ecosystems (2011b) Targeted Survey for Long-tailed Dunnarts for the Granny Deeps Project Area. Unpublished report prepared by Terrestrial Ecosystems for Barrick Gold of Australia dated June 2011.

Thackway, R. and Cresswell, I.D. (eds.). (1995). An Interim Biogeographic Regionalisation for Australia: a Framework for Establishing the National System of Reserves, Version 4.0. Australian Nature Conservation Agency, Canberra.

Turpin, J.M. (2010). Level 1 Survey for a Proposed Pipeline from Carosue Dam to Pinjin. Unpublished report for Tropicana Joint Venture.

Turpin, J.M. and Bamford, M.J. (2010). Fauna Survey of the Leonora Area. Unpublished report for St Barbara Limited.

Turpin, J. M. (2015). North Kimberley mammals – on the fringe of the high-rainfall zone. Australian Mammalogy 37, 86–91.

Turpin, J.M. and Bamford, M. (2015). A new population of the northern quoll (Dasyurus hallucatus) on the edge of the Little Sandy Desert, Western Australia. Australian Mammalogy, 37(1) 86-91.

Turpin, J.M. and Johnstone, R.E. (2017). An isolated population of the southern scrub-robin (*Drymodes brunneopygia*) in the Great Victoria Desert. Pacific Conservation Biology 23 (1), 95 – 106.

Turpin, J. M., White, N. E., Dunlop, J. A., and Bamford, M. J. (2018). New populations of the black-flanked rock-wallaby (*Petrogale lateralis*) from the Little Sandy Desert and Murchison, Western Australia. Australian Mammalogy 40, 234–242.

Van Dyck, S and Strahan, R. (ed.). (2008). Mammals of Australia. 3rd Edition. Reed New Holland, Sydney.

Western Australian Museum (2018). Check-list of the Terrestrial Vertebrate Fauna of Western Australia. Western Australian Museum. Updated September 2018.

Western Wildlife (2016). Dacian Gold Limited: Mt Morgans Gold Project. Report prepared for Dacian Gold Limited, by Western Wildlife, July 2016.

Woinarski, J. C. Z., Woolley, L. A., Garnett, S. T., Legge, S. M., Murphy, B. P., Lawes, M. J., Comer, S., Dickman, C. R., Doherty, T. S., Edwards, G., Nankivell, A., Palmer, R., and Paton, D. (2017). Compilation and traits of Australian bird species killed by cats. Biological Conservation 216: 1–9. doi:10.1016/j.biocon.2017.09.017.

Appendix 1. Categories Used in the Assessment of Conservation Status.

IUCN categories as used for the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016*.

CATEGORY	DEFINITION
Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild	Taxa known to survive only in captivity.
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not Threatened.

Definitions of relevant categories under the EPBC Act 1999.

CATEGORY	DEFINITION
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention ((Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state; • The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); or • The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).

Categories used in the Biodiversity Conservation Act 2016.

CATEGORY	DEFINITION
Critically Endangered	Facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Facing a very high risk of extinction in the wild in the near future.
Vulnerable	Facing a high risk of extinction in the wild in the medium-term future.
Extinct	There is no reasonable doubt that the last individual has died. A species is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form.
Extinct in the wild	It is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A species is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form
Special Conservation Interest	It is of special conservation interest because it - (i) has a naturally low population range; or (ii) has a restricted natural range; or (iii) is subject to or recovering from a significant population decline or reduction in natural range Conservation dependent species – that is species that have previously been listed as threatened but have recovered to the extent that they no longer meet the criteria for threatened, and the species is dependent on conservation actions continuing, i.e., the species is the focus of a specific conservation programme, the cessation of which would result in it again becoming eligible for listing as a threatened species within a period.
Migratory	A native species is eligible for listing in the category of migratory if: (i) Members of the species periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or (ii) the species is the subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth. International agreements that apply to the listing of a species as a migratory species are: Japan - Australia Migratory Birds Agreement (JAMBA); China - Australia Migratory Birds Agreement (CAMBA); Republic of Korea - Australia Migratory Birds Agreement (ROKAMBA); and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn).
Species otherwise in need of special protection	A species that is otherwise in need of special protection if it does not meet any of the above criteria but is a species for which a need for special protection exists.

Department of Biodiversity, Conservation and Attractions Priority Fauna Species (species not listed under the BC Act, but for which there is some concern).

CATEGORY	DEFINITION
Priority One (P1)	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 Two (P2)	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 Three (P3)	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 Four (P4)	Rare, Near Threatened and other species in need of monitoring: (a) 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. (b) 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. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix 2: Fauna Recorded or Expected in the Survey Area.

Fauna Recorded and Expected from the Survey Area (Tables 1 to 4).
These lists are derived from the results of database and literature searches and from previous field surveys conducted in the local area. These are:

- NatureMap Database (NM), Birdlife Australia Database (BA);
- Species recorded during fauna surveys in nearby areas at:
    - Leonora (100 km west of project area, Turpin and Bamford 2010; Kingfisher 2018c);
    - Lake Carey (species recorded by Brearley *et al*., 1997 and Dunlop and Payne 1999);
    - Eastern Goldfields Pipeline (EGP) (fringing the eastern margins of Lake Carey, Kingfisher 2014);
    - Species recorded at Granny Smith mine (GS) (Terrestrial Ecosystems 2011);
    - Species recorded during previous fauna surveys conducted at Sunrise Dam (Ninox 1995, Kingfisher 2016, 2017);
- Species recorded during the 2018 Butcher Well Assessment (listed under "BW").
- Species recorded during the 2021 Cleveland Assessment (listed under "C")
- Species recorded during the 2022 Sunrise Dam Assessment (this assessment, listed under "SD" 2022).

Key:
Note the conservation status of significant taxa is listed under "Status". This includes species listed under legislation, DBCA Priority Fauna and Locally Significant Fauna. Species recorded opportunistically in the greater region (outside the project area) are listed as "R".

TABLE 1. Frogs expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM	EGP	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
							2011	1995	2016	2017	2018	2021	2022
HYLIDAE													
Sheep Frog	*Cyclorana maini*		X				X				X		X
Water-holding Frog	*Cyclorana occidentalis*		X		X	X	X	X	X		X		
Little Red Tree Frog	*Litoria rubella*		X								X		
LIMNODYNASTINAE													
Kunapalari Frog	*Neobatrachus kunapalari*		X				X				X	X	X
Desert Trilling Frog	*Neobatrachus sudellae*												
Shoemaker Frog	*Neobatrachus sutor*		X	X	X	X	X	X			X		
Wilsmore's Frog	*Neobatrachus wilsmorei*					X		X				X	
Centralian Burrowing Frog	*Platyplectrum spenceri*		X		X								
Western Toadlet	*Pseudophryne occidentalis*												
Total Number of Species Expected: 9													
TOTAL Recorded:			**6**	**1**	**3**	**3**	**4**	**3**	**1**	**0**	**5**	**2**	**2**

TABLE 2. Reptiles Expected to Occur and Recorded in the Survey Area.

Common Name	Species Name	Status	NM	EGP	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
							2011	1995	2016	2017	2018	2021	2022
AGAMIDAE													
Laverton Ring-tailed Dragon	*Ctenophorus infans*	L	X								X		
Mallee Military Dragon	*Ctenophorus fordi*		X	X	X	X		X	X	X	X	X	X
Central Netted Dragon	*Ctenophorus nuchalis*		X		X	X		X				X	
Western Netted Dragon	*Ctenophorus reticulates*		X		X	X					X		
Claypan Dragon	*Ctenophorus salinarum*		X		X	X		X	X	X	X	X	
Lozenge-marked Dragon	*Ctenophorus scutulatus*		X	X	X					X	X		X
Mulga Dragon	*Diporiphora amphiboluroides*		X										
Thorny Devil	*Moloch horridus*		X	X				X			X	X	X
Bearded Dragon	*Pogona minor*		X	X	X	X				X	X	X	X
Pebble Dragon	*Tympanocryptis cephalus*		X				X	X					
DIPLODACTYLIDAE													
Variable Fat-tailed Gecko	*Diplodactylus conspicillatus*												X
Desert Fat-tailed Gecko	*Diplodactylus laevis*		X										
Western Stone Gecko	*Diplodactylus granariensis*		X		X		X						
Beautiful Gecko	*Diplodactylus pulcher*		X		X		X	X			X	X	X
Beaded Gecko	*Lucasium damaeum*			X									
Main's Ground Gecko	*Lucasium maini*		X			X							
Mottled Ground Gecko	*Lucasium squarrosum*				X	X						X	X
Beaked Gecko	*Rhynchoedura ornata*		X			X	X	X				X	X
Thorn-tailed Gecko	*Strophurus assimilis*		X										
Western Spiny-tailed Gecko	*Strophurus strophurus*				X						X	X	
Western Shield Spiny-tailed Gecko	*Strophurus wellingtonae*		X		X		X				X		
CARPHODACTYLIDAE													
Smooth Knob-tailed Gecko	*Nephrurus levis*												
Midline Knob-tail	*Nephrurus vertebralis*		X		X	X					X	X	X
Barking Gecko	*Underwoodisaurus milii*		X			X				X	X	X	X
GEKKONIDAE													
Purplish Dtella	*Gehyra purpurascens*		X	X									
Tree Dtella	*Gehyra variegata*		X	X	X	X	X	X	X		X	X	X
Bynoe's Gecko	*Heteronotia binoei*		X		X	X	X	X			X	X	X
PYGOPODIDAE													
Black-headed Worm Lizard	*Aprasia picturata*	L	X										

Common Name	Species Name	Status	NM	EGP	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
							2011	1995	2016	2017	2018	2021	2022
Marble-faced Delma	*Delma australis*		X							X		X	
Unbanded Dema	*Delma butleri*		X										
Burton's Legless-Lizard	*Lialis burtonis*		X			X					X	X	
Western Hooded Scaly-foot	*Pygopus nigriceps*		X		X	X			X	X	X		X
SCINCIDAE													
Inland Snake-eyed Skink	*Cryptoblepharus australis*		X										
Buchanan's Snake-eyed Skink	*Cryptoblepharus buchananii*		X					X			X	X	X
Wedge-snout Ctenotus	*Ctenotus brooksi*		X										
Greer's Ctenotus	*Ctenotus greeri*					X		X					X
Dusky Ctenotus	*Ctenotus helenae*					X	X						X
Leonhard's Ctenotus	*Ctenotus leonhardii*		X		X	X	X	X	X	X	X	X	X
Panther Skink	*Ctenotus pantherinus*		X										X
Wedge-snouted Ctenotus	*Ctenotus schomburgkii*		X			X		X			X	X	X
Rock Ctenotus	*Ctenotus severus*				X		X				X		
Spotted Ctenotus	*Ctenotus uber*		X		X	X	X				X		X
Spinifex Slender Blue-tongue	*Cyclodomorphus melanops*		X			X							
Pygmy Spiny-tailed Skink	*Egernia depressa*		X	X	X	X	X	X	X	X	X		X
Goldfields Crevice Skink	*Egernia formosa*		X			X		X			X		X
Broad-banded Sandswimmer	*Eremiascincus richardsonii*		X				X				X		
North-western Sandslider	*Lerista bipes*					X		X		X	X		X
Central Deserts Robust Slider	*Lerista desertorum*				X	X	X	X		X	X		X
Common Mulch Lerista	*Lerista kingi*		X		X						X		
Southern Robust Slider	*Lerista picturata*		X			X				X		X	
Common Mulch Lerista	*Lerista timda*		X			X						X	
Desert Skink	*Liopholis inornata*		X			X							
Night Skink	*Liopholis striata*		X		X								
Common Dwarf Skink	*Menetia greyii*		X		X	X	X				X	X	X
Saltbush Morethia	*Morethia adelaidensis*				X								
Woodland Dark Fleck Skink	*Morethia butleri*		X		X		X	X			X		X
Western Blue-tongue	*Tiliqua occipitalis*		X				X						
VARANIDAE													
Short-tailed Pygmy Monitor	*Varanus brevicauda*					X		X					
Pygmy Mulga Monitor	*Varanus caudolineatus*		X		X	X	X	X			X	X	X
Perentie	*Varanus giganteus*		X								X		
Sand Monitor	*Varanus gouldii*		X		X	X						X	X

Common Name	Species Name	Status	NM	EGP	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
							2011	1995	2016	2017	2018	2021	2022
Yellow-spotted Monitor	*Varanus panoptes*		X	X	X		X		X	X	X	X	X
Racehorse Monitor	*Varanus tristis*		X										
TYPHLOPIDAE													
Dark-spinned Blind Snake	*Anilios bicolor*				X								
Prong-snouted Blind Snake	*Anilios bituberculatus*					X				X	X	X	
Hook-Snouted Blind Snake	*Anilios hamatus*					X					X		
Common Beaked Blind Snake	*Anilios waitii*				X							X	
BOIDAE													
Stimson's Python	*Antaresia stimsoni*				X						X		
ELAPIDAE													
Desert Death Adder	*Acanthophis pyrrhus*												
Southern Shovel-nosed Snake	*Brachyurophis semifasciatus*		X		X						X		
Narrow-banded Snake	*Brachyurophis fasciolatus*		X										
Yellow-faced Whipsnake	*Demansia psammophis*		X			X							
Moon Snake	*Furina ornata*		X								X		
Black-naped Snake	*Neelaps bimaculatus*												
Monk Snake	*Parasuta monachus*		X		X	X	X	X			X		X
Mulga Snake	*Pseudechis australis*		X	X		X		X					
Spotted Mulga Snake	*Pseudechis butleri*		X										
Ringed Brown Snake	*Pseudonaja modesta*		X		X						X		
Western Brown Snake	*Pseudonaja mengdeni*		X		X	X		X			X	X	
Jan's Banded Snake	*Simoselaps bertholdi*		X			X		X		X	X		X
Rosen's Snake	*Suta fasciata*		X			X		X					
Total Number of Species: 80		2	60	10	35	39	21	25	8	15	40	27	31

TABLE 3. Birds Expected to Occur and Recorded in the Survey Area.

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
CASUARIIDAE												
Emu	*Dromaius novaehollandiae*		X	X	X	X	X	X	X	X	X	X
PHASIANIDAE												
Stubble Quail	*Coturnix pectoralis*		X	X	X			X	X			
MEGAPODIIDAE												
Malleefowl	*Leipoa ocellata*	V	X	X								X
ANATIDAE												
Musk Duck	*Biziura lobata*		X									
Black Swan	*Cygnus atratus*		X		X		X		X			X
Australian Shelduck	*Tadorna tadornoides*		X	X	X		X		X			X
Australian Wood Duck	*Chenonetta jubata*		X	X			X					
Pacific Black Duck	*Anas superciliosa*		X	X	X		X		X	X		X
Pink-eared Duck	*Malacorhynchus membranaceus*		X		X		X		X			X
Grey Teal	*Anas gracilis*		X	X	X	X	X		X	X		X
Australasian Shoveler	*Anas rhynchotis*		X				X					
Hardhead	*Aythya australis*		X									
PODICIPEDIDAE												
Australasian Grebe	*Tachybaptus novaehollandiae*		X		X		X		X			
Hoary-headed Grebe	*Poliocephalus poliocephalus*		X		X				X			
COLUMBIDAE												
Common Bronzewing	*Phaps chalcoptera*		X	X	X	X	X	X	X	X		X
Crested Pigeon	*Ocyphaps lophotes*		X	X	X	X	X	X	X	X	X	X
Diamond Dove	*Geopelia cuneata*		X									
PODARGIDAE												
Tawny Frogmouth	*Podargus strigoides*		X	X							X	
EUROSTOPODIDAE												
Spotted Nightjar	*Eurostopodus argus*		X	X						X	X	
AEGOTHELIDAE												
Australian Owlet-nightjar	*Aegotheles cristatus*		X	X	X		X		X	X	X	
APODIDAE												
Fork-tailed Swift	*Apus pacificus*	M	X									
ARDEIDAE												
White-faced Heron	*Egretta novaehollandiae*		X	X			X					
White-necked Heron	*Ardea pacifica*		X	X		X						

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
Eastern Great Egret	*Ardea modesta*	M	X									
ACCIPITRIDAE												
Black-shouldered Kite	*Elanus axillaris*		X		X				X			
Square-tailed Kite	*Lophoictinia isura*		X									
Black-breasted Buzzard	*Hamirostra melanosternon*		X									
Whistling Kite	*Haliastur sphenurus*		X			X						
Black Kite	*Milvus migrans*											
Brown Goshawk	*Accipiter fasciatus*		X	X			X					X
Collared Sparrowhawk	*Accipiter cirrocephalus*		X									X
Spotted Harrier	*Circus assimilis*		X									
Wedge-tailed Eagle	*Aquila audax*		X	X	X	X	X	X	X	X	X	X
Little Eagle	*Hieraaetus morphnoides*		X									
FALCONIDAE												
Nankeen Kestrel	*Falco cenchroides*		X	X	X	X	X	X	X	X	X	X
Brown Falcon	*Falco berigora*		X	X	X	X	X	X	X			X
Australian Hobby	*Falco longipennis*		X	X	X		X	X	X			
Peregrine Falcon	*Falco peregrinus*	S7	X				X			X		
Grey Falcon	*Falco hypoleucos*	V	X									
RALLIDAE												
Eurasian Coot	*Fulica atra*		X		X		X		X			
Black-tailed Native-hen	*Tribonyx ventralis*		X		X				X			
OTIDIDAE												
Australian Bustard	*Ardeotis australis*	L	X	X							X	
BURHINIDAE												
Bush Stone-curlew	*Burhinus grallarius*	L	X	X	X				X			
RECURVIROSTRIDAE												
Red-necked Avocet	*Recurvirostra novaehollandiae*		X							X		
Black-winged Stilt	*Himantopus himantopus*		X		X				X			
Banded Stilt	*Cladorhynchus leucocephalus*	L	X		X		X		X	X		
CHARADRIIDAE												
Red-capped Plover	*Charadrius ruficapillus*		X									X
Black-fronted Dotterel	*Elseyornis melanops*		X		X		X		X			X
Red-kneed Dotterel	*Erythrogonys cinctus*		X		X				X			
Inland Dotterel	*Charadrius australis*		X									
Oriental Plover	*Charadrius veredus*	M										

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
Grey Plover	*Pluvialis squatarola*	M	X	X								
Hooded Plover	*Thinornis rubricollis*	P4										
Banded Lapwing	*Vanellus tricolor*		X	X			X			X		
SCOLOPACIDAE												
Common Greenshank	*Tringa nebularia*	M	X									
Wood Sandpiper	*Tringa glareola*	M	X									
Red-necked Stint	*Calidris ruficollis*	M	X									
Sharp-tailed Sandpiper	*Calidris acuminata*	M	X									
Curlew Sandpiper	*Calidris ferruginea*	M	X									
Common Sandpiper	*Actitis hypoleucos*	M	X									
TURNICIDAE												
Little Button-quail	*Turnix velox*		X	X								
LARIDAE												
Silver Gull	*Larus novaehollandiae*		X									
CACATUIDAE												
Galah	*Cacatua roseicapilla*		X	X	X	X	X		X	X	X	X
Little Corella	*Cacatua sanguinea*											
Cockatiel	*Nymphicus hollandicus*		X	X	X		X	X				X
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	L	X	X								
PSITTACIDAE												
Australian Ringneck	*Barnardius zonarius*		X	X	X			X	X	X	X	X
Mulga Parrot	*Psephotus varius*		X	X	X	X	X	X	X	X		X
Budgerigar	*Melopsittacus undulatus*		X	X		X	X				X	
Bourke's Parrot	*Neopsephotus bourkii*		X	X	X		X	X				
Scarlet-chested Parrot	*Neophema splendida*		X	X								
Regent Parrot	*Polytelis anthopeplus*	L	X									
CUCULIDAE												
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		X	X	X	X	X	X	X			
Black-eared Cuckoo	*Chrysococcyx osculans*		X	X	X	X		X				
Pallid Cuckoo	*Cacomantis pallidus*		X	X	X			X		X	X	
STRIGIDAE												
Southern Boobook	*Ninox boobook*		X	X								
TYTONIDAE												
Eastern Barn Owl	*Tyto alba*		X	X								
HALCYONIDAE												

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
Red-backed Kingfisher	*Todiramphus pyrrhopygius*		X	X		X				X		
Sacred Kingfisher	*Todiramphus sanctus*		X									
MEROPIDAE												
Rainbow Bee-eater	*Merops ornatus*		X	X		X	X					
CLIMACTERIDAE												
White-browed Treecreeper	*Climacteris affinis*		X	X								X
PTILONORHYNCHIDAE												
Western Bowerbird	*Ptilonorhynchus guttatus*		X		X	X		X			X	X
MALURIDAE												
Splendid Fairy-wren	*Malurus splendens*		X	X	X	X	X	X	X	X		X
White-winged Fairy-wren	*Malurus leucopterus*		X	X	X	X	X	X	X	X	X	X
Variegated Fairy-wren	*Malurus lamberti*		X	X	X	X		X		X	X	X
ACANTHIZIDAE												
Rufous Fieldwren	*Calamanthus campestris*		X	X								
Redthroat	*Pyrrholaemus brunneus*		X	X	X	X	X	X	X	X		X
Weebill	*Smicrornis brevirostris*		X	X	X				X	X		X
Western Gerygone	*Gerygone fusca*		X									
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X	X	X	X	X	X	X	X	X	
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		X	X	X	X	X	X	X	X	X	X
Slaty-backed Thornbill	*Acanthiza robustirostris*		X	X	X	X	X	X	X	X		X
Inland Thornbill	*Acanthiza apicalis*		X	X	X	X	X	X	X	X	X	X
Slender billed Thornbill	*Acanthizai redalei*	L	X	X	X		X	X	X	X	X	X
Southern Whiteface	*Aphelocephala leucopsis*		X	X	X		X		X	X		
PARDALOTIDAE												
Striated Pardalote	*Pardalotus striatus*		X	X	X		X		X			
MELIPHAGIDAE												
Pied Honeyeater	*Certhionyx variegatus*		X	X		X						
Singing Honeyeater	*Gavicalis virescens*		X	X	X	X	X	X	X	X	X	X
Grey-fronted Honeyeater	*Ptilotula plumula*		X	X	X	X				X	X	
White-fronted Honeyeater	*Purnella albifrons*		X	X	X	X	X		X	X	X	X
Yellow-throated Miner	*Manorina flavigula*		X	X	X	X	X	X	X	X	X	X
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X	X	X	X	X	X	X	X	X	X
Crimson Chat	*Epthianura tricolor*		X	X	X	X	X		X		X	
White-fronted Chat	*Epthianura albifrons*		X	X								X
Orange Chat	*Epthianura aurifrons*											

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
Black Honeyeater	*Sugomel niger*		X									
Brown Honeyeater	*Lichmera indistincta*		X	X		X						X
Brown-headed Honeyeater	*Melithreptus brevirostris*											
POMATOSTOMIDAE												
White-browed Babbler	*Pomatostomus superciliosus*		X	X	X	X	X	X	X		X	X
PSOPHODIDAE												
Chestnut-breasted Quail-thrush	*Cinclosoma castaneothorax*			X						X	X	X
Chiming Wedgebill	*Psophodes occidentalis*		X									
NEOSITTIDAE												
Varied Sittella	*Daphoenositta chrysoptera*		X	X		X						X
CAMPEPHAGIDAE												
Ground Cuckoo-shrike	*Coracina maxima*		X	X	X					X		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		X	X	X	X	X	X	X	X	X	X
White-winged Triller	*Lalage tricolor*		X	X	X			X		X	X	
PACHYCEPHALIDAE												
Rufous Whistler	*Pachycephala rufiventris*		X	X	X	X	X	X	X	X	X	X
Grey Shrike-thrush	*Colluricincla harmonica*		X	X	X	X	X	X	X	X	X	X
Crested Bellbird	*Oreoica gutturalis*		X	X	X	X	X	X	X	X	X	X
ARTAMIDAE												
Masked Woodswallow	*Artamus personatus*		X	X	X	X			X	X	X	
Black-faced Woodswallow	*Artamus cinereus*		X	X	X	X		X	X	X	X	X
Little Woodswallow	*Artamus minor*		X	X								X
Grey Butcherbird	*Cracticus torquatus*		X	X	X	X	X	X	X	X	X	X
Pied Butcherbird	*Cracticus nigrogularis*		X	X	X	X	X	X	X	X	X	X
Australian Magpie	*Cracticus tibicen*		X	X	X	X	X	X	X	X	X	X
Grey Currawong	*Strepera versicolor*		X	X								X
RHIPIDURIDAE												
Grey Fantail	*Rhipidura albiscapa*		X									X
Willie Wagtail	*Rhipidura leucophrys*		X	X	X	X	X	X	X	X	X	X
CORVIDAE												
Little Crow	*Corvus bennetti*		X	X	X		X	X	X	X	X	X
Torresian Crow	*Corvus orru*		X	X	X	X	X	X			X	X
Australian Raven	*Corvus coronoides*		X									
MONARCHIDAE												

Common Name	Species Name	Status	NM / BA	EGP	Lake Carey	Leonora	Sunrise Dam			BW	C	SD
							1995	2016	2017	2018	2021	2022
Magpie-lark	*Grallina cyanoleuca*		X	X	X	X	X	X	X	X		X
PETROICIDAE												
Red-capped Robin	*Petroica goodenovii*		X	X	X	X	X	X	X	X	X	X
Hooded Robin	*Melanodryas cucullata*		X	X							X	X
Jacky Winter	*Microeca fascinans*		X	X								
MEGALURIDAE												
Rufous Songlark	*Cincloramphus mathewsi*		X	X		X						
Brown Songlark	*Cincloramphus cruralis*		X	X	X	X	X	X				
HIRUNDINIDAE												
White-backed Swallow	*Cheramoeca leucosterna*		X	X	X	X	X	X	X	X		
Welcome Swallow	*Hirundo neoxena*		X	X	X		X		X	X	X	X
Fairy Martin	*Petrochelidon ariel*		X	X	X			X				X
Tree Martin	*Petrochelidon nigricans*		X	X	X	X		X		X		
NECTARINIIDAE												
Mistletoebird	*Dicaeum hirundinaceum*		X	X	X	X	X	X	X			X
ESTRILDIDAE												
Zebra Finch	*Taeniopygia guttata*		X	X	X	X	X	X	X		X	X
MOTACILLIDAE												
Australasian Pipit	*Anthus novaeseelandiae*		X	X	X	X	X	X	X			X
Total Number of Species: 143		19	119	94	65	56	64	50	63	53	44	62

TABLE 4. Mammals Expected to Occur and Recorded in the Survey Area.

Common Name	Species Name	Status	NM	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
						2011	1995	2016	2017	2018	2021	2022
TACHYGLOSSIDAE												
Echidna	*Tachyglossus aculeatus*			X			X	X	X	X	X	X
DASYURIDAE												
Brush-tailed Mulgara	*Dasycercus blythi*	P4										X
Ride's Ningaui	*Ningaui ridei*		X	X	X							X
Southern Ningaui	*Ningaui yvonnae*										X	
Kultarr	*Antechinomys laniger*	L	X			X						
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*	L		X						X	X	X
Fat-tailed Dunnart	*Sminthopsis crassicaudata*		X	X	X						X	X
Little Long-tailed Dunnart	*Sminthopsis dolichura*		X	X		X			X	X	X	X
Hairy-footed Dunnart	*Sminthopsis hirtipes*					X						
Long-tailed Dunnart	*Sminthopsis longicaudata*	P4				X				X	X	X
Stripe-faced Dunnart	*Sminthopsis macroura*					X						
Ooldea Dunanrt	*Sminthopsis ooldea*										X	X
MACROPODIDAE												
Euro	*Macropus robustus*			X				X		X	X	X
Red Kangaroo	*Macropus rufus*			X		X	X	X	X	X	X	X
Western Grey Kangaroo	*Macropus fuliginosus*										X	
EMBALLONURIDAE												
Hill's Sheathtail Bat	*Taphozous hilli*									X		X
MOLOSSIDAE												
Inland Freetail Bat	*Ozimops petersi*			X					X	X	X	X
Southern Freetail Bat	*Ozimops kitcheneri*											
White-striped Freetail Bat	*Austronomus australis*			X						X	X	
VESPERTILIONIDAE												
Gould's Wattled Bat	*Chalinolobus gouldii*		X	X					X	X	X	X
Chocolate Wattled Bat	*Chalinolobus morio*			X		X						
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X			X	X			X	X	X
Central Long-eared Bat	*Nyctophilus major tor*	P3		X								
Inland Broad-nosed Bat	*Scotorepens balstoni*		X	X					X	X	X	X
Southern Forest Bat	*Vespadelus regulus*											
Inland forest bat	*Vespadelus baverstocki*											
Inland Cave Bat	*Vespadelus finlaysoni*			X		X				X		X
MURIDAE												

Common Name	Species Name	Status	NM	Leonora	Lake Carey	GS	Sunrise Dam			BW	C	SD
						2011	1995	2016	2017	2018	2021	2022
Spinifex Hopping Mouse	*Notomys alexis*		X	X	X	X		X	X	X	X	X
Bolam's Mouse	*Pseudomys bolami*				X							
Desert Mouse	*Pseudomys desertor*			X						X	X	
Sandy Inland Mouse	*Pseudomys hermannsburgensis*		X	X		X						X
INTRODUCED MAMMALS												
Dingo / Dog	*Canis lupus*			X			X	X	X	X	X	X
European Red Fox	*Vulpes vulpes*			X			X				X	X
Feral Cat	*Felis catus*			X			X		X	X	X	X
Rabbit	*Oryctolagus cuniculus*		X	X			X	X	X	X	X	X
House Mouse	*Mus musculus*		X	X	X	X			X	X	X	X
Goat	*Capra hircus*			X				X	X	X		X
Feral Donkey	*Equus asinus*									X		
Horse	*Equus caballus*							X	X			X
Dromedary Camel	*Camelus dromedarius*								X		X	X
Cattle	*Bos taurus*			X				X	X	X	X	X
Total Number of Native Species: 30			**19**	**17**	**5**	**11**	**3**	**4**	**7**	**15**	**17**	**18**
Total Number of Introduced Species: 10			**2**	**8**	**1**	**1**	**4**	**5**	**8**	**7**	**7**	**9**

Appendix 3: Species Recorded at Sunrise Dam.

Fauna Recorded from the Survey Area (Tables 1 to 5).
These lists are derived from the results of previous field surveys conducted within Sunrise Dam tenure. These are:

- Species recorded during previous fauna surveys conducted at Sunrise Dam:
  - Ninox 1995, 2004 (comprising four separate surveys);
  - Kingfisher 2016, 2017;
- Species recorded during the 2022 assessment (this assessment, listed under 2022).

Key:
Note the conservation status of significant taxa is listed under "Status". This includes species listed under legislation, DBCA Priority Fauna and Locally Significant Fauna. Species recorded opportunistically in the greater region (outside the project area) are listed as "R".

TABLE 1. Frogs recorded in the Survey Area.

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004:1	2004:2	2004:3	2004:4	2016	2017	2022
HYLIDAE										
Sheep Frog	*Cyclorana maini*			X						X
Water-holding Frog	*Cyclorana occidentalis*		X					X		
Little Red Tree Frog	*Litoria rubella*	R								
LIMNODYNASTINAE										
Kunapalari Frog	*Neobatrachus kunapalari*									X
Shoemaker Frog	*Neobatrachus sutor*		X	X	X					
Wilsmore's Frog	*Neobatrachus wilsmorei*		X	X		X				
Centralian Burrowing Frog	*Platyplectrum spenceri*	R								
TOTAL Recorded: 7		**0**	**3**	**3**	**1**	**1**	**0**	**1**	**0**	**2**

TABLE 2. Reptiles Recorded in the Survey Area.

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004:1	2004:2	2004:3	2004:4	2016	2017	2022
AGAMIDAE										
Mallee Military Dragon	*Ctenophorus fordi*		X			X	X	X	X	X
Military Dragon	*Ctenophorus isolepis*			X						
Central Netted Dragon	*Ctenophorus nuchalis*		X							
Claypan Dragon	*Ctenophorus salinarum*		X					X	X	
Lozenge-marked Dragon	*Ctenophorus scutulatus*								X	X
Mulga Dragon	*Diporiphora amphiboluroides*			X						
Thorny Devil	*Moloch horridus*		X	X						X
Bearded Dragon	*Pogona minor*			X		X	X		X	X
Pebble Dragon	*Tympanocryptis cephalus*		X							
DIPLODACTYLIDAE										
Variable Fat-tailed Gecko	*Diplodactylus conspicillatus*			X			X			X
Beautiful Gecko	*Diplodactylus pulcher*		X	X		X	X			X
Main's Ground Gecko	*Lucasium maini*			X						
Mottled Ground Gecko	*Lucasium squarrosum*			X		X	X			X
Beaked Gecko	*Rhynchoedura ornata*		X							X
Western Spiny-tailed Gecko	*Strophurus strophurus*						X			
Western Shield Spiny-tailed Gecko	*Strophurus wellingtonae*			X		X	X			
CARPHODACTYLIDAE										
Midline Knob-tail	*Nephrurus vertebralis*									X
Barking Gecko	*Underwoodisaurus milii*								X	X
GEKKONIDAE										
Purplish Dtella	*Gehyra purpurascens*						X			
Tree Dtella	*Gehyra variegata*		X	X		X	X	X		X
Bynoe's Gecko	*Heteronotia binoei*		X		X		X			X
PYGOPODIDAE										
Marble-faced Delma	*Delma australis*								X	
Unbanded Dema	*Delma butleri*		X							
Burton's Legless-Lizard	*Lialis burtonis*				X					
Western Hooded Scaly-foot	*Pygopus nigriceps*		X					X	X	X
SCINCIDAE										
Buchanan's Snake-eyed Skink	*Cryptoblepharus buchananii*		X	X						X
Ariadna'sCtenotus	*Ctenotus ariadnae*			X			X			
Greer's Ctenotus	*Ctenotus greeri*		X	X			X			X
Dusky Ctenotus	*Ctenotus helenae*			X		X	X			X
Leonhard's Ctenotus	*Ctenotus leonhardii*		X	X		X	X	X	X	X

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004:1	2004:2	2004:3	2004:4	2016	2017	2022
Panther Skink	*Ctenotus pantherinus*			X		X	X			X
Wedge-snouted Ctenotus	*Ctenotus schomburgkii*		X	X			X			X
Spotted Ctenotus	*Ctenotus uber*			X		X				X
Spinifex Slender Blue-tongue	*Cyclodomorphus melanops*			X						
Pygmy Spiny-tailed Skink	*Egernia depressa*		X	X			X	X	X	X
Goldfields Crevice Skink	*Egernia formosa*		X							X
North-western Sandslider	*Lerista bipes*		X	X		X	X		X	X
Central Deserts Robust Slider	*Lerista desertorum*		X	X			X		X	X
Southern Robust Slider	*Lerista picturata*								X	
Common Dwarf Skink	*Menetia greyii*			X						X
Woodland Dark Fleck Skink	*Morethia butleri*		X	X			X			X
VARANIDAE										
Short-tailed Pygmy Monitor	*Varanus brevicauda*		X							
Pygmy Mulga Monitor	*Varanus caudolineatus*		X	X		X	X			X
Sand Monitor	*Varanus gouldii*			X		X				X
Yellow-spotted Monitor	*Varanus panoptes*					X		X	X	X
TYPHLOPIDAE										
Prong-snouted Blind Snake	*Anilios bituberculatus*								X	
Hook-Snouted Blind Snake	*Anilios hamatus*					X				
Common Beaked Blind Snake	*Anilios waitii*					X				
ELAPIDAE										
Yellow-faced Whipsnake	*Demansia psammophis*			X		X	X			
Monk Snake	*Parasuta monachus*		X	X						X
Mulga Snake	*Pseudechis australis*		X							
Ringed Brown Snake	*Pseudonaja modesta*			X						
Western Brown Snake	*Pseudonaja mengdeni*		X	X		X	X			
Jan's Banded Snake	*Simoselaps bertholdi*		X						X	X
Rosen's Snake	*Suta fasciata*		X							
Total Number of Species: 55		0	26	30	1	19	23	8	15	31

TABLE 3. Birds Recorded in the Survey Area.

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004: 1	2004: 2	2004: 3	2004: 4	2016	2017	2022
CASUARIIDAE										
Emu	*Dromaius novaehollandiae*		X	X	X	X	X	X	X	X
PHASIANIDAE										
Stubble Quail	*Coturnix pectoralis*							X	X	
MEGAPODIIDAE										
Malleefowl	*Leipoa ocellata*	V								X
ANATIDAE										
Black Swan	*Cygnus atratus*		X		X				X	X
Australian Shelduck	*Tadorna tadornoides*		X	X	X	X	X		X	X
Australian Wood Duck	*Chenonetta jubata*		X	X						
Pacific Black Duck	*Anas superciliosa*		X	X	X	X	X		X	X
Pink-eared Duck	*Malacorhynchus membranaceus*		X	X	X	X	X		X	X
Grey Teal	*Anas gracilis*		X	X	X	X	X		X	X
Chestnut Teal	*Anas castanea*			X						
Australasian Shoveler	*Anas rhynchotis*		X				X			
Hardhead	*Aythya australis*					X				
PODICIPEDIDAE										
Australasian Grebe	*Tachybaptus novaehollandiae*		X			X	X		X	
Hoary-headed Grebe	*Poliocephalus poliocephalus*			X	X	X	X		X	
COLUMBIDAE										
Common Bronzewing	*Phaps chalcoptera*		X			X	X	X	X	X
Crested Pigeon	*Ocyphaps lophotes*		X	X	X	X	X	X	X	X
PODARGIDAE										
Tawny Frogmouth	*Podargus strigoides*					X				
AEGOTHELIDAE										
Australian Owlet-nightjar	*Aegotheles cristatus*		X	X			X		X	
ARDEIDAE										
White-faced Heron	*Egretta novaehollandiae*		X	X	X					
White-necked Heron	*Ardea pacifica*						X			
THRESKIORNITHIDAE										
Straw-necked Ibis	*Threskiornis spinicollis*						X			
ACCIPITRIDAE										
Black-shouldered Kite	*Elanus axillaris*								X	
Whistling Kite	*Haliastur sphenurus*				X					

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004: 1	2004: 2	2004: 3	2004: 4	2016	2017	2022
Brown Goshawk	*Accipiter fasciatus*		X							X
Collared Sparrowhawk	*Accipiter cirrocephalus*									X
Wedge-tailed Eagle	*Aquila audax*		X	X	X	X	X	X	X	X
FALCONIDAE										
Nankeen Kestrel	*Falco cenchroides*		X	X	X	X	X	X	X	X
Brown Falcon	*Falco berigora*		X	X	X			X	X	X
Australian Hobby	*Falco longipennis*		X	X	X	X		X	X	
Peregrine Falcon	*Falco peregrinus*	S7	X	X		X				
RALLIDAE										
Eurasian Coot	*Fulica atra*		X	X		X	X		X	
Black-tailed Native-hen	*Tribonyx ventralis*			X		X	X		X	
OTIDIDAE										
Australian Bustard	*Ardeotis australis*	L		X	X	X				
BURHINIDAE										
Bush Stone-curlew	*Burhinus grallarius*	L							X	
RECURVIROSTRIDAE										
Red-necked Avocet	*Recurvirostra novaehollandiae*						X			
Black-winged Stilt	*Himantopus himantopus*				X		X		X	
Banded Stilt	*Cladorhynchus leucocephalus*	L	X						X	
CHARADRIIDAE										
Red-capped Plover	*Charadrius ruficapillus*									X
Black-fronted Dotterel	*Elseyornis melanops*		X			X	X		X	X
Red-kneed Dotterel	*Erythrogonys cinctus*						X		X	
Banded Lapwing	*Vanellus tricolor*		X	X	X					
SCOLOPACIDAE										
Common Greenshank	*Tringa nebularia*	M					X			
CACATUIDAE										
Galah	*Cacatua roseicapilla*		X	X	X	X	X		X	X
Cockatiel	*Nymphicus hollandicus*		X	X		X	X	X		X
PSITTACIDAE										
Australian Ringneck	*Barnardius zonarius*			X	X	X	X	X	X	X
Mulga Parrot	*Psephotus varius*		X	X	X	X	X	X	X	X
Budgerigar	*Melopsittacus undulatus*		X	X		X	X			
Bourke's Parrot	*Neopsephotus bourkii*		X					X		
CUCULIDAE										

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004: 1	2004: 2	2004: 3	2004: 4	2016	2017	2022
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		X	X	X			X	X	
Black-eared Cuckoo	*Chrysococcyx osculans*							X		
Pallid Cuckoo	*Cacomantis pallidus*				X	X		X		
MEROPIDAE										
Rainbow Bee-eater	*Merops ornatus*		X							
CLIMACTERIDAE										
White-browed Treecreeper	*Climacteris affinis*		X							X
PTILONORHYNCHIDAE										
Western Bowerbird	*Ptilonorhynchus guttatus*			X	X	X		X		X
MALURIDAE										
Splendid Fairy-wren	*Malurus splendens*		X	X	X	X		X	X	X
White-winged Fairy-wren	*Malurus leucopterus*		X	X	X	X	X	X	X	X
Variegated Fairy-wren	*Malurus lamberti*							X		X
ACANTHIZIDAE										
Redthroat	*Pyrrholaemus brunneus*		X	X	X	X		X	X	X
Weebill	*Smicrornis brevirostris*			X	X	X	X		X	X
Western Gerygone	*Gerygone fusca*				X	X				
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X					X	X	
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		X	X	X	X	X	X	X	X
Slaty-backed Thornbill	*Acanthiza robustirostris*		X					X	X	X
Inland Thornbill	*Acanthiza apicalis*		X	X	X	X	X	X	X	X
Slender billed Thornbill	*Acanthizai redalei*	L	X					X	X	X
Southern Whiteface	*Aphelocephala leucopsis*		X	X	X	X			X	
PARDALOTIDAE										
Striated Pardalote	*Pardalotus striatus*		X		X	X	X		X	
MELIPHAGIDAE										
Red Wattlebird	*Anthochaera carunculata*				X	X				
Singing Honeyeater	*Gavicalis virescens*		X	X	X	X		X	X	X
White-fronted Honeyeater	*Purnella albifrons*		X	X	X	X			X	X
Yellow-throated Miner	*Manorina flavigula*		X	X	X	X	X	X	X	X
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X	X	X	X	X	X	X	X
Crimson Chat	*Epthianura tricolor*		X	X					X	
White-fronted Chat	*Epthianura albifrons*			X			X			X
Brown Honeyeater	*Lichmera indistincta*									X
POMATOSTOMIDAE										

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004: 1	2004: 2	2004: 3	2004: 4	2016	2017	2022
White-browed Babbler	*Pomatostomus superciliosus*		X	X	X	X	X	X	X	X
PSOPHODIDAE										
Chestnut-breasted Quail-thrush	*Cinclosoma castaneothorax*									X
NEOSITTIDAE										
Varied Sittella	*Daphoenositta chrysoptera*									X
CAMPEPHAGIDAE										
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		X	X	X	X	X	X	X	X
White-winged Triller	*Lalage tricolor*					X		X		
PACHYCEPHALIDAE										
Rufous Whistler	*Pachycephala rufiventris*		X	X	X	X		X	X	X
Grey Shrike-thrush	*Colluricincla harmonica*		X	X	X		X	X	X	X
Crested Bellbird	*Oreoica gutturalis*		X	X	X	X	X	X	X	X
ARTAMIDAE										
Masked Woodswallow	*Artamus personatus*								X	
Black-faced Woodswallow	*Artamus cinereus*				X			X	X	X
Little Woodswallow	*Artamus minor*									X
Grey Butcherbird	*Cracticus torquatus*		X	X	X	X	X	X	X	X
Pied Butcherbird	*Cracticus nigrogularis*		X	X	X	X	X	X	X	X
Australian Magpie	*Cracticus tibicen*		X			X		X	X	X
Grey Currawong	*Strepera versicolor*				X	X				X
RHIPIDURIDAE										
Grey Fantail	*Rhipidura albiscapa*									X
Willie Wagtail	*Rhipidura leucophrys*		X	X	X	X	X	X	X	X
CORVIDAE										
Little Crow	*Corvus bennetti*		X	X	X	X	X	X	X	X
Torresian Crow	*Corvus orru*		X			X		X		X
MONARCHIDAE										
Magpie-lark	*Grallina cyanoleuca*		X	X	X	X	X	X	X	X
PETROICIDAE										
Red-capped Robin	*Petroica goodenovii*		X	X	X	X		X	X	X
Hooded Robin	*Melanodryas cucullata*									X
MEGALURIDAE										
Brown Songlark	*Cincloramphus cruralis*		X					X		
HIRUNDINIDAE										

Common Name	Species Name	Status	Sunrise Dam							
			1995	2004: 1	2004: 2	2004: 3	2004: 4	2016	2017	2022
White-backed Swallow	*Cheramoeca leucosterna*		X		X	X	X	X	X	
Welcome Swallow	*Hirundo neoxena*		X	X	X				X	X
Fairy Martin	*Petrochelidon ariel*							X		X
Tree Martin	*Petrochelidon nigricans*							X		
NECTARINIIDAE										
Mistletoebird	*Dicaeum hirundinaceum*		X				X	X	X	X
ESTRILDIDAE										
Zebra Finch	*Taeniopygia guttata*		X	X	X	X	X	X	X	X
MOTACILLIDAE										
Australasian Pipit	*Anthus novaeseelandiae*		X	X				X	X	X
Total Number of Species: 105		7	64	56	55	57	48	50	63	62

TABLE 4. Mammals Recorded in the Survey Area.

Common Name	Species Name	Status	1995	2004:1	2004:2	2004:3	2004:4	2016	2017	2022
TACHYGLOSSIDAE										
Echidna	*Tachyglossus aculeatus*				X		X	X	X	X
DASYURIDAE										
Brush-tailed Mulgara	*Dasycercus blythi*	P4								X
Ride's Ningaui	*Ningaui ridei*			X	X	X	X			X
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*	L								X
Fat-tailed Dunnart	*Sminthopsis crassicaudata*									X
Little Long-tailed Dunnart	*Sminthopsis dolichura*					X			X	X
Long-tailed Dunnart	*Sminthopsis longicaudata*	P4								X
Ooldea Dunanrt	*Sminthopsis ooldea*									X
MACROPODIDAE										
Euro	*Macropus robustus*				X	X	X	X		X
Red Kangaroo	*Macropus rufus*			X	X	X		X	X	X
Western Grey Kangaroo	*Macropus fuliginosus*				X					
EMBALLONURIDAE										
Hill's Sheathtail Bat	*Taphozous hilli*									X
MOLOSSIDAE										
Inland Freetail Bat	*Ozimops petersi*								X	X
VESPERTILIONIDAE										
Gould's Wattled Bat	*Chalinolobus gouldii*								X	X
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X	X		X				X
Inland Broad-nosed Bat	*Scotorepens balstoni*					X			X	X
Inland Cave Bat	*Vespadelus finlaysoni*									X
MURIDAE										
Spinifex Hopping Mouse	*Notomys alexis*			X	X	X	X	X	X	X
Desert Mouse	*Pseudomys desertor*					X				
Sandy Inland Mouse	*Pseudomys hermannsburgensis*									X
INTRODUCED MAMMALS										
Dingo / Dog	*Canis lupus*		X					X	X	X
European Red Fox	*Vulpes vulpes*		X							X
Feral Cat	*Felis catus*		X						X	X
Rabbit	*Oryctolagus cuniculus*		X					X	X	X
House Mouse	*Mus musculus*								X	X
Goat	*Capra hircus*							X	X	X
Horse	*Equus caballus*							X	X	X
Dromedary Camel	*Camelus dromedarius*								X	X
Cattle	*Bos taurus*							X	X	X
Total Number of Native Species: 20		**3**	**1**	**4**	**6**	**8**	**4**	**4**	**7**	**18**
Total Number of Introduced Species: 9		**0**	**4**					**5**	**8**	**9**

TABLE 5. Species Recorded in the Renewable Energy and Borefields Areas (North and South). Note the Renewable Energy Areas are listed from north to south (areas 1 – 3), conservation status is listed under "S", Borefields listed as north or south (BN or BS). The areas surveyed included:

- Renewable Area 1 = proposed wind farm option north of Golden Delicious;
- Renewable Area 2 = proposed wind farm option west of Bindah Road;
- Renewable Area 3 = proposed solar farm near Sunrise Dam;
- Borefield Area North = Black Swan Borefield; and
- Borefield Area South = L39/210 Fuji Wilga Borefield.

Common Name	Species Name	S	1	2	3	BN	BS
Lozenge-marked Dragon	*Ctenophorus scutulatus*				X	X	
Bearded Dragon	*Pogona minor*		X				
Wedge-snouted Ctenotus	*Ctenotus schomburgkii*				X		
Pygmy Spiny-tailed Skink	*Egernia depressa*				X		X
Mottled Ground Gecko	*Lucasium squarrosum*			X			
Midline Knob-tail	*Nephrurus vertebralis*			X			
Leonhard's Ctenotus	*Ctenotus leonhardii*			X			
Woodland Dark Fleck Skink	*Morethia butleri*			X			
Monk Snake	*Parasuta monachus*			X			
Sand Monitor	*Varanus gouldii*						X
Emu	*Dromaius novaehollandiae*					X	X
Malleefowl	*Leipoa ocellata*	V					X
Crested Pigeon	*Ocyphaps lophotes*		X				
Common Bronzewing	*Phaps chalcoptera*		X				X
Brown Goshawk	*Accipiter fasciatus*		X				
Nankeen Kestrel	*Falco cenchroides*						X
Australian Ringneck	*Barnardius zonarius*		X		X		X
Mulga Parrot	*Psephotus varius*		X	X	X	X	
White-browed Treecreeper	*Climacteris affinis*			X			X
Splendid Fairy-wren	*Malurus splendens*				X		
White-winged Fairy-wren	*Malurus leucopterus*			X			
Redthroat	*Pyrrholaemus brunneus*		X	X	X		X
Inland Thornbill	*Acanthiz aapicalis*		X	X	X	X	
Chestnut-rumped Thornbill	*Acanthiz auropygialis*		X		X		X
Yellow-throated Miner	*Manorina flavigula*			X	X		
Singing Honeyeater	*Gavicalis virescens*		X		X		X
White-fronted Honeyeater	*Purnella albifrons*		X				
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X				
Brown Honeyeater	*Lichmera indistincta*		X				
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*			X			
White-browed Babbler	*Pomatostomus superciliosus*					X	X

Common Name	Species Name	S	1	2	3	BN	BS
Rufous Whistler	*Pachycephala rufiventris*			X	X	X	X
Grey Shrike-thrush	*Colluricincla harmonica*		X	X	X		X
Crested Bellbird	*Oreoica gutturalis*		X	X	X		X
Grey Butcherbird	*Cracticus torquatus*		X				
Pied Butcherbird	*Cracticus nigrogularis*			X			
Australian Magpie	*Cracticus tibicen*						X
Grey Currawong	*Strepera versicolor*					X	
Willie Wagtail	*Rhipidura leucophrys*		X				
Torresian Crow	*Corvus orru*			X			
Welcome Swallow	*Hirundo neoxena*		X				
Mistletoebird	*Dicaeum hirundinaceum*		X				
Ride's Ningaui	*Ningaui ridei*			X			
Little Long-tailed Dunnart	*Sminthopsis dolichura*			X			
Spinifex Hopping Mouse	*Notomys alexis*						X
Red Kangaroo	*Macropus rufus*		X				
Gould's Wattled Bat	*Chalinolobus gouldii*		X				
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X				
Dingo / Dog	*Canis lupus*						X
Cattle	*Bos taurus*		X	X			X

Appendix 4: Locations of Significant Fauna (Zone 51J).

Species	Status	Easting	Northing	Comments
Brush-tailed Mulgara	P4	448763	6777552	Foraging excavation
Brush-tailed Mulgara	P4	448724	6777574	Camera Record
Brush-tailed Mulgara	P4	448763	6777552	Burrow
Brush-tailed Mulgara	P4	448831	6777641	Burrow
Brush-tailed Mulgara	P4	448674	6777873	Camera record
Long-tailed Dunnart	P4	454654	6778696	Camera record
Malleefowl	V	455892	6775432	Tracks
Malleefowl	V	456557	6774604	Tracks
Malleefowl	V	456615	6774704	Tracks
Slender-billed Thornbill	L	444162	6779414	Two birds
Slender-billed Thornbill	L	442704	6780315	Two birds
Black Swan	NA	444366	6779471	Old Nest
Black Swan	NA	444289	6779437	Old Nest

Note: status refers to conservation status (EPBC listed, DBCA Priority listed, locally significant).

Appendix 5: Photographs of Fauna Sampling Sites

Site 1: Acacia shrubland on low stony rise

Site 2:Mulga on hardpan plain

Site 3: Mixed Acacia over chenopod shrubland on sandplain

Site 4: *Casuarina pauper* woodland on a gypsiferous rise

Site 5: *Triodia basedowii* sandplain with Mulga shrubland

Site 6: Acacia shrubland on sandplain

Site A3: Dense vegetation fringing drainage line