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## **Lake Way Project Demonstration Plant – Salt Lake Potash Ltd.**

### **Fauna assessment of proposed project area.**

M. Bamford and B. Metcalf

#### **Background**

Salt Lake Potash proposes the development of the Lake Way Demonstration Plant project; the proposal includes the construction/operation of drainage trenches to extract brine from the lake, which would then be concentrated in a series of evaporation ponds (Figure 1). While most of the development is confined to the playa environment of the lake, there is some proposed infrastructure development on nearby terrestrial landscapes to the west of the lake. The proposed disturbance footprint on the playa surface has an area of ca. 757ha which is c. 3.6% of the playa. The drainage trenches will cause some drawdown but because of the fine sediments the cone of depression is predicted to be steep-sided and narrow; the development footprint and drawdown account for about 7.5% of the playa surface. The plant infrastructure on terrestrial areas west of the lake has an area of 47ha.

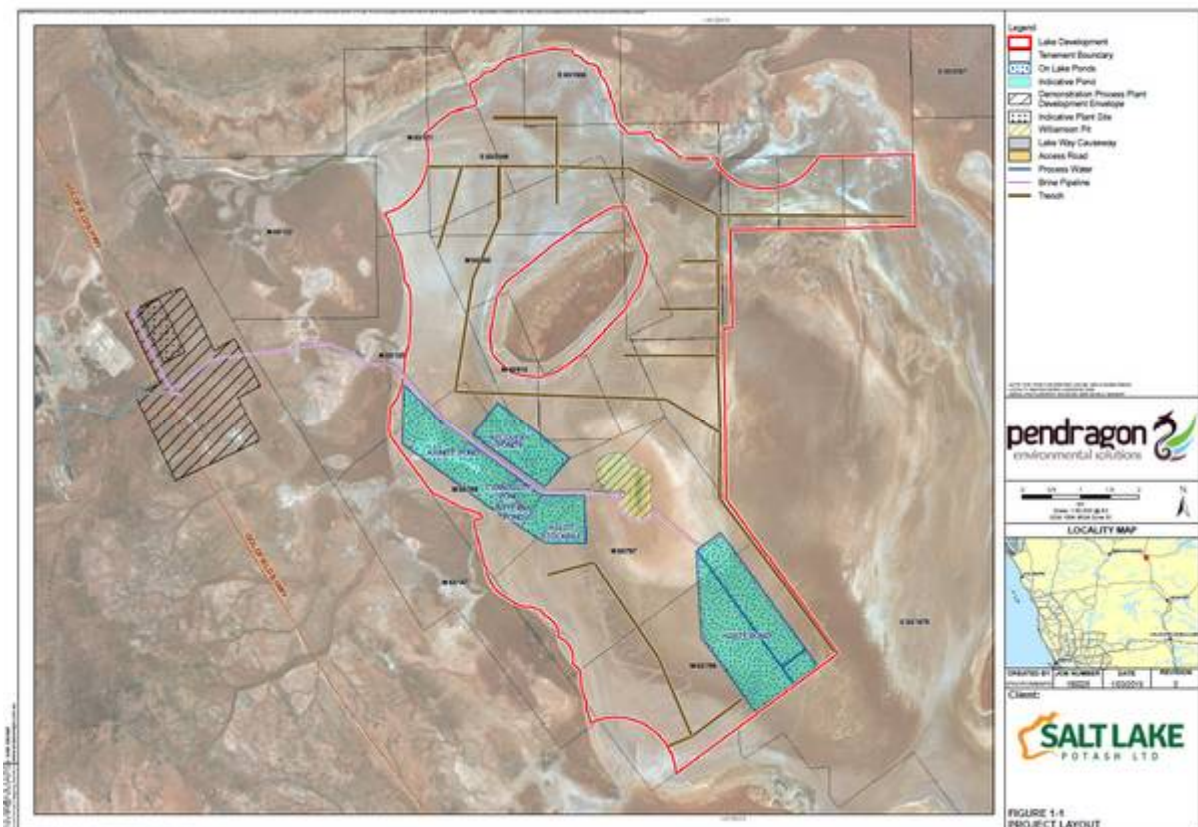
The Environmental Impact Assessment for this proposal is being prepared by Pendragon Environmental Solutions. Bamford Consulting Ecologists (BCE) has been asked to provide information on the fauna component of this assessment.

BCE uses a ‘values and impacts’ assessment process with the following components:

- The identification of fauna values:
  - Assemblage characteristics: uniqueness, completeness and richness;
  - Species of conservation significance;
  - Recognition of ecotypes or vegetation/substrate associations (VSAs) that provide habitat for fauna, particularly those that are rare, unusual and/or support significant fauna;
  - Patterns of biodiversity across the landscape;
  - Ecological processes upon which the fauna depend.
- The review of impacting processes such as:
  - Habitat loss leading to population decline;
  - Habitat loss leading to population fragmentation;
  - Degradation of habitat due to weed invasion leading to population decline;
  - Ongoing mortality from operations;
  - Species interactions including feral and overabundant native species;

- Hydrological change;
- Altered fire regimes; and
- Disturbance (dust, light, noise).

The following memo provides information on the approach to the assessment, the fauna values and reviews impacting processes in relation to these values and the proposed works.



**Figure 1. Layout of Salt Lake Potash Lake Way project. The development envelope includes the lake playa enclosed within the red line, and the hatched infrastructure area to the west of the lake.**

## Methods

### Desktop Assessment

#### *Sources of information*

Information on the fauna assemblage of the survey area was drawn from a wide range of sources. These included state and federal government databases and results of regional studies. Databases accessed were the Atlas of Living Australia (ALA), Department of Biodiversity, Conservation and Attractions (DBCA) NatureMap (incorporating the Western Australian Museum's FaunaBase and the DBCA Threatened and Priority Fauna Database), BirdLife Australia's Atlas Database (BA) and the EPBC Protected Matters Search Tool of

the Department of Energy and the Environment (DEE) (Table 1). Information from the above sources was supplemented with species expected in the area based on general patterns of distribution. Sources of information used for these general patterns were:

Frogs: Tyler *et al.* (2009) and Anstis (2013);  
 Reptiles: Storret *et al.* (1983, 1990, 1999 and 2002) and Wilson and Swan (2017);  
 Birds: Johnstone and Storr (1998, 2005) and Barrett *et al.* (2003); and  
 Mammals: Menkhorst & Knight (2004); Armstrong (2011); Churchill (2008); and Van Dyck and Strahan (2008).

Table 1. Sources of information used for the desktop assessment.

| Database   | Type of records held on database  | Area searched  |
|--|---|--|
| Atlas of Living Australia.                             | Records of biodiversity data from multiple sources across Australia.  | Point search: 26.75°S, 120.32°E plus 10 km buffer. Searched: January 2019. |
| NatureMap (DBCA)                                       | Records in the WAM and DBCA databases. Includes historical data and records on Threatened and Priority species in WA. | Point search: 26.75°S, 120.32°E plus 20 km buffer. Searched: January 2019. |
| BirdLife Australia Atlas Database (Birdlife Australia) | Records of bird observations in Australia, 1998-2019.   | Point search: 26.75°S, 120.32°E plus 40 km buffer. Searched: January 2019. |
| EPBC Protected Matters (DEE)                           | Records on matters of national environmental significance protected under the EPBC Act.                               | Point search: 26.75°S, 120.32°E plus 40 km buffer. Searched: January 2019. |

In addition, information on fauna and potential impacts was available from a number of previous studies in the area. These included:

- Bamford and Bancroft (2004). Review of the Wetland Avifauna of Lake Way. Unpublished report for Agincourt Resources.
- Outback Ecology Services (2005). Wiluna Gold Mine. Dewatering Discharge Licence Report (DDLRL) Jan 2005 – Dec 2005. Unpublished report to Agincourt Resources.
- Outback Ecology Services (2006). Wiluna Gold. Monitoring of Lake Way during mining operations. Unpublished report to Agincourt Resources.
- Outback Ecology Services (2008). Toro Energy Ltd. Lake Way Baseline Environmental Survey. Salt Lake Ecology. Unpublished report to Nova Energy Ltd.
- EPA (2012). Report and Recommendations of the EPA: Wiluna Uranium Project, Toro Energy Ltd. Report 1437.

- Outback Ecology Services (2012a). Appendix E: Revision of “Toro Energy Ltd Wiluna Uranium Project Subterranean Fauna Assessment, March 2011”. Unpublished report to Toro Energy Ltd.
- Outback Ecology Services (2012b). Wiluna Uranium Project Stygofauna May 2012. Memo to Toro Energy Ltd. 7<sup>th</sup> May 2012.
- Office of the Appeals Convener (2012). Statement that a proposal may be implemented; Wiluna Uranium Mine, 30km south and 15 km south-east of Wiluna, Shire of Wiluna. Ministerial Statement 913.
- MWH Australia (2015). Review of impacts to stygofauna from Wiluna Uranium Project. Letter to Toro Energy Ltd. 19<sup>th</sup> June 2015.
- Ecologia (2015). Extension to the Wiluna Uranium Project – Cumulative Impact Assessment. Unpublished report to Toro Energy Ltd.
- Toro Energy Ltd (2015). Extension to the Wiluna Uranium Project; Assessment No: 2002 (CMS14025): Public Environmental Review.
- Bennelongia Environmental Consultants (2017). Lake Wells Potash Project: Wetland Ecology Baseline Survey. Unpublished report for Australian Potash Ltd.
- Focused Vision Consulting (2017). Ecological Monitoring Program, Lake Way L5206/1987/10; Blackham Resources Ltd. – Matilda Operations Pty Ltd. Unpublished report by Focused Vision Consulting, in conjunction with Bennelongia Environmental Consultants, for Blackham Resources.

### *Nomenclature and taxonomy*

As per the recommendations of EPA (2004), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum’s (WAM) Checklist of the Fauna of Western Australia 2016. The authorities used for each vertebrate group were: amphibians (Doughty *et al.* 2016a), reptiles (Doughty *et al.* 2016b), birds (Johnstone and Darnell 2016), and mammals (Travouillon 2016). In some cases, more widely-recognised names and naming conventions have been followed, particularly for birds where there are national and international naming conventions in place (e.g. the BirdLife Australia working list of names for Australian Birds). This includes the use of capital letters in English names. English names of species where available are used throughout the text; Latin species names are presented with corresponding English names in tables in the appendices.

### *Interpretation of species lists*

Species lists generated from the review of sources of information are generous as they include records drawn from a large region and possibly from environments not represented in the survey area. Therefore, some species that were returned by one or more of the data searches have been excluded because their ecology, or the environment within the survey area, meant that it is highly unlikely that these species will be present. Such species can include, for example, seabirds that might occur as extremely rare vagrants at a terrestrial, inland site, but for which the project area is of no importance. Species returned from databases but excluded from species lists due to lack of suitable habitat (and some database errors) are not presented.

Species returned from the databases and not excluded on the basis of ecology or environment are therefore considered potentially present or expected to be present in the survey area at least occasionally, whether or not they were recorded during field surveys, and whether or not the survey area is likely to be important for them. This list of expected species is therefore subject to interpretation by assigning each a predicted status in the survey area.

/The status categories used are:

**Resident:** species with a population permanently present in the survey area;

**Migrant or regular visitor:** species that occur within the project area regularly in at least moderate numbers, such as part of annual cycle;

**Irregular visitor:** species that occur within the survey area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the project area in at least moderate numbers and for some time;

**Vagrant:** species that occur within the project area unpredictably, in small numbers and/or for very brief periods. Therefore, the project area is unlikely to be of importance for the species; and

**Locally extinct:** species that would have been present but has not been recently recorded in the local area and therefore is almost certainly no longer present in the project area.

These status categories make it possible to distinguish between vagrant species, which may be recorded at any time but for which the site is not important in a conservation context, and species which use the site in other ways but for which the site is important at least occasionally. This is particularly useful for birds that may naturally be migratory or nomadic, and for some mammals that can also be mobile or irruptive, and further recognises that even the most detailed field survey can fail to record species which will be present at times, or may have been previously confirmed as present. The status categories are assigned conservatively. For example, a lizard known from the general area is assumed to be a resident unless there is very good evidence that the site will not support it, and even then it may be classed as a vagrant rather than assumed to be absent if the site might support dispersing individuals. It must be stressed that these status categories are predictions only and that often very intensive sampling would be required to confirm a species' status.

## **Field Investigation and Personnel**

The project area was visited between 31<sup>st</sup> January and 1<sup>st</sup> February 2019 by Dr Mike Bamford (B.Sc. Hons. Ph.D. Biol.) and Brenden Metcalf (B.Sc. Hons. Env. Sci.). The site visit involved looking around as much of the project area as possible in daylight. Vehicle and foot traverses were conducted to access as many parts of the lease area as possible within the timeframe. Access to some locations was limited because of heritage considerations and the availability of tracks, but it was possible to readily view the lake playa and to access the lake shoreline just south of the lease area, and along the western, north-eastern and northern boundaries. This enabled environmental descriptions to be prepared and some opportunistic

observations on fauna to be made. Familiarity with the environment enables interpretation of species lists from databases.

### **Vegetation and Substrate Associations**

Vegetation and Substrate Associations (VSAs) in the project area were assessed during the desktop review and as part of the field investigations. Within the project area, all major VSAs were visited to develop an understanding of major fauna habitat types present and to assess the likelihood of conservation significant species being present in the area.

### **Survey Limitations**

The EPA Guidance Statement 56 (EPA 2004) outlines a number of limitations that may arise during surveying. These survey limitations are discussed in the context of the BCE investigation of the survey area in Table 2.

Table 2. Survey limitations as outlined by EPA.

| <b>EPA Limitation</b>   | <b>BCE Comment</b>  |
|---|---|
| Level of survey.  | Level 1 (desktop study and site inspection). Survey intensity was deemed adequate for the various habitat types viewable from aerial photograph, scale of the project and the amount of data records available in the region. |
| Competency/experience of the consultant(s) carrying out the survey.   | The ecologists have had extensive experience in conducting fauna surveys and have conducted several fauna studies in the region (over three decades).   |
| Scope. (What faunal groups were sampled and were some sampling methods not able to be employed because of constraints?) | The survey focussed on vertebrate fauna and fauna values. Knowledge of invertebrate fauna from Lake Way was reviewed.   |
| Proportion of fauna identified, recorded and/or collected.  | All vertebrate fauna observed were identified.  |
| Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.    | Abundant information from databases and previous studies.   |
| The proportion of the task achieved and further work which might be needed.   | The survey was completed and the report provides fauna values for the project area.   |

| EPA Limitation   | BCE Comment  |
|--|--|
| Timing/weather/season/cycle.   | Timing is not of great importance for level 1 investigations.  |
| Disturbances (e.g. fire, flood, accidental human intervention etc.) that affected results of survey. | None   |
| Intensity. (In retrospect, was the intensity adequate?)  | The survey area is ~ 6184 ha and was traversed by vehicle and on foot and thus was adequately comprehensive to assess fauna and fauna values.                    |
| Completeness (e.g. was relevant area fully surveyed).  | Site was fully surveyed to the level appropriate for a level 1 assessment. Fauna database searches covered a 10 to 40 km radius beyond the survey area boundary. |
| Resources (e.g. degree of expertise available in animal identification to taxon level).              | Field personnel have extensive experience with fauna and habitat in the region.  |
| Remoteness and/or access problems.   | Parts of the lease were declared Aboriginal Heritage areas; these areas were unable to be accessed.  |
| Availability of contextual (e.g. bio-geographic) information on the region.                          | Extensive regional information was available and was consulted.  |

**Fauna assemblage**

The project focuses on the lake bed of Lake Way where infrastructure will be placed, and the plant area just west of the lake (Figure 1). The regional vertebrate fauna assemblage potentially includes 302 species (not including eight species considered to be locally extinct; see



Table 3), only a small portion of these are expected to actively utilise the lake playa itself (see Table 4). It is expected that the main groups actively utilising the lake bed will include waterbirds and invertebrates. A complete list of vertebrate fauna species appears in Appendix 1, indicating those of conservation significance and assigning each species a status category in the area. Because the lake itself and the upland environments are very different, the discussion on fauna below makes a distinction between playa and upland fauna.

## Vertebrate Fauna

- Assemblage characteristics. The overall fauna assemblage is typical of the region, with elements from the Murchison and Arid zone, but many species returned from databases may not be present due to lack of suitable habitat. For example, the plant site area lies on rocky ground and thus species associated with spinifex on sandy soil will not be present in that area, but may be present nearby. Of the total assemblage of 302 species, 53 vertebrate fauna species are expected to actively utilise the lake bed/edge, including one reptile, 48 waterbird species and four other bird species (see Appendix 1). This salt lake component of the assemblage will be highly variable seasonally and annually, being heavily influenced by rainfall events. High rainfall events, resulting in the lake filling completely or partially, are likely to result in aquatic macroinvertebrate numbers increasing. This will allow waterbird numbers to increase, with some species likely to exploit the food source and have a mass breeding event, if conditions are suitable.
- Species of conservation significance. Numbers of conservation significant species that may occur within the region and the development envelope on the lake playa are summarised in Table 5. A high proportion of significant species (11 of 15 species listed as CS1) are associated with the lake playa and are migratory waterbirds, whereas very few significant species are associated with terrestrial environments; this is partly because of the high rate of extinction of significant mammals in the region. Significant species are discussed further below.
- Vegetation and Substrate Associations (VSAs). There is a very limited diversity of VSAs within the development area; the majority of the area is lake bed, with areas of sparse chenopod shrubland (including *Tecticornia* flats) on the margins of the lake. Upland areas away from the lake support a range of shrublands and woodlands on substrates ranging from loam to rocky hills. VSAs on and around Lake Wells include:
  - Lake playa;
  - *Tecticornia* flats;
  - rocky hills;
  - low rises of calcrete and quartz supporting open shrubland of acacia and sometimes chenopods, sloping to tall shrubland of acacia over tussock grass on loam flats;
  - sandy plains and sand dunes close to the lake supporting scattered eucalypts, acacia tall shrubland over spinifex;
  - Fragmented closed low forest of melaleuca on sandy ridges close to the lake.

Examples of VSA types are illustrated in Appendix 4. Vegetation types that approximate some of the VSAs are mapped in Figures 2 and 3.

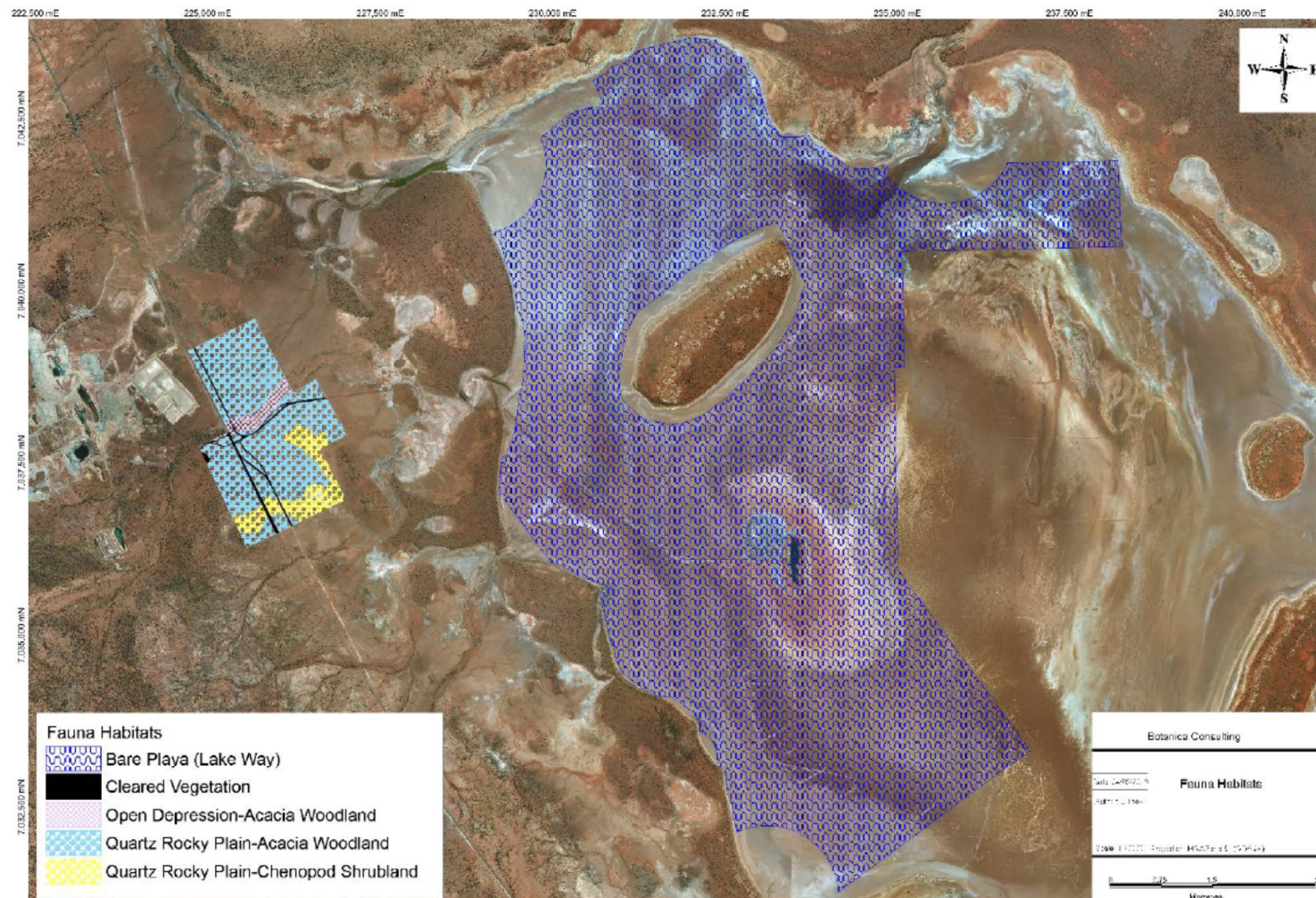


Figure 2. Vegetation types in the development envelope across Lake Way and the infrastructure area to the west of the lake.



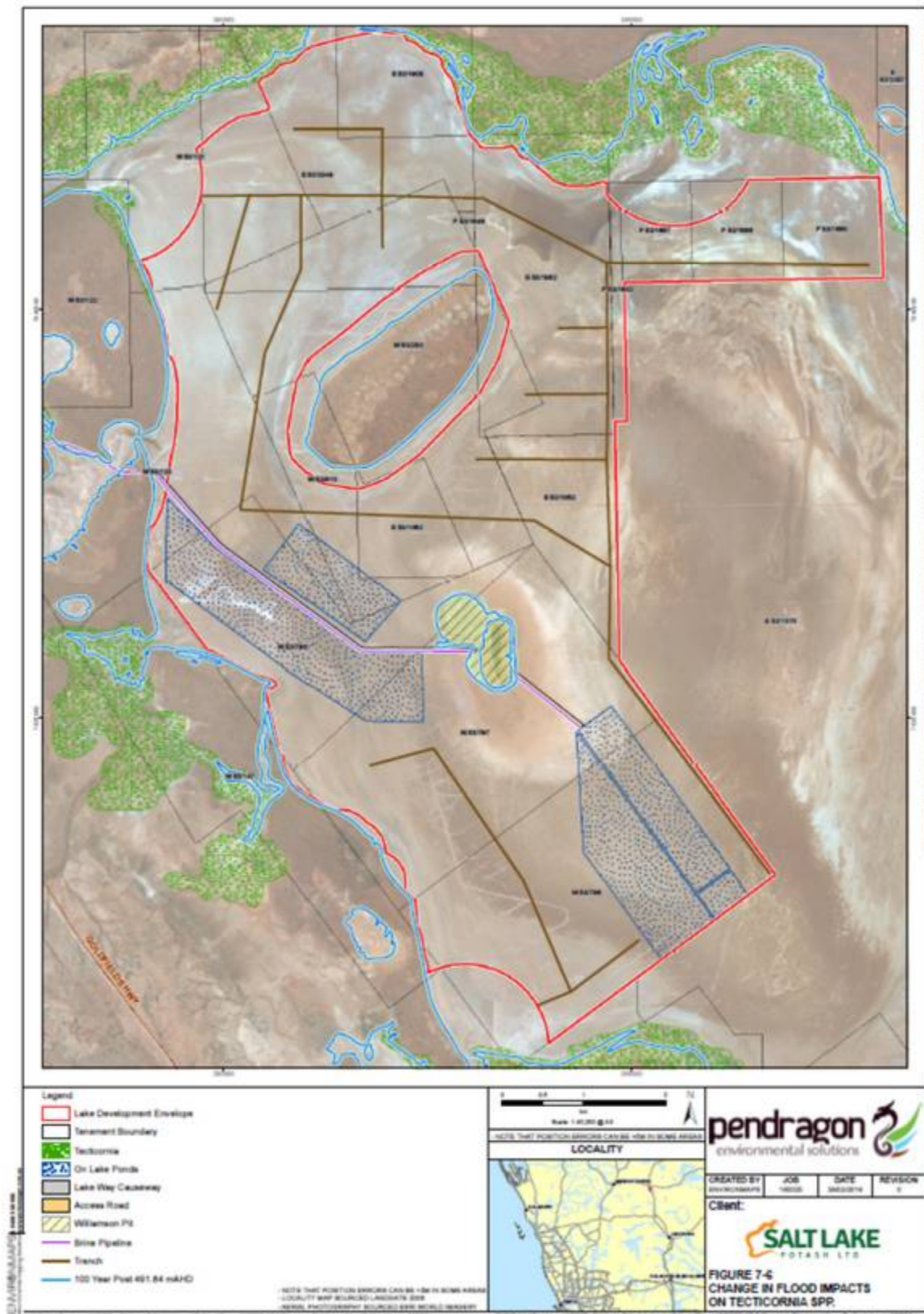


Figure 3. Extent of *Tecticornia* shrubland (green stippling); also showing 100 year flood event and infrastructure layout across lake playa.

- Patterns of biodiversity across the landscape. Vertebrate fauna has limited diversity within the lease area; the lake bed/edge has limited complexity and limited productivity during dry periods. Productivity is likely to increase dramatically following high rainfall events, resulting in an increased vertebrate diversity i.e. predominantly waterbirds. Invertebrate fauna associated with the lake and with subterranean environments are discussed below.
- Ecological processes upon which the fauna depend. A range of ecological processes can be important for fauna, but a major feature of the project area is hydrology, primarily for invertebrates, including aquatic macroinvertebrates, but secondarily for waterbirds that will rely on periodic irruptions of invertebrates as a food source. Introduced species (in particular the European Fox and Feral Cat) have probably led to local extinction of several mammal species and are likely to impact native species that utilise the project area.

#### Species of conservation significance 1 (listed under legislation)

Migratory Waterbirds. Eleven migratory waterbirds listed under the EPBC Act and Schedule 5 of the WA Biodiversity Conservation Act may visit Lake Way when conditions are suitable following heavy rainfall events and a subsequent increase in aquatic macroinvertebrate populations. Because such conditions are infrequent and irregular, these species can be designated as irregular visitors, but they may occasionally be present in large numbers. The migratory waterbirds generally migrate to Australia from October to May via the East Asian – Australasian Flyway and do not breed when in Australia.

Night Parrot. The Night Parrot is listed as Critically Endangered under the EPBC Act and the WA Biodiversity Conservation Act. There is a known population of the species in the Wiluna area, approximately 85km north-east of Lake Way (near Matuwa (formerly Lorna Glen station); see Hamilton *et al.* 2017). What little is known about the Night Parrot, particularly the Western Australian population/s, suggests that it has a preference for spinifex grassland, chenopod shrublands and the ecotone between these two vegetation types. The species may utilise the chenopod shrublands on the lake edge, though no areas of mature spinifex grassland were recorded during the site visit. The species was surveyed for by Botanica using autonomous recording units placed close to chenopod shrublands and where spinifex was present on adjacent uplands. The species was not recorded but must still be considered as potentially present at least occasionally, given the nearby records and some suitable habitat. Note that the plant development area and development area across the lake playa do not provide generally recognised habitat for the species.

Malleefowl. While not recorded in the project area, the Malleefowl is known from the general region and potentially could have breeding mounds in upland areas. In general, vegetation such as in the proposed plant site is too sparse for the species but it may still be a regular visitor.

Fork-tailed Swift. This is an aerial, non-breeding migrant that could potentially overfly the project area in summer. It is largely independent of terrestrial ecosystems.

### Species of conservation significance 2 (listed as priority by the DBCA)

Blue-billed Duck. The Blue-billed Duck is listed as Priority 4 by the DBCA and Near Threatened on the IUCN red list (IUCN, 2019a). This species may be threatened by illegal trapping, habitat loss/ alteration as a result of climate change and impacts from introduced predators. The species is considered to be an irregular visitor (possibly only a vagrant) to the study area; it generally has a preference for permanent, deep water wetlands.

Brush-tailed Mulgara. This Priority 4 species has been recorded in the general area in some previous studies, and occurs in sandy to sandy loam soils that typically support spinifex. There is such habitat in the vicinity of Lake Way, but not in the area of the proposed plant site. However, individuals may occasionally visit this area.

Inland Long-eared Bat. This Priority 3 species may utilise hollows and crevices in large trees and some suitable habitat is present in the vicinity of Lake Way, but not in the site of the proposed plant. It may still forage in the area.

### Species of conservation significance 3 (not listed but locally significant)

Non-migratory Waterbirds. Due to the highly-variable rainfall patterns of inland Australia, waterbirds species that utilise these areas are nomadic and respond rapidly to flooding events. Lakes that aren't utilised for many years may suddenly support breeding populations of numerous waterbird species e.g. Bancroft and Bamford (2004) mention "Red-necked Avocets, Silver Gulls and Gull-billed Terns responded to the flooding of Lake Way by breeding there in the summer of 1988/1989". These species have the potential to be impacted if the proposed development were to alter the ecology of the lake system through changes in hydrology and salinity. The Banded Stilt is an episodic breeder on inland salt lakes and while breeding has not been documented on Lake Way, it has been recorded on lakes to the north-east and south-east (Marchant and Higgins 1993). The Banded Stilt breeds infrequently and often in few, large colonies, so single breeding events can be very important for the species.

Bush Stone-curlew. This species has declined and almost disappeared from the southern half of its range, but may still be present in small numbers in the vicinity of the project area. It thus could be present, probably only as an occasional visitor, at the site of the proposed plant and even on the margins of the lake.

Rainbow Bee-eater. This species was formerly listed as migratory under the EPBC Act; while it has been de-listed it is in fact a true breeding migrant to southern Australia including around Wiluna. It will construct nest burrows in soft soil including on the edges of tracks

**Table 3.        Composition of vertebrate fauna of the region.**

| Taxon              | Number of species expected | Number of species in each status category |                            |                   |           |                 |
|--------------------|----------------------------|---|----------------------------|-------------------|-----------|-----------------|
|                    |                            | Resident                                  | Regular visitor or migrant | Irregular visitor | Vagrant   | Locally extinct |
| frogs              | 8                          | 7   | -                          | 1                 | -         | -               |
| reptiles           | 81                         | 81  | -                          | -                 | -         | -               |
| birds              | 169                        | 63  | 50                         | 37                | 19        | -               |
| Native mammals     | 34                         | 23  | 1                          | 2                 | 0         | 8               |
| Introduced mammals | 10                         | 6   | 2                          | -                 | 2         | -               |
| <b>Total</b>       | <b>302</b>                 | <b>180</b>                                | <b>53</b>                  | <b>40</b>         | <b>21</b> | <b>8</b>        |

**Table 4.        Composition of the vertebrate fauna of the lake playa area.**

| Taxon              | Number of species expected | Number of species in each status category |                            |                   |           |                 |
|--------------------|----------------------------|---|----------------------------|-------------------|-----------|-----------------|
|                    |                            | Resident                                  | Regular visitor or migrant | Irregular visitor | Vagrant   | Locally extinct |
| frogs              | 0                          | -   | -                          | -                 | -         | -               |
| reptiles           | 1                          | 1   | -                          | -                 | -         | -               |
| birds              | 53                         | 1   | 10                         | 24                | 18        | -               |
| Native mammals     | 0                          | -   | -                          | -                 | -         | -               |
| Introduced mammals | 2                          | 2   | -                          | -                 | -         | -               |
| <b>Total</b>       | <b>56</b>                  | <b>4</b>                                  | <b>10</b>                  | <b>24</b>         | <b>18</b> | <b>-</b>        |

**Table 5. Number of vertebrate species of conservation significance in each major taxon within the development areas, excluding locally extinct species. Significant species of the lake playa are included but also indicated in parenthesis.**

| Taxon    | Conservation Significant (CS) fauna |       |       |
|----------|-------------------------------------|-------|-------|
|          | CS1                                 | CS2   | CS3   |
| Frogs    | -                                   | -     | -     |
| Reptiles | -                                   | -     | -     |
| Birds    | 15 (11)                             | 1 (1) | 5 (2) |
| Mammals  | -                                   | 2     |       |

CS1 = listed under legislation

CS2 = listed as priority by DBCA

CS3 = locally significant

## Invertebrate Fauna

As part of other projects, a number of studies have been conducted on invertebrate fauna in the Lake Way area and nearby salt lakes, including stygofauna; of particular interest are potential or known short-range endemic (SRE) species.

- Work conducted for the Wiluna Uranium Project PER document (Toro Energy, 2015) identified potential SRE species in their proposed development envelope (Millipede and Centipede project areas).
  - Eight potential terrestrial SRE species were recorded from the Lake Way area. Two of these, the scorpion *Urodacus* ‘yeelirrie’ and the isopod *Spherillo* sp. indet. (Lake Maitland 2) were found in low halophytic shrubland on the lake margins.
  - Stygofauna was sampled, but other surveys were considered more relevant to the current project e.g. Outback Ecology (2012a).
- Outback Ecology (2008) conducted an ecological assessment of Lake Way for Toro Energy when the lake was dry; thus sediment was collected and cultured to determine invertebrates, algae and diatoms present. The aim of the study was to collect baseline data for monitoring of impacts. Relevant conclusions were:
  - There was a low richness and abundance of diatoms compared with some other lakes in the region, but it was noted that sampling would be more appropriate when the lake was flooded.
  - Aquatic macro-invertebrates included ostracods and a brine shrimp *Parartemia* sp. d. but there was no comment on the broader distribution of these.
  - The study found resting stages of an algae (charaphyte) and an aquatic flowering plant (*Ruppia*; Potamagetonaceae) and noted that both are “common components in temporary inland waters in Western Australia.”
- Outback Ecology (2012a) sampled stygofauna for Agincourt Gold. They surveyed numerous calcrete systems that occur in the area e.g. Hinkler Well, Lake Violet, Uramurdah, Wiluna BF and Millibillie Bubble Well (Figure 4). These are near-surface calcrete systems adjacent to but not within Lake Way. These are all listed as Priority



Ecological Communities by the DBCA (2019). The study found a rich stygofauna assemblage in these systems that lie outside the margins of Lake Way.

- Twenty-nine stygofauna species were recorded from Toro's Centipede project area (on the southern edge of Salt Lake Potash lease area); three of these species were not recorded outside of the proposed impact area:

- *Brevisomabathynella* sp. SAM2 (Bathynellacea - Crustacean);
- *Schizoperasp.* TK4 (Copepoda - Copepod); and
- *Schizopera* sp. TK7 (Copepoda - Copepod).

These species appear to show a preference for "hypersaline groundwater within the geologies of the interface of the calcrete and lake playa systems containing calcrete and/or gravel facies".

- Thirty-six stygofauna species were recorded from Toro's Lake Way project area (covering the north-east corner of the Salt Lake Potash lease area); four species from "within the modelled 0.5m groundwater drawdown contour area<sup>1</sup> (with no dewatering barrier in place) are not known to have distribution ranges that extend beyond the modelled drawdown zone [ of the Agincourt Gold area]".

- Paramelitidae sp. SAM2 (Amphipoda - Amphipod);
- *Brevisomabathynella uramurdahensis* (Bathynellacea - Crustacean)
- *Brevisomabathynella* sp. OES6 (Bathynellacea - Crustacean); and
- *Parapseudoleptomesochra* sp. TK2 (Copepoda - Copepod).

These species are all collected from the Uramurdah calcrete system at a location ~2.5km inland (north) from the lake bed. They are expected to occur throughout the Uramurdah system, which extends 10km further north and 5km in an east-west direction.

- Bennelongia (2017) assessed the ecological value of the wetlands within the Lake Wells system (a lake system ~300km east of Lake Way), including aquatic invertebrates, diatoms, aquatic macrophytes and waterbirds. Their report concluded that "Rather than hosting many rare or endemic species, the principal ecological value of Lake Wells is its function as a wetland that episodically hosts an abundant and speciose biota". This is also likely to apply to Lake Way, which however appears to have a slightly less rich assemblage of aquatic macroinvertebrates (Focussed Vision Consulting 2017).
- Focused Vision Consulting (2017), in conjunction with Bennelongia, reported on an ecological monitoring program of aquatic invertebrates in Lake Way developed for Blackham Resources Ltd. The dewatering of Blackham's Matilda Gold Project is discharged into Lake Way; the monitoring program assesses potential impacts to the ecology of Lake Way as a result of this discharge. They monitored aquatic invertebrates, diatoms and vegetation, and tested heavy metal levels in lake sediment.
  - Three species of aquatic invertebrate were recorded from sites at Lake Way:
    - An undescribed seed shrimp (Family Cyprididae), currently only known from Lake Way;
    - *Parartemia laticaudata*, a brine shrimp; and
    - *Bdelloidea* sp. 2:2, a rotifer.
  - Thirteen species of diatoms from five orders and eight genera were recorded from monitoring sites around Lake Way. Assemblages were "mostly typical

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<sup>1</sup> The drawdown area referred to is for mining proposed under Toro's Wiluna Uranium Project, not drawdown associated with Salt Lake Potash's proposal.

of shallow salt lake flora, with the majority of specimens belonging to widespread halophilic, marine and estuarine taxa”.

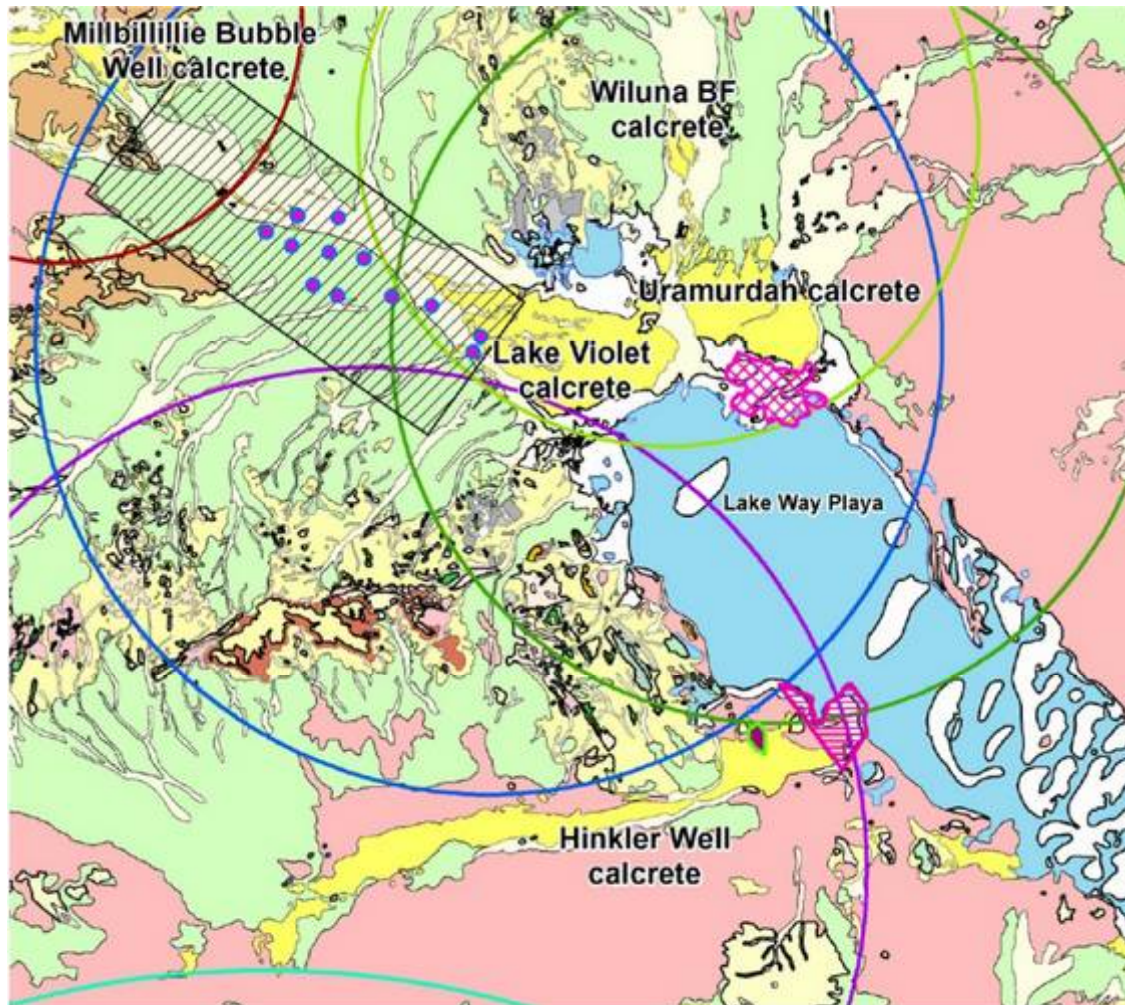


Figure 4. Calcrete systems (shown in yellow) in the vicinity of Lake Way (reproduced from OutBack Ecology Services (2012b)).

## **Fauna overview with respect to the development proposal**

The significance of the vertebrate fauna assemblage of the development areas lies mainly with occasional waterbird usage and abundance on Lake Way during flood events. This includes listed migratory species and breeding by non-migratory species. Terrestrial fauna species are mostly widespread and few are of conservation significance. Impacts on terrestrial environments are largely restricted to the proposed plant site that does not encompass sandy soils supporting spinifex and open woodland that may support some significant species in the region. The Night Parrot, a species of high conservation significance and with a known association with salt lakes in the broader region, was not found but could still be present, at least infrequently. It is most likely to occur where long-unburnt spinifex lies close to salt marsh: such an environment occurs south and east of the development area on the lake playa, but outside the Salt Lake Potash lease. Components of the invertebrate assemblage that have been studied include aquatic macro-invertebrates, potential SRE terrestrial invertebrates and stygofauna.

- The playa of Lake Way supports a limited aquatic macro-invertebrate fauna when flooded, and while one species (an unidentified seed shrimp) is known only from the lake, this may be an artefact of sampling and the species may be found in other lakes in the region. Otherwise, the aquatic macro-invertebrate assemblage appears typical of salt lakes in the broader region.
- Potential SRE terrestrial invertebrates were mostly collected from upland environments but a scorpion and an isopod (slater) were recorded from chenopod (halophytic) shrublands on the margins of the lake (Toro 2015). These shrublands will not be directly impacted by the proposal.
- Stygofauna of subterranean calcrete systems of the lake margins appear to be rich. Stygofauna assemblages can exhibit a high degree of endemism. These calcrete systems are outside areas of impact of the Salt Lake Potash demonstration plant project.

## Potential Impacts

Impacts are a result of the interaction of the proposed development and the fauna values, and can be interpreted from the nature of both. For example, the assessment of fauna values identifies maintenance of lake hydrology as the major issue for biodiversity. Impacting processes are discussed below.

- Alteration of hydrology resulting in habitat modification/loss. Construction of evaporation ponds and trenches will result in localised changes to the lake hydrology.
  - There will be a narrow zone of drawdown along trenches. The combination of this drawdown with trenches, ponds and other infrastructure affects ca. 7% of the playa surface. Modelling indicates this drawdown will not extend into fringing environments such as *Tecticornia* flats, nor into calcrete aquifers. Eggs and spores of aquatic macro-invertebrates, plants, diatoms and algae lie in surface sediments and thus should be independent of drawdown effects.
  - Modelling suggests that the project will affect water levels slightly during flood events, with an increased flood depth of 44mm for a 1 in 100 year event.
- Ongoing mortality from operations. The construction and operation of evaporation ponds and trenches has to the potential to trap wildlife throughout the life of the project. Species may drown or suffer from extended contact with hypersaline brines.
- Habitat loss. Within the Lake Way playa area of ~17,000ha (excluding *Tecticornia* flats), the proposed area of disturbance is approximately 757ha\* (3.6%). Some of the “disturbance” areas (e.g. bunding and pond walls), will provide habitat for waterbirds that prefer nesting on islands, even minimally raised above the lake surface. There will also be an area of habitat loss (up to about 47ha) in adjacent terrestrial ecosystems, but these are very extensive in the region.  
\* this includes evaporation ponds, trenches, bores, pipelines and powerlines.
- Species interactions including feral and overabundant native species. Feral predators are already present and affecting the fauna assemblage, but the creation of tracks/bunding/pondwalls may provide cover and improve access for feral predators. The presence of personnel in these areas can also lead to an increase in activity of feral species. Recommendations to limit these effects are discussed below.
- Disturbance (dust, light, noise). Some level of disturbance during construction is inevitable but temporary. If operations continue at night, lighting may be a source of mortality for insects (Rich and Longcore 2006). Noise, light and movements (people and vehicles) during operations of the project could affect waterbirds, especially during breeding events, although the tolerance of waterbirds to disturbance is complex.

## Recommendations

Impacts outlined above clearly indicate a range of recommendations to ensure that adverse effects are minimised.

- Alteration of lake hydrology resulting in habitat modification/loss.
  - Ensure areas of disturbance e.g. ground disturbance and drawdown, are minimised; and
  - Monitor subsurface water levels to ensure fringing stygofauna are not impacted.
- Ongoing mortality from operations. Entrapment in trenches/ponds. Trenches and ponds should be designed to minimise access by fauna and/or allow for rapid escape.
- Species interactions including feral and overabundant native species. Personnel should be encouraged not to feed feral fauna and to report Foxes and Cats.
- Habitat loss. Clearing and construction should be strictly limited to areas needed.
- Disturbance (dust, light, noise). All forms of disturbance should be minimised throughout the construction and operation of the project. The project should be designed to operate with minimal lighting and noise to reduce impacts to fauna. If waterbirds attempt to breed on bunds or islands, buffers may need to be introduced to prevent adversely impacting breeding success. The width of these buffers may need to be determined at the time, as different birds respond differently to disturbance when breeding. Therefore, there needs to be an adaptive response capability in the event of waterbird breeding events.
- Monitoring. Waterbirds should be monitored during breeding events as part of measures to avoid disturbance. It is understood that some aquatic macro-invertebrate monitoring is already being conducted by Blackham and it may be possible to work in with this project for the identification of invertebrates in trenches and during flood events.

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**Appendix 1.** Vertebrate fauna assemblage of the region; highlighted (bold) rows are those species expected to actively utilise the lake edge and lake bed. Other species are largely restricted to terrestrial environments. The list is based on based upon database and literature searches and the January 2019 site inspection. Sources of information are:

- ALA: Atlas of Living Australia, searched January 2019;
- N: Naturemap Database, searched January 2019;
- EPBC: EPBC Protected Matters, searched January 2019;
- BA: Birdlife Australia's Birddata database, searched January 2019;
- B&B: Bancroft & Bamford (2004) review of the avifauna of Lake Way; marked (\*) are those species actually recorded from Lake Way itself; some of those were recorded breeding (BR)
- BCE 2019: species observed in the project area in January 2019;

Conservation significance (CS) codes:

- CS1, CS2, CS3 = (summary) levels of conservation significance. See Appendix 4 for full explanation.
- EPBC Act listings: Cr = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory (see Appendix 3).
- Biodiversity Conservation Act listings: for all CS1 species S1 to 7 = Schedules 1 to 7 respectively, (see Appendix 3).
- DBCA Priority species: P1 to P4 = Priority 1 to 4 (see Appendix 4).

Expected status as outlined in Methods.

| FROGS                  |                                  | CS | ALA | N | BCE 2019 | Expected status in area |
|------------------------|----------------------------------|----|-----|---|----------|-------------------------|
| <b>HYLIDAE</b>         |                                  |    |     |   |          |                         |
| Water-holding Frog     | <i>Cyclorana platycephala</i>    |    | X   | X |          | Resident                |
| Sheep Frog             | <i>Cyclorana maini</i>           |    |     | X |          | Resident                |
| Desert Tree Frog       | <i>Litoria rubella</i>           |    |     |   |          | Irregular visitor       |
| <b>LIMNODYNASTIDAE</b> |                                  |    |     |   |          |                         |
| Kunapalari Frog        | <i>Neobatrachus kunapalari</i>   |    | X   | X |          | Resident                |
| Desert Trilling Frog   | <i>Neobatrachus sudellae</i>     |    | X   | X |          | Resident                |
| Shoemaker Frog         | <i>Neobatrachus sutor</i>        |    |     | X |          | Resident                |
| Plonking Frog          | <i>Neobatrachus wilsmorei</i>    |    | X   | X |          | Resident                |
| <b>MYOBATRACHIDAE</b>  |                                  |    |     |   |          |                         |
| Western Toadlet        | <i>Pseudophryne occidentalis</i> |    |     | X |          | Resident                |

| REPTILES                |                                | CS | ALA | N | BCE 2019 | Expected status in area |
|-------------------------|--------------------------------|----|-----|---|----------|-------------------------|
| <b>AGAMIDAE</b>         |                                |    |     |   |          |                         |
| Long-nosed Water Dragon | <i>Gowidon longirostris</i>    |    | X   | X |          | Resident                |
| Mallee Sand Dragon      | <i>Ctenophorus fordi</i>       |    |     |   |          | Resident                |
| Military Dragon         | <i>Ctenophorus isolepis</i>    |    | X   | X | X        | Resident                |
| Central Netted Dragon   | <i>Ctenophorus nuchalis</i>    |    |     | X |          | Resident                |
| Western Netted Dragon   | <i>Ctenophorus reticulatus</i> |    |     | X |          | Resident                |



| REPTILES                          |                                       | CS | ALA | N | BCE 2019 | Expected status in area |
|-----------------------------------|---------------------------------------|----|-----|---|----------|-------------------------|
| Salt Lake Dragon                  | <i>Ctenophorus salinarum</i>          |    | X   | X | X        | Resident                |
| Lozenge-marked Dragon             | <i>Ctenophorus scutulatus</i>         |    | X   | X |          | Resident                |
| Mulga Dragon                      | <i>Diporiphora amphiboluroides</i>    |    |     |   |          | Resident                |
| Thorny Devil                      | <i>Moloch horridus</i>                |    | X   | X |          | Resident                |
| Western Bearded Dragon            | <i>Pogona minor</i>                   |    | X   | X |          | Resident                |
| Pebble Dragon                     | <i>Tympanocryptis cephalus</i>        |    |     | X |          | Resident                |
| <b>DIPLODACTYLIDAE</b>            |                                       |    |     |   |          |                         |
| Fat-tailed Gecko                  | <i>Diplodactylus conspicillatus</i>   |    | X   | X |          | Resident                |
| Goldfields Stone Gecko            | <i>Diplodactylus granariensis</i>     |    |     | X |          | Resident                |
| Western Saddled Ground Gecko      | <i>Diplodactylus pulcher</i>          |    |     | X |          | Resident                |
|                                   | <i>Diplodactylus vittatus</i>         |    | X   | X |          | Resident                |
|                                   | <i>Lucasium damaeum</i>               |    |     | X |          | Resident                |
| Mottled Ground Gecko              | <i>Lucasium squarrosus</i>            |    | X   | X |          | Resident                |
|                                   | <i>Lucasium stenodactylum</i>         |    |     | X |          | Resident                |
| Beaked Gecko                      | <i>Rhynchoedura ornata</i>            |    | X   | X |          | Resident                |
| Jewelled Gecko                    | <i>Strophurus elderi</i>              |    | X   | X |          | Resident                |
| Western Ring-tailed Gecko         | <i>Strophurus strophurus</i>          |    |     | X |          | Resident                |
| Western Shield Spiny-tailed Gecko | <i>Strophurus wellingtonae</i>        |    |     | X |          | Resident                |
| <b>CARPHODACTYLIDAE</b>           |                                       |    |     |   |          |                         |
| Smooth Knob-tailed Gecko          | <i>Nephrurus laevisissimus</i>        |    | X   | X |          | Resident                |
| Midline Knob-tailed Gecko         | <i>Nephrurus vertebralis</i>          |    | X   | X |          | Resident                |
| Banded Knob-tailed Gecko          | <i>Nephrurus wheeleri</i>             |    |     | X |          | Resident                |
| Barking Gecko                     | <i>Underwoodisaurus milii</i>         |    |     | X |          | Resident                |
| <b>GEKKONIDAE</b>                 |                                       |    |     |   |          |                         |
| Purple Arid Dtella                | <i>Gehyra purpurascens</i>            |    |     |   |          | Resident                |
| Variegated Dtella                 | <i>Gehyra variegata</i>               |    | X   | X |          | Resident                |
| Bynoe's Gecko                     | <i>Heteronotia binoei</i>             |    |     | X |          | Resident                |
| <b>PYGOPODIDAE</b>                |                                       |    |     |   |          |                         |
| Unbanded Delma                    | <i>Delma butleri</i>                  |    | X   | X |          | Resident                |
| Sharp-snouted Delma               | <i>Delma nasuta</i>                   |    |     |   |          | Resident                |
| Burton's Legless Lizard           | <i>Lialis burtonis</i>                |    | X   | X |          | Resident                |
| Western Hooded Scaly-foot         | <i>Pygopus nigriceps</i>              |    |     |   |          | Resident                |
| <b>SCINCIDAE</b>                  |                                       |    |     |   |          |                         |
| Buchanan's Snake-eyed Skink       | <i>Cryptoblepharus buchananii</i>     |    |     |   |          | Resident                |
| Peron's Fence Skink               | <i>Cryptoblepharus plagiocephalus</i> |    | X   | X |          | Resident                |
|                                   | <i>Ctenotus grandis</i>               |    |     |   |          | Resident                |
|                                   | <i>Ctenotus helenae</i>               |    |     |   |          | Resident                |
|                                   | <i>Ctenotus leonhardii</i>            |    | X   | X |          | Resident                |
|                                   | <i>Ctenotus mimetes</i>               |    |     |   |          | Resident                |
| Leopard Skink                     | <i>Ctenotus pantherinus</i>           |    |     | X |          | Resident                |

| REPTILES                          |                                       | CS | ALA | N | BCE 2019 | Expected status in area |
|-----------------------------------|---------------------------------------|----|-----|---|----------|-------------------------|
| Fourteen striped Ctenotus         | <i>Ctenotus quattuordecimlineatus</i> |    | X   | X |          | Resident                |
| Barred Wedge-snout Ctenotus       | <i>Ctenotus schomburgkii</i>          |    |     | X |          | Resident                |
|                                   | <i>Ctenotus severus</i>               |    |     | X |          | Resident                |
| Spotted Ctenotus                  | <i>Ctenotus uber</i>                  |    |     |   |          | Resident                |
| Pygmy Spiny-tailed Skink          | <i>Egernia depressa</i>               |    |     | X |          | Resident                |
| Goldfields Crevice Skink          | <i>Egernia formosa</i>                |    |     |   |          | Resident                |
| Broad-banded Sand-swimmer         | <i>Eremiascincus richardsonii</i>     |    | X   | X |          | Resident                |
|                                   | <i>Lerista bipes</i>                  |    | X   | X |          | Resident                |
|                                   | <i>Lerista desertorum</i>             |    | X   | X |          | Resident                |
|                                   | <i>Lerista kingi</i>                  |    |     |   |          | Resident                |
| Unpatterned Robust Slider         | <i>Lerista m. macropisthopus</i>      |    |     |   |          | Resident                |
| Timid Slider                      | <i>Lerista timida</i>                 |    | X   | X |          | Resident                |
| Desert Skink                      | <i>Liopholis inornata</i>             |    | X   | X |          | Resident                |
| Common Dwarf Skink                | <i>Menetia greyii</i>                 |    |     | X |          | Resident                |
| Saltbush Morethia Skink           | <i>Morethia adelaidensis</i>          |    |     |   |          | Resident                |
| Woodland Dark-flecked Morethia    | <i>Morethia butleri</i>               |    | X   | X |          | Resident                |
| Central Blue-tongue               | <i>Tiliqua multifasciata</i>          |    |     | X |          | Resident                |
| Western Blue-tongue               | <i>Tiliqua occipitalis</i>            |    |     | X |          | Resident                |
| <b>VARANIDAE</b>                  |                                       |    |     |   |          |                         |
| Short-tailed Pygmy Monitor        | <i>Varanus brevicauda</i>             |    |     | X |          | Resident                |
| Stripe-tailed Monitor             | <i>Varanus caudolineatus</i>          |    |     | X |          | Resident                |
| Pygmy Desert Monitor              | <i>Varanus eremius</i>                |    |     | X |          | Resident                |
| Perentie                          | <i>Varanus giganteus</i>              |    |     | X |          | Resident                |
| Sand Goanna                       | <i>Varanus gouldii</i>                |    | X   | X |          | Resident                |
| Yellow-spotted Monitor            | <i>Varanus panoptes</i>               |    |     | X | X        | Resident                |
| Black-headed Monitor              | <i>Varanus tristis</i>                |    |     | X |          | Resident                |
| <b>TYPHLOPIDAE</b>                |                                       |    |     |   |          |                         |
| Northern Hook-snouted Blind Snake | <i>Anilius hamatus</i>                |    | X   |   |          | Resident                |
| Beaked Blind Snake                | <i>Anilius waitii</i>                 |    | X   |   |          | Resident                |
| <b>BOIDAE</b>                     |                                       |    |     |   |          |                         |
| Pygmy Python                      | <i>Antaresia perthensis</i>           |    |     | X |          | Resident                |
| Stimson's Python                  | <i>Antaresia stimsoni</i>             |    |     |   |          | Resident                |
| <b>ELAPIDAE</b>                   |                                       |    |     |   |          |                         |
| Desert Death Adder                | <i>Acanthophis pyrrhus</i>            |    |     |   |          | Resident                |
| North-western Shovel-nosed Snake  | <i>Brachyuropis approximans</i>       |    |     | X |          | Resident                |
| Southern Shovel-nosed Snake       | <i>Brachyuropis semifasciata</i>      |    | X   | X |          | Resident                |
| Yellow-faced Whipsnake            | <i>Demansia psammophis</i>            |    |     | X |          | Resident                |
| Moon Snake                        | <i>Furina ornata</i>                  |    |     | X |          | Resident                |
| Monk Snake                        | <i>Parasuta monachus</i>              |    | X   | X |          | Resident                |
| Mulga Snake                       | <i>Pseudechis australis</i>           |    |     | X |          | Resident                |

| REPTILES            |                             | CS | ALA | N | BCE 2019 | Expected status in area |
|---------------------|-----------------------------|----|-----|---|----------|-------------------------|
| Spotted Mulga Snake | <i>Pseudechis butleri</i>   |    |     |   |          | Resident                |
| Ringed Brown Snake  | <i>Pseudonaja modesta</i>   |    |     | X |          | Resident                |
| Western Brown Snake | <i>Pseudonaja mengdeni</i>  |    |     | X |          | Resident                |
| Jan's Banded Snake  | <i>Simoselaps bertholdi</i> |    |     | X |          | Resident                |
| Rosen's Snake       | <i>Suta fasciata</i>        |    | X   | X |          | Resident                |

| BIRDS                 |                                    | CS   | ALA | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|-----------------------|------------------------------------|------|-----|---|------|----|-----|----------|-------------------------|
| <b>CASUARIIDAE</b>    |                                    |      |     |   |      |    |     |          |                         |
| Emu                   | <i>Dromaius novaehollandiae</i>    |      |     | X |      | X  |     | X        | Resident                |
| <b>MEGAPODIIDAE</b>   |                                    |      |     |   |      |    |     |          |                         |
| Malleefowl            | <i>Leipoa ocellata</i>             | V S3 |     |   | X    |    |     |          | Resident                |
| <b>OTIDIDAE</b>       |                                    |      |     |   |      |    |     |          |                         |
| Australian Bustard    | <i>Ardeotis australis</i>          |      |     | X |      | X  |     |          | Regular visitor         |
| <b>BURHINIDAE</b>     |                                    |      |     |   |      |    |     |          |                         |
| Bush Stone-curlew     | <i>Burhinus grallarius</i>         | CS3  | X   | X |      |    |     |          | Irregular visitor       |
| <b>PHASIANIDAE</b>    |                                    |      |     |   |      |    |     |          |                         |
| Brown Quail           | <i>Synoicus ypsilophora</i>        |      |     |   |      |    |     |          | Irregular visitor       |
| <b>TURNICIDAE</b>     |                                    |      |     |   |      |    |     |          |                         |
| Little Button-quail   | <i>Turnix velox</i>                |      |     |   |      | X  |     |          | Regular visitor         |
| <b>ANATIDAE</b>       |                                    |      |     |   |      |    |     |          |                         |
| Grey Teal             | <i>Anas gracilis</i>               |      | X   | X |      | X  | X   | X        | Regular visitor         |
| Australasian Shoveler | <i>Anas rhynchotis</i>             |      |     |   |      | X  | X   |          | Irregular visitor       |
| Pacific Black Duck    | <i>Anas superciliosa</i>           |      |     |   |      | X  | X   | X        | Regular visitor         |
| Hardhead              | <i>Aythya australis</i>            |      |     |   |      |    | X   |          | Regular visitor         |
| Musk Duck             | <i>Biziura lobata</i>              |      |     |   |      |    | X   |          | Vagrant                 |
| Australian Wood Duck  | <i>Chenonetta jubata</i>           |      |     | X |      | X  | X   | X        | Irregular visitor       |
| Black Swan            | <i>Cygnus atratus</i>              |      |     | X |      | X  | X   |          | Irregular visitor       |
| Pink-eared Duck       | <i>Malacorhynchus membranaceus</i> |      |     |   |      |    | X   |          | Regular visitor         |
| Blue-billed Duck      | <i>Oxyura australis</i>            | P4   |     |   |      |    |     |          | Vagrant                 |
| Freckled Duck         | <i>Stictonetta naevosa</i>         |      |     |   |      |    |     |          | Vagrant                 |
| Australian Shelduck   | <i>Tadorna tadornoides</i>         |      |     | X |      | X  | X   |          | Irregular visitor       |
| <b>PODICIPEDIDAE</b>  |                                    |      |     |   |      |    |     |          |                         |
| Great Crested Grebe   | <i>Podiceps cristatus</i>          |      |     |   |      | X  |     |          | Vagrant                 |
| Hoary-headed Grebe    | <i>Poliocephalus poliocephalus</i> |      |     | X |      | X  | X   |          | Regular visitor         |

| BIRDS              |                                    | CS | ALA | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|--------------------|------------------------------------|----|-----|---|------|----|-----|----------|-------------------------|
| Australasian Grebe | <i>Tachybaptus novaehollandiae</i> |    |     |   |      | X  | X   |          | Regular visitor         |

|                           |  |      |   |   |   |   |        |   |                   |
|---------------------------|--|------|---|---|---|---|--------|---|-------------------|
| <b>COLUMBIDAE</b>         |  |      |   |   |   |   |        |   |                   |
| Diamond Dove              | <i>Geopelia cuneata</i>                |      |   | X |   | X |        |   | visitor           |
| Crested Pigeon            | <i>Ocyphaps lophotes</i>               |      | X | X |   | X |        | X | Resident          |
| Common Bronzewing         | <i>Phaps chalcoptera</i>               |      |   | X |   |   |        |   | Resident          |
| <b>CUCULIDAE</b>          |  |      |   |   |   |   |        |   |                   |
| Horsfield's Bronze-Cuckoo | <i>Chalcites basalis</i>               |      |   | X |   | X |        |   | Regular migrant   |
| Black-eared Cuckoo        | <i>Chalcites osculans</i>              |      |   |   | X | X |        |   | Regular migrant   |
| Pallid Cuckoo             | <i>Cuculus pallidus</i>                |      |   | X |   | X |        |   | Regular migrant   |
| <b>APODIDAE</b>           |  |      |   |   |   |   |        |   |                   |
| Fork-tailed Swift         | <i>Apus pacificus</i>                  | M S5 |   |   |   |   |        |   | Regular migrant   |
| <b>RALLIDAE</b>           |  |      |   |   |   |   |        |   |                   |
| Eurasian Coot             | <i>Fulica atra</i>                     |      |   |   |   |   | X      |   | Irregular visitor |
| Australian Spotted Crake  | <i>Porzana fluminea</i>                |      |   |   |   |   | X      |   | Irregular visitor |
| Black-tailed Native-hen   | <i>Gallinula ventralis</i>             |      |   | X |   | X | X      |   | Irregular visitor |
| <b>RECURVIROSTRIDAE</b>   |  |      |   |   |   |   |        |   |                   |
| Banded Stilt              | <i>Cladorhynchus leucocephalus</i>     | CS3  |   |   |   |   | X      |   | Irregular visitor |
| Black-winged Stilt        | <i>Himantopus himantopus</i>           |      |   | X |   | X | X      |   | Irregular visitor |
| Red-necked Avocet         | <i>Recurvirostra novaehollandiae</i>   |      | X | X |   | X | X      |   | Irregular Visitor |
| <b>CHARADRIIDAE</b>       |  |      |   |   |   |   |        |   |                   |
| Inland Dotterel           | <i>Charadrius australis</i>            |      |   |   |   |   | X      |   | Regular visitor   |
| Black-fronted Dotterel    | <i>Charadrius melanops</i>             |      |   | X |   | X | X      | X | Regular visitor   |
| Red-capped Plover         | <i>Charadrius ruficapillus</i>         |      |   |   |   |   | X (BR) | X | Regular visitor   |
| Oriental Plover           | <i>Charadrius veredus</i>              | M S5 |   |   | X |   | X      |   | Vagrant           |
| Red-kneed Dotterel        | <i>Erythrogonys cinctus</i>            |      | X | X |   |   | X      |   | Regular visitor   |
| Banded Lapwing            | <i>Vanellus tricolor</i>               |      |   |   |   | X | X      |   | Regular visitor   |
| <b>GLAREOLIDAE</b>        |  |      |   |   |   |   |        |   |                   |
| Australian Pratincole     | <i>Stiltia isabella</i>                |      |   |   |   |   | X      |   | Irregular visitor |
| <b>LARIDAE</b>            |  |      |   |   |   |   |        |   |                   |
| Silver Gull               | <i>Chroicocephalus novaehollandiae</i> |      |   |   |   |   | X (BR) |   | Irregular visitor |
| Gull-billed Tern          | <i>Gelochelidon nilotica</i>           | M S5 |   |   |   |   | X (BR) |   | Irregular visitor |
| Whiskered Tern            | <i>Chlidonias hybrida</i>              |      |   |   |   |   | X      |   | Irregular visitor |

[illegible]

| BIRDS                     |                                     | CS   | ALA | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|---------------------------|-------------------------------------|------|-----|---|------|----|-----|----------|-------------------------|
| Black Kite                | <i>Milvus migrans</i>               |      |     | X |      | X  |     |          | Irregular visitor       |
| <b>FALCONIDAE</b>         |                                     |      |     |   |      |    |     |          |                         |
| Brown Falcon              | <i>Falco berigora</i>               |      | X   | X |      | X  |     |          | Regular visitor         |
| Nankeen Kestrel           | <i>Falco cenchroides</i>            |      |     | X |      | X  |     | X        | Regular visitor         |
| Grey Falcon               | <i>Falco hypoleucos</i>             | S3   |     |   |      |    |     |          | Vagrant                 |
| Australian Hobby          | <i>Falco longipennis</i>            |      | X   | X |      |    |     |          | Regular visitor         |
| Peregrine Falcon          | <i>Falco peregrinus</i>             | S7   |     |   |      |    |     |          | Regular visitor         |
| Black Falcon              | <i>Falco subniger</i>               |      |     |   |      |    |     |          | Irregular visitor       |
| <b>STRIGIDAE</b>          |                                     |      |     |   |      |    |     |          |                         |
| Southern Boobook          | <i>Ninox novaeseelandiae</i>        |      |     |   |      |    |     |          | Resident                |
| <b>TYTONIDAE</b>          |                                     |      |     |   |      |    |     |          |                         |
| Barn Owl                  | <i>Tyto alba</i>                    |      |     |   |      |    |     |          | Regular Visitor         |
| <b>PODARGIDAE</b>         |                                     |      |     |   |      |    |     |          |                         |
| Tawny Frogmouth           | <i>Podargus strigoides</i>          |      |     | X |      | X  |     |          | Resident                |
| <b>CAPRIMULGIDAE</b>      |                                     |      |     |   |      |    |     |          |                         |
| Spotted Nightjar          | <i>Eurostopodus argus</i>           |      |     |   |      | X  |     |          | Regular visitor         |
| <b>AEGOTHELIDAE</b>       |                                     |      |     |   |      |    |     |          |                         |
| Australian Owlet-nightjar | <i>Aegotheles cristatus</i>         |      |     | X |      | X  |     |          | Resident                |
| <b>MEROPIIDAE</b>         |                                     |      |     |   |      |    |     |          |                         |
| Rainbow Bee-eater         | <i>Merops ornatus</i>               | CS3  |     | X | X    |    |     |          | Regular migrant         |
| <b>ALCEDINIDAE</b>        |                                     |      |     |   |      |    |     |          |                         |
| Red-backed Kingfisher     | <i>Todiramphus pyrrhopygia</i>      |      | X   | X |      | X  |     |          | Resident                |
| Sacred Kingfisher         | <i>Todiramphus sanctus</i>          |      |     |   |      | X  |     |          | Regular visitor         |
| <b>CACATUIDAE</b>         |                                     |      |     |   |      |    |     |          |                         |
| Major Mitchell's Cockatoo | <i>Cacatua leadbeateri</i>          |      |     |   |      |    |     |          | Irregular visitor       |
| Little Corella            | <i>Cacatua sanguinea</i>            |      | X   | X |      | X  |     |          | Vagrant                 |
| Galah                     | <i>Eolophus roseicapilla</i>        |      | X   | X |      | X  |     | X        | Regular visitor         |
| Cockatiel                 | <i>Nymphicus hollandicus</i>        |      |     | X |      | X  |     |          | Regular visitor         |
| <b>PSITTACIDAE</b>        |                                     |      |     |   |      |    |     |          |                         |
| Australian Ringneck       | <i>Barnardius zonarius</i>          |      | X   | X |      | X  |     | X        | Resident                |
| Purple-crowned Lorikeet   | <i>Glossopsitta porphyrocephala</i> |      |     |   |      |    |     |          | Regular visitor         |
| Budgerigar                | <i>Melopsittacus undulatus</i>      |      |     | X |      | X  |     |          | Regular visitor         |
| Scarlet-chested Parrot    | <i>Neopsephotus splendida</i>       |      |     |   |      |    |     |          | Irregular visitor       |
| Bourke's Parrot           | <i>Neopsephotus bourkii</i>         |      |     | X |      |    |     |          | Regular visitor         |
| Night Parrot              | <i>Pezoporus occidentalis</i>       | E S1 |     |   | X    |    |     |          | Vagrant                 |

| BIRDS                    |                                  | CS   | ALA | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|--------------------------|----------------------------------|------|-----|---|------|----|-----|----------|-------------------------|
| Princess Parrot          | <i>Polytelis alexandrae</i>      | V P4 |     |   | X    |    |     |          | Vagrant                 |
| Regent Parrot            | <i>Polytelis anthopeplus</i>     |      |     |   |      |    |     |          | Regular visitor         |
| Mulga Parrot             | <i>Psephotellus varius</i>       |      | X   | X |      | X  |     |          | Resident                |
| <b>CLIMACTERIDAE</b>     |                                  |      |     |   |      |    |     |          |                         |
| White-browed Treecreeper | <i>Climacteris affinis</i>       |      |     | X |      |    |     |          | Resident                |
| <b>PTILONORHYNCHIDAE</b> |                                  |      |     |   |      |    |     |          |                         |
| Western Bowerbird        | <i>Ptilonorhynchus guttatus</i>  |      | X   | X |      | X  |     |          | Resident                |
| <b>MALURIDAE</b>         |                                  |      |     |   |      |    |     |          |                         |
| Variegated Fairy-wren    | <i>Malurus lamberti</i>          |      | X   | X |      | X  |     |          | Resident                |
| White-winged Fairy-wren  | <i>Malurus leucopterus</i>       |      | X   | X |      | X  |     | X        | Resident                |
| Splendid Fairy-wren      | <i>Malurus splendens</i>         |      | X   | X |      | X  |     |          | Resident                |
| Rufous-crowned Emu-Wren  | <i>Stipiturus ruficeps</i>       | CS3  | X   |   |      |    |     |          | Resident                |
| <b>MELIPHAGIDAE</b>      |                                  |      |     |   |      |    |     |          |                         |
| Spiny-cheeked Honeyeater | <i>Acanthagenys rufogularis</i>  |      | X   | X |      | X  |     | X        | Resident                |
| Red Wattlebird           | <i>Anthochaera carunculata</i>   |      |     |   |      |    |     |          | Regular visitor         |
| Pied Honeyeater          | <i>Certhionyx variegatus</i>     |      |     | X |      | X  |     |          | Regular visitor         |
| Grey Honeyeater          | <i>Conopophila whitei</i>        |      | X   |   |      |    |     |          | Irregular visitor       |
| White-fronted Chat       | <i>Epthianura albifrons</i>      |      |     |   |      |    |     |          | Regular visitor         |
| Orange Chat              | <i>Epthianura aurifrons</i>      |      | X   | X |      |    |     |          | Irregular visitor       |
| Crimson Chat             | <i>Epthianura tricolor</i>       |      | X   | X |      | X  |     | X        | Regular visitor         |
| Grey-fronted Honeyeater  | <i>Ptilotula plumula</i>         |      | X   | X |      | X  |     |          | Irregular visitor       |
| White-plumed Honeyeater  | <i>Ptilotula pencillata</i>      |      | X   | X |      | X  |     | X        | Irregular visitor       |
| Yellow-plumed Honeyeater | <i>Ptilotula ornata</i>          |      |     |   |      |    |     |          | Regular visitor         |
| Singing Honeyeater       | <i>Gavicalis virescens</i>       |      | X   | X |      | X  |     | X        | Resident                |
| Brown Honeyeater         | <i>Lichmera indistincta</i>      |      |     | X |      | X  |     |          | Resident                |
| Yellow-throated Miner    | <i>Manorina flavigula</i>        |      | X   | X |      | X  |     | X        | Resident                |
| Brown-headed Honeyeater  | <i>Melithreptus brevirostris</i> |      |     |   |      |    |     |          | Resident                |
| White-fronted Honeyeater | <i>Purnella albifrons</i>        |      |     | X |      | X  |     |          | Regular visitor         |
| Black Honeyeater         | <i>Sugomel niger</i>             |      |     |   |      | X  |     |          | Irregular visitor       |
| <b>PARDALOTIDAE</b>      |                                  |      |     |   |      |    |     |          |                         |
| Red-browed Pardalote     | <i>Pardalotus rubricatus</i>     |      |     |   |      | X  |     |          | Resident                |
| Striated Pardalote       | <i>Pardalotus striatus</i>       |      | X   | X |      | X  |     |          | Resident                |
| <b>ACANTHIZIDAE</b>      |                                  |      |     |   |      |    |     |          |                         |

| BIRDS                           |                                   | CS         | ALA      | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|---------------------------------|-----------------------------------|------------|----------|---|------|----|-----|----------|-------------------------|
| Inland Thornbill                | <i>Acanthiza apicalis</i>         |            | X        | X |      | X  |     |          | Resident                |
| Yellow-rumped Thornbill         | <i>Acanthiza chrysorrhoa</i>      |            | X        | X |      | X  |     |          | Resident                |
| <b>Slender-billed Thornbill</b> | <b><i>Acanthiza iredalei</i></b>  | <b>CS3</b> | <b>X</b> |   |      |    |     |          | <b>Resident</b>         |
| Slaty-backed Thornbill          | <i>Acanthiza robustirostris</i>   |            | X        | X |      | X  |     |          | Resident                |
| Chestnut-rumped Thornbill       | <i>Acanthiza uropygialis</i>      |            | X        | X |      | X  |     |          | Resident                |
| Southern Whiteface              | <i>Aphelocephala leucopsis</i>    |            | X        | X |      | X  |     |          | Resident                |
| Rufous Fieldwren                | <i>Calamanthus campestris</i>     |            | X        | X |      |    |     |          | Regular visitor         |
| Western Gerygone                | <i>Gerygone fusca</i>             |            | X        | X |      | X  |     |          | Resident                |
| Redthroat                       | <i>Pyrrholaemus brunneus</i>      |            | X        | X |      | X  |     |          | Resident                |
| Weebill                         | <i>Smicrornis brevirostris</i>    |            | X        | X |      | X  |     |          | Resident                |
| <b>NEOSITTIDAE</b>              |                                   |            |          |   |      |    |     |          |                         |
| Varied Sittella                 | <i>Daphoenositta chrysoptera</i>  |            | X        | X |      |    |     |          | Resident                |
| <b>POMATOSTOMIDAE</b>           |                                   |            |          |   |      |    |     |          |                         |
| White-browed Babbler            | <i>Pomatostomus superciliosus</i> |            | X        | X |      | X  |     |          | Resident                |
| Grey-crowned Babbler            | <i>Pomatostomus temporalis</i>    |            | X        | X |      | X  |     | X        | Resident                |
| <b>CINCLOSOMATIDAE</b>          |                                   |            |          |   |      |    |     |          |                         |
| Chestnut Quail-thrush           | <i>Cinclosoma castanotum</i>      |            |          |   |      |    |     |          | Regular visitor         |
| Copper-backed Quail-thrush      | <i>Cinclosoma castaneothorax</i>  |            | X        | X |      | X  |     |          | Irregular visitor       |
| Chiming Wedgebill               | <i>Psophodes occidentalis</i>     |            | X        | X |      |    |     |          | Regular visitor         |
| <b>CAMPEPHAGIDAE</b>            |                                   |            |          |   |      |    |     |          |                         |
| Ground Cuckoo-shrike            | <i>Coracina maxima</i>            |            |          |   |      | X  |     | X        | Resident                |
| Black-faced Cuckoo-shrike       | <i>Coracina novaehollandiae</i>   |            | X        | X |      | X  |     | X        | Resident                |
| White-winged Triller            | <i>Lalage tricolor</i>            |            |          | X |      | X  |     | X        | Resident                |
| <b>PACHYCEPHALIDAE</b>          |                                   |            |          |   |      |    |     |          |                         |
| Grey Shrike-thrush              | <i>Colluricincla harmonica</i>    |            |          | X |      | X  |     |          | Resident                |
| Crested Bellbird                | <i>Oreoica gutturalis</i>         |            | X        | X |      | X  |     | X        | Resident                |
| Rufous Whistler                 | <i>Pachycephala rufiventris</i>   |            | X        | X |      | X  |     |          | Resident                |
| <b>ARTAMIDAE</b>                |                                   |            |          |   |      |    |     |          |                         |
| Black-faced Woodswallow         | <i>Artamus cinereus</i>           |            | X        | X |      | X  |     | X        | Resident                |
| Dusky Woodswallow               | <i>Artamus cyanopterus</i>        |            |          |   |      |    |     |          | Resident                |
| Little Woodswallow              | <i>Artamus minor</i>              |            |          |   |      |    |     |          | Irregular visitor       |
| Masked Woodswallow              | <i>Artamus personatus</i>         |            | X        | X |      | X  |     |          | Regular Visitor         |



| BIRDS                |                                | CS | ALA | N | EPBC | BA | B&B | BCE 2019 | Expected status in area |
|----------------------|--------------------------------|----|-----|---|------|----|-----|----------|-------------------------|
| Pied Butcherbird     | <i>Cracticus nigrogularis</i>  |    |     | X |      | X  |     | X        | Resident                |
| Australian Magpie    | <i>Cracticus tibicen</i>       |    | X   | X |      | X  |     | X        | Resident                |
| Grey Butcherbird     | <i>Cracticus torquatus</i>     |    |     | X |      | X  |     | X        | Resident                |
| Grey Currawong       | <i>Strepera versicolor</i>     |    |     |   |      |    |     |          | Regular Visitor         |
| <b>RHIPIDURIDAE</b>  |                                |    |     |   |      |    |     |          |                         |
| Grey Fantail         | <i>Rhipidura fuliginosa</i>    |    |     |   |      | X  |     |          | Resident                |
| Willie Wagtail       | <i>Rhipidura leucophrys</i>    |    | X   |   |      | X  |     | X        | Resident                |
| <b>CORVIDAE</b>      |                                |    |     |   |      |    |     |          |                         |
| Little Crow          | <i>Corvus bennetti</i>         |    |     | X |      | X  |     | X        | Resident                |
| Torresian Crow       | <i>Corvus orru</i>             |    |     | X |      | X  |     | X        | Resident                |
| <b>MONARCHIDAE</b>   |                                |    |     |   |      |    |     |          |                         |
| Magpie-lark          | <i>Grallina cyanoleuca</i>     |    | X   | X |      | X  |     | X        | Resident                |
| <b>PETROICIDAE</b>   |                                |    |     |   |      |    |     |          |                         |
| Hooded Robin         | <i>Melanodryas cucullata</i>   |    | X   | X |      | X  |     |          | Resident                |
| Jacky Winter         | <i>Microeca leucophaea</i>     |    |     | X |      |    |     |          | Resident                |
| Red-capped Robin     | <i>Petroica goodenovii</i>     |    | X   | X |      | X  |     |          | Resident                |
| <b>NECTARINIIDAE</b> |                                |    |     |   |      |    |     |          |                         |
| Mistletoebird        | <i>Dicaeum hirundinaceum</i>   |    |     | X |      | X  |     | X        | Regular visitor         |
| <b>ESTRILDIDAE</b>   |                                |    |     |   |      |    |     |          |                         |
| Zebra Finch          | <i>Taeniopygia guttata</i>     |    | X   | X |      | X  |     | X        | Resident                |
| <b>MOTACILLIDAE</b>  |                                |    |     |   |      |    |     |          |                         |
| Australasian Pipit   | <i>Anthus australis</i>        |    | X   | X |      | X  |     | X        | Resident                |
| <b>LOCUSTELLIDAE</b> |                                |    |     |   |      |    |     |          |                         |
| Brown Songlark       | <i>Cinclorhamphus cruralis</i> |    | X   | X |      | X  |     |          | Resident                |
| Rufous Songlark      | <i>Cinclorhamphus mathewsi</i> |    |     |   |      | X  |     |          | Resident                |
| <b>HIRUNDINIDAE</b>  |                                |    |     |   |      |    |     |          |                         |
| White-backed Swallow | <i>Cheramoeca leucosternum</i> |    |     | X |      | X  |     | X        | Resident                |
| Welcome Swallow      | <i>Hirundo neoxena</i>         |    |     | X |      | X  |     |          | Resident                |
| Fairy Martin         | <i>Petrochelidon ariel</i>     |    |     | X |      | X  |     |          | Irregular visitor       |
| Tree Martin          | <i>Petrochelidon nigricans</i> |    |     | X |      | X  |     | X        | Resident                |

| MAMMALS               |                               | CS | ALA | N | EPBC | Expected status in area |
|-----------------------|-------------------------------|----|-----|---|------|-------------------------|
| <b>TACHYGLOSSIDAE</b> |                               |    |     |   |      |                         |
| Echidna               | <i>Tachyglossus aculeatus</i> |    |     |   | X    | Resident                |

| MAMMALS                     |                                    | CS    | ALA | N | EPBC | Expected status in area |
|-----------------------------|------------------------------------|-------|-----|---|------|-------------------------|
| <b>DASYURIDAE</b>           |                                    |       |     |   |      |                         |
| Kultarr                     | <i>Antechinomys laniger</i>        |       |     | X |      | Resident                |
| Brush-tailed Mulgara        | <i>Dasyercus blythi</i>            | P4    |     | X |      | Regular visitor         |
| Chuditch                    | <i>Dasyurus geoffroii</i>          | V S3  |     |   |      | Locally extinct         |
| Wongai Ningau               | <i>Ningau ridei</i>                |       | X   | X |      | Resident                |
| Woolley's Pseudantechinus   | <i>Pseudantechinus woolleyae</i>   |       |     |   |      | Resident                |
| Fat-tailed Dunnart          | <i>Sminthopsis crassicaudata</i>   |       |     | X |      | Resident                |
| Little Long-tailed Dunnart  | <i>Sminthopsis dolichura</i>       |       |     |   |      | Resident                |
| Hairy-footed Dunnart        | <i>Sminthopsis hirtipes</i>        |       |     | X |      | Resident                |
| Striped-faced Dunnart       | <i>Sminthopsis macroura</i>        |       |     | X |      | Resident                |
| Ooldea Dunnart              | <i>Sminthopsis ooldea</i>          |       |     | X |      | Resident                |
| Lesser Hairy-footed Dunnart | <i>Sminthopsis youngsoni</i>       |       |     | X |      | Resident                |
| <b>THYLACOMYIDAE</b>        |                                    |       |     |   |      |                         |
| Greater Bilby               | <i>Macrotis lagotis</i>            | V S3  |     |   |      | Locally extinct         |
| <b>POTOROIDAE</b>           |                                    |       |     |   |      |                         |
| Boodie                      | <i>Bettongia lesueur</i>           | Ex S4 |     |   |      | Locally extinct         |
| <b>PERAMELIDAE</b>          |                                    |       |     |   |      |                         |
| Pig-footed Bandicoot        | <i>Chaeropus ecaudatus</i>         | Ex S4 |     |   |      | Extinct                 |
| Golden Bandicoot            | <i>Isodon auratus</i>              | V S3  |     |   |      | Locally extinct         |
| Western Barred Bandicoot    | <i>Perameles bougainville</i>      | E S3  |     |   |      | Locally extinct         |
| <b>MACROPODIDAE</b>         |                                    |       |     |   |      |                         |
| Rufous Hare-Wallaby         | <i>Lagorchestes hirsutus</i>       | Ex S4 |     |   |      | Locally extinct         |
| Euro, Biggada               | <i>Macropus robustus</i>           |       |     | X |      | Resident                |
| Red Kangaroo, Marlu         | <i>Macropus rufus</i>              |       |     |   |      | Resident                |
| <b>MOLOSSIDAE</b>           |                                    |       |     |   |      |                         |
| White-striped Freetail Bat  | <i>Austronomus australis</i>       |       |     | X |      | migrant                 |
| Inland Freetail Bat         | <i>Ozimops petersi</i>             |       |     | X |      | Resident                |
| Beccari's Freetail Bat      | <i>Ozimops beccarii</i>            |       |     | X |      | Resident                |
| <b>VESPERTILIONIDAE</b>     |                                    |       |     |   |      |                         |
| Gould's Wattled Bat         | <i>Chalinolobus gouldii</i>        |       |     | X |      | Resident                |
| Lesser Long-eared Bat       | <i>Nyctophilus geoffroyi</i>       |       |     | X |      | Resident                |
| Inland Long-eared Bat       | <i>Nyctophilus major tor</i>       | P3    |     |   |      | Resident                |
| Inland Broad-nosed Bat      | <i>Scotorepens balstoni</i>        |       | X   | X |      | Resident                |
| Inland Forest Bat           | <i>Vespadelus baverstocki</i>      |       |     |   |      | Resident                |
| Inland Forest Bat           | <i>Vespadelus finlaysoni</i>       |       |     | X |      | Resident                |
| <b>MURIDAE</b>              |                                    |       |     |   |      |                         |
| Stick-nest Rat              | <i>Leporillus sp</i>               | Ex S4 |     |   |      | Extinct                 |
| Spinifex Hopping-Mouse      | <i>Notomys alexis</i>              |       |     | X |      | Irregular visitor       |
| Mitchell's Hopping-Mouse    | <i>Notomys mitchellii</i>          |       |     |   |      | Resident                |
| Bolam's Mouse               | <i>Pseudomys bolami</i>            |       |     |   |      | Resident                |
| Sandy Inland Mouse          | <i>Pseudomys hermannsburgensis</i> |       |     | X |      | Resident                |
| <b>INTRODUCED MAMMALS</b>   |                                    |       |     |   |      |                         |
| European Cattle             | <i>Bos taurus</i>                  | Int.  |     | X |      | Regular visitor         |
| Camel                       | <i>Camelus dromedarius</i>         | Int.  |     |   |      | Regular visitor         |
| Dog, Dingo                  | <i>Canis lupus</i>                 | Int.  |     | X |      | Resident                |

| MAMMALS     |                              | CS   | ALA | N | EPBC | Expected status in area |
|-------------|------------------------------|------|-----|---|------|-------------------------|
| Goat        | <i>Capra hircus</i>          | Int. |     |   |      | Resident                |
| Donkey      | <i>Equus asinus</i>          | Int. |     | X |      | Vagrant                 |
| Horse       | <i>Equus caballus</i>        | Int. |     | X |      | Vagrant                 |
| Cat         | <i>Felis catus</i>           | Int. |     | X |      | Resident                |
| House Mouse | <i>Mus musculus</i>          | Int. |     | X |      | Resident                |
| Rabbit      | <i>Oryctolagus cuniculus</i> | Int. |     | X |      | Resident                |
| Red Fox     | <i>Vulpes vulpes</i>         | Int. |     | X |      | Resident                |

Appendix 2. Annotated species list from site inspection, 31<sup>st</sup> January – 1<sup>st</sup> February 2019.

**REPTILES**

1. *Ctenophorus isolepis*. Several seen on red dunes east of lake.
2. *Ctenophorus salinarum*. Seen in samphire on northern edge of lake.
3. *Varanus panoptes*. One juvenile crossing Gunbarrel Hwy near Matilda turnoff. Also one seen in shrubland on northern side of lake.

**BIRDS**

4. Emu. Tracks in Millipede area and two seen near Gunbarrel Hwy.
5. Grey Teal. Four on freshwater pool near Matilda Camp.
6. Pacific Black Duck. Two on freshwater pool near Matilda Camp.
7. Wood Duck. Three on small pool along Goldfields Hwy near Potash turnoff.
8. Unidentified heron. One on freshwater pool near Matilda Camp. A small, stocky heron similar in size to Striated Heron. Plain blue-grey with white streaks prominent on side of neck and throat. Flew in a 'bouncy' manner like a nightjar. Possibly had rufous lower underparts. Very shy.
9. Crested Pigeon. One at Matilda Camp.
10. Black-fronted Dotterel. Seven on freshwater pool near Matilda Camp.
11. Red-capped Plover. Two on small pool on northern edge of lake.
12. Australian Ringneck. Pairs seen occasionally.
13. Galah. Two in shrubland north of lake.
14. Whistling Kite. Few along Goldfields Hwy.
15. Wedge-tailed Eagle. Two adults and a juvenile over north of lake.
16. Sparrowhawk/Brown Goshawk. One beside freshwater pool near Matilda Camp.
17. Nankeen Kestrel. One long pipeline track north-east of lake.
18. White-winged Fairy-wren. Parties in samphire around lake.
19. Yellow-throated Miner. Many at Matilda Camp and occasional elsewhere.
20. White-plumed Honeyeater. Around Matilda camp.
21. Spiny-cheeked Honeyeater. Few in acacia shrubland.
22. Singing Honeyeater. Small numbers throughout.
23. Crimson Chat. Small group north of lake.
24. Willie Wagtail. Small numbers throughout.
25. Grey-crowned Babbler. Party in tall shrubland north of lake.
26. Crested Bellbird. One seen in millipede area.
27. White-winged Triller. Female seen in shrubland north of lake.
28. Ground Cuckoo-shrike. Two perched in a eucalypt north of lake.
29. Black-faced Woodswallow. Few seen throughout.
30. Magpie-lark. Pairs seen occasionally.
31. Mistletoebird. Several among mistletoe in mulga; males seen.
32. Little Crow. Few throughout.
33. Torresian Crow. Few around Matilda Camp and on northern edge of lake.
34. Pied Butcherbird. Few around Matilda Camp.
35. Grey Butcherbird. One in shrubland north of lake.
36. Australian Magpie. Party at Matilda Camp and party seen in shrubland north of lake.
37. Welcome Swallow. Few around Matilda Camp.
38. Tree Martin. Few around Matilda Camp.
39. Australasian Pipit. Few seen along tracks and roads.

40. Zebra Finch. Pairs and small groups seen occasionally; one flock of about 50 near Gunbarrel Hwy.

#### **MAMMALS**

41. Red Kangaroo. Several seen.  
42. Rabbit. Burrows, tracks and scats in Centipede area.  
43. Feral Cat. Tracks seen in several places.

### Appendix 3. Categories used for the assessment of conservation significance.

IUCN categories (based on review by Mace and Stuart 1994) as used for the Environment Protection and Biodiversity Conservation Act 1999 and the Western Australian Biodiversity Conservation Act 2018.

|                                       |  |
|---------------------------------------|--|
| Extinct                               | Taxa not definitely located in the wild during the past 50 years.  |
| Extinct in the Wild (Ex)              | Taxa known to survive only in captivity.   |
| Critically Endangered (CR)            | Taxa facing an extremely high risk of extinction in the wild in the immediate future.  |
| Endangered (E)                        | Taxa facing a very high risk of extinction in the wild in the near future.   |
| Vulnerable (V)                        | 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.  |

### Schedules used in the WA Biodiversity Conservation Act 2018

|                 |   |
|-----------------|---|
| Schedule 1 (S1) | Critically Endangered fauna.                                      |
| Schedule 2 (S2) | Endangered fauna  |
| Schedule 3 (S3) | Vulnerable Migratory species listed under international treaties. |
| Schedule 4 (S4) | Presumed extinct fauna  |
| Schedule 5 (S5) | Migratory birds under international agreement                     |
| Schedule 6 (S6) | Conservation dependant fauna                                      |
| Schedule 7 (S7) | Other specially protected fauna                                   |

WA Department of Biodiversity, Conservation and Attractions, Priority species (species not listed under the Biodiversity Conservation Act 2018, but for which there is some concern).

Priority 1 (P1) Taxa with few, poorly known populations on threatened lands.

Priority 2 (P2) Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.

Priority 3 (P3) Taxa with several, poorly known populations, some on conservation lands.

Priority 4 (P4) Taxa in need of monitoring: Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.

Appendix 4. Photographs of some of the key VSA types in and around project area (M. Bamford; January 2019).



4.1. Lake Wells playa from north-east, illustrating the environment where infrastructure will be placed across the lake.



4.2. Chenopod (including *Tecticornia*) shrubland on northern end of Lake Way and adjacent to lease area.





4.3. North-west corner of lease area with scattered *Melaleuca* and chenopod shrubs.



4.4. View from south looking into lease area and illustrating shrubland and *Melaleuca* along sandy ridges with chenopod shrubland on lake margins.



4.5. Acacia open tall shrubland over grasses on sandy loam plain.



4.6. Eucalypt open woodland over spinifex on sandy flats and low dunes.





4.7. Open acacia low shrubland on loam soils with exposed calcrete south of the lease area.  
This overlies one of the calcrete systems rich in stygofauna.