APA Group

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Ref: EGP_0005L

29 July 2014

Environmental Protection Authority
Locked Bag 33
Cloisters Square WA 6850

To Whom It May Concern,

RE: EASTERN GOLDFIELDS PIPELINE PROJECT – EPA REFERRAL

In accordance with Section 38 of the *Environmental Protection Act 1986*, please find enclosed our EPA Referral Form, Supporting Documentation (EGP-RP-H-0003) and associated attachments for the Eastern Goldfields Pipeline (EGP) Project.

Please don't hesitate to contact me on 08 6189 4430 if you have any concerns or require clarification regarding this submission.

Yours sincerely,

M Burns.

Madonna Burns

Project Approvals Manager
APA Group

Environmental Protection Authority

GOVERNMENT OF WESTERN AUSTRALIA

1. EPA REFERRAL FORM PROPONENT

Referral of a Proposal by the Proponent to the Environmental Protection Authority under Section 38(1) of the *Environmental Protection Act 1986*.

PURPOSE OF THIS FORM

Section 38(1) of the *Environmental Protection Act 1986* (EP Act) provides that where a development proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires assessment under the EP Act. This form sets out the information requirements for the referral of a proposal by a proponent.

Proponents are encouraged to familiarise themselves with the EPA's *General Guide on Referral of Proposals* [see Environmental Impact Assessment/Referral of Proposals and Schemes] before completing this form.

A referral under section 38(1) of the EP Act by a proponent to the EPA must be made on this form. A request to the EPA for a declaration under section 39B (derived proposal) must be made on this form. This form will be treated as a referral provided all information required by Part A has been included and all information requested by Part B has been provided to the extent that it is pertinent to the proposal being referred. Referral documents are to be submitted in two formats – hard copy and electronic copy. The electronic copy of the referral will be provided for public comment for a period of 7 days, prior to the EPA making its decision on whether or not to assess the proposal.

CHECKLIST

Before you submit this form, please check that you have:

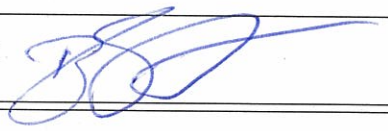
	Yes	No
Completed all the questions in Part A (essential).	X	
Completed all applicable questions in Part B.	X	
Included Attachment 1 – location maps.	X	
Included Attachment 2 – additional document(s) the proponent wishes to provide (if applicable).	X	
Included Attachment 3 – confidential information (if applicable).	N/A	
Enclosed an electronic copy of all referral information, including spatial data and contextual mapping but excluding confidential information.	X	

Following a review of the information presented in this form, please consider the following question (a response is optional).

Do you consider the proposal requires formal environmental impact assessment?		
☐ Yes	☒ No	☐ Not sure
If yes, what level of assessment?		
☐ Assessment on Proponent Information	☐ Public Environmental Review	

PROPONENT DECLARATION (to be completed by the proponent)

I, …Barrie Sturgeon……., *(full name)* declare that I am authorised on behalf of…APA Operations Pty Ltd……. (being the person responsible for the proposal) to submit this form and further declare that the information contained in this form is true and not misleading.

Signature: 	Name (print) Barrie Sturgeon
Position: Senior Program Manager	Company APA Operation Pty Ltd
Date: 28/07/2014	

PART A - PROPONENT AND PROPOSAL INFORMATION
(All fields of Part A must be completed for this document to be treated as a referral)

1. PROPONENT AND PROPOSAL INFORMATION

1.1 Proponent

Name	APA Operations Pty Ltd
Joint Venture parties (if applicable)	N/A
Australian Company Number (if applicable)	123 090 933
Postal Address (where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State)	Eastpoint Plaza, Level 5 233 Adelaide Terrace Perth WA 6000
Key proponent contact for the proposal: • name • address • phone • email	Madonna Burns Project Approvals Officer Eastpoint Plaza, Level 5 233 Adelaide Terrace Perth WA 6000 08 6189 4430 0408 097 676 Madonna.Burns@apa.com.au
Consultant for the proposal (if applicable): • name • address • phone • email	Michelle Doak Eco Logical Australia Pty Ltd PO Box 237 West Perth BC WA 6872 (08) 9227 1070 michelledoak@ecoaus.com.au

1.2 Proposal

Title	Eastern Goldfields Pipeline
Description	APA Group (APA) proposes to construct and operate a 294 km high pressure gas pipeline; the Eastern Goldfields Pipeline (EGP), from existing infrastructure near Murrin Murrin mine site to the AngloGold Ashanti Australia Ltd (AGAA) goldmines at Sunrise Dam Gold Mine (SDGM) and Tropicana Gold Mine (TGM). APA will be the sole owner and operator of

	the EGP. While the pipeline initially will only supply SDGM and TGM, there is the ability to provide gas to additional operations along the route in the future. Thus this proposal is therefore separate from the existing TGM Gold Project ministerial (MS839). See supporting documentation Section 3 for more details.
Extent (area) of proposed ground disturbance.	Disturbance will be restricted to an area inside, the Construction Pipeline Licence Area and supporting Mining Tenements. The proposed pipeline will require the clearing for the construction Right-of-Way (ROW) of (nominally) a 30 m wide corridor for the entire 294 km, as well as turn-around bays, turkey nest dams, water abstraction areas, borrow pits, access tracks and a construction camp. The proposed disturbance associated with this project will be predominantly temporary activities associated with construction, and is not anticipated to exceed 915 ha. Post construction approximately 81% of the pipeline ROW will be rehabilitated, excluding a 4WD access tracks and small above ground facilities (< 1 ha). See supporting documentation section 3.3 for more details.
Timeframe in which the activity or development is proposed to occur (including start and finish dates where applicable).	Construction is planned to commence February 2015, pending all approvals etc., with first gas contractual requirements with AGAA January 2016.
Details of any staging of the proposal.	The Proposal will be completed in one construction phase.
Is the proposal a strategic proposal?	No
Is the proponent requesting a declaration that the proposal is a derived proposal? If so, provide the following information on the strategic assessment within which the referred proposal was identified: • title of the strategic assessment; and • Ministerial Statement number.	No
Please indicate whether, and in what way, the proposal is related to other proposals in the region.	The EGP will transport natural gas to the existing SDGM and TGM Gold mines, currently trucking their fuel to site. The

	pipeline will also be designed to be able to facilitate (potential) future clients, or synergies with other mines in the area. Of the initial mines to be serviced by the pipeline only TGM has been formally assessed (MS839). The pipeline will be constructed and owned by APA, independent of AGAA, and will not include any upgrades or changes to existing mine site power generation facilities. The pipeline construction project will be independent of the established mining operations and their existing approvals and ministerial advice, and will lie within its own dedicated miscellaneous licences (or easement) therefore not relying upon the mines for tenure. The pipeline will however overlap with the TGM Gold Mine ministerial area (Attachment 1 Maps).
Does the proponent own the land on which the proposal is to be established? If not, what other arrangements have been established to access the land?	APA has applied for a Petroleum Pipeline Licence (STP-PLA-0025) under the *Petroleum Pipelines Act 1969*. The pipeline construction ROW licence area occupies a corridor within existing AngloGold Ashanti Australia (AGAA) Miscellaneous Licenses and those currently being granted via the WA *Mining Act 1978*. An access agreement has been executed between APA and AGAA to enable land access. In due course (post construction) land access will be via an easement granted under the *Land Administration Act 1997*. In addition some small sections (deviations) of the pipeline corridor are located on existing mining leases held by AngloGold Ashanti Australia, Dacian Gold and Minara Resources. The Mining Act tenure under the proposed Pipeline Licence is provided in Appendix B of the Supporting Document.
What is the current land use on the property, and the extent (area in hectares) of the property?	The EGP traverses two pastoral leases; Mt Weld Station and Glenorn Station, a range of Mining Act tenure and unallocated crown land. The proposed pipeline corridor area is 2940 ha and the proposed extent of the construction ROW is 882 ha. Anticipated disturbance has been reduced

	where possible, and is not more than 915 ha. See supporting documentation section 3.1 for more details.

1.3 Location

Name of the Shire in which the proposal is located.	Shire of Menzies Shire of Laverton
For urban areas: • street address; • lot number; • suburb; and • nearest road intersection.	NA
For remote localities: • nearest town; and • distance and direction from that town to the proposal site.	For convenience, the pipeline route has been divided into 2 sections: • Section 1 – 84km from Laverton Road near Murrin Murrin Nickel Mine located 50 km south-west of Laverton, to the SDGM Gold Mine (SDGM) located 55 km south of Laverton; and • Section 2 – 210 km from SDGM Gold Mine (SDGM) to TGM Gold Mine (TGM) located 330 km north-east of Kalgoorlie.
Electronic copy of spatial data - GIS or CAD, geo-referenced and conforming to the following parameters: • GIS: polygons representing all activities and named; • CAD: simple closed polygons representing all activities and named; • datum: GDA94; • projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA); • format: Arcview shapefile, Arcinfo coverages, Microstation or AutoCAD.	Enclosed?: Yes The following preliminary GIS data (ArcMap shape files) has been attached • proposed construction licence area (polygon) • proposed alignment (polyline) • proposed construction right-of-way All data is in GDA94 Zone 51

1.4 Confidential Information

Does the proponent wish to request the EPA to allow any part of the referral information to be treated as confidential?	No
If yes, is confidential information attached as a separate document in hard copy?	No

1.5 Government Approvals

Is rezoning of any land required before the	

proposal can be implemented? If yes, please provide details.	No
Is approval required from any Commonwealth or State Government agency or Local Authority for any part of the proposal? If yes, please complete the table below.	Yes. See supporting documentation section 1.4 for more information.

Yes	Approval required	Application lodged Yes / No	Agency/Local Authority contact(s) for proposal
Department of Mines and Petroleum	STP-PLA-0025 Consent to Construct Consent to Operate PL36 Variation	Yes Licence Application lodged and Variation to be lodged by the end of July No Consent to construct and Operate will be lodged in due course	DMP Alyssa Carstairs – Titles Coordinator, Walter Law – Manager Petroleum and Geothermal Infrastructure, Joel Peters – Environmental Officer, **Trent Richards – Environmental Officer**
Department of Mines and Petroleum	Native Vegetation Purpose Permit	No Dependent on outcome of this EP Act referral	DMP
Department of the Environment	Referral under the Commonwealth Environmental Protection and Biodiversity Act 1999	Yes	DoE Hana McDonald
Department of Environment Regulation	Works Approval for septics at camps – prescribed premises activity	No Awaiting appointment of construction contractor and workforce requirements	NA
Department of Water	Bores	No Currently exploring suitable locations / options	NA
Shire of Menzies	Approval for the Waste Water Treatment Plant for the construction camp	No Awaiting appointment of construction contractor and workforce requirements	Greg Dwyer (Shire President)

PART B - ENVIRONMENTAL IMPACTS AND PROPOSED MANAGEMENT

2. ENVIRONMENTAL IMPACTS

Describe the impacts of the proposal on the following elements of the environment, by answering the questions contained in Sections 2.1-2.11:

2.1 flora and vegetation;

2.2 fauna;

2.3 rivers, creeks, wetlands and estuaries;

2.4 significant areas and/ or land features;

2.5 coastal zone areas;

2.6 marine areas and biota;

2.7 water supply and drainage catchments;

2.8 pollution;

2.9 greenhouse gas emissions;

2.10 contamination; and

2.11 social surroundings.

These features should be shown on the site plan, where appropriate.

For all information, please indicate:

(a) the source of the information; and

(b) the currency of the information.

2.1 Flora and Vegetation

2.1.1 Do you propose to clear any native flora and vegetation as a part of this proposal?

[A proposal to clear native vegetation may require a clearing permit under Part V of the EP Act (Environmental Protection (Clearing of Native Vegetation) Regulations 2004)]. Please contact the Department of Environment and Conservation (DEC) for more information.

(please tick) ☒ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section

2.1.2 How much vegetation are you proposing to clear (in hectares)?

All construction works will be confined to the abovementioned Construction Pipeline Licence Area. The location of camps, vehicle turnaround bays, borrow pits, temporary storage and laydown have not yet been finalised, but will be strategically located so as to avoid high risk, or conservation significant areas.

Clearing will be minimised wherever possible and is not anticipated to exceed 915 ha as per the following table.

Component	Disturbance (ha)
Pipeline corridor (30 m width for approximately 294 km)	882
Construction camp (including laydown area)	11
Above ground facilities (1 x off-take, 2x MLVs, 2x delivery/metering etc.)	1
Temporary access tracks	~4
Turnaround	4
Turkey nest dams	3
Borrow pits	10
TOTAL TEMPORARY DISTURBANCE	915
Rehabilitation post-construction	738
TOTAL PERMANENT DISTURBANCE (operational access track [176 ha] and above ground facilities [1 ha])	177

See supporting documentation section 3.3 for more information.

2.1.3 Have you submitted an application to clear native vegetation to the DEC (unless you are exempt from such a requirement)?

☐ Yes ☒ No **If yes**, on what date and to which office was the application submitted of the DEC?

2.1.4 Are you aware of any recent flora surveys carried out over the area to be disturbed by this proposal?

☒ Yes ☐ No **If yes**, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

A number of flora and vegetation surveys have been undertaken along the pipeline corridor by Botanica Consulting including the following:

- A Level 1 flora and vegetation survey of the proposed pipeline from Murrin Murrin to Sunrise Dam Gold Mine; and
- A Level 1 flora and vegetation survey of the proposed pipeline from Sunrise Dam Gold Mine to Tropicana Gold Mine.

The surveys included detailed literature reviews, database searches and Level 1 flora and vegetation surveys. Both surveys were undertaken in accordance with EPA Guidance Statement No 51 and EPA Position Statement No. 3.

See supporting documentation section 4.5 and 4.6 for recent flora surveys carried out over the area to be disturbed. Flora and vegetation reports are provided in Attachment 1.

2.1.5 Has a search of DEC records for known occurrences of rare or priority flora or threatened ecological communities been conducted for the site?

☒ Yes ☐ No If you are proposing to clear native vegetation for any part of your proposal, a search of DEC records of known occurrences of rare or priority flora and threatened ecological communities will be required. Please contact DEC for more information.

See supporting documentation section 4.5 DEC records for known occurrences of rare and priority flora and TECs.

2.1.6 Are there any known occurrences of rare or priority flora or threatened ecological communities on the site?

☒ Yes ☐ No **If yes**, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

See supporting documentation section 4.5 for information regarding occurrences of rare or priority flora and threatened ecological communities within the project area.

See supporting documentation section 2 for details regarding correspondence with Department of Parks and Wildlife.

2.1.7 If located within the Perth Metropolitan Region, is the proposed development within or adjacent to a listed Bush Forever Site? (You will need to contact the Bush Forever Office, at the Department for Planning and Infrastructure)

☐ Yes ☒ No **If yes**, please indicate which Bush Forever Site is affected (site number and name of site where appropriate).

N/A

2.1.8 What is the condition of the vegetation at the site?

Refer to Section 4.5 of the Supporting Document.

2.2 Fauna

2.2.1 Do you expect that any fauna or fauna habitat will be impacted by the proposal?

(please tick) ☒ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

2.2.2 Describe the nature and extent of the expected impact.

See supporting documentation section 5 for more details regarding impacts and proposed management for potential impacts to fauna.

2.2.3 Are you aware of any recent fauna surveys carried out over the area to be disturbed by this proposal?

☒ Yes ☐ No **If yes**, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

A number of terrestrial fauna surveys have been undertaken along the pipeline alignment by Kingfisher Consulting and include the following:

- A Level 1 fauna survey of the proposed pipeline alignment from Murrin Murrin to Sunrise Dam; and
- A Level 1 fauna survey of the proposed pipeline alignment from Sunrise Dam to Tropicana Gold Mine.

The surveys both comprised detailed literature reviews, database searches and a Level 1 fauna survey of both sections of the pipeline alignment. Both surveys were undertaken in accordance with EPA Guidance Statement No 56, Position Statement No. 3 and the EPA and DEC technical guide to terrestrial vertebrate fauna surveys.

See supporting documentation section 4.6 for a summary of fauna surveys carried out. Fauna survey reports are provided in Attachment 1.

2.2.4 Has a search of DEC records for known occurrences of Specially Protected (threatened) fauna been conducted for the site?

☒ Yes ☐ No (please tick)

See supporting documentation section 4.6 for a summary of the DEC records for fauna.

2.2.5 Are there any known occurrences of Specially Protected (threatened) fauna on the site?

☒ Yes ☐ No **If yes**, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

See supporting documentation section 4.6 for a summary of threatened fauna.

See supporting documentation section 2 for details regarding correspondence with Department of Parks and Wildlife.

2.3 Rivers, Creeks, Wetlands and Estuaries

2.3.1 Will the development occur within 200 metres of a river, creek, wetland or estuary?

(please tick) ☒ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

The proposed EGP skirts around the northern and eastern borders of Lake Carey, past Mount Margaret to SDGM. The pipeline then extends from SDGM to TGM. The pipeline route traverses a portion of Hope Campbell Lake part way between these two mines. Both Lake Carey and Hope Campbell Lake are ephemeral, as are the river, creek beds and waterways associated with them. All have high salinity. Depending on the climatic conditions, these areas can be subject to inundation. Other than the Lakes that have been mentioned above, the pipeline does not intersect with any significant watercourses, Ramsar wetland sites, wetlands of national significance or perennial waterways.

Further information can be found in Section 4.4 of the Supporting Documentation.

2.3.2 Will the development result in the clearing of vegetation within the 200 metre zone?

☒ Yes ☐ No **If yes**, please describe the extent of the expected impact.

All efforts will be made to minimise vegetation clearance for the entirety of the route. This will generally result in a 30 m wide construction corridor. In sensitive areas as within 200 m of lakes, pending safety and practicability issues, the construction corridor will be reduced to 20-25 m to further reduce impacts to associated vegetation.

See supporting documentation section 5 for more details on impacts and proposed management of abovementioned impacts.

2.3.3 Will the development result in the filling or excavation of a river, creek, wetland or estuary?

☒ Yes ☐ No **If yes**, please describe the extent of the expected impact.

See supporting documentation section 4 and 5 for more details on impacts and proposed management of impacts. Excavation is required in Hope Campbell Lake, a hypersaline ephemeral wetland.

2.3.4 Will the development result in the impoundment of a river, creek, wetland or estuary?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.3.5 Will the development result in draining to a river, creek, wetland or estuary?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.3.6 Are you aware if the proposal will impact on a river, creek, wetland or estuary (or its buffer) within one of the following categories? (please tick)

Conservation Category Wetland	☐ Yes	☒ No	☐ Unsure
Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998	☐ Yes	☒ No	☐ Unsure
Perth's Bush Forever site	☐ Yes	☒ No	☐ Unsure
Environmental Protection (Swan & Canning Rivers) Policy 1998	☐ Yes	☒ No	☐ Unsure
The management area as defined in s4(1) of the *Swan River Trust Act 1988*	☐ Yes	☒ No	☐ Unsure
Which is subject to an international agreement, because of the importance of the wetland for waterbirds and waterbird habitats (e.g. Ramsar, JAMBA, CAMBA)	☐ Yes	☒ No	☐ Unsure

2.4 Significant Areas and/ or Land Features

2.4.1 Is the proposed development located within or adjacent to an existing or proposed National Park or Nature Reserve?

☐ Yes ☒ No **If yes**, please provide details.

The proposed pipeline does not intersect, nor traverse next to any existing or proposed National Parks or Nature Reserves.

2.4.2 Are you aware of any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act) that will be impacted by the proposed development?

☐ Yes ☒ No **If yes**, please provide details.

The proposed pipeline does not intersect, nor traverse next to any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act).

2.4.3 Are you aware of any significant natural land features (e.g. caves, ranges etc) that will be impacted by the proposed development?

☒ Yes ☐ No **If yes**, please provide details.

The pipeline will intersect one of the Banded Iron Formations (BIF) in the area. BIF rangers are (generally) of very significant biodiversity value as a consequence of their unique geology, soils and relative isolation. Surveys carried out confirmed the area is highly likely to support conservation significant species such as Long-tailed Dunnart, Malleefowl and Bush Stone-curlew. The route through this area has therefore been designed to minimise impacts and disturbance, in addition, the construction ROW will be reduced in width to 20 m where it is safe to do so.

See supporting documentation section 4.3 for more details about landforms along the alignment.

2.5 Coastal Zone Areas (Coastal Dunes and Beaches)

2.5.1 Will the development occur within 300metres of a coastal area?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

☒ No **If no**, go to the next section.

2.5.2 What is the expected setback of the development from the high tide level and from the primary dune?

2.5.3 Will the development impact on coastal areas with significant landforms including beach ridge plain, cuspate headland, coastal dunes or karst?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.5.4 Is the development likely to impact on mangroves?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.6 Marine Areas and Biota

2.6.1 Is the development likely to impact on an area of sensitive benthic communities, such as seagrasses, coral reefs or mangroves?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.6.2 Is the development likely to impact on marine conservation reserves or areas recommended for reservation (as described in *A Representative Marine Reserve System for Western Australia*, CALM, 1994)?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact.

2.6.3 Is the development likely to impact on marine areas used extensively for recreation or for commercial fishing activities?

☐ Yes ☒ No **If yes**, please describe the extent of the expected impact, and provide any written advice from relevant agencies (e.g. Fisheries WA).

2.7 Water Supply and Drainage Catchments

2.7.1 Are you in a proclaimed or proposed groundwater or surface water protection area?

(You may need to contact the Department of Water (DoW) for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

☐ Yes ☒ No **If yes**, please describe what category of area.

2.7.2 Are you in an existing or proposed Underground Water Supply and Pollution Control area?

(You may need to contact the DoW for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

☐ Yes ☒ No **If yes**, please describe what category of area.

2.7.3 Are you in a Public Drinking Water Supply Area (PDWSA)?

(You may need to contact the DoW for more information or refer to the DoW website. A proposal to clear vegetation within a PDWSA requires approval from DoW.)

☐ Yes ☒ No **If yes**, please describe what category of area.

The proposed pipeline does not intersect any Public Drinking Water Supply Areas; the closest being the Laverton Water Reserve / Catchment Area more than 25 km to north.

2.7.4 Is there sufficient water available for the proposal?

(Please consult with the DoW as to whether approvals are required to source water as you propose. Where necessary, please provide a letter of intent from the DoW)

☒ Yes ☐ No (please tick)

2.7.5 Will the proposal require drainage of the land?

☒ Yes ☐ No **If yes**, how is the site to be drained and will the drainage be connected to an existing Local Authority or Water Corporation drainage system? Please provide details.

Dewatering / draining of very localised sections of the pipeline trench may be required in low lying areas and/or where the corridor traverses Hope Campbell Lake to facilitate the construction of the pipeline. See supporting documentation section 5.2.4 for more information regarding drainage and dewatering.

2.7.6 Is there a water requirement for the construction and/ or operation of this proposal?

(please tick) ☒ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

2.7.7 What is the water requirement for the construction and operation of this proposal, in kilolitres per year?

Water will be used for construction, such as dust suppression. It will also be used around the camp, such as ablutions. Water will be required for hydrotesting the pipeline prior to commissioning. Operational water requirements are minimal and restricted to the delivery facilities located within the mine sites.

See supporting documentation section 3.5.14.2 for more information.

2.7.8 What is the proposed source of water for the proposal? (e.g. dam, bore, surface water etc.)

Water will be sourced from existing or new groundwater bores. If dewatering is required in the trench, this will also comprise a water source. Additional water will be sourced from existing mines such as Granny Smith, SDGM and TGM.

Any groundwater abstraction or dewatering will be carried out in line with appropriate licences.

2.8 Pollution

2.8.1 Is there likely to be any discharge of pollutants from this development, such as noise, vibration, gaseous emissions, dust, liquid effluent, solid waste or other pollutants?

(please tick) ☒ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

2.8.2 Is the proposal a prescribed premise, under the Environmental Protection Regulations 1987?

(Refer to the EPA's *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* for more information)

☒ Yes ☐ No **If yes**, please describe what category of prescribed premise.

The workforce accommodation requirements will be finalised upon appointment of a construction contractor. However, given the length or the pipeline and its location, a construction camp will likely be required for around 200 workers. It is anticipated that the associated ablutions would then trigger the threshold for a prescribed premises by producing more than 100 cubic meters per day.

Should this be the case, referral to the Department of Environment and Regulation for the facilities will be undertaken, and all resultant licence conditions will be abided by.

2.8.3 Will the proposal result in gaseous emissions to air?

☒ Yes ☐ No **If yes**, please briefly describe.

Emissions are unavoidable during construction and will be generated from a variety of plant and equipment. However all plant and equipment will be maintained as per supplier specification and be in good working order; utilised by trained and competent operators. It should be noted that the operation of the gas pipeline will result in the ceasing of use of diesel power generation at SDGM and TGM resulting in local improvements in air quality.

See supporting documentation section 5.2.5 for more details on impacts.

2.8.4 Have you done any modelling or analysis to demonstrate that air quality standards will be met, including consideration of cumulative impacts from other emission sources?

☐ Yes ☒ No **If yes**, please briefly describe.

2.8.5 Will the proposal result in liquid effluent discharge?

☐ Yes ☒ No **If yes**, please briefly describe the nature, concentrations and receiving environment.

The project will require ablutions fit to services the maximum potential workforce. Water will be recycled where possible. Water that is used for hydrotesting will not have chemicals added to it and will be sourced from bores including those for dewatering (if required). It is anticipated that hydrotest water will be provided to the TGM for re-use.

See supporting documentation section 5 for more details.

2.8.6 If there is likely to be discharges to a watercourse or marine environment, has any analysis been done to demonstrate that the State Water Quality Management Strategy or other appropriate standards will be able to be met?

☐ Yes ☒ No **If yes**, please describe.

2.8.7 Will the proposal produce or result in solid wastes?

☒ Yes ☐ No **If yes**, please briefly describe the nature, concentrations and disposal location/ method.

Wastes potentially produced include:

- Construction Waste – inert; packaging, wooden pallets, steel (e.g. pipe off-cuts), builder's rubble, formwork, welding rods etc.: All construction waste will be separately stockpiled / stored onsite.
- Putrescible – food scraps, general camp waste. All putrescibles will be stored in lidded bins to prevent escape and feral attraction.
- Fuels, and oils i.e. small quantities of left over oils and used chemical / aerosol containers containing residual product.

All wastes will be separately stockpiled or stored onsite, and will be removed from site to an appropriately licenced facility, regularly as required.

See supporting documentation section 5.2.3 for more details.

2.8.8 Will the proposal result in significant off-site noise emissions?

☐ Yes ☒ No **If yes**, please briefly describe.

Noise generated by this project is expected to be standard for construction projects. In addition, the proposal area is in in an area remote of any sensitive receptors (i.e. no residences) and vehicles and equipment will be fitted with standard noise reduction – mufflers etc. All activities conducted will be in line with the Environmental Protection (Noise) Regulations 1997.

See supporting documentation section 5.2.6 for more details.

2.8.9 Will the development be subject to the Environmental Protection (Noise) Regulations 1997?

☐ Yes ☒ No **If yes**, has any analysis been carried out to demonstrate that the proposal will comply with the Regulations?

Please attach the analysis.

2.8.10 Does the proposal have the potential to generate off-site, **air quality impacts**, dust, odour or another pollutant that may affect the amenity of residents and other "sensitive premises" such as schools and hospitals (proposals in this category may include intensive agriculture, aquaculture, marinas, mines and quarries etc.)?

☐ Yes ☒ No **If yes**, please describe and provide the distance to residences and other "sensitive premises".

Dust will be generated though general access to site, as well as excavation and trenching activities. However, the proposal area is in an area remote of any sensitive receptors (i.e. no residences). Notwithstanding, dust will be managed as per the CEP. Water will be applied to the construction ROW for dust suppression.

See supporting documentation section 5.2.5 for more details.

2.8.11 If the proposal has a residential component or involves "sensitive premises", is it located near a land use that may discharge a pollutant?

☐ Yes ☒ No ☐ Not Applicable

If yes, please describe and provide the distance to the potential pollution source

2.9 Greenhouse Gas Emissions

2.9.1 Is this proposal likely to result in substantial greenhouse gas emissions (greater than 100 000 tonnes per annum of carbon dioxide equivalent emissions)?

☐ Yes ☒ No **If yes**, please provide an estimate of the annual gross emissions in absolute and in carbon dioxide equivalent figures.

2.9.2 Further, if yes, please describe proposed measures to minimise emissions, and any sink enhancement actions proposed to offset emissions.

2.10 Contamination

2.10.1 Has the property on which the proposal is to be located been used in the past for activities which may have caused soil or groundwater contamination?

☒ Yes ☐ No ☐ Unsure **If yes**, please describe.

A small reserve 4388, located south of the Mount Morgans town site has historically been used to dispose of sewage. This site is not listed on the contaminated sites register.

See supporting documentation section 5.2.3 for more information.

2.10.2 Has any assessment been done for soil or groundwater contamination on the site?

☐ Yes ☒ No **If yes**, please describe.

2.10.3 Has the site been registered as a contaminated site under the *Contaminated Sites Act 2003*? (on finalisation of the CS Regulations and proclamation of the CS Act)

☐ Yes ☒ No **If yes**, please describe.

2.11 Social Surroundings

2.11.1 Is the proposal on a property which contains or is near a site of Aboriginal ethnographic or archaeological significance that may be disturbed?

☐ Yes ☒ No ☐ Unsure **If yes**, please describe.

Aboriginal heritage

Heritage assessments have been undertaken to determine if there were any ethnographic or archaeological places of importance or significance as defined by Section 5 of the *Aboriginal Heritage Act 1972*. The surveyed area found some Aboriginal heritage (archaeological) sites but these are not situated in the pipeline corridor. See supporting documentation section 4.7 for more information.

Other

No European heritage values were located along the pipeline route.

2.11.2 Is the proposal on a property which contains or is near a site of high public interest (e.g. a major recreation area or natural scenic feature)?

☐ Yes ☒ No **If yes**, please describe.

2.11.3 Will the proposal result in or require substantial transport of goods, which may affect the amenity of the local area?

☐ Yes ☒ No **If yes**, please describe.

3. PROPOSED MANAGEMENT

3.1 Principles of Environmental Protection

3.1.1 Have you considered how your project gives attention to the following Principles, as set out in section 4A of the EP Act? (For information on the Principles of Environmental Protection, please see EPA Position Statement No. 7, available on the EPA website)

1. The precautionary principle.	☒ Yes	☐ No
2. The principle of intergenerational equity.	☒ Yes	☐ No
3. The principle of the conservation of biological diversity and ecological integrity.	☒ Yes	☐ No
4. Principles relating to improved valuation, pricing and incentive mechanisms.	☒ Yes	☐ No
5. The principle of waste minimisation.	☒ Yes	☐ No

3.1.2 Is the proposal consistent with the EPA's Environmental Protection Bulletins/Position Statements and Environmental Assessment Guidelines/Guidance Statements (available on the EPA website)?

☒ Yes ☐ No

As per Environmental Assessment Guideline (EAG) 8 for Environmental factors and objectives (EPA 2013) and EAG 9 for Application of a significant framework in the environmental impact assessment process (EPA 2013) the EGP project will impact on the Flora and Vegetation and Terrestrial Fauna Factors. This is outlined in detail in Section 5 of the supporting documentation. However, given the information collected from various surveys, advice received from specialists and the mitigations and management measures proposed the associated objectives are likely to be met.

Given construction will be temporary (~ 10 months), the corridor intersects only small areas (maximum 30 m width) and the area will be almost fully rehabilitated post construction the project will allow for the maintenance of diversity, viability and ecosystem function at the species, population and assemblage level.

3.2 Consultation

3.2.1 Has public consultation taken place (such as with other government agencies, community groups or neighbours), or is it intended that consultation shall take place?

☒ Yes ☐ No **If yes**, please list those consulted and attach comments or summarise response on a separate sheet.

A Stakeholder Engagement Plan for the project is being prepared. It will be the responsibility of APA to ensure that any significant environmental issues that are identified in environmental assessments undertaken for the project are adequately communicated to all relevant stakeholders, personnel and contractors. Steps shall be taken to ensure the intent, scope and relevance of these assessments are understood by all the stakeholders particularly how APA plans to minimise, as far as practicably possible, the impact of the proposed pipeline on the use of land, and conservation value by the affected stakeholders.

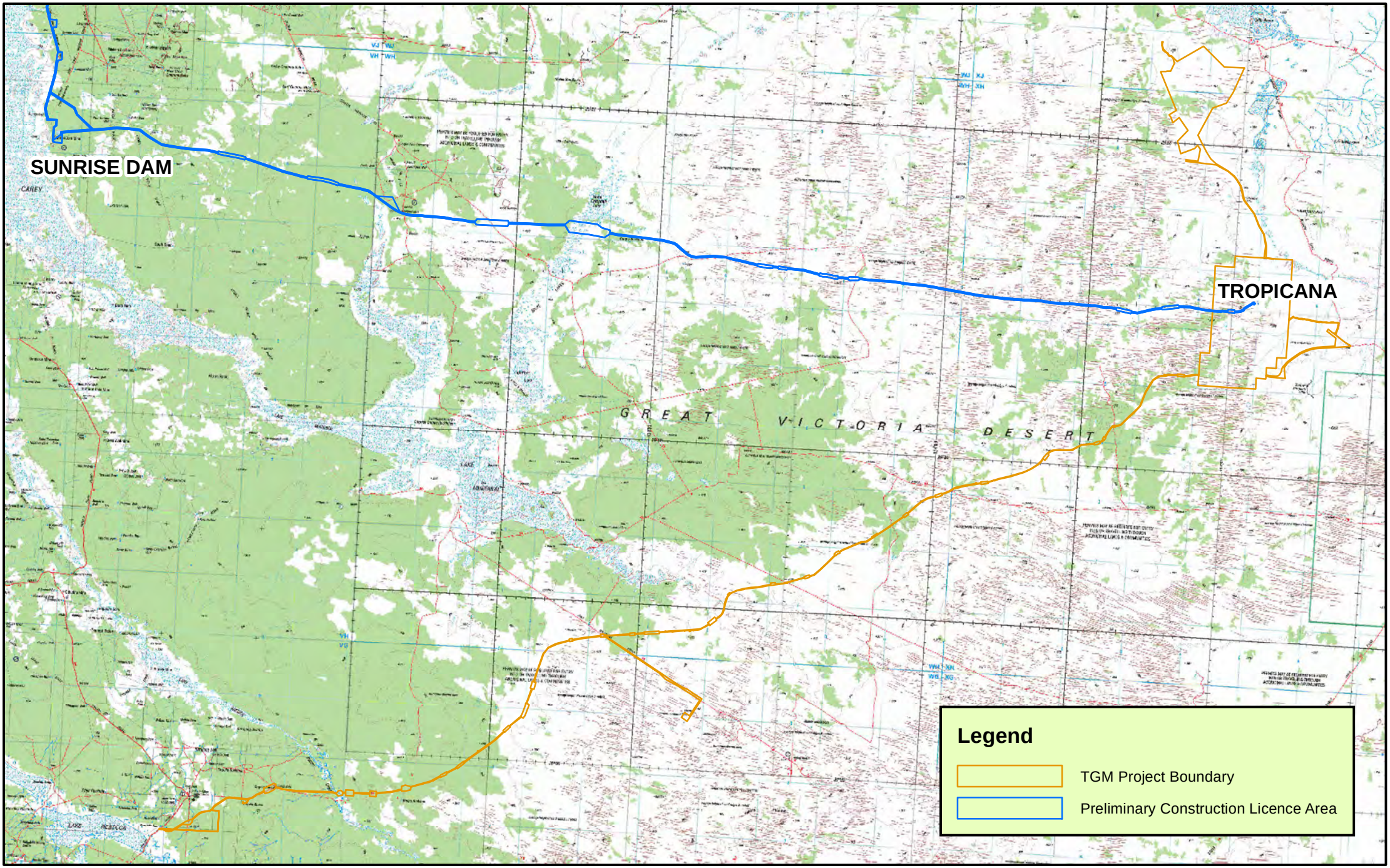
All key government stakeholders were invited to an initial Lead Agency meeting for the EGP, held on the 17/4/2014. No major issues were raised and all departments have been contacted again as follow up, and as

a part of the approvals process. In addition, all landholders and interested parties have been contacted and liaised with as a part of the tenure acquisition process.

See supporting documentation section 2 for more details.

Eastern Goldfields Pipeline

Eastern Goldfields Pipeline



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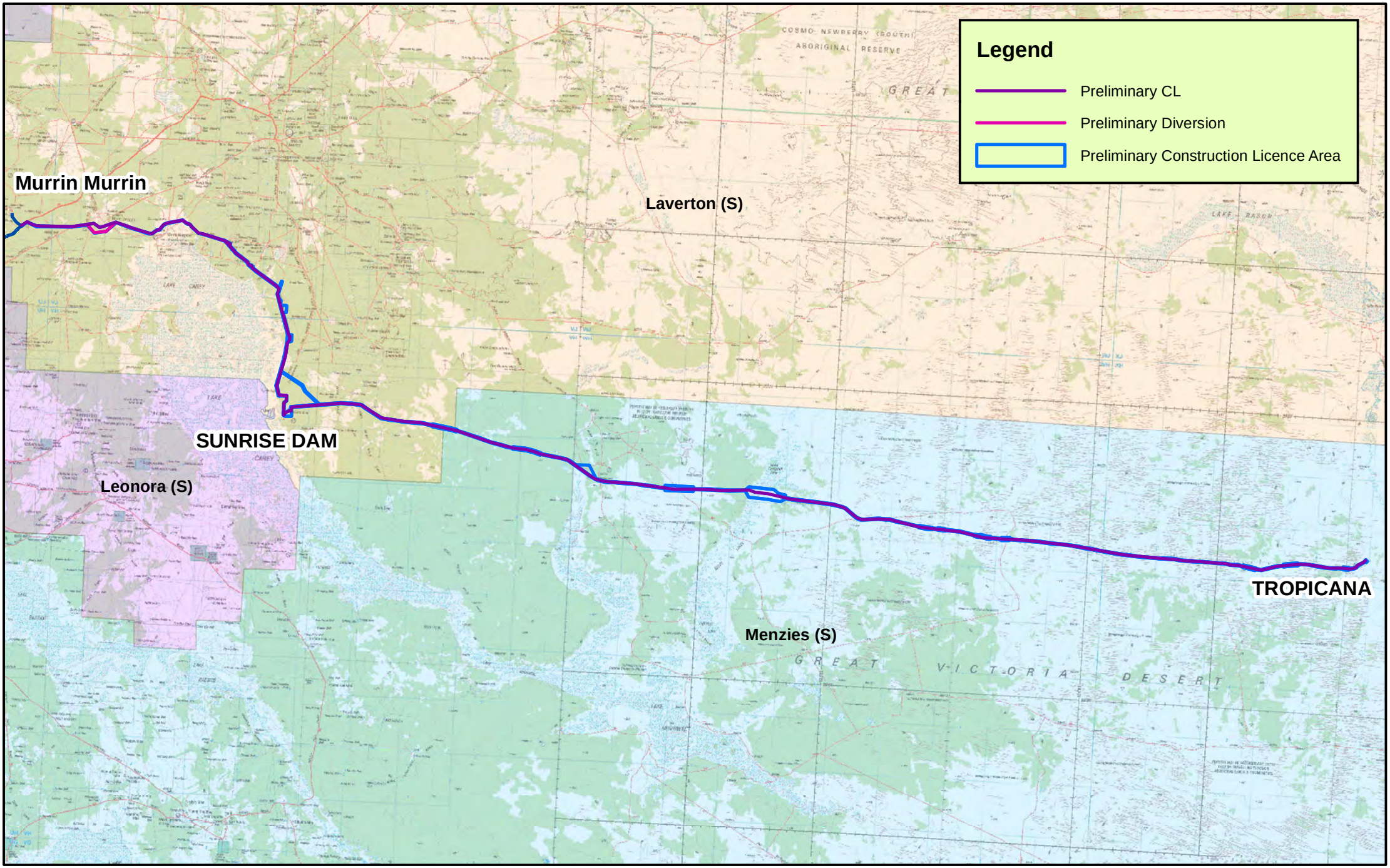

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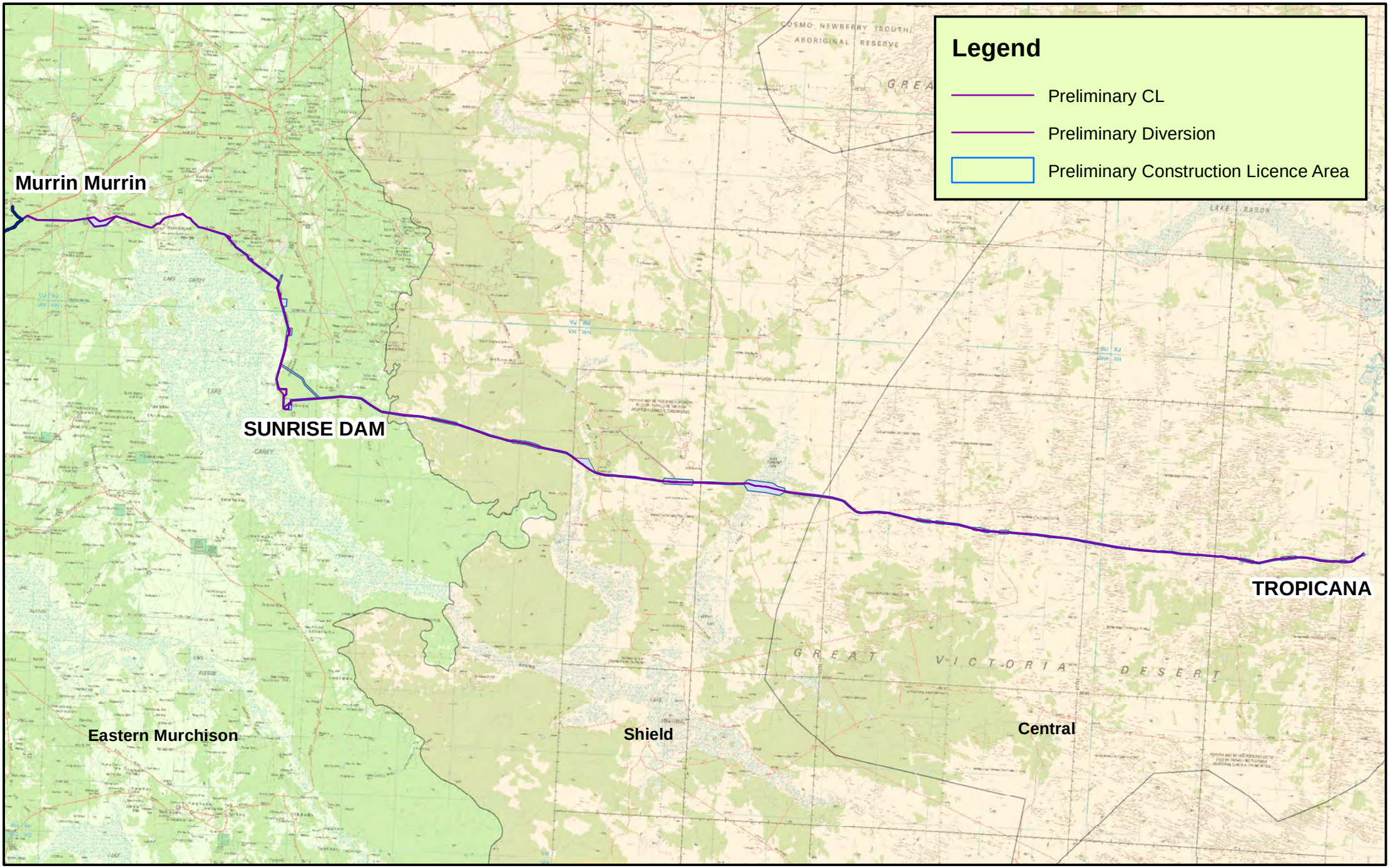

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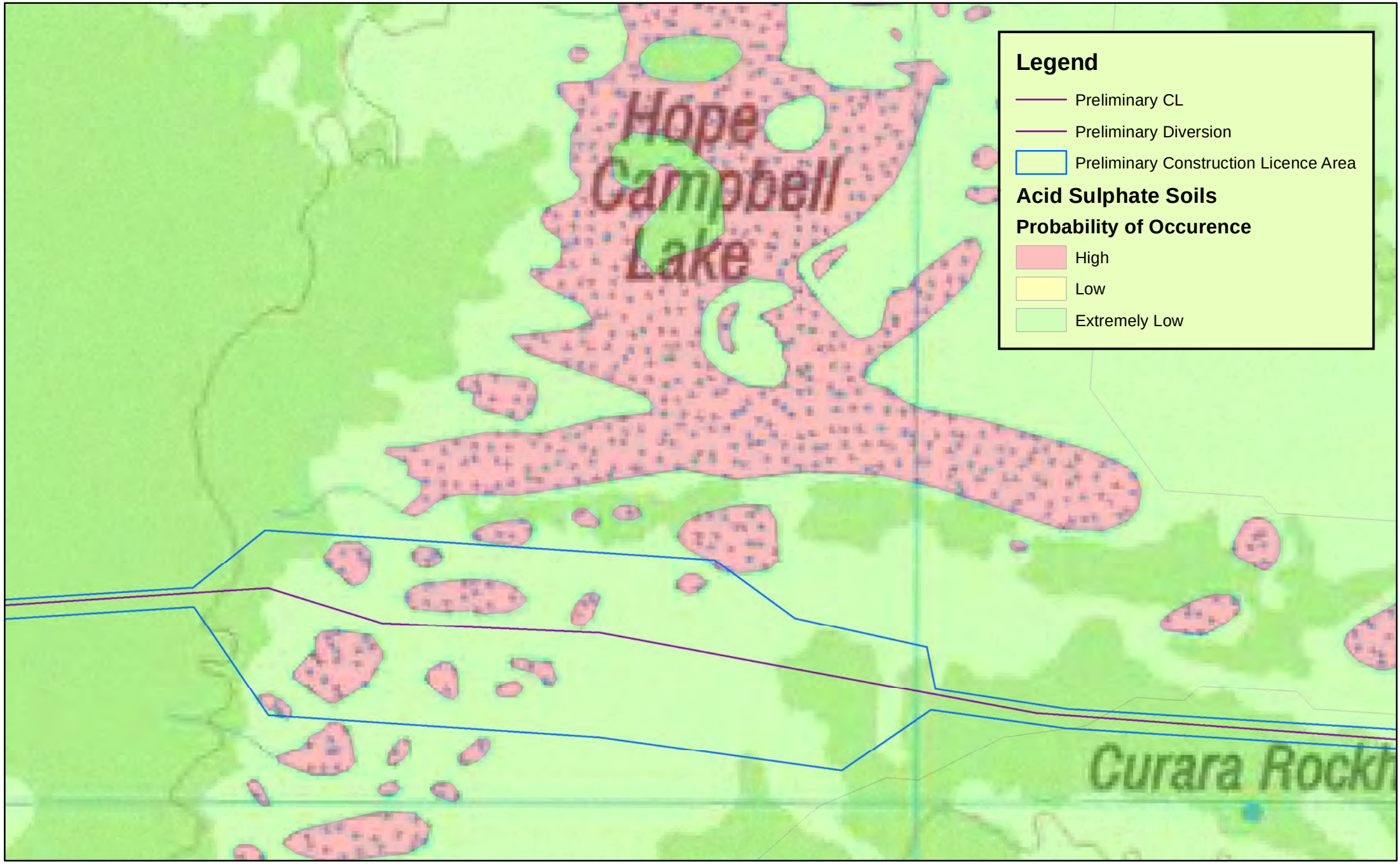

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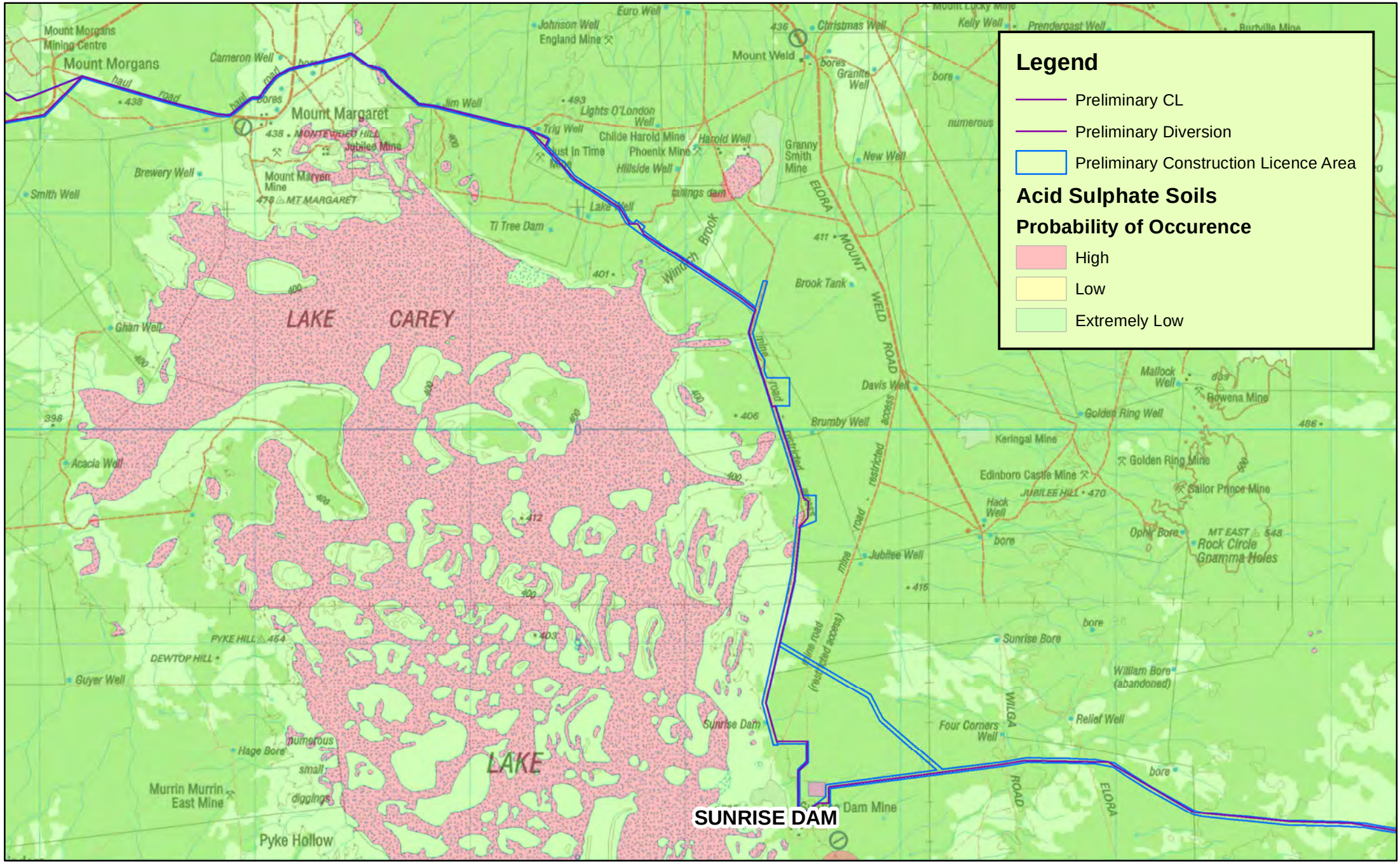
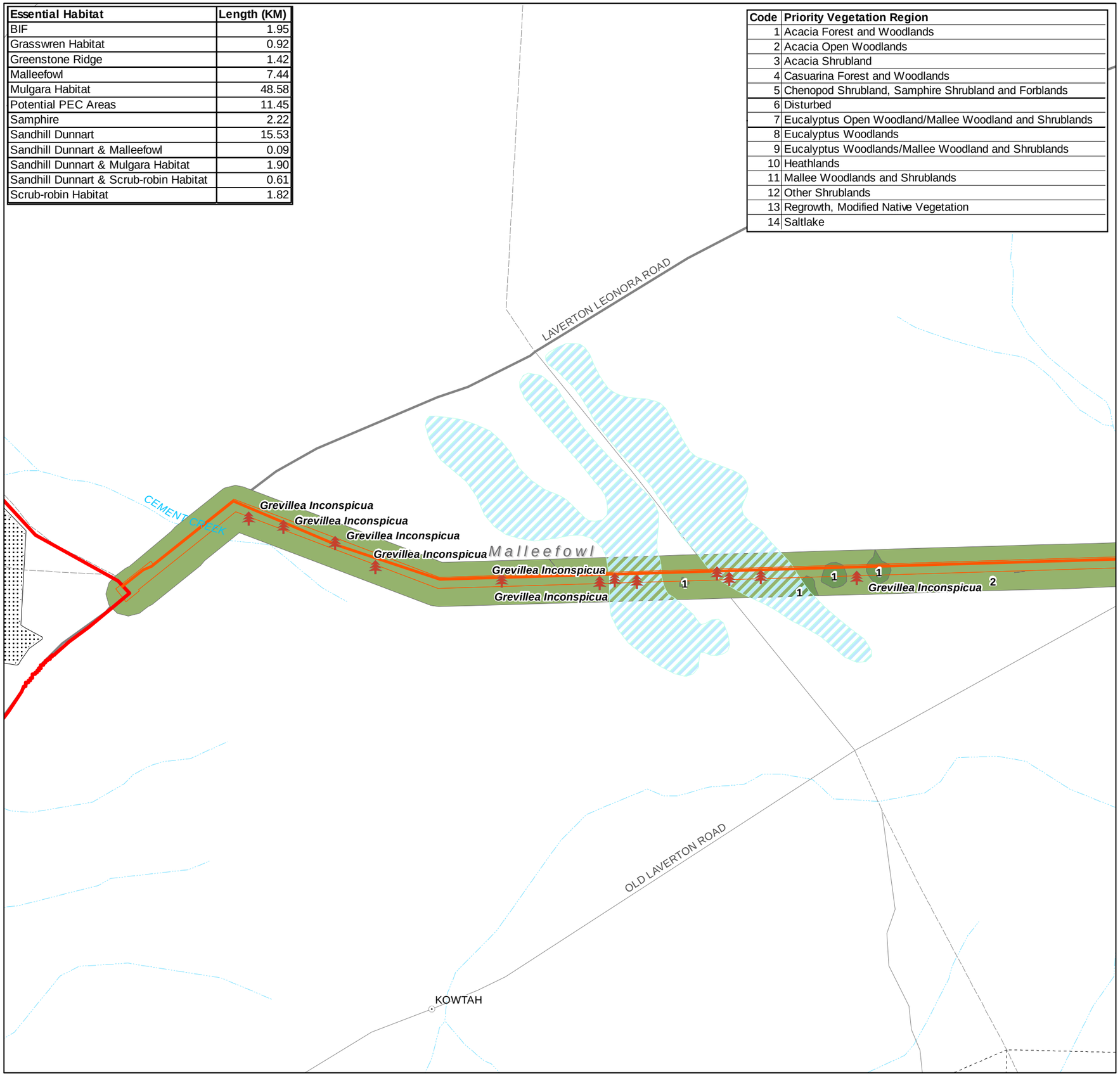


Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 1

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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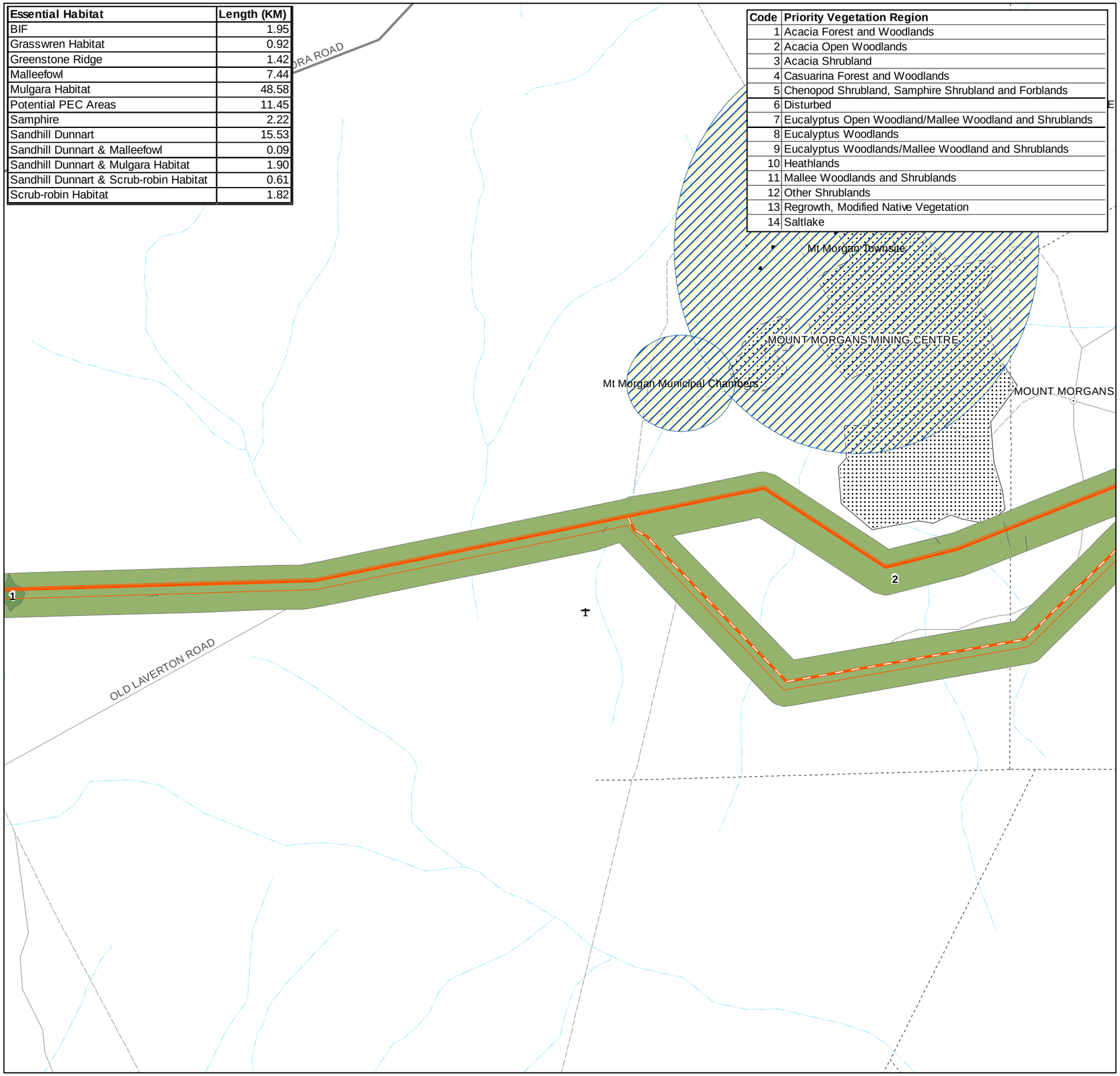

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 2

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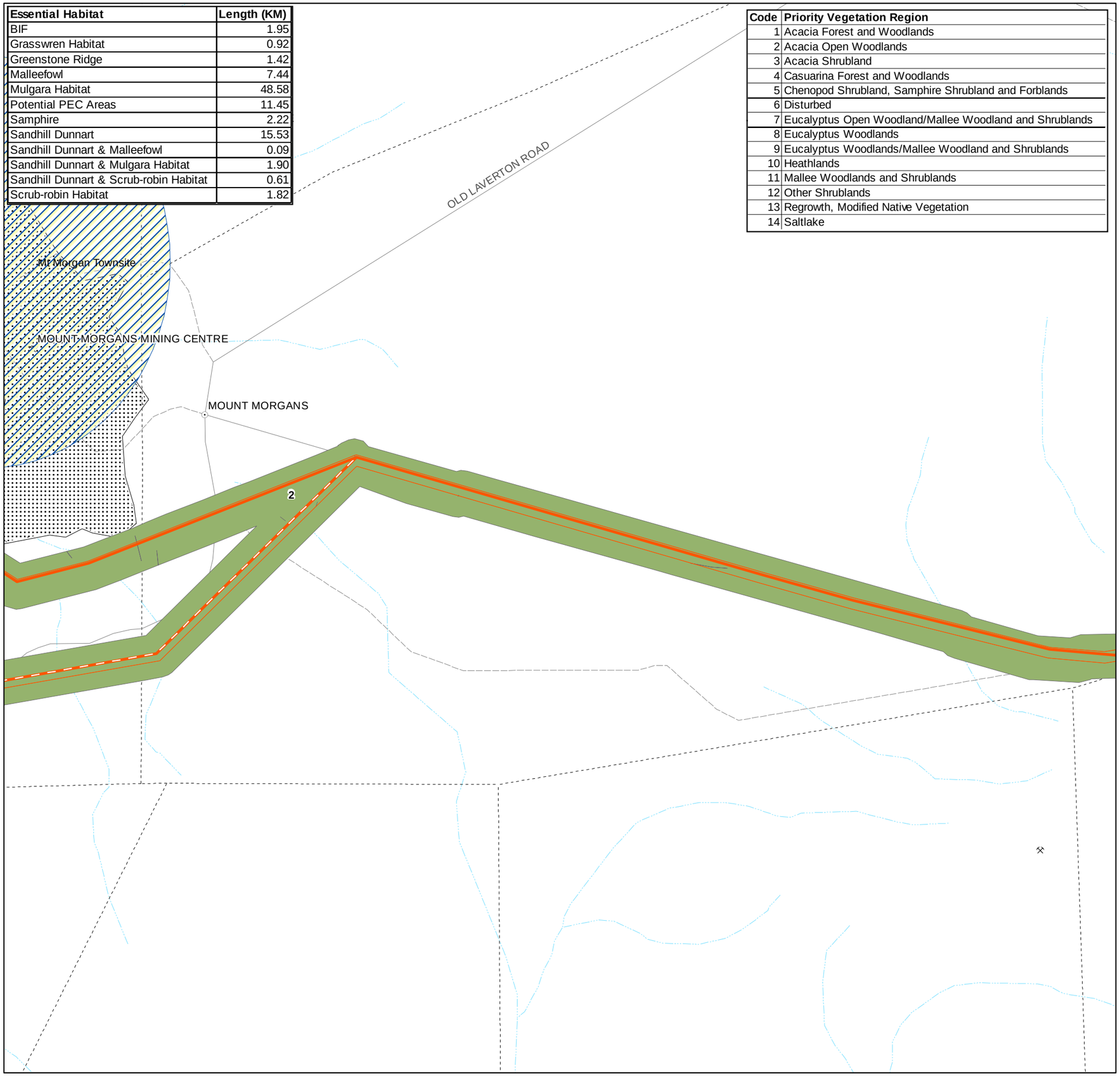

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
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Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 3

DATE: 29JUL2014

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APA Group

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Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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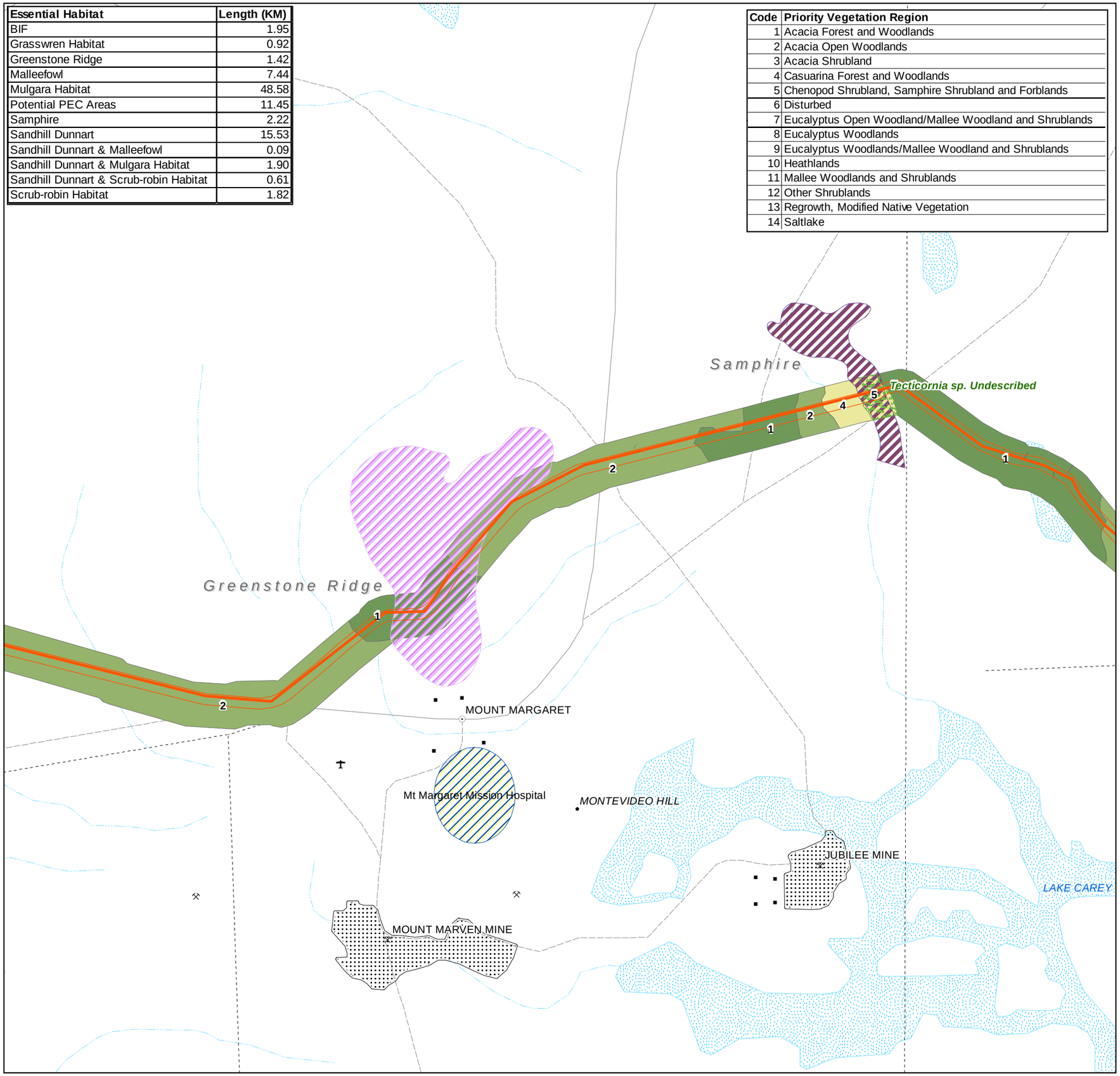

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
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Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
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Railway
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Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
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Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
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Priority Flora Regions

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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 4

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APA Group

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Scrub-robin Habitat	1.82

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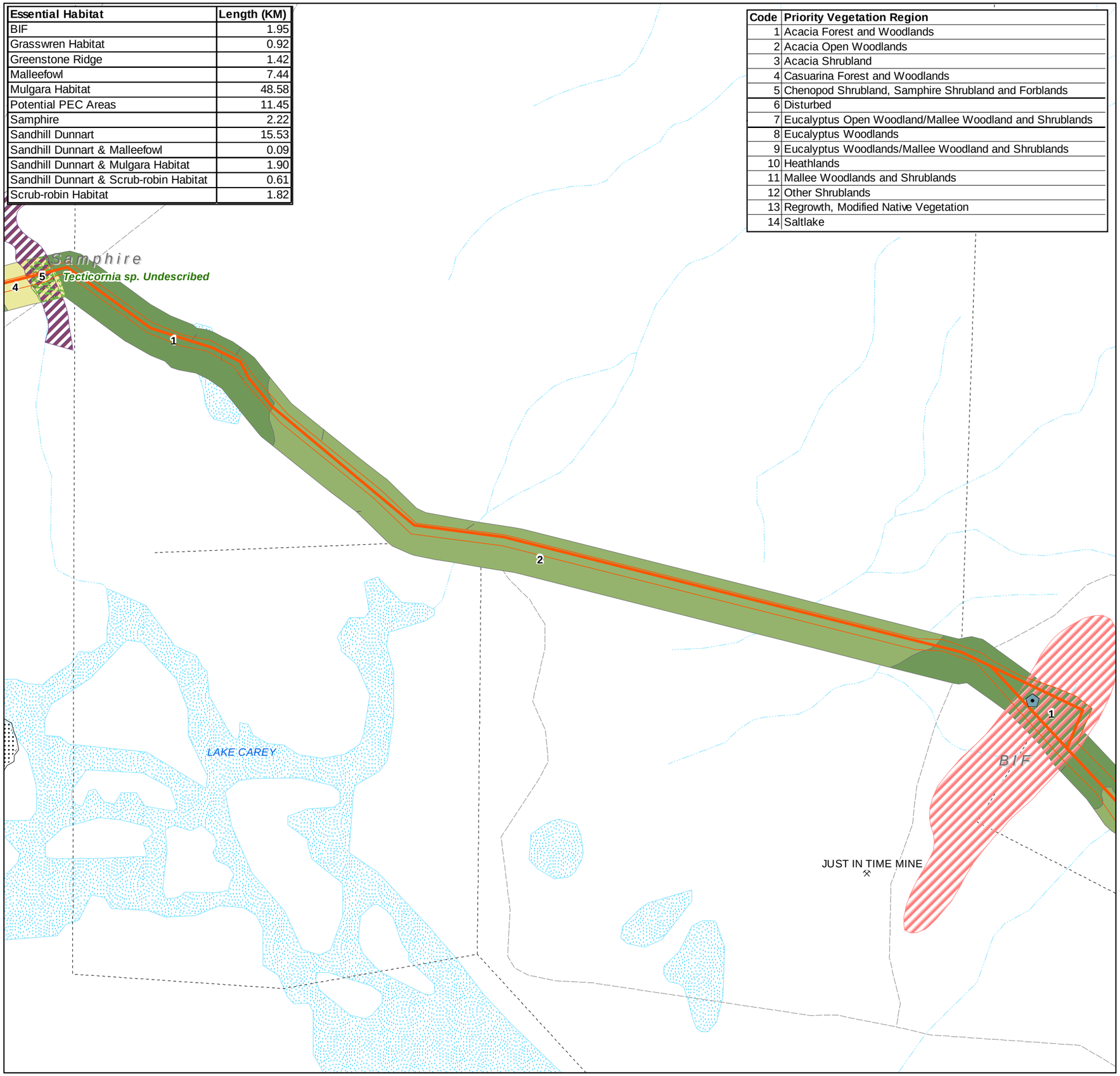

- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
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- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
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- Striated Grasswren
- Wooley's Pseudoantichinus

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
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- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
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APA Group

Eastern Goldfields Pipeline (EGP)
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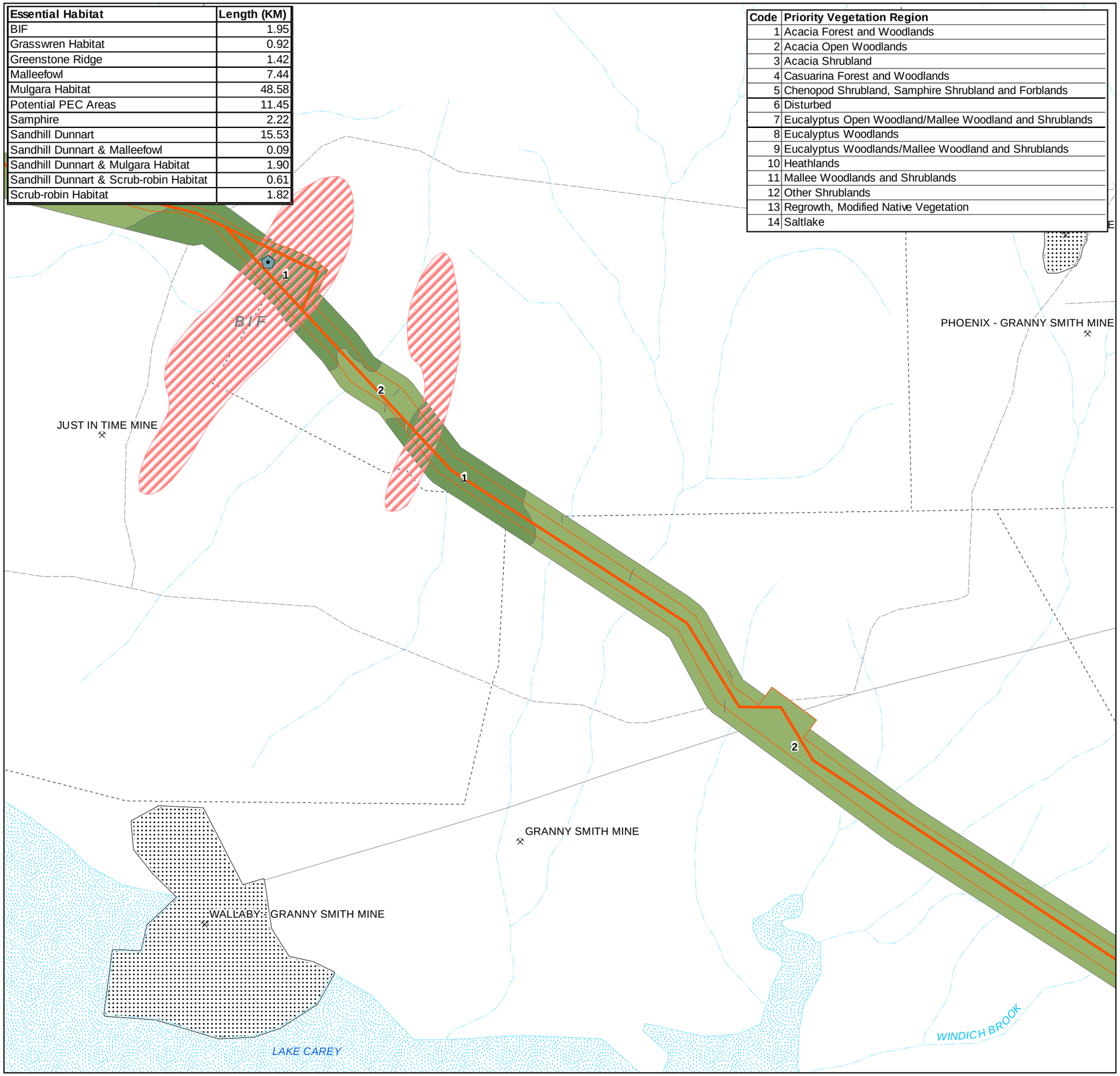
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 6

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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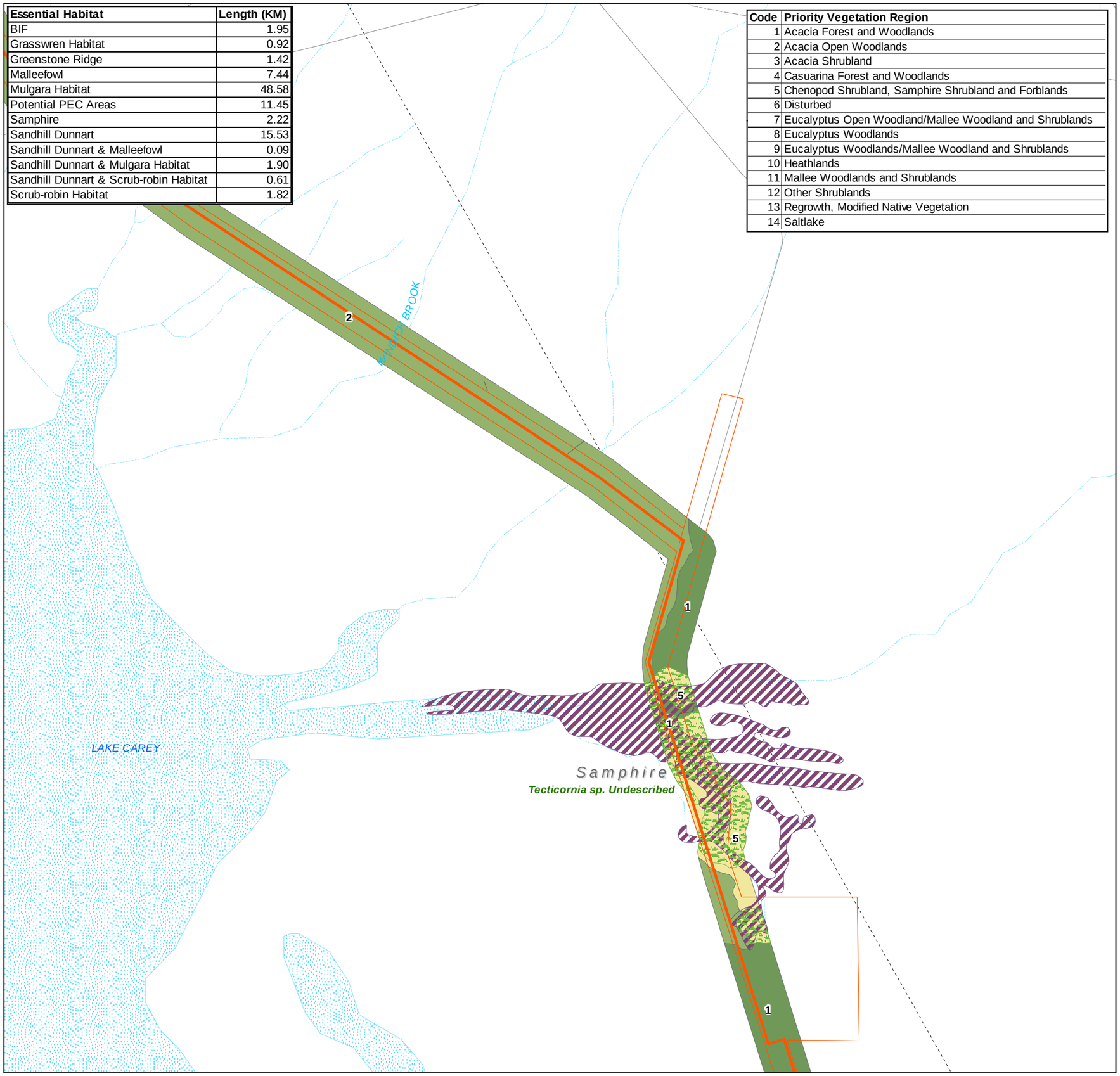
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 7

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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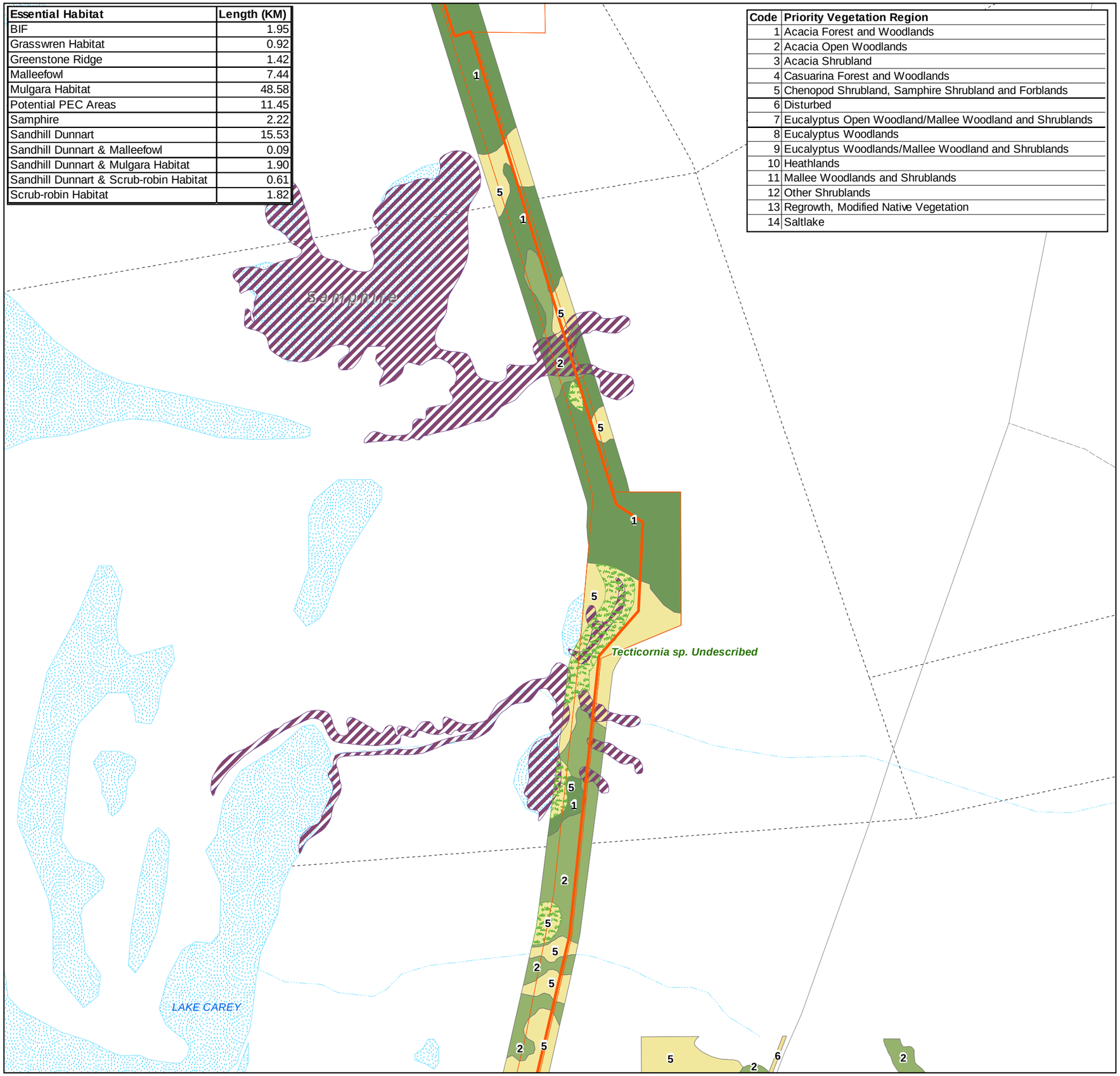
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 8

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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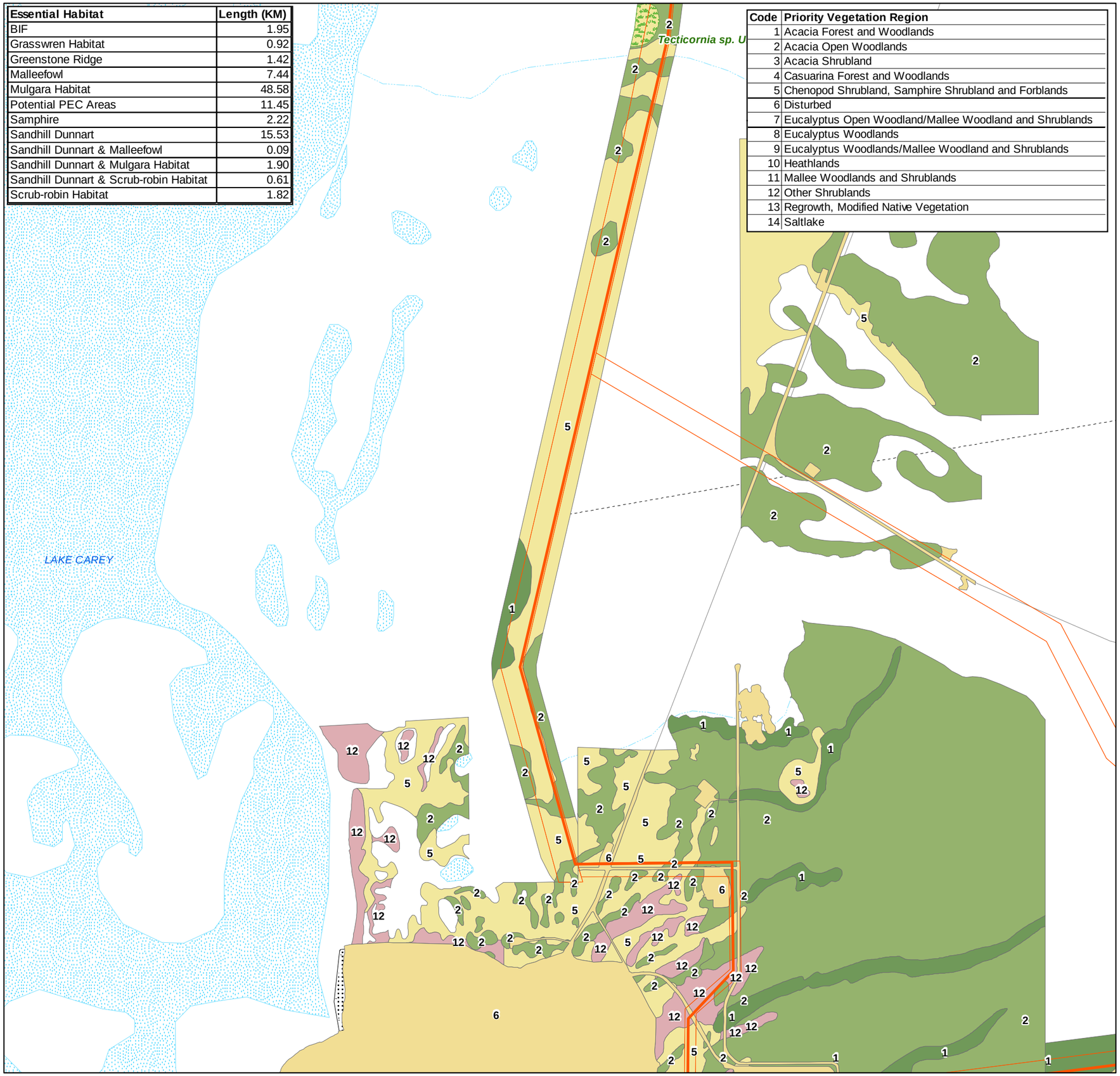
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
- Mountains/Hills
- Highway
- Secondary Road
- Minor Road
- Track
- Fence
- Railway
- Canal
- River - Non-perennial
- River - Perennial
- Sand Ridges
- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
- Sandhill Dunnart
- Scarlet-chested Parrot
- Southern Marsupial Mole
- Southern Scrub-Robin
- Striated Grasswren
- Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
- European Heritage Sites

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
- Dicrastylis Cundeeleensis
- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 9

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake

JUBILEE - GRANNY S

SUNRISE DAM

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 10

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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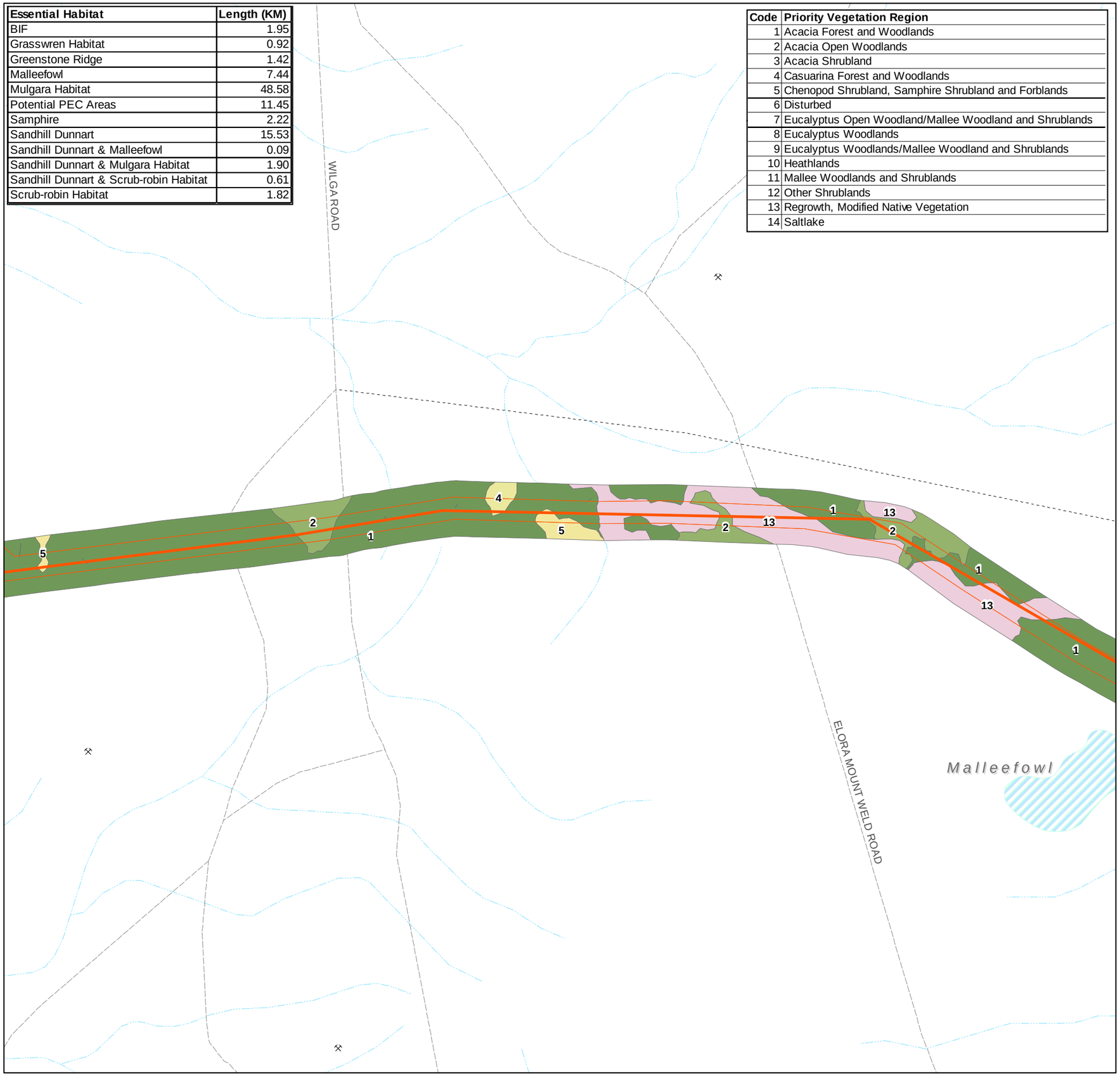
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 11

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
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Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
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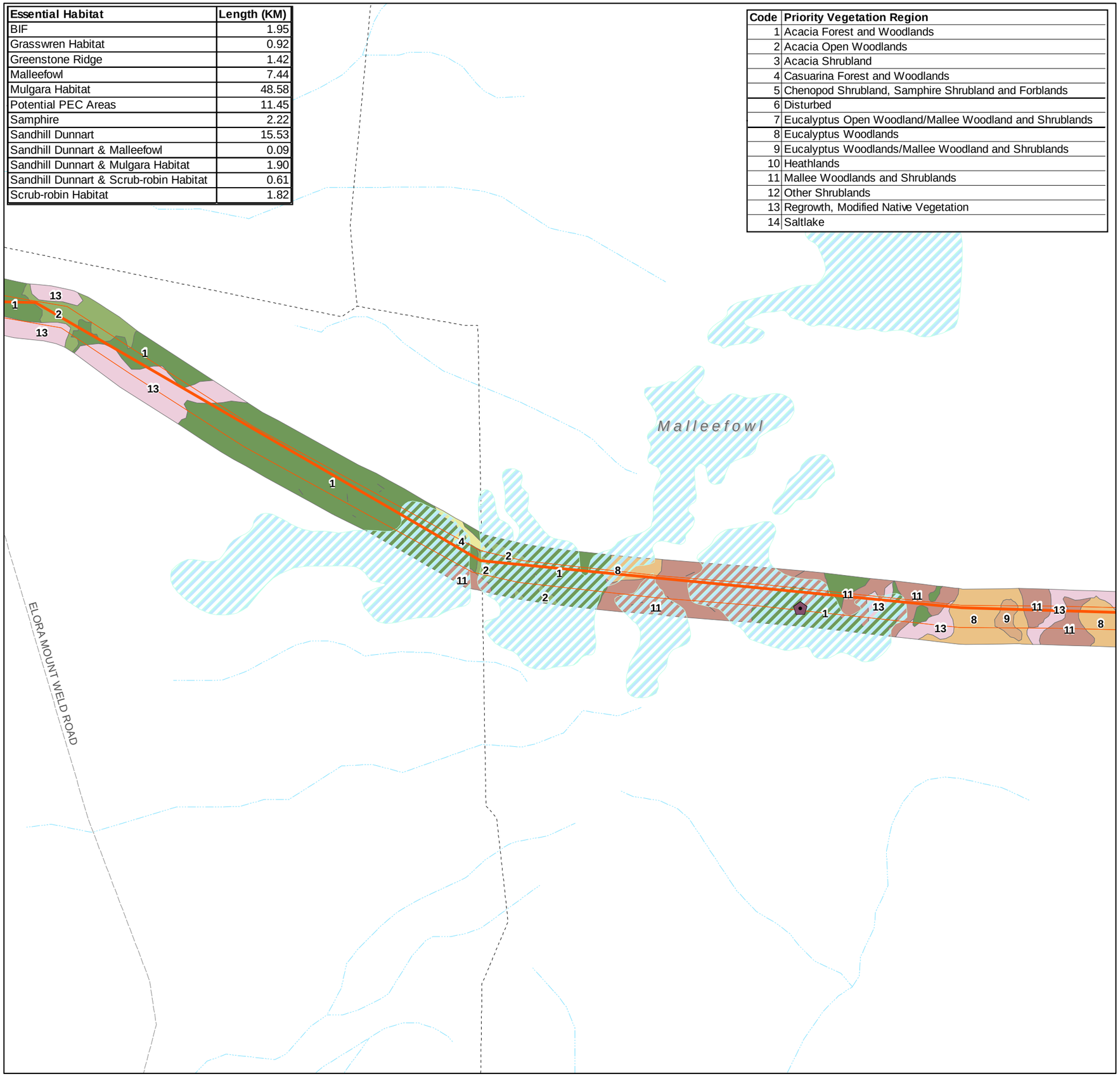
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 12

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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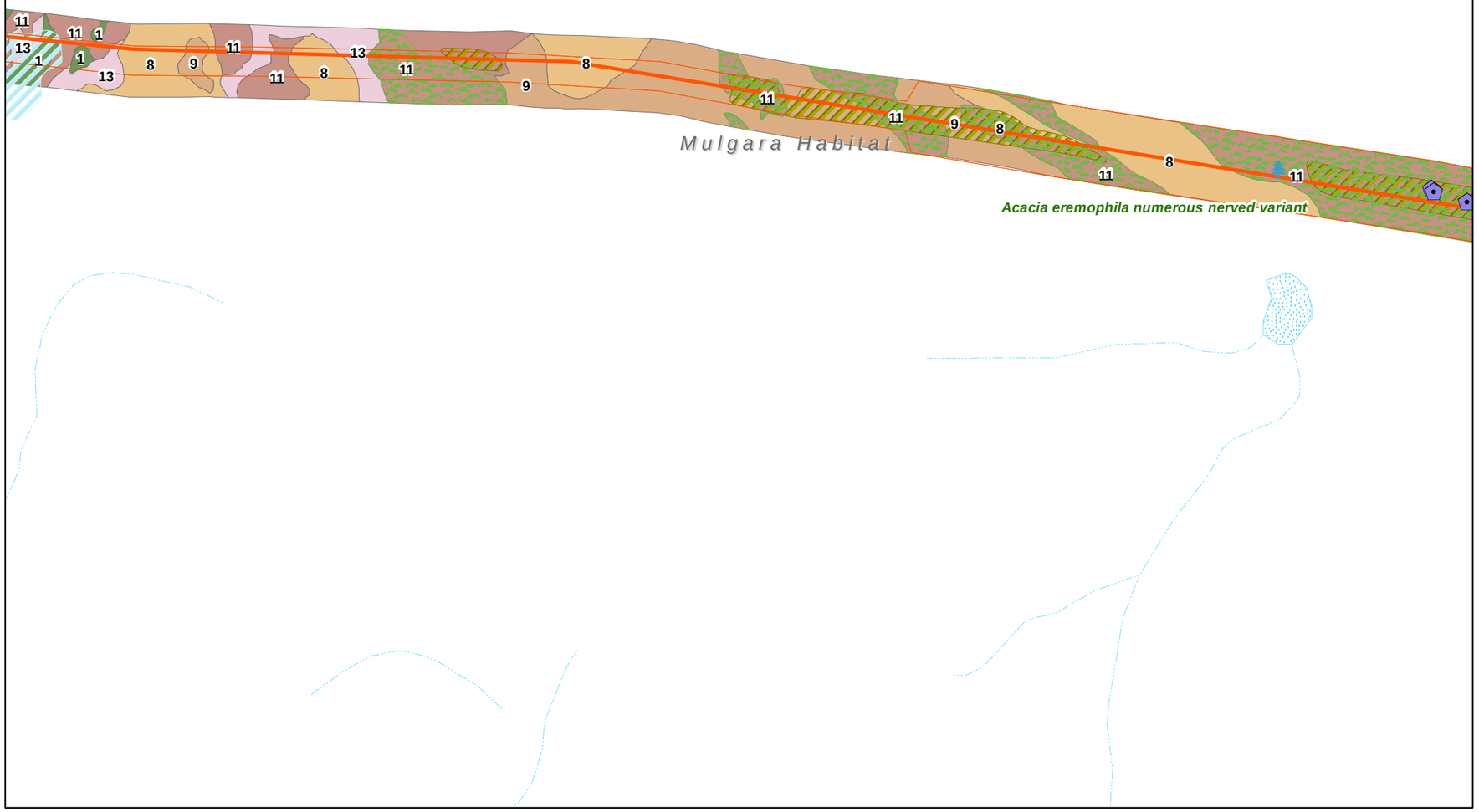
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 13

DATE: 29JUL2014

VERSION: 4

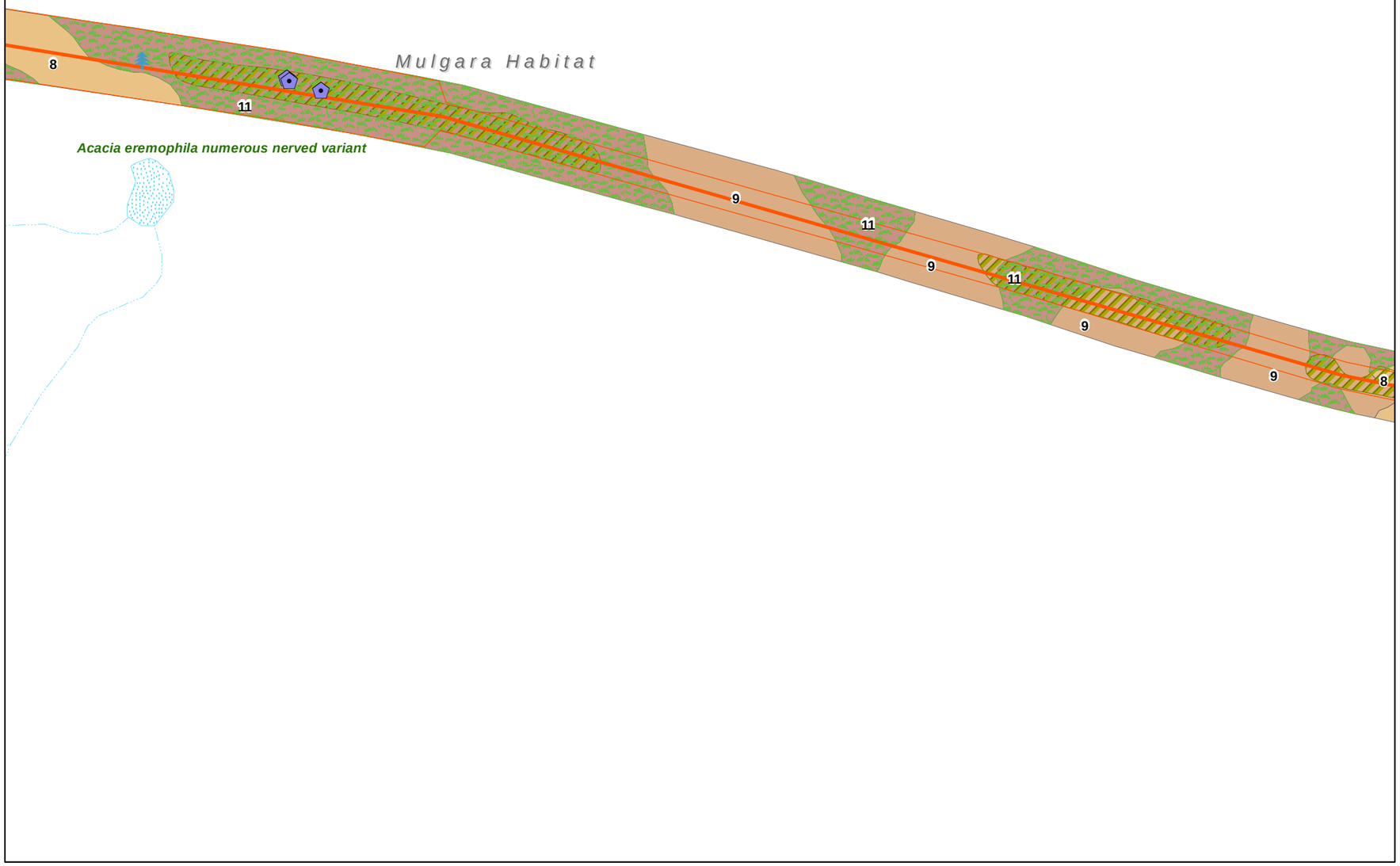
DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
Government of Western Australia (© Department of Envirnment and Conservation)

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
- Mountains/Hills
- Highway
- Secondary Road
- Minor Road
- Track
- Fence
- Railway
- Canal
- River - Non-perennial
- River - Perennial
- Sand Ridges
- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
- Sandhill Dunnart
- Scarlet-chested Parrot
- Southern Marsupial Mole
- Southern Scrub-Robin
- Striated Grasswren
- Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
- European Heritage Sites

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
- Dicrastylis Cundeeleensis
- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 14

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
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Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
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Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
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4	Casuarina Forest and Woodlands
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6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
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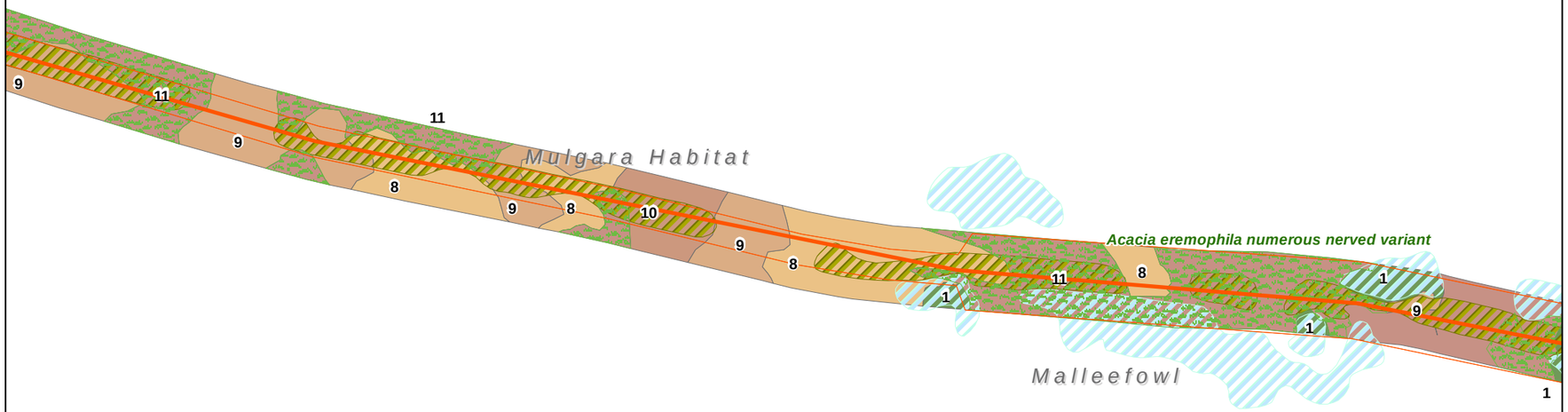
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 15

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
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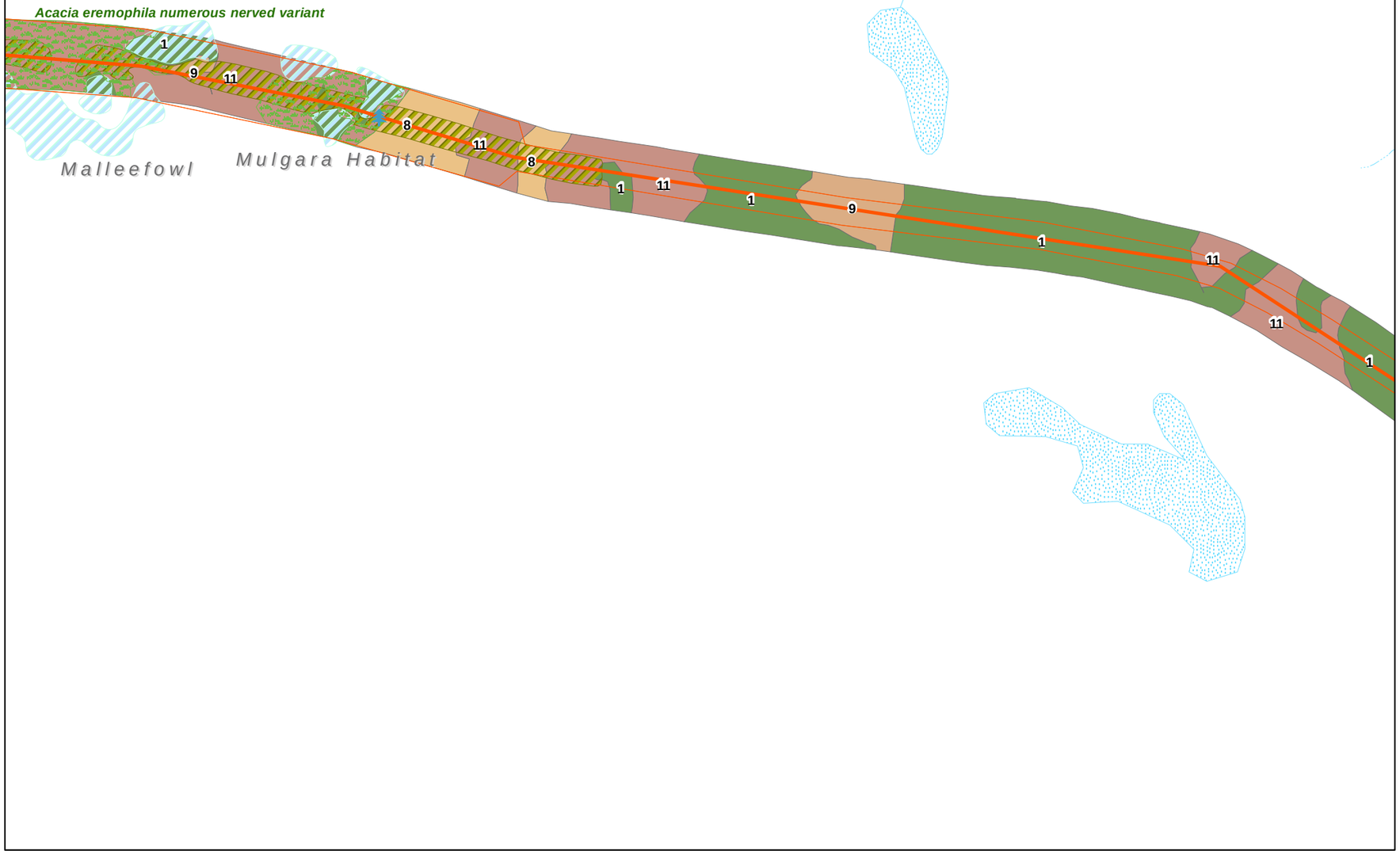
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 16

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
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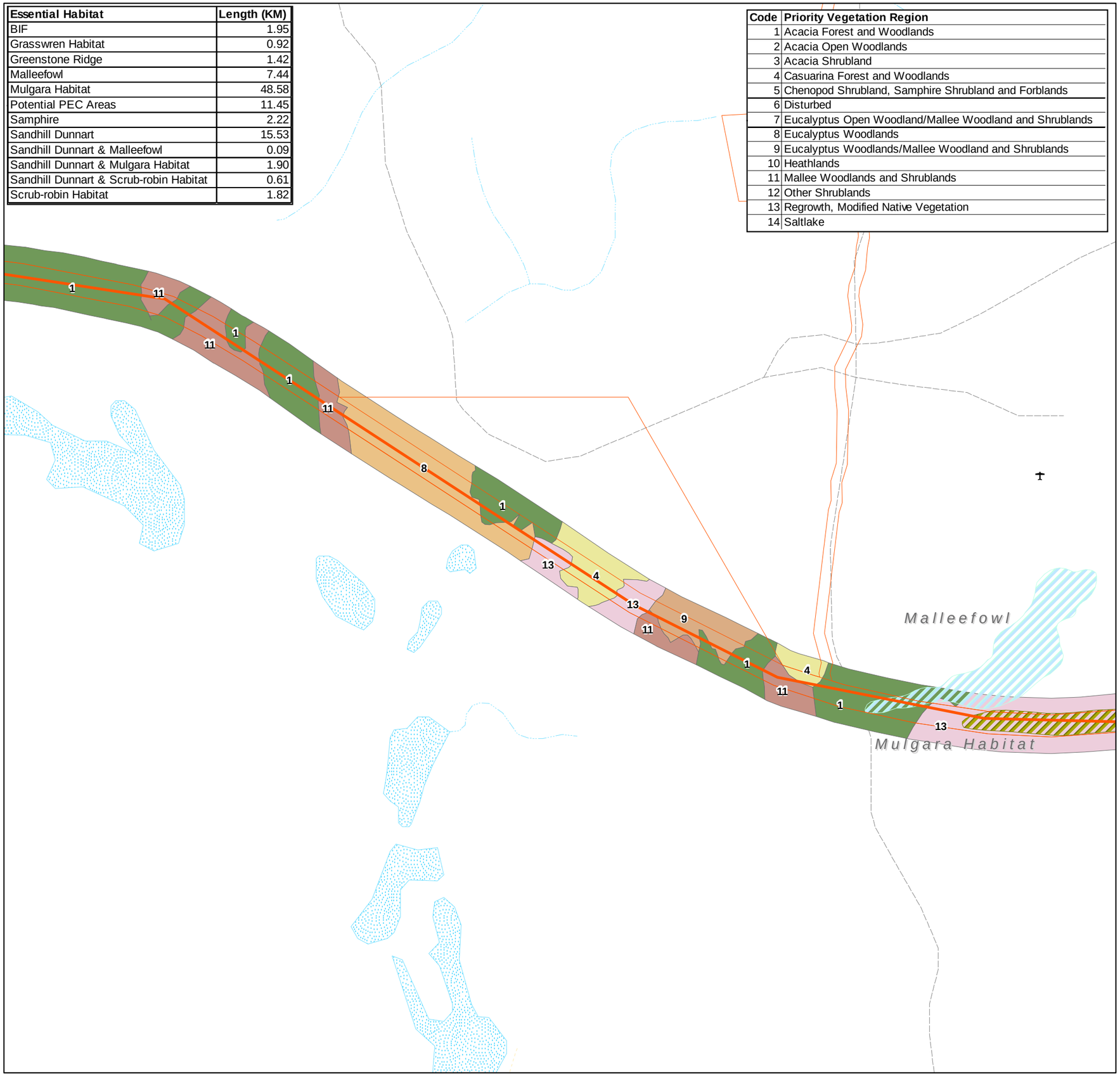
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
- Mountains/Hills
- Highway
- Secondary Road
- Minor Road
- Track
- Fence
- Railway
- Canal
- River - Non-perennial
- River - Perennial
- Sand Ridges
- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
- Sandhill Dunnart
- Scarlet-chested Parrot
- Southern Marsupial Mole
- Southern Scrub-Robin
- Striated Grasswren
- Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
- European Heritage Sites

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
- Dicrastylis Cundeeleensis
- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 17

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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APA Group

Essential Habitat	Length (KM)
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Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
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9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 18

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
Government of Western Australia (© Department of Envirnment and Conservation)

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Sandhill Dunnart & Mulgara Habitat	1.90
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Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
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11	Mallee Woodlands and Shrublands
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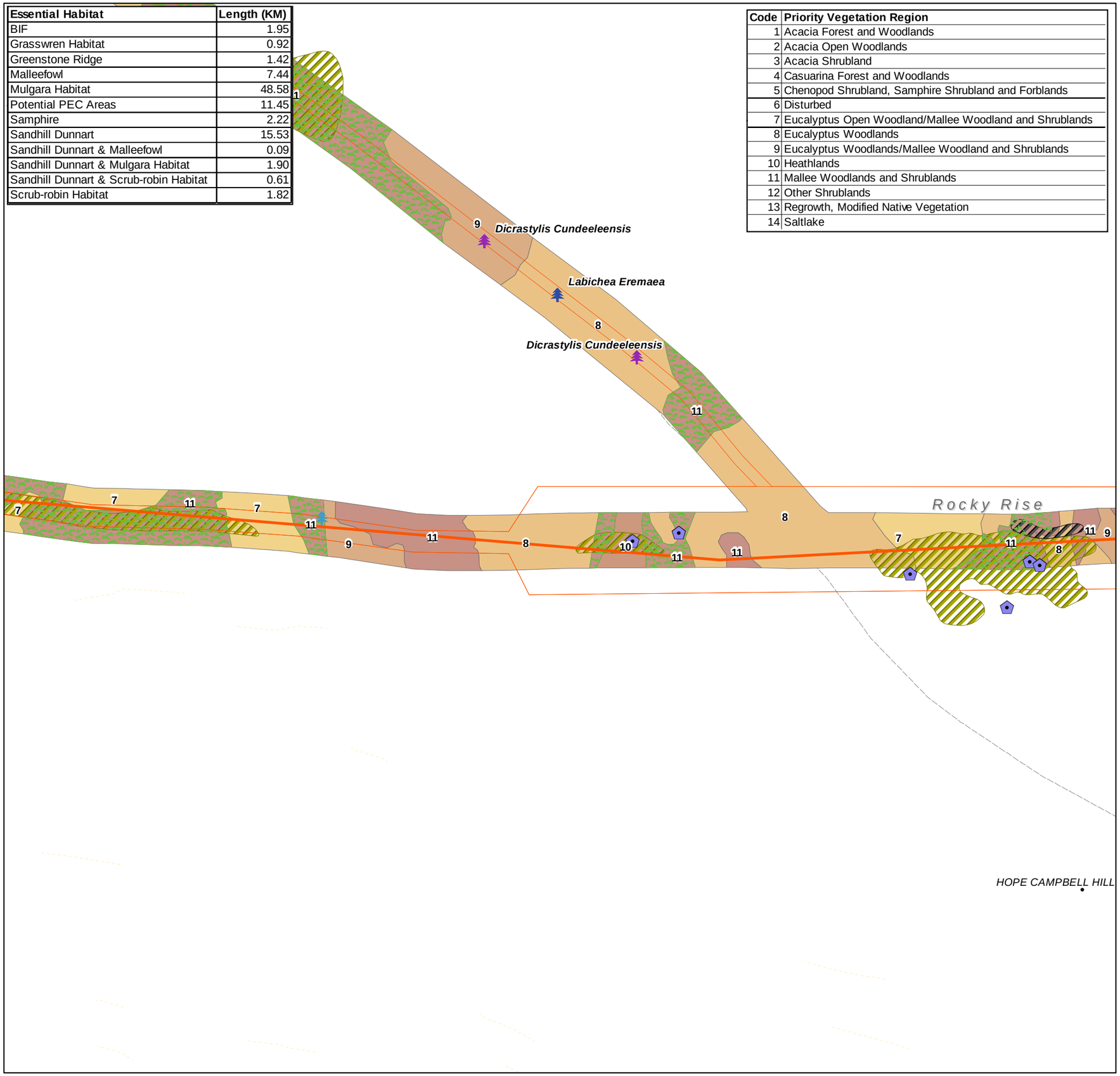
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 19

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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Datum: GDA 1994

APA Group

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Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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2	Acacia Open Woodlands
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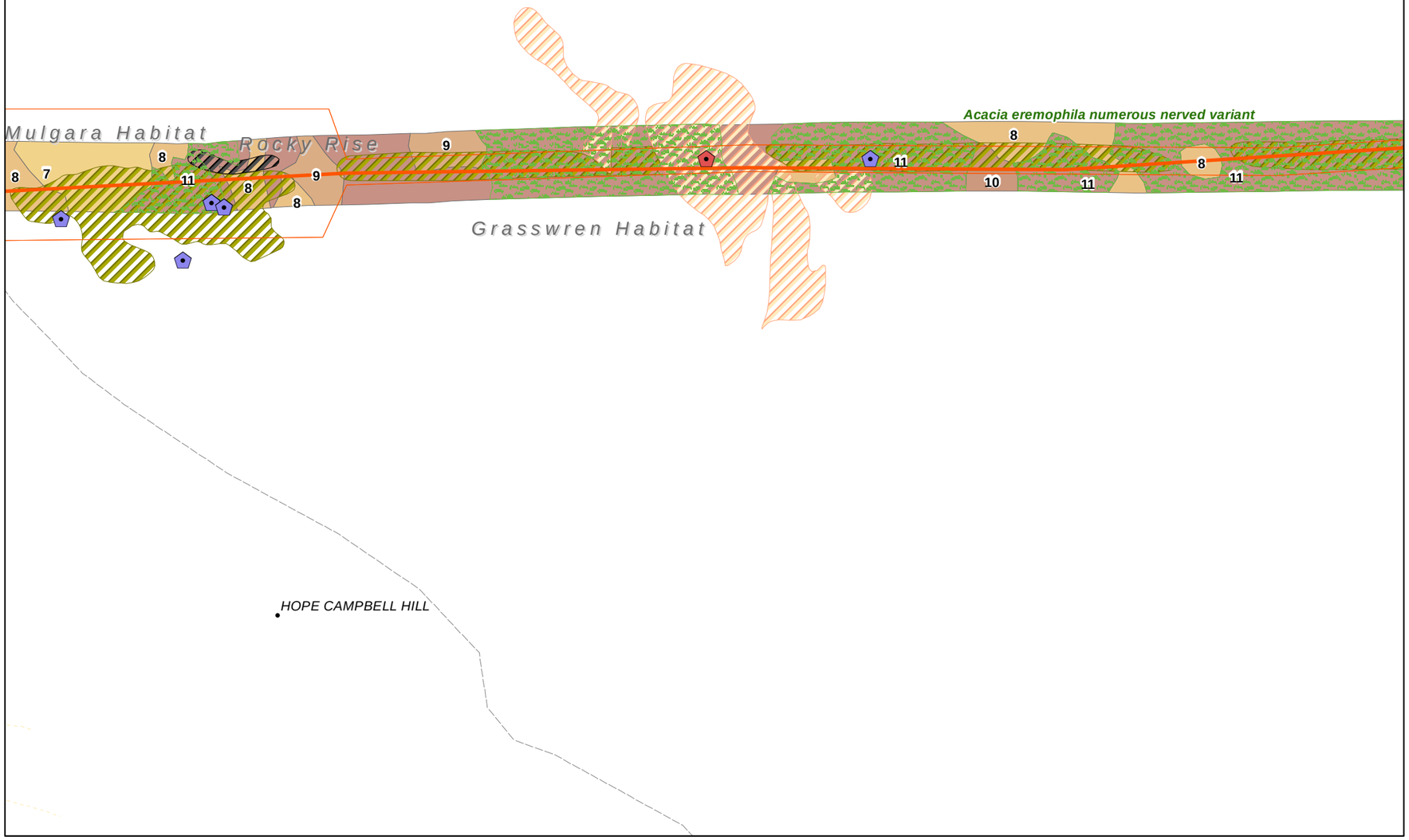
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 20

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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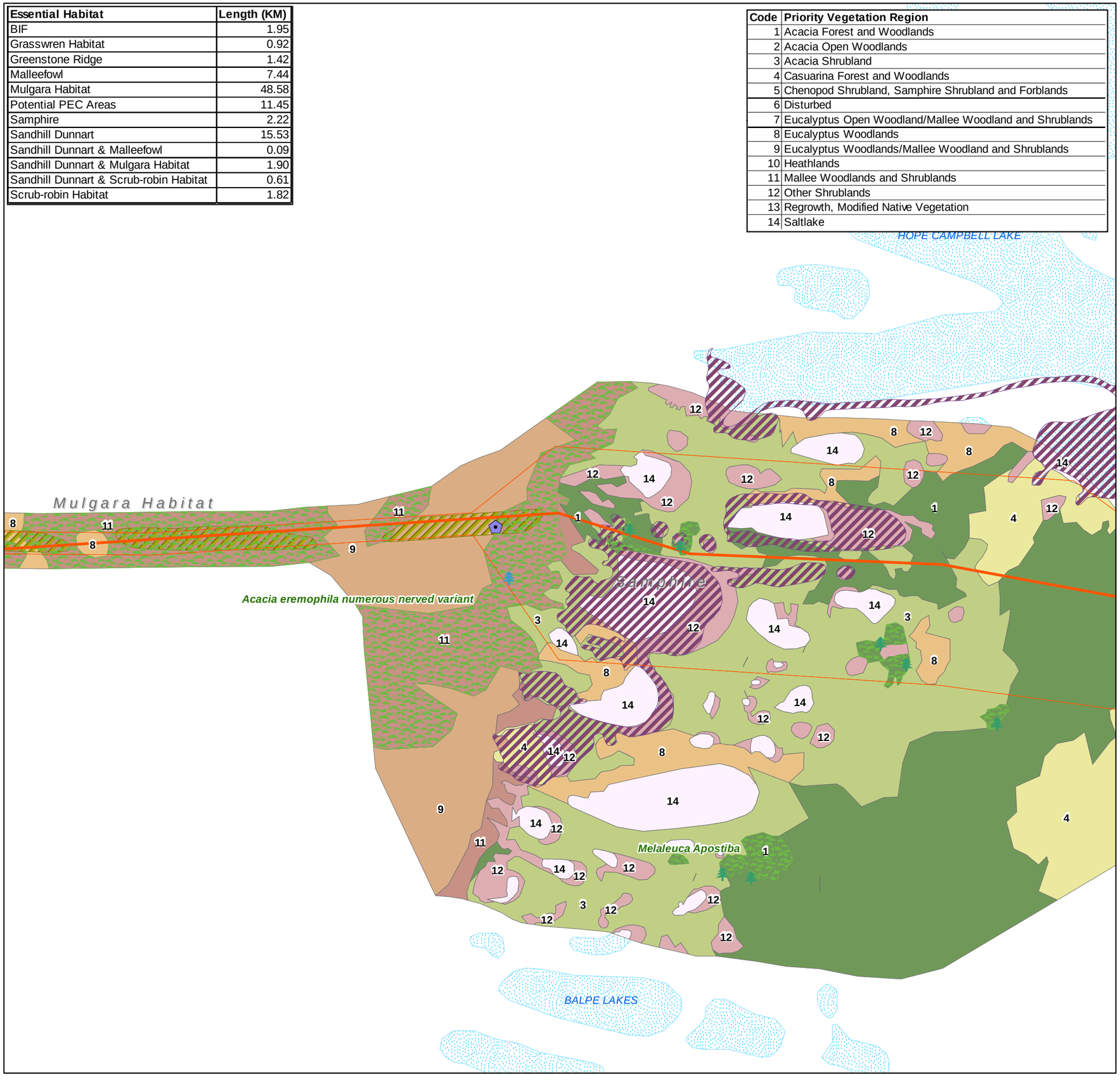
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 21

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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2	Acacia Open Woodlands
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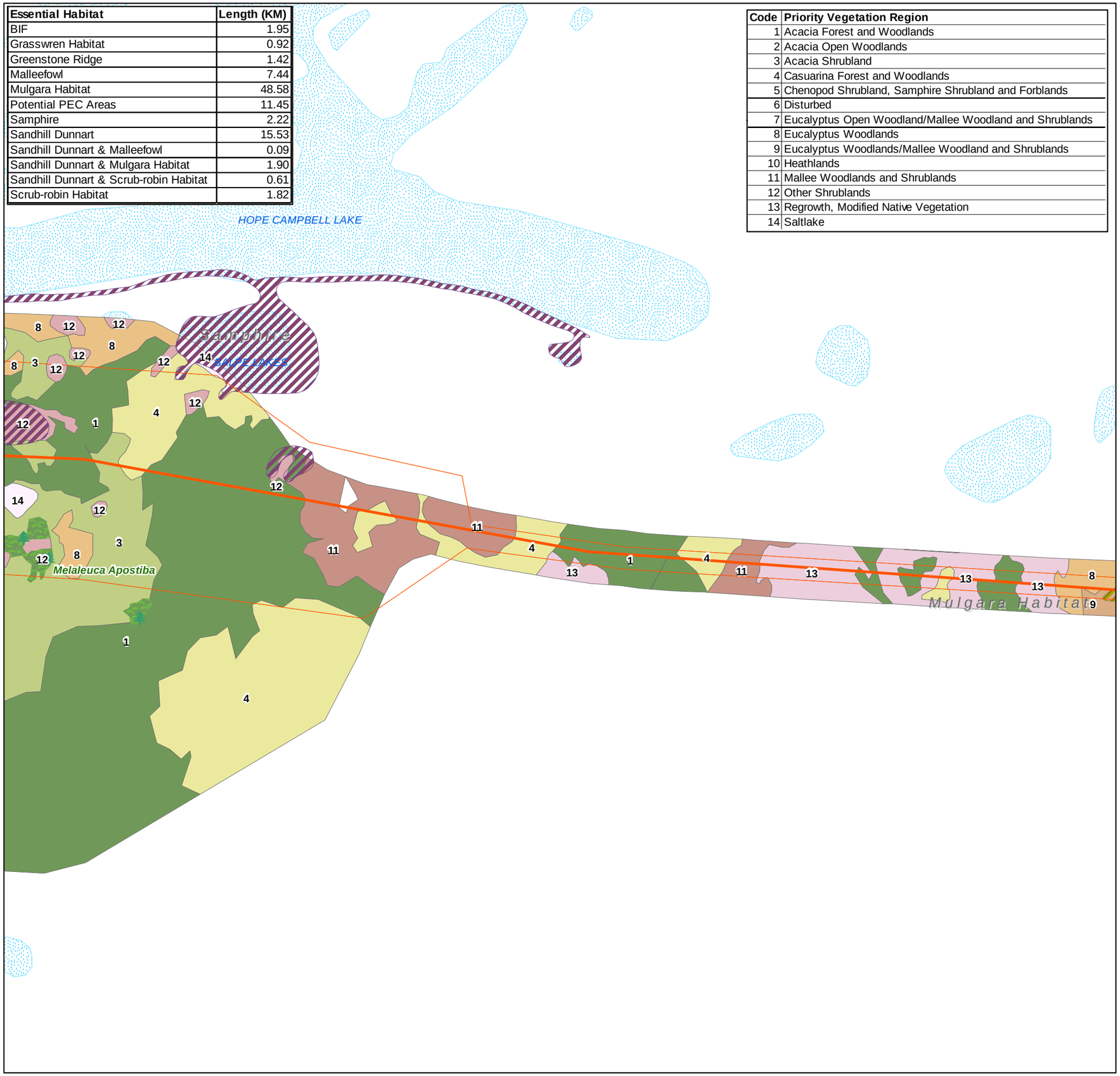
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 22

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
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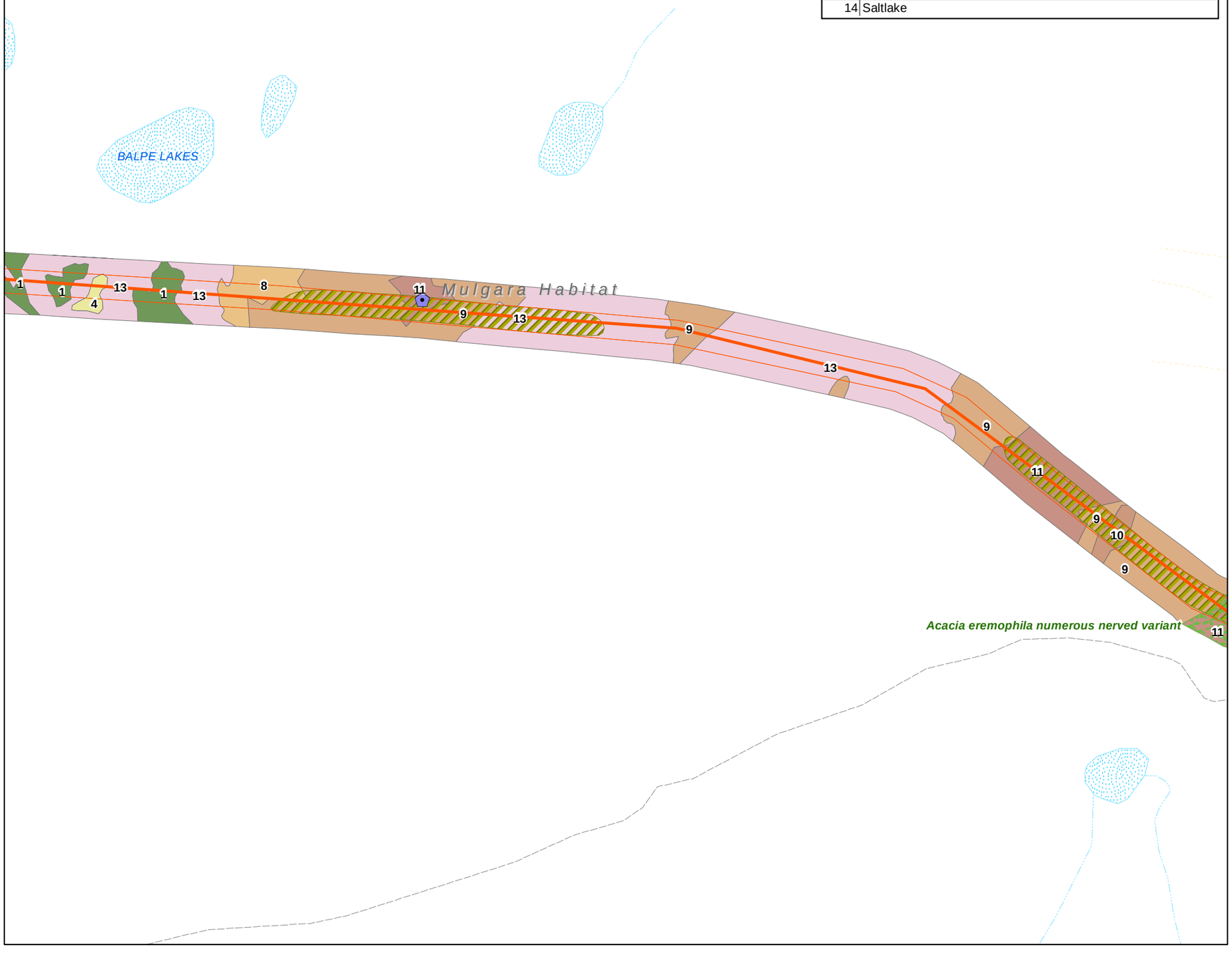
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
- Mountains/Hills
- Highway
- Secondary Road
- Minor Road
- Track
- Fence
- Railway
- Canal
- River - Non-perennial
- River - Perennial
- Sand Ridges
- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
- Sandhill Dunnart
- Scarlet-chested Parrot
- Southern Marsupial Mole
- Southern Scrub-Robin
- Striated Grasswren
- Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
- European Heritage Sites

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
- Dicrastylis Cundeeleensis
- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 23

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
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12	Other Shrublands
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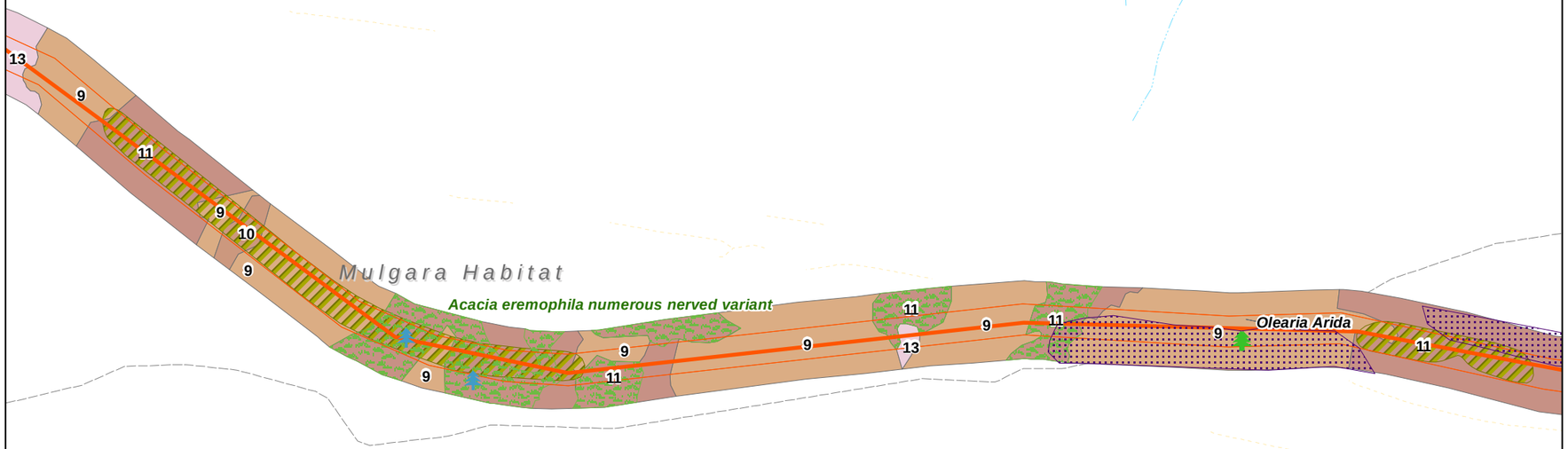
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 24

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
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APA Group

Essential Habitat	Length (KM)
BIF	1.95
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Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
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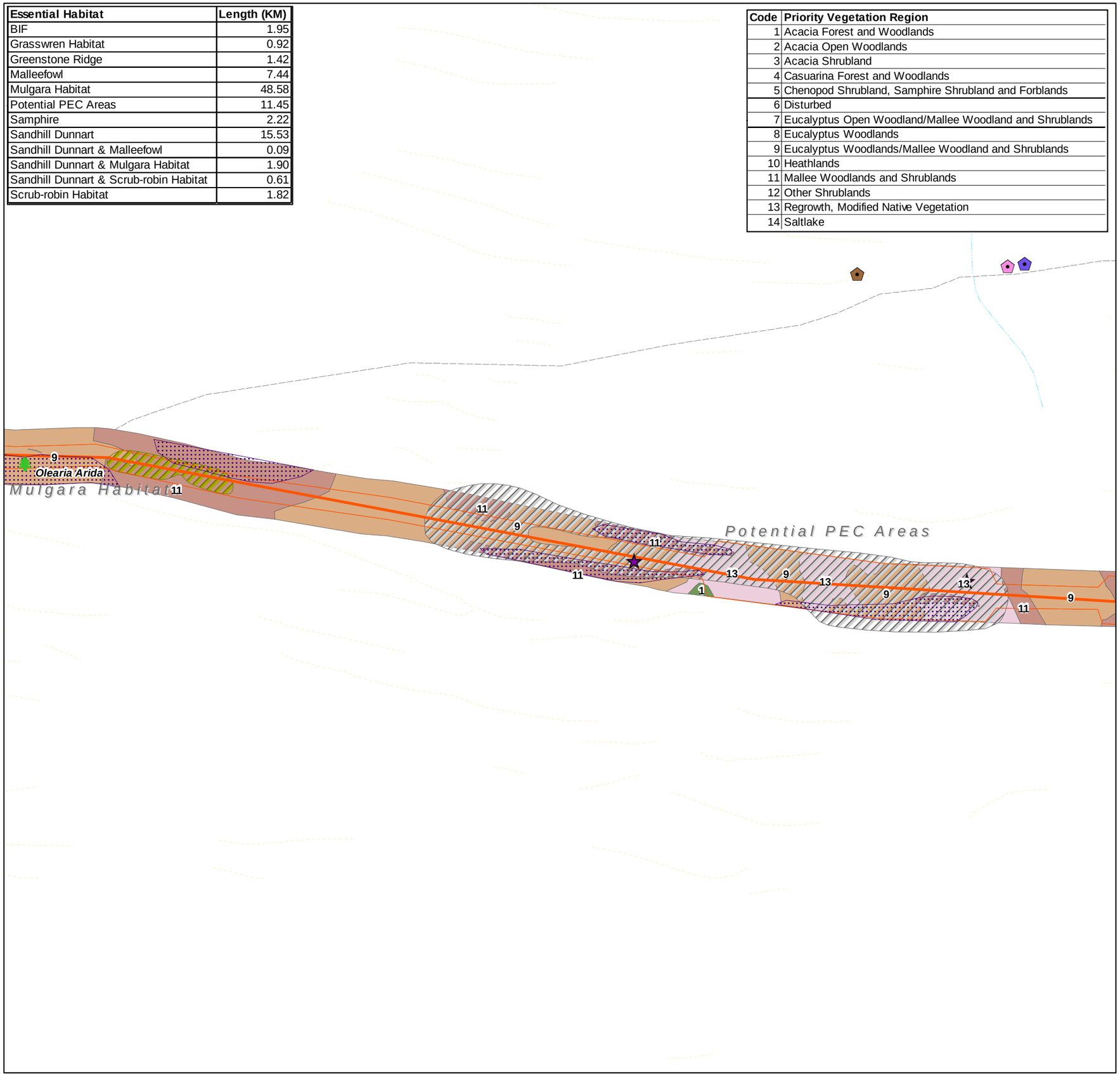
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 25

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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3	Acacia Shrubland
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11	Mallee Woodlands and Shrublands
12	Other Shrublands
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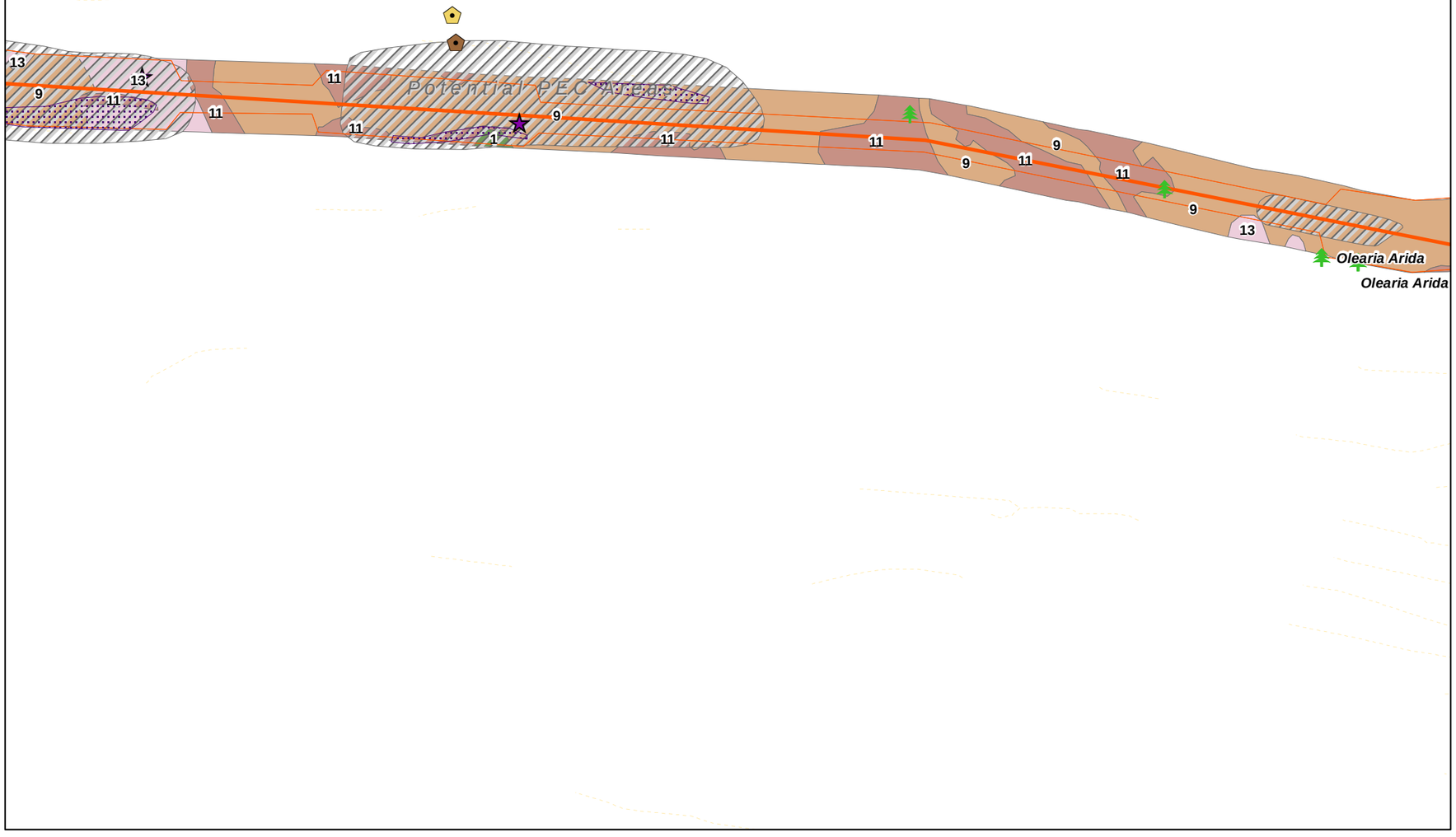
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
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Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 26

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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APA Group

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Code	Priority Vegetation Region
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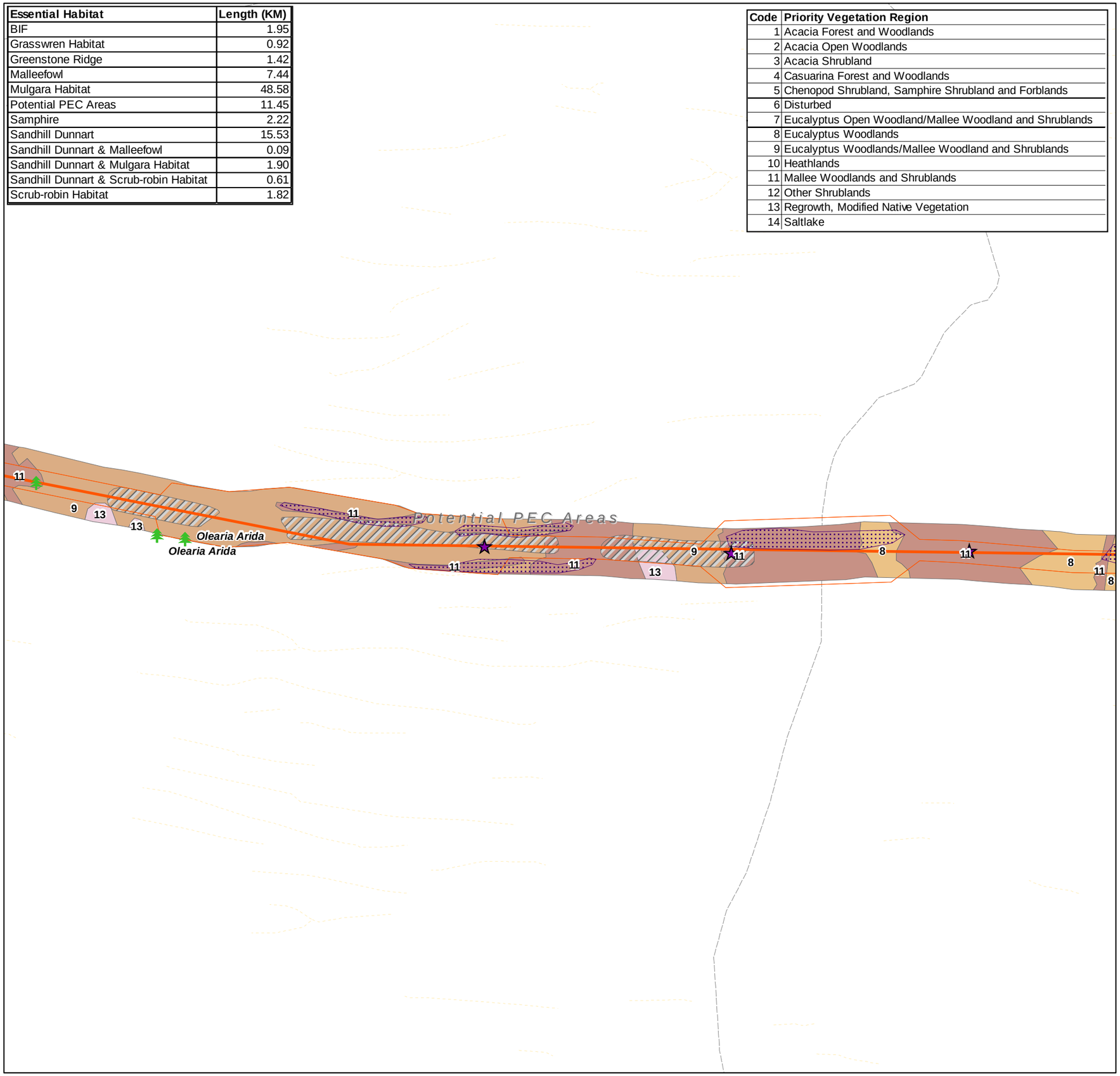
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 27

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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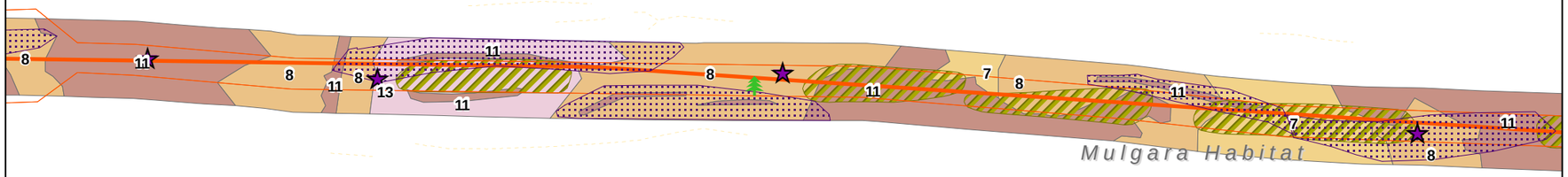
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 28

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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10	Heathlands
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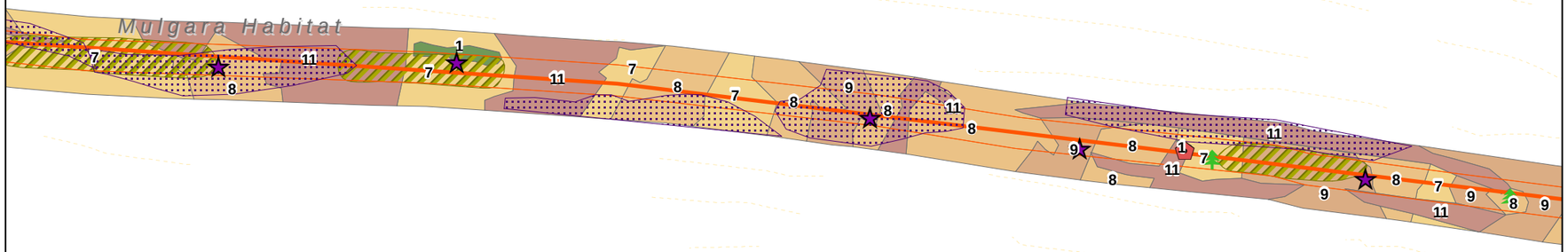
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 29

DATE: 29JUL2014

VERSION: 4

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APA Group

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Scrub-robin Habitat	1.82

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12	Other Shrublands
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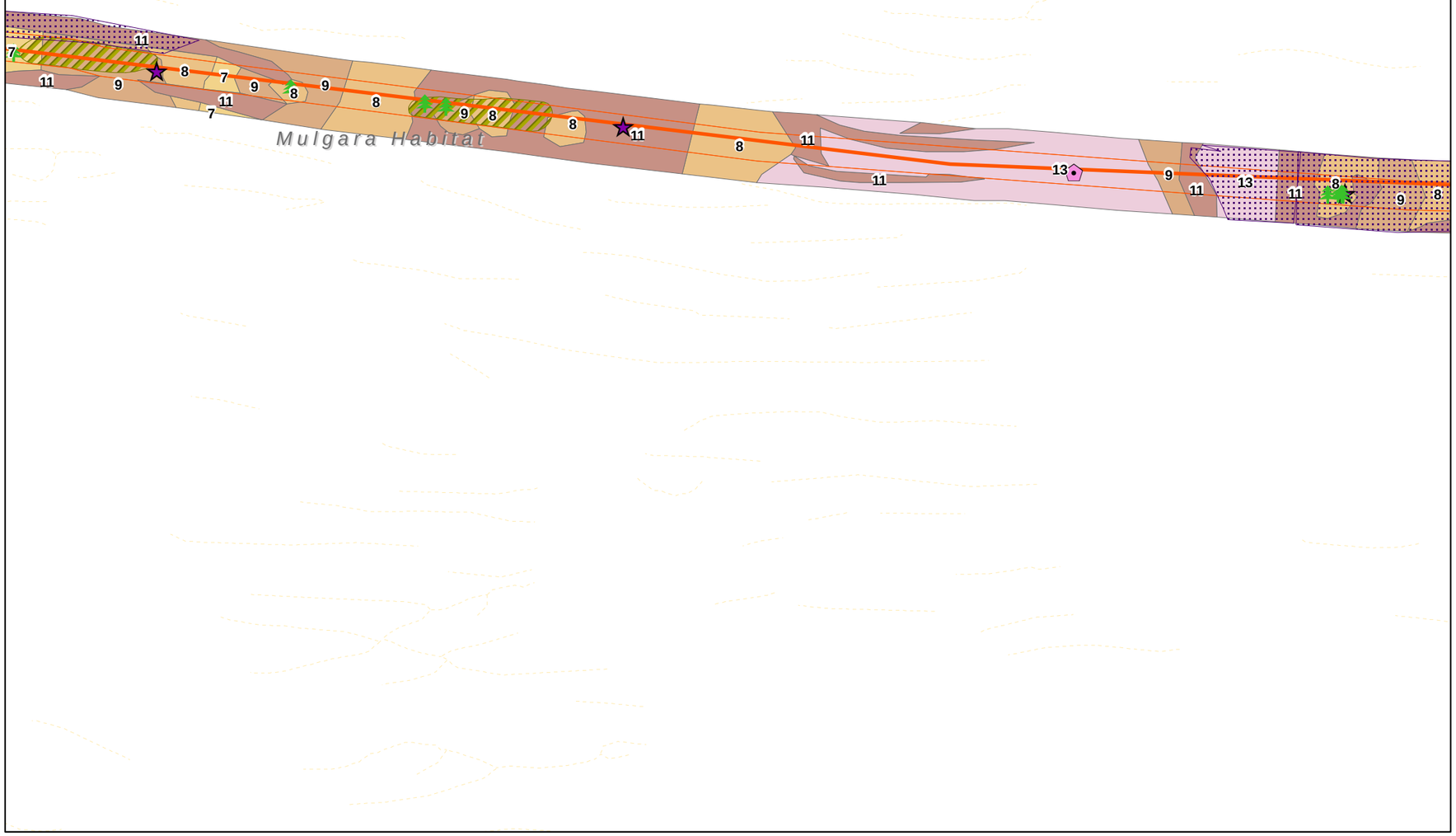

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 30

DATE: 29JUL2014

VERSION: 4

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EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Priority Flora

Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 31

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
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APA Group

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Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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13	Regrowth, Modified Native Vegetation
14	Saltlake

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 32

DATE: 29JUL2014

VERSION: 4

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Sandhill Dunnart & Mulgara Habitat	1.90
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Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
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13	Regrowth, Modified Native Vegetation
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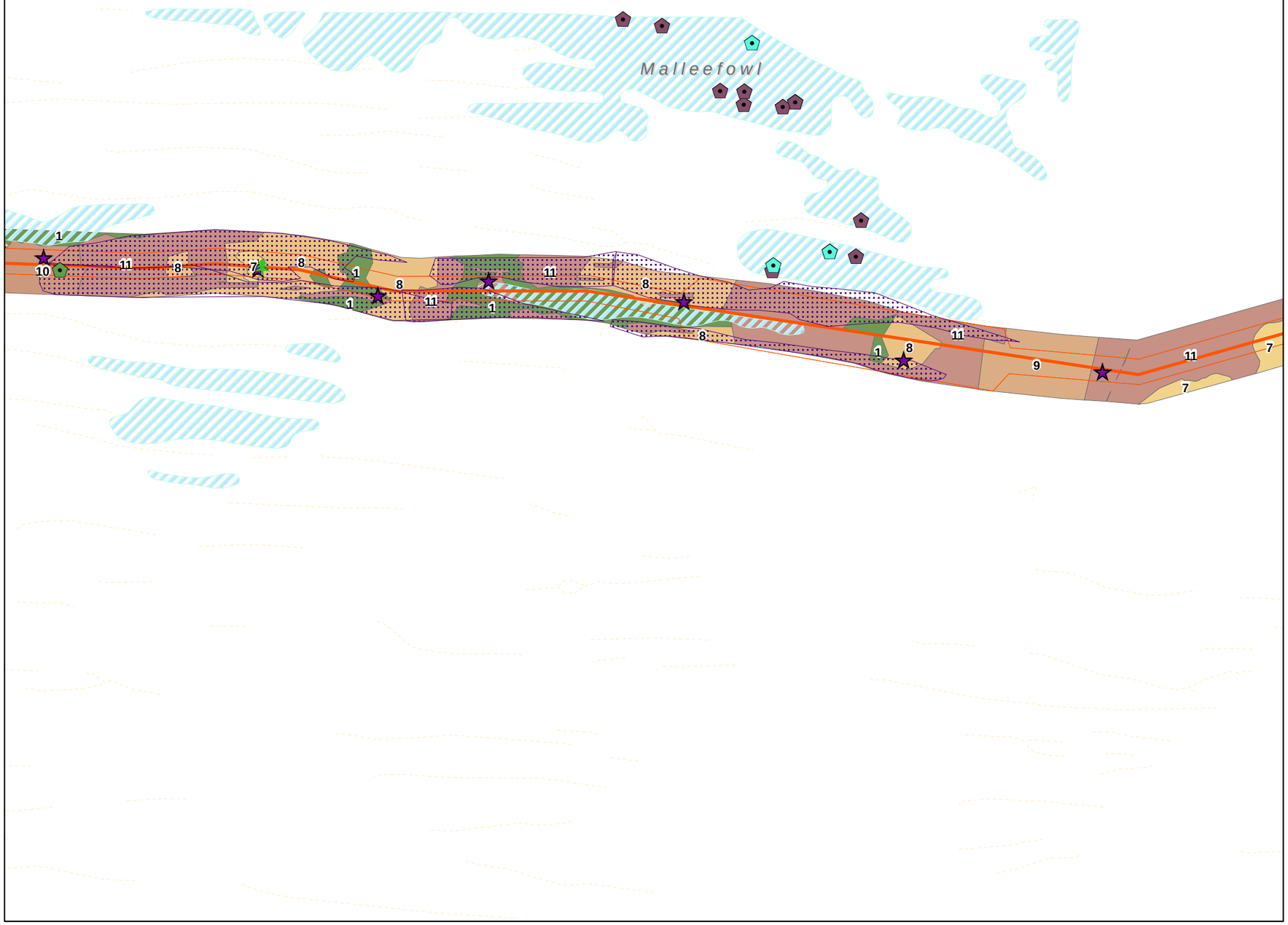

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
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Minor Road
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Fence
Railway
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River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
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Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

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Dicrastylis Cundeeleensis
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Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

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Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 33

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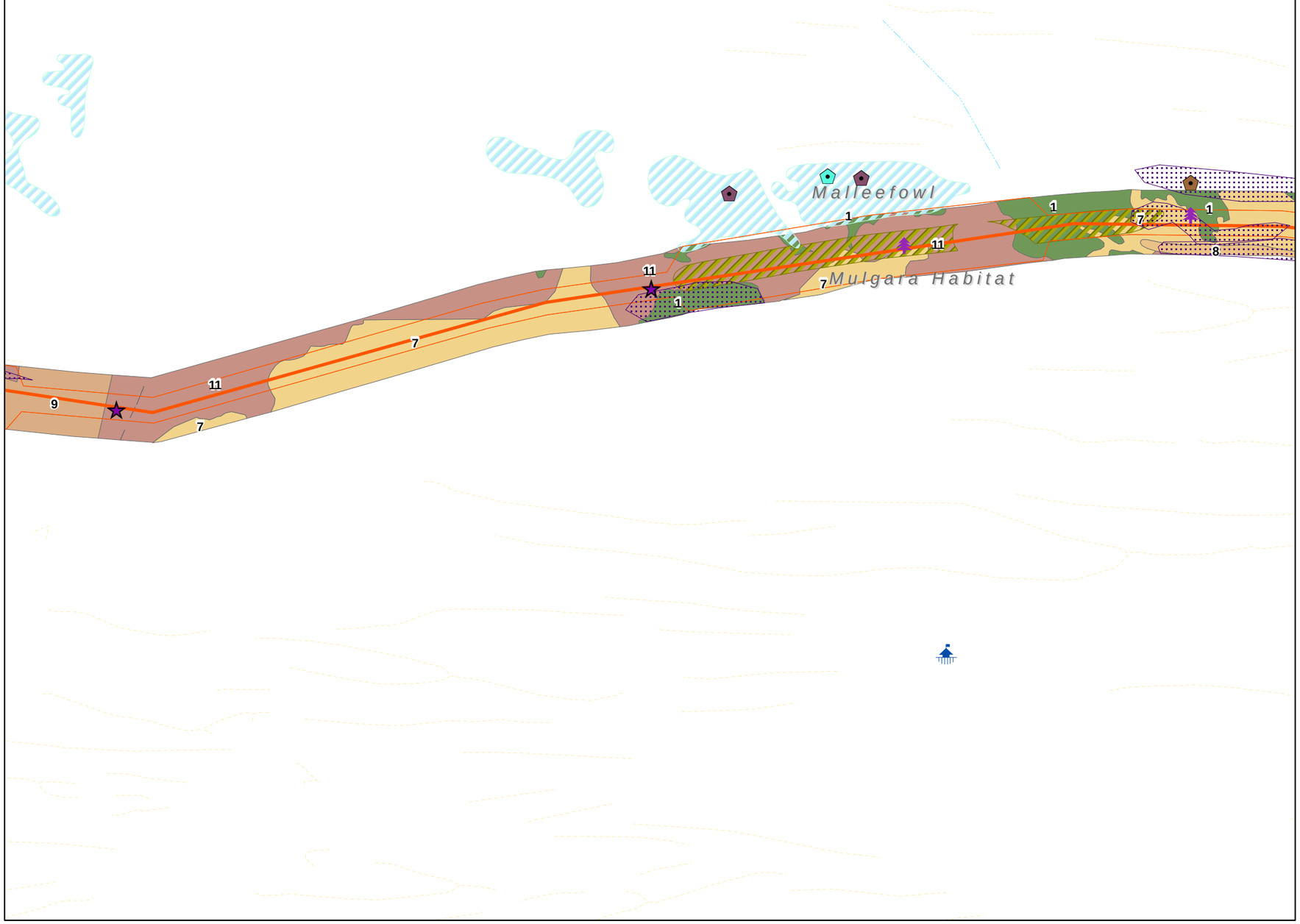

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
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Reserves
Mine
Land Subject To Inundation
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River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat

Habitat Points
Habitat Region

Fauna Sightings

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Brush-tailed Mulgara
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Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
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Fauna Essential Habitat Regions

BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage

European Heritage Sites
European Heritage Sites

Priority Flora

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Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
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Olearia Arida
Priority Flora Regions

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0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 34

DATE: 29JUL2014

VERSION: 4

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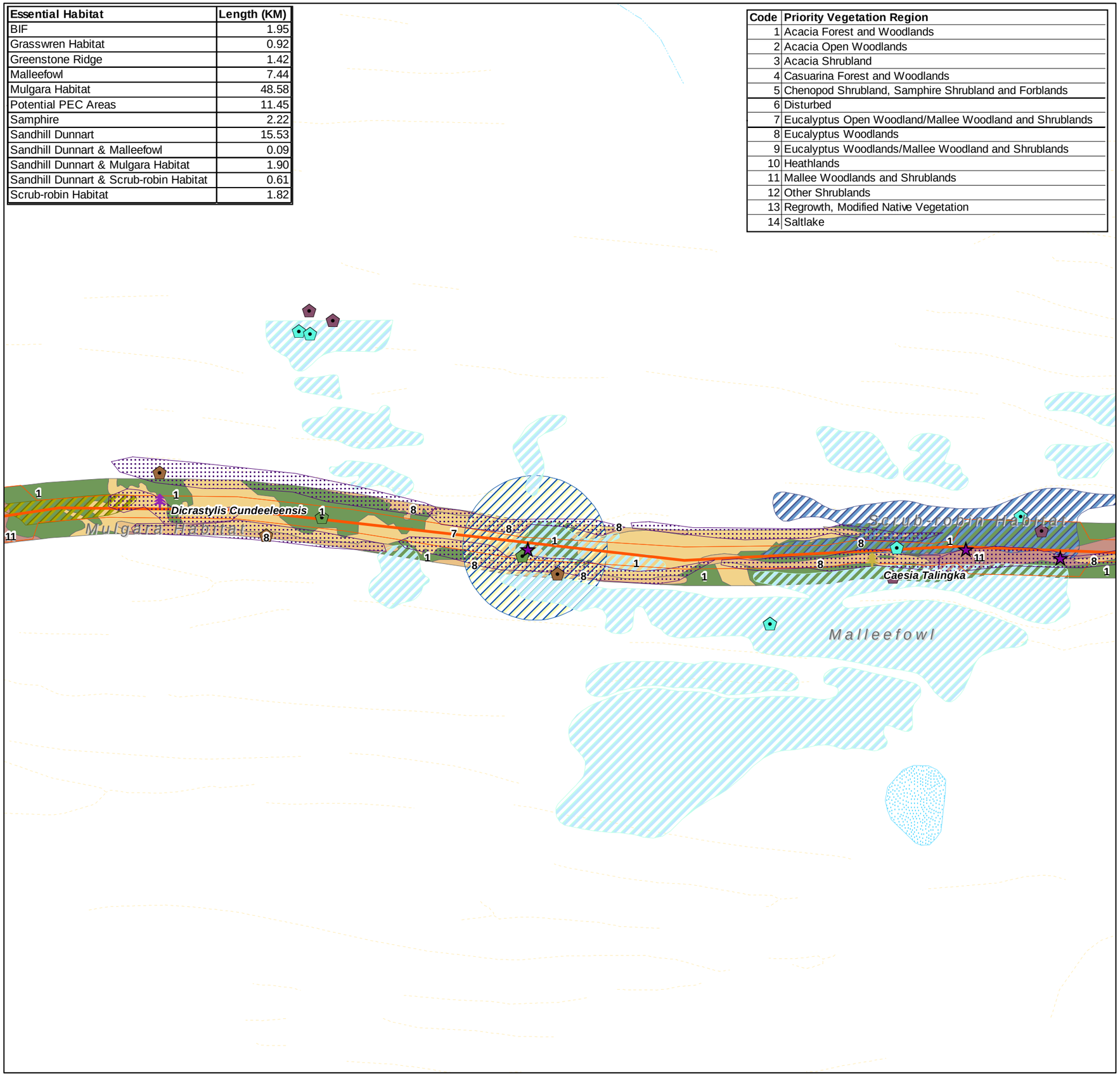
13	Regrowth, Modified Native Vegetation
14	Saltlake



- EGP
- Dacian Deviation
- APA Pipelines
- EGP Construction Licence Area
- Place Name
- Buildings
- Homestead
- Cemetary
- Aircraft Facility
- Mine
- Mountains/Hills
- Highway
- Secondary Road
- Minor Road
- Track
- Fence
- Railway
- Canal
- River - Non-perennial
- River - Perennial
- Sand Ridges
- Large Building
- Recreational Area
- Reserves
- Mine
- Land Subject To Inundation
- Swamp
- River - Non-perennial
- River - Perennial
- Lake - Non-perennial
- Lake - Perennial
- Reservoirs

Sandhill Dunnart Habitat

- Habitat Points
- Habitat Region

Fauna Sightings

- Australian Bustard
- Brush-tailed Mulgara
- Chestnut Quail-Thrush
- Malleefowl
- Rainbow Bee-eater
- Rufous Tree-creeper
- Sandhill Dunnart
- Scarlet-chested Parrot
- Southern Marsupial Mole
- Southern Scrub-Robin
- Striated Grasswren
- Wooley's Pseudoantichinus

Priority Flora

- Acacia eremophila (numerous-nerved)
- Caesia Talingka
- Dicrastylis Cundeeleensis
- Grevillea Inconspicua
- Grevillea Secunda
- Labichea Eremaea
- Melaleuca Apostiba
- Olearia Arida
- Priority Flora Regions

Fauna Essential Habitat Regions

- BIF
- Grasswren Habitat
- Greenstone Ridge
- Malleefowl
- Mulgara Habitat
- Potential PEC areas*
- Rocky Rise
- Samphire
- Scrub-robin Habitat

European Heritage

- European Heritage Sites
- European Heritage Sites

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea, Allocasurina acutivaluis, Mallee, Marble Gum

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Kilometres
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APA Group

Eastern Goldfields Pipeline (EGP)
Map: 35

DATE: 29JUL2014

VERSION: 4

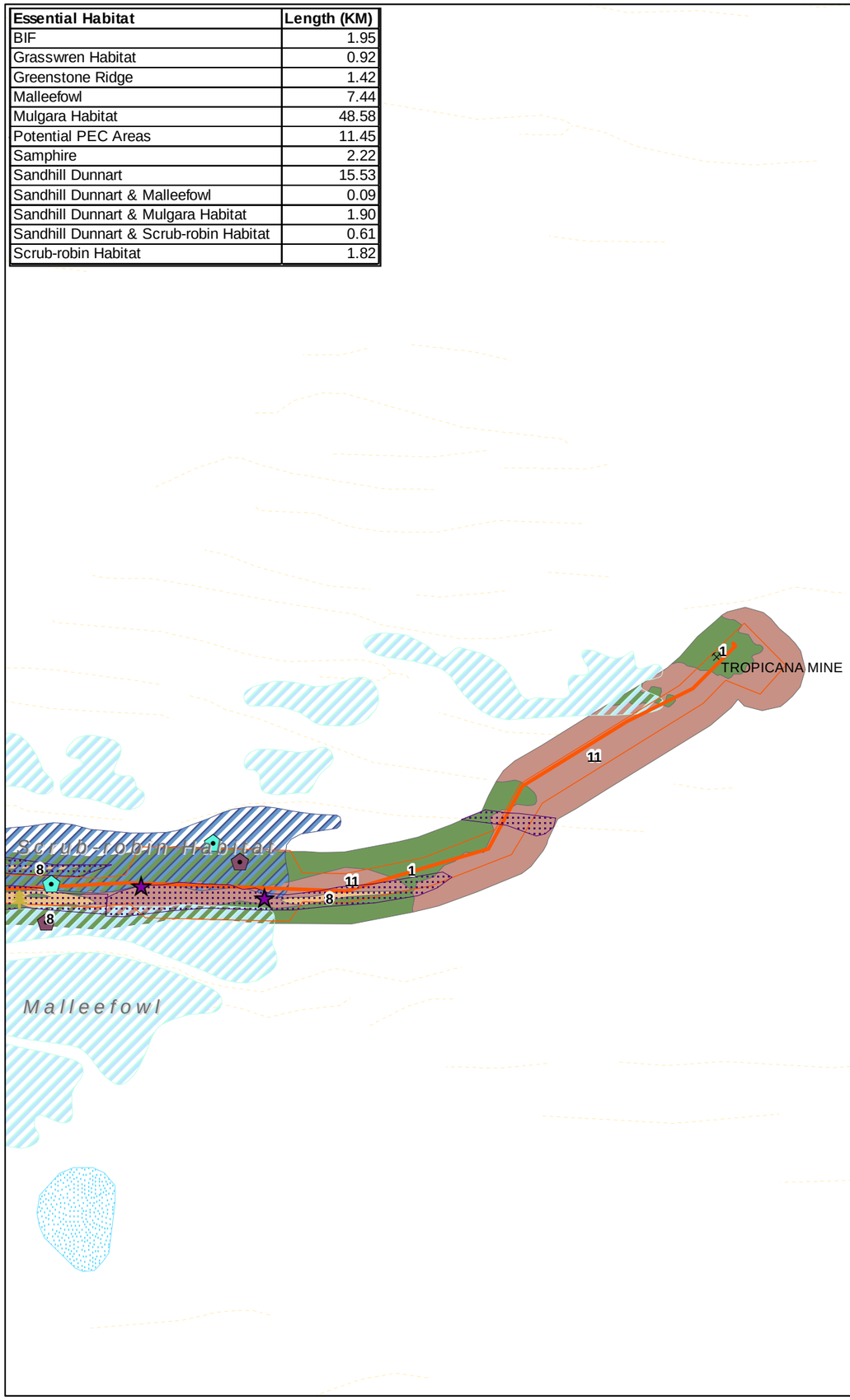
DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
Government of Western Australia (© Department of Envirnment and Conservation)

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake



EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
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Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
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Sandhill Dunnart Habitat

Habitat Points
Habitat Region

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Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
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0 0.25 0.5 1 1.5 2
Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 36

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti,
Geoscience Australia (© Commonwealth of Australia 2013),
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Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

EGP Latitude and longitude - coordinates for each turning point

Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)
121° 54' 58.896"	-28° 47' 22.162"
121° 55' 6.304"	-28° 47' 17.150"
121° 55' 9.065"	-28° 47' 16.141"
121° 55' 36.379"	-28° 46' 57.295"
121° 56' 10.810"	-28° 47' 10.567"
121° 56' 44.673"	-28° 47' 20.779"
122° 0' 51.023"	-28° 47' 16.109"
122° 3' 20.412"	-28° 46' 50.176"
122° 4' 0.602"	-28° 47' 13.593"
122° 4' 24.491"	-28° 47' 8.410"
122° 5' 53.631"	-28° 46' 37.976"
122° 8' 7.950"	-28° 47' 13.164"
122° 8' 38.155"	-28° 47' 20.869"
122° 9' 43.311"	-28° 47' 35.665"
122° 10' 5.194"	-28° 47' 37.466"
122° 10' 43.320"	-28° 47' 11.687"
122° 10' 56.390"	-28° 47' 11.439"
122° 11' 5.841"	-28° 46' 59.417"
122° 11' 25.537"	-28° 46' 39.633"
122° 11' 49.636"	-28° 46' 28.977"
122° 13' 34.453"	-28° 46' 6.153"
122° 14' 2.002"	-28° 46' 24.182"
122° 14' 22.462"	-28° 46' 30.029"
122° 14' 31.598"	-28° 46' 34.118"
122° 14' 34.508"	-28° 46' 39.034"
122° 14' 41.986"	-28° 46' 47.250"
122° 15' 29.165"	-28° 47' 22.294"
122° 15' 58.887"	-28° 47' 25.888"
122° 18' 30.476"	-28° 48' 0.270"
122° 19' 10.832"	-28° 48' 17.562"
122° 19' 5.526"	-28° 48' 28.666"
122° 19' 54.801"	-28° 49' 15.821"
122° 21' 12.766"	-28° 50' 1.012"
122° 21' 29.926"	-28° 50' 25.509"
122° 21' 43.832"	-28° 50' 25.733"
122° 21' 54.422"	-28° 50' 41.236"
122° 24' 37.430"	-28° 52' 16.751"

122° 25' 4.860"	-28° 52' 35.156"
122° 24' 53.161"	-28° 53' 10.635"
122° 25' 32.282"	-28° 55' 2.446"
122° 25' 37.560"	-28° 55' 1.016"
122° 26' 25.424"	-28° 57' 19.643"
122° 26' 34.164"	-28° 57' 24.680"
122° 26' 32.540"	-28° 57' 50.737"
122° 26' 19.301"	-28° 58' 3.811"
122° 26' 9.090"	-28° 59' 25.645"
122° 25' 18.977"	-29° 2' 29.397"
122° 25' 37.045"	-29° 3' 27.105"
122° 26' 29.234"	-29° 3' 26.817"
122° 26' 29.462"	-29° 3' 58.513"
122° 26' 14.417"	-29° 4' 12.446"
122° 26' 13.434"	-29° 5' 25.796"
122° 26' 21.084"	-29° 5' 25.875"
122° 26' 21.085"	-29° 5' 25.783"
122° 26' 20.429"	-29° 5' 25.776"
122° 26' 20.538"	-29° 5' 17.694"
122° 26' 47.213"	-29° 5' 0.462"
122° 27' 6.551"	-29° 5' 0.476"
122° 27' 6.572"	-29° 4' 36.313"
122° 31' 56.248"	-29° 4' 4.856"
122° 32' 44.527"	-29° 3' 57.911"
122° 35' 6.731"	-29° 4' 0.963"
122° 37' 34.551"	-29° 5' 16.820"
122° 40' 14.764"	-29° 5' 31.018"
122° 42' 5.149"	-29° 5' 34.103"
122° 46' 23.611"	-29° 6' 11.604"
122° 50' 23.391"	-29° 7' 12.505"
122° 52' 56.155"	-29° 7' 39.532"
122° 54' 31.500"	-29° 7' 46.531"
122° 55' 25.248"	-29° 7' 55.812"
122° 56' 10.839"	-29° 8' 7.802"
122° 59' 19.152"	-29° 8' 33.459"
123° 1' 55.654"	-29° 10' 2.913"
123° 2' 43.435"	-29° 10' 24.058"
123° 3' 52.459"	-29° 10' 36.053"
123° 7' 8.231"	-29° 10' 40.249"
123° 11' 50.812"	-29° 11' 0.594"
123° 14' 9.903"	-29° 10' 53.865"
123° 15' 56.594"	-29° 10' 52.360"

123° 17' 20.389"	-29° 10' 52.715"
123° 20' 31.675"	-29° 10' 41.391"
123° 21' 15.548"	-29° 10' 53.112"
123° 22' 39.526"	-29° 10' 56.096"
123° 25' 27.596"	-29° 11' 22.674"
123° 30' 22.163"	-29° 11' 40.440"
123° 31' 37.501"	-29° 11' 56.141"
123° 33' 11.378"	-29° 12' 56.247"
123° 33' 52.685"	-29° 13' 3.610"
123° 35' 41.134"	-29° 12' 52.609"
123° 37' 0.827"	-29° 12' 54.151"
123° 40' 36.402"	-29° 13' 28.721"
123° 45' 8.602"	-29° 13' 42.027"
123° 47' 54.609"	-29° 14' 9.925"
123° 53' 8.204"	-29° 14' 11.661"
123° 57' 59.221"	-29° 14' 26.902"
124° 4' 21.471"	-29° 15' 4.907"
124° 8' 46.014"	-29° 15' 12.423"
124° 10' 13.555"	-29° 15' 12.705"
124° 11' 5.119"	-29° 15' 18.247"
124° 13' 18.618"	-29° 15' 18.182"
124° 15' 23.941"	-29° 15' 20.881"
124° 15' 44.628"	-29° 15' 19.506"
124° 16' 8.774"	-29° 15' 20.763"
124° 16' 36.387"	-29° 15' 25.939"
124° 17' 32.618"	-29° 15' 25.356"
124° 20' 12.654"	-29° 15' 45.044"
124° 22' 5.210"	-29° 15' 16.099"
124° 24' 37.058"	-29° 14' 54.741"
124° 25' 36.331"	-29° 14' 54.752"
124° 28' 5.506"	-29° 15' 7.866"
124° 29' 35.627"	-29° 15' 2.896"
124° 30' 31.890"	-29° 15' 4.094"
124° 31' 8.279"	-29° 14' 54.205"
124° 31' 16.697"	-29° 14' 40.108"
124° 31' 43.368"	-29° 14' 25.195"
124° 32' 0.203"	-29° 14' 17.677"
124° 32' 10.899"	-29° 14' 7.918"
124° 32' 10.271"	-29° 14' 7.403"
124° 32' 10.615"	-29° 14' 7.108"
122° 18' 40.224"	-28° 48' 4.448"
122° 19' 5.526"	-28° 48' 28.666"

122° 2' 35.016"	-28° 46' 58.062"
122° 2' 37.129"	-28° 47' 1.912"
122° 2' 41.297"	-28° 47' 3.893"
122° 3' 27.415"	-28° 47' 46.696"
122° 4' 46.616"	-28° 47' 34.934"
122° 5' 53.631"	-28° 46' 37.976"

EGP Associated Tenure

Mining Lease	Exploration Licence	Prospecting Licence	Miscellaneous Licence
M 3800389	E 3801652	P 3803669	L 3800048
M 3800396	E 3802301	P 3803796	L 3800144
M 3800397	E 3802784	P 3803797	L 3800209
M 3800440	E 3802795	P 3804125	L 3800223
M 3800525	E 3802822	P 3904682	L 3900031
M 3800532	E 3802873	P 3905134	L 3900058
M 3800533	E 3802888	P 3905135	L 3900059
M 3800548	E 3802893	P 3905284	L 3900120
M 3800595	E 3802942	P 3905358	L 3900121
M 3800726	E 3900950	P 3905469	L 3900136
M 3800848	E 3901284		L 3900163
M 3800849	E 3901306		L 3900204
M 3900018	E 3901310		L 3800105
M 3900217	E 3901614		L 3900225
M 3900248	E 3901744		L 3900226
M 3900250	E 3901748		L 3900227
M 3900261	E 3901748		L 3900228
M 3900273	E 3901771		L 3900229
M 3900282	E 3901780		
M 3900301	E 3901796		
M 3900348	E 3901797		
M 3900359	E 3901801		
M 3900366	E 3901802		
M 3900395			
M 3900403			
M 3900423			
M 3900441			
M 3900501			
M 3900504			
M 3900737			
M 3900745			
M 3900868			
M 3900979			
M 3900980			
M 3901014			
M 3901015			
M 3901018			
M 3901088			
M 3901092			

MURRIN MURRIN TO TGM GAS LATERAL - ENVIRONMENTAL RISK ASSESSMENT

ASPECT	POTENTIAL IMPACT	INHERENT RISK	MITIGATION MEASURES	RESIDUAL RISK
Stakeholder liaison	Inappropriate stakeholder liaison causes complaints and delays to project	E	Advise stakeholders of future activities, timing and potential implications for them. Implement agreed stakeholder requirements for land access (e.g. close gates to paddocks, work undertaken at certain times).	M
Clear vegetation and grade	Loss or degradation/fragmentation of vegetation, flora and fauna habitat (including cons. sig. species)	E	Reduce working width to 25 m through Schedule 1 Area, buffer zones for two PECs (Murrin Murrin to SDGM section), mapped fauna habitat for Malleefowl, Mulgara, Grasswren, potential Sandhill Dunnart and samphire communities. Internal approval process for all clearing and ground disturbance will be implemented. All areas requiring clearing will be clearly delineated (with pegs and flagging tape) to minimise the risk of overclearing. No clearing or disturbance during construction outside of pre-defined clearing areas. Ensure that all known "No Go" areas are clearly demarcated and protected from damage. "No go" areas will include conservation significant habitats, heritage sites, or protected vegetation communities that are not to be cleared. The demarcation will be removed at the end of construction to discourage people from investigating the areas. Known locations of Priority flora will be avoided where reasonably practical. Potential habitat trees will be marked prior to clearing with a view of retaining the trees. Where large trees (>300mm) are removed they will be salvaged and stockpiled for use during rehabilitation. Cleared vegetation will be stockpiled away from drainage lines. No deliberate burning of vegetation spoil to occur. Rehabilitate corridor as soon as practicable (majority of disturbance is expected to be temporary).	H
	Loss of individual fauna (including cons. sig. fauna)	E	Pre-clearing survey to relocate fauna from the pipeline corridor (including inspection of any hollows). Vehicle/machinery speed limits restricted to 40km/hr during clearing activities. Fauna handler available during clearing activities to relocate any additional fauna found.	M
	Introduction or spread of weeds and/or disease	E	Strict vehicle hygiene practise will be adopted by staff and contractors, with all machinery, vehicles and plant to be free of soil and vegetative matter upon arrival to site. An inspection of machinery/vehicle/plant will be conducted upon arrival on site to confirm. Strict vehicle hygiene practice will be adopted by staff and contractors, with all machinery, vehicles and plant to be free of soil and vegetative matter when moving between weed infested and uninfested areas. Undertake regular inspections to record new observations of invasive flora infestations or changes in invasive flora disrtibution.	L

	Alteration of local surface water flows (e.g. for access roads)	E	Implement measures to maintain surface water flows (e.g. pipes installed beneath access roads to maintain connectivity).	M
	Generation of dust, with associated impacts to sensitive premises and flora/fauna	E	Limit cleared area to only what is necessary. Limit road speeds to 60km/hr. Implement dust suppression techniques. Frequency will be determined based on weather conditions and level of activity.	M
	Generation of noise, with associated alteration of fauna behaviour/movement	E	Pre-clearing survey to relocate fauna from the pipeline corridor (including inspection of any hollows). All activities to be conducted in compliance with the Environmental Protection (Noise) Regulations 1997. Ensure all equipment is appropriately fitted, maintained or substituted with noise reduction devices if necessary. Activities shall be managed according to weather conditions and proximity to noise sensitive areas.	H
	Disturbance of Aboriginal heritage (archaeological or ethnographic) sites	H	The discovery of any previously unrecorded heritage sites or artefacts will stop work and will be managed in accordance with the Heritage Management Strategy and other applicable site procedures.	M
	Potential bushfire, with associated impacts of loss of habitat or fauna, altered vegetation structure and potential increased proliferation of invasive flora	E	Ensure that dry vegetation material does not build up on equipment involved in vegetation clearing, increasing the risk of fires. All vehicles and where possible mobile equipment will utilise diesel (rather than petrol). Locate vegetation stockpiles sufficient distance from ignition sources. Fire fighting equipment will be available at all times.	M
	Impacts on surface water bodies	E	Implement measures to maintain surface water flows (e.g. pipes installed beneath access roads to maintain connectivity). Cleared vegetation and soil will be stockpiled away from drainage lines. Rehabilitate corridor as soon as practicable (majority of disturbance is expected to be temporary).	H
	Loss of or reduced productivity of topsoil after inappropriate stripping and stockpiling	H	Topsoil will be stripped to a depth of 100mm. Topsoil will be stockpiled immediately adjacent to where it was stripped. Cleared topsoil will be stockpiled away from drainage lines.	L
	Loss of growth medium due to erosion (wind and water) and potential release of sediment to surface water bodies	E	Cleared Growth medium will be stockpiled away from drainage lines. The time that unconsolidated soils and stockpiles are exposed will be minimised to prevent surface water run-off and sedimentation. To prevent sediment release from cleared areas near drainage lines or surface water areas, ground disturbance work will be scheduled to occur predominantly outside traditional high rainfall event times such as December-May. In areas where there is still a possibility that sediment may be released, sediment collection systems will be considered.	M
	Loss of individual fauna	M	Pre-clearing survey to relocate fauna from the pipeline corridor. Vehicle/machinery speed limits restricted to 40km/hr during clearing activities. Fauna handler available during excavation and trenching activities to relocate any additional fauna found.	L

Excavation of topsoil and trenching	Entrapment (and potential loss or injury) of fauna in open trenches	E	Trench shall be left open for the minimum amount of time practicable and no longer than 7 days. Fauna refuges and/or egress ramps are to be placed inside open excavations to enable fauna to shelter or escape. These shall be spaced no greater than 50m intervals and at each end of the trench. The gradient of egress points within the trench must enable an animal to use them, with no lip or obstacles. Where rainfall and flooding of open trenches is expected, floating fauna refuges (e.g. logs) will be installed in the trench at not more than 50m intervals. Open trench lengths are not to exceed a length capable of being inspected and cleared by the fauna handling team (minimum 2 people) within the required time limits (total length of open trench not more than 10km). The fauna handling team will comprise of at least one Lead Fauna Handler, having completed sufficient training (TGM Fauna Handling training as a minimum). All open trench/excavations are to be inspected at least twice daily for trapped fauna. This is to be undertaken as follows: first clearing shall occur no later than three hours after sunrise; second clearing shall occur between the hours of 3-6pm. During extreme temperatures (37 degrees or above), fauna inspections will also occur at midday. Relocated fauna will be relocated a minimum distance of 50m from the trench. All deceased fauna will be removed from the trench to prevent further fauna entering (e.g. to scavenge). Records of fauna inspections to be included in a Fauna Removal Log. Records to be maintained include sunrise time, time of inspections, details of inspections (e.g. trench length, personnel involved), the species (or if not known a photo and description provided) and number of fauna cleared from the trenches, fauna interactions, fauna mortalities and all actions taken.	H
	Alteration of surface water flow in area and potential sedimentation	E	Install sedimentation traps in areas where surface water flows will be unavoidably interrupted. Rehabilitate corridor as soon as practicable (majority of disturbance is expected to be temporary).	H
	Disturbance of acid sulfate soils leading to soil acidification or generation of acidic leachate	E	Prepare and implement a management plan to define ASS areas and treatment requirements (e.g. limit dewatering so deeper ASS not oxidised, lime treatments).	M
	Generation of dust	E	Implement dust suppression techniques. Frequency will be determined based on weather conditions and level of activity. Review weather conditions prior to relocating material, and postpone activity if excessive winds will result in excessive dust.	M
	Generation of noise and vibration associated with blasting of rock	E	Blasting limited to certain small sections of the pipeline corridor (e.g. banded iron formations). Size of blast to be limited to only that necessary for pipeline corridor excavation.	H
	Soil erosion (particularly in sande dune areas)	H	Utilise gravel on access roads to minimise erosion in sand dune areas. Implement dust suppression measures and sedimentation traps to contain soil in stockpiled area. Rehabilitate corridor in sand dune areas as soon as practicable (majority of disturbance is expected to be temporary).	M

Construction camp operation	Incorrect disposal of waste leads to pollution/contamination of environment, attraction of feral and native animals (with potential for alien substances to poison animals upon ingestion) and odours	E	Waste stations will be established and labelled for the appropriate segregation of waste (i.e. paper, aluminium cans, plastics, metals, hydrocarbon contaminated materials). All domestic waste skips and bins shall have lids and be closed at all times to reduce the likelihood of fauna being attracted to the area. Ensure waste skips and bins are managed to prevent windblown rubbish (lids, suitably located and emptied regularly). Rubbish will be covered/secured when being transported. All waste shall be disposed of in a licensed landfill facility. Controlled Wastes will be removed from site by an appropriately licensed operator to an approved waste disposal location. Implement an invasive fauna recording system. Ensure sewage management facilities are approved by the relevant authorities (Local Council, Department of Health, Department of Environment Regulation). Installation of warning system such as alarms or flashing lights to all demountable toilet blocks to indicate that the facility is nearing capacity.	L
	Introduction of weeds	E	No invasive flora will be allowed onsite or used within gardens at the construction camp. Domestic waste to be disposed of in the correct manner to prevent seed invasion from food waste products. Vehicles to remain on designated access roads. Any fill (if required) shall be certified weed free.	L
	Introduction of pests/vermin	M	No pets will be allowed at the site. All personnel will be discouraged from feeding native or pest fauna. Any imported supplies to be inspected for pests/vermin.	L
	Generation of noise	E	Implement curfew such that no excessive noise permitted beyond 10pm. Equipment (e.g. power generation) to be subject to noise mufflers or be in enclosed area to limit noise emissions.	L
	Generation of light	H	Lighting to be concentrated on required areas only.	M
	Potential bushfire resulting from cigarette smoking/disposal or camp fires	H	Open fires are not allowed. Properly constructed cigarette butt containers to be provided around offices, crib rooms and workshops etc. Ensure sufficient distance between construction camp extent and native vegetation (i.e. fire breaks). Maintain fire response equipment at the camp. All machinery and vehicles to be parked in designated areas.	L
	Air emissions from operating power generators	H	Power generators limited to that which is necessary. Implement maintenance program to ensure poer generators are operating as efficiently as possible.	M

	Pollution/contamination of environment (soils, surface water or groundwater) due to fuel or chemical spills	H	All environmentally hazardous substances shall be stored in accordance with statutory requirements or where no requirements are legislated in a low permeability bunded area that holds 110% of volume being stored or 25% of any interconnected tanks or in accordance with Dangerous Goods Storage Licence. All bunded areas will be located within a secondary containment area to prevent pollution in the event that primary containment systems are breached. Store all equipment (e.g. welders, small generators) that holds <10L of hydrocarbon or chemical in a containment area when not being used. Ensure that refuelling bays (including double skinned tanks) contain all spills through the use of concrete aprons, suitable lining or dedicated drainage. Maintain bunding protection systems to reduce the likelihood of damage by vehicle/equipment. Maintain an MSDS file for all chemicals, fuels etc. stored or utilised at the camp. Ensure ready access to spill clean-up equipment at the camp (e.g. spill kit next to storage area and any main areas of handling).	M
Fuel and chemical handling and storage	Pollution/contamination of environment (soils, surface water or groundwater)	E	Appropriate licenses for the transport, handling, storage and disposal of hazardous materials including any Dangerous Goods Licensing. Ensuring appropriate containment, bunding and storage facilities are present and meet the specifications of Australian Standard 1940. Groundwater contamination shall be prevented by appropriate secondary containment and management of waste, environmentally hazardous materials and the management of surface water. Ensure that environmentally hazardous chemical storage vessels are either self-bunding or located in a low permeability bund with 110% capacity maintained at all times. Ensure all containment bunds are maintained to prevent the release of chemicals/hydrocarbons. Ensure all re-fuelling bays at bulk storage facilities have appropriate spill containment. Hydrocarbon contaminated soil will be collected and disposed of or remediated at an approved site. Establishing and implementing Emergency Response Procedures for hydrocarbon spills. Relevant staff to be trained in the use of spill kits and emergency response.	M
	Potential bushfire resulting from inappropriate storage	H	Correct storage and isolation of flammable liquids (in accordance with MSDS). Ensure an appropriate distance between storage and handling areas, and nearby vegetated areas. Ensure fire fighting equipment is available near storage and handling areas.	L
	Poisoning of fauna	L	All fuels and chemicals to be stored in sealed containers, bunded and locked storage area.	L
	Injury or loss of individual fauna (including cons. sig. species)	H	Restricted road speeds in areas of conservation significant species habitats (areas to be sign posted). Signs indicating the likely presence of threatened fauna in areas of preferred habitat will be erected to increase driver awareness of the risk to fauna. Borrow pits will be located a suitable distance from the road to limit potential interaction between animals and vehicles. Road kills of native fauna shall be removed from the road and reported to the Lead Fauna Handler and Environmental Officer.	M

Vehicle and machinery movements	Introduction or spread of weeds and/or diseases	E	Strict vehicle hygiene practise will be adopted by staff and contractors, with all machinery, vehicles and plant to be free of soil and vegetative matter upon arrival to site. An inspection of machinery/vehicle/plant will be conducted upon arrival on site to confirm. Strict vehicle hygiene practice will be adopted by staff and contractors, with all machinery, vehicles and plant to be free of soil and vegetative matter when moving between weed infested and uninfested areas. Vehicle/machinery movement will be restricted to access roads and the pipeline construction corridor.	L
	Erosion and compaction of authorised access roads	E	Conduct weekly inspections of access roads for evidence of erosion. Implement remediation works where erosion is identified. Any access tracks that are not premanent shall be ripped prior to rehabilitation.	M
	Erosion and compaction of substrate from unauthorised off-road driving	M	Unauthorised off-road driving will be prohibited. Vehicle/machinery movement will be restricted to access roads and the pipeline construction corridor. Any eroded/compacted areas will be ripped and re-contoured to restore normal drainage patterns, and rehabilitated.	L
	Clearing of vegetation from unauthorised off-road driving (e.g. tracks associated with bogged vehicles)	M	All areas requiring clearing will be clearly delineated (with pegs and flagging tape) to minimise the risk of overclearing. No clearing or disturbance during construction outside of pre-defined clearing areas. Unauthorised off-road driving will be prohibited. Vehicle/machinery movement will be restricted to access roads and the pipeline construction corridor.	L
	Generation of dust	E	Vehicle/machinery movement will be restricted to access roads and the pipeline construction corridor. Implement dust suppression techniques.	H
	Generation of noise	E	Vehicle/machinery movement will be restricted to access roads and the pipeline construction corridor. Regular vehicle mainteance shall be undertaken to maintain efficient vehicles. Any work undertaken outside of standard working hours will be subject to the Noise Regulations.	H
	Air emissions	H	Regular vehicle mainteance shall be undertaken to maintain efficient vehicles.	M
	Borrow pits required for construction of access roads (gravel) and issues associated with water pooling	H	Limit borrow pits to that which is necessary. Rehabilitate borrow pits as soon as practicable.	M
	Drawdown of groundwater (from bore use or dewatering), potential effects groundwater dependant communities and ASS	E	Dewatering undertaken consistent with DoW abstraction licence. Preparation and implementation of ASS management plan (as required).	H
	Water release from standpipes leads to salinisation of soil or vegetation	E	Ensure safety measures at standpipe such that water release does not occur. Install impervious drainage measures where refilling from standpipe to collect any accidental water release. Ensure standpipe area drains internally to limit any runoff and salinisation of surrounding vegetation. Limit time that standpipe is required. Remediate area sufficient to correct any potential salinisation issues for rehabilitation purposes.	M

Water use and management	Establishment of turkey nests and water storage could lead to salinisation of soil and surrounding vegetation (including any overflow from turkey nest) as well as potential impacts to fauna (i.e. drowning, attraction of feral anmals)	E	Ensure impervious surface at turkey nests. Limit time that turkey nests are required to store saline water. Install alarm to advise of potential breach of turkey nest storage. Remediate area sufficient to correct any potential salinisation issues for rehabilitation purposes. Install fencing around turkey nest. Install fauna exit ramps in turkey nests (e.g. shadecloth/netting over side to allow escape).	M
	Salinisation of soil or vegetation death from hyper-saline water use for dust suppression	H	Hypersaline water not to be used for dust suppression on soil/growth medium stockpiles. Soil/growth medium recovered for rehabilitation will not be exposed to hypersaline water. If hypersaline water is to be used for dust suppression, control systems will be established to prevent salinisation of adjacent vegetation.	M
	Incorrect storage, treatment and disposal of sewage leads to pollution/contamination of enviroment and odours	H	Controlled Wastes will be removed from site by an appropriately licensed operator to an approved waste disposal location. Ensure sewage management facilities are approved by the relevant authorities (Local Council, Department of Health, Department of Environment Regulation). Installation of warning system such as alarms or flashing lights to all demountable toilet blocks to indicate that the facility is nearing capacity.	L
Welding, lowering-in and backfilling	Potential bushfire	E	Hot works permits will be required for work that has the potential to create ignition sources. Hot works shall not occur within three metres of vegetation without approval from the Environment Team. Hot works shall be undertaken within a welding tent. Fire response equipment to be available and ready for use at all active welding sites (including fire extinguishers and water tank).	H
	Entrapment of fauna in open trenches or pipelines	E	Conduct fauna inspection and removal immediately prior (within 0.5hrs) to installing pipe and backfilling. Caps on end of welded pipeline sections. Fauna exit ramps to be installed at both ends of trenches. Fauna shelters/refuges to be placed at intervals not exceeding 50m.	M
	Introduction of weeds and/or diseases (based on importing fill or sand from borrow pits)	E	Any soil/fill brought to site will be certified free of propagules of invasive flora. Gravel or borrow material will be sourced locally, therefore free of phytophthora and invasive flora.	L
	Generation of dust	H	Review weather conditions prior to relocating material, and postpone activity if excessive winds will result in excessive dust.	M
Hot tapping	Uncontrolled gas release to environment	E	Valves tested prior to installation. Signage and exclusion zone to be in place during hot tapping. Hot tapping to be undertaken by trained personnel.	M
Testing	Water storage in turkey nest attracts fauna and could potentially lead to drowning of animals	E	Restrict access to water storage areas either by fencing or installing some other suitable barrier where required. Artificial water storage areas shall have adequate fauna egress points i.e. shade cloth in all corners, weighted down. Excavations containing water, mud or other liquids/slurries which do not have adequate egress (e.g. ramps) shall be inspected for trapped fauna daily.	M
	Release of hydrotest water leading to soil erosion and potential contamination (if contains chemicals or is not fresh water)	E	Hydrotest water to be collected and contained (e.g. water tank, turkey nest), with potential subsequent use at TGM or in-situ infiltration.	M

Commissioning	Uncontrolled gas release to environment	E	Valves tested prior to installation. Commissioning activities to be planned and undertaken by trained personnel. Commissioning signage and exclusion zones in place during commissioning.	M
	Generation of noise	M	No additional measures can be implemented - noise will be limited to venting and any impacts expected to be behavioural avoidance by any potentially nearby fauna.	M
Demobilisation, site clean-up and remediation	Inappropriate rehabilitation leads to soil erosion (particularly in sand dune areas) and potential effects to surface water bodies, and increased weed density (altered vegetation and fauna habitat)	E	Ensure that cleared vegetation and soil/growth medium are retained for later use in rehabilitation (stockpiled separately). When possible, soil/growth medium will not be stripped or stockpiled in wet conditions. Areas no longer required will be rehabilitated as soon as is practicable. Rehabilitation will include placing cleared vegetation and logs within the area to provide fauna refuge. Clean seeds (if required) will be used for rehabilitation. Seed will be harvested locally to reduce the risk of new invasive flora introduction. Following rehabilitation, areas will be monitored and treated for invasive flora invasion, if necessary.	L
	Generation of dust	H	Review weather conditions prior to relocating material, and postpone activity if excessive winds will result in loss of significant rehabilitation material.	M
Opening up country (initial vegetation clearing, access road to remain for maintenance, inspections after rehabilitation has occurred)	Degradation of tracks (e.g. erosion) due to increased traffic (including other stakeholders in area)	H	Inspect tracks every 6 months to ensure erosion is not occurring. If it is then rectification measures to be implemented.	L
	Increased recreation in the area due to increased access	H	Install signs outlining authorised access only. Install gates at entry points to limit access.	M
	Potential facilitation of movement of feral animals (particularly goats) into new areas	H	Inspect tracks every 6 months to identify evidence of goat activity. If identified survey in broader area to determine abundance and implement control measures as required (in consultation with DPaW).	L

LIKELIHOOD

Almost certain	Expected to occur once or more in the life of the project; planned event.
Likely	Will probably occur during the life of the project; 50% chance of occurrence.
Possible/occasional	May occur during the life of the project; 25% chance of occurrence.
Unlikely	Unlikely to occur within the life of the project; 5% chance of occurrence.
Rare	Only occurs in exceptional circumstances; theoretically possible.

CONSEQUENCES

Catastrophic	Widespread, permanent effects; viability of ecosystems or species affected.
Major	Serious environmental effect with some impairment of ecosystem function; medium-long (>2yrs) term impact; environmentally significant area or widespread effects; rectification may be difficult.
Moderate	Moderate effect on biological or physical environment, medium-short term (<2yrs) impact; widespread or low significance area; effects can be rectified.
Minor	Low-level impact on biological or physical environment; short-term impact (<6 months), localised (<1ha) or low significance area; minimal rectification required.
Insignificant	Minor or no effect; any effects rectified immediately with negligible residual effects. No effect on Threatened species listed under EPBC Act, or other conservation significant fauna species.

RISK MATRIX

	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	N	N	L	L	M
Unlikely	N	L	L	M	H
Possible/occasional	L	L	M	H	E
Likely	L	M	H	E	E
Almost certain	M	H	E	E	E

E - Extreme risk
H - High risk
M - Medium risk
L - Low risk
N - Negligable risk

Health, Safety and Environment (HSE) Policy

At APA we aspire to provide a safe place of work. We are committed to the effective implementation of our HSE policy and to the continual improvement in our HSE performance.

To achieve this APA Group will:

- Provide leadership and direction to drive accountability for our HSE performance.
- Document, implement and maintain an appropriate Safety Management System.
- Comply with applicable HSE legislation and best practice requirements to which APA Group subscribes.
- Establish and regularly monitor measurable objectives and targets to ensure continued improvement against established standards.
- Communicate HSE commitments and information to employees, contractors and other relevant stakeholders.
- Proactively reduce the risk of injury by investigating all reported accidents, incidents and near misses promptly and taking appropriate actions to prevent a reoccurrence.
- Provide appropriate training, supervision, specialist support and other resources to HSE matters.
- Consult and engage with our employees and other stakeholders to build relationships based on our values for meeting the goals of our HSE Policy.
- Partner with companies having similar HSE standards and values as APA Group.
- Ensure processes are in place for the prevention of pollution.

General Responsibilities for Health, Safety & Environment

Every employee (permanent or temporary) has an obligation to look after their own health and safety and the safety of those who may be affected by their acts or omissions. They must comply with the group's HSE policies and procedures. They must report all accidents, incidents and near misses.

All managers and supervisors are responsible for managing HSE in accordance with the group policy and our Safety Management System as an integral and mandatory duty of their position.

Contractors and sub-contractors have an obligation to look after their own health and safety and the safety of those who may be affected by their acts or omissions. They must have a system that complies with all applicable health, safety and environmental legislation and local site rules or with the APA Group HSE policies and procedures.

Mick McCormack – Managing Director / CEO

APA safeguard

The policy is subject to review every three years. Next review is due by 06/07/2015

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30th June 2014

RE: Modification of the proposed Murrin Murrin to Sunrise Dam Gold Mine proposed gas pipeline

Following the Level 1 flora surveys of the proposed gas pipeline route (within tenement L29/227) from Murrin Murrin to Sunrise Dam Gold Mine in October 2013 and April 2014, Botanica Consulting (BC) were advised of a required modification to the proposed pipeline route near the Mt Morgan Mine Site. The modification is approximately 7km in length and diverts to the south of the original corridor alignment surveyed (Attachment 1). In this letter it is referred to as the 'Dacian Diversion'

Using high quality ortho-aerial imagery provided by Anglo Gold Ashanti Australia (AGAA) BC were able to map vegetation communities within the Dacian Diversion based on visual similarities to vegetation previously mapped along the original pipeline route. A map of the vegetation communities mapped within the Dacian Diversion is provided in Attachment 2.

A flora and vegetation desktop assessment of the Dacian Diversion was conducted with the results summarized as follows:

- Five vegetation communities were identified within the Dacian Diversion area which are consistent with vegetation communities identified within the original pipeline route (Attachment 2).

- No DRF/Threatened Flora, pursuant to subsection (2) of section 23F of the *WC Act 1950,* the Commonwealth *EPBC Act 1999* and as listed by the Department of Parks and Wildlife (DPaW) were identified within the Dacian Diversion;

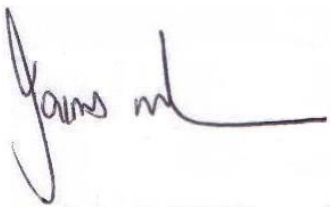
- There are no DPaW recorded locations of Priority Flora within the Dacian Diversion. The nearest location of Priority Flora (*Grevillea inconspicua* P4) recorded by BC is located approximately 6km west of the Dacian Diversion.

- No Threatened Ecological Communities pursuant to Commonwealth legislation or Priority Ecological Communities as listed by the DPaW were recorded within the Dacian Diversion.

- The Dacian Diversion is not located within an Environmentally Sensitive Area or a Schedule 1 Area as described in the *Environmental Protection Act 1986* and Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004;*

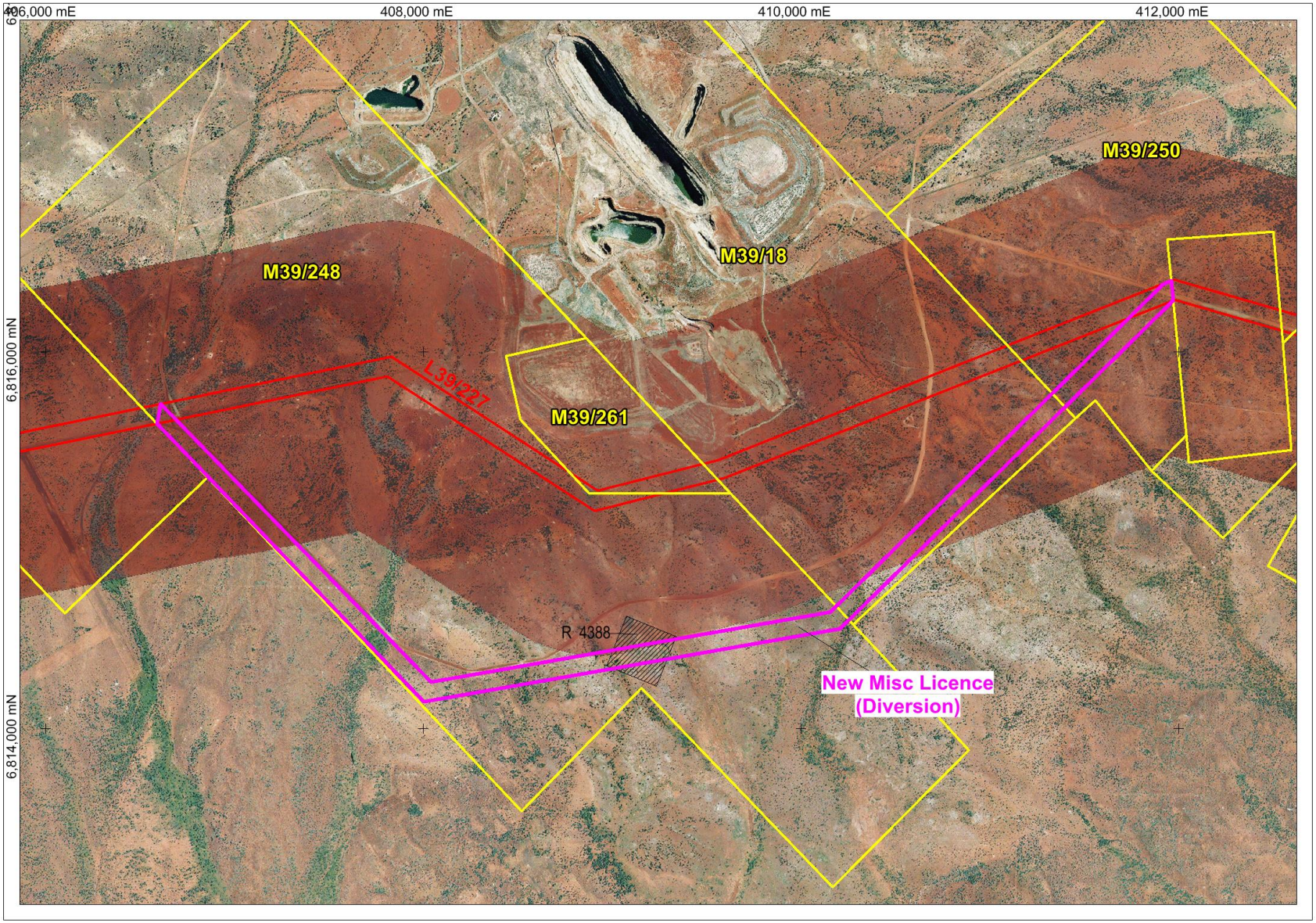
As the desktop assessment has not identified any areas of conservation significance (in relation to flora and vegetation) no further survey work of the Dacian Diversion is considered necessary.

Regards

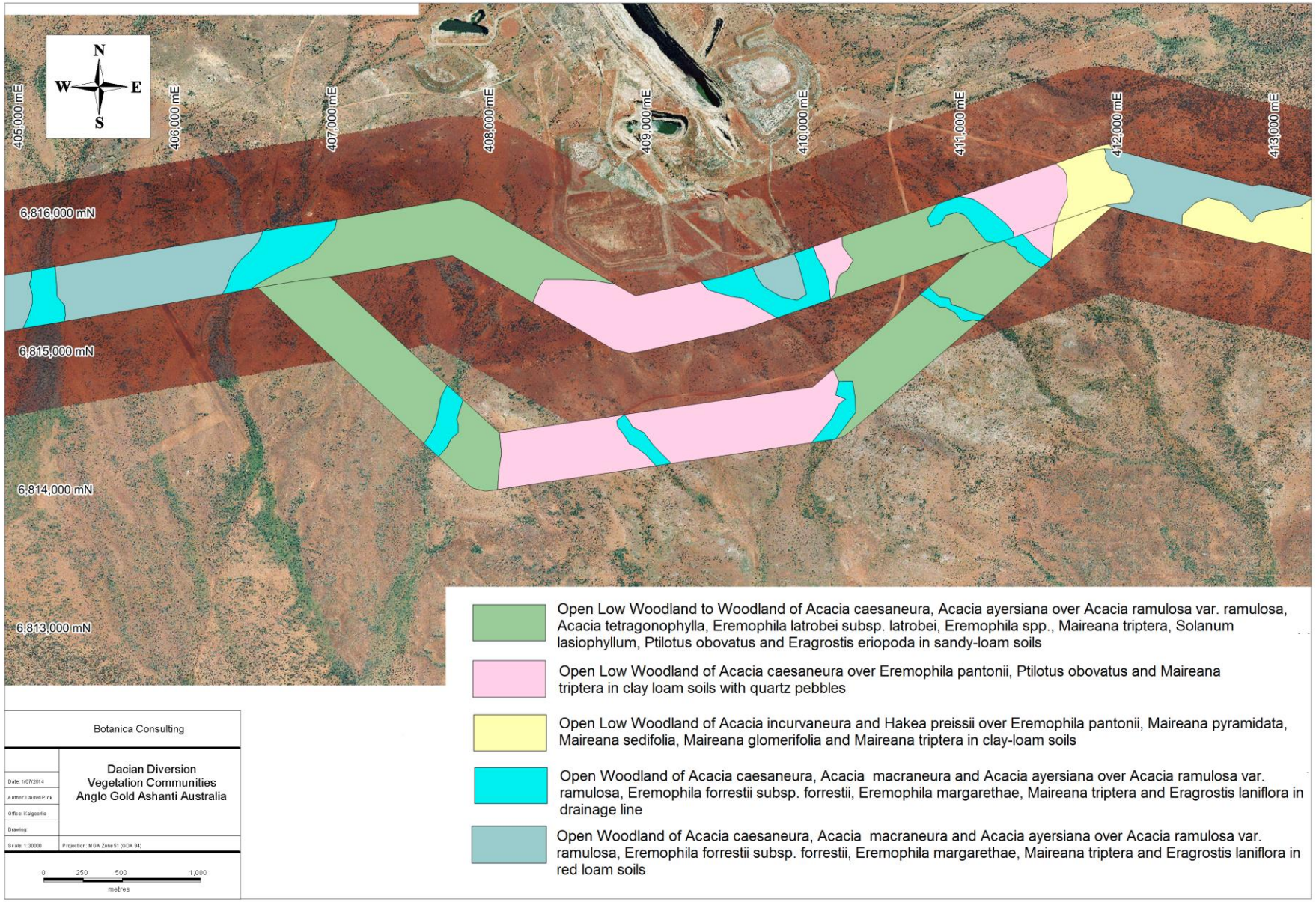


Jim Williams
Director
Botanica Consulting

Attachment 1: Map showing the Dacian Diversion (pink polygon) including the original pipeline route (red polygon) and surrounding tenements



Attachment 2: Vegetation Communities of the original pipeline route and the Dacian Diversion



Murrin Murrin – Sunrise Dam Infrastructure Corridor Level 1 Fauna Survey

Prepared for: Anglogold Ashanti Australia
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Prepared by: J Turpin
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Carlisle, WA, 6101

July 2014

EXECUTIVE SUMMARY

An 84km infrastructure corridor between Laverton Road near Muurrin Murrin Nickel Mine and Sunrise Dam Gold Mine (Sunrise Dam) is currently being proposed to provide gas to AnglGold Ashanti Australia's (AngloGold) Sunrise Dam operation. As part of the Environmental Impact Assessment for the project, Kingfisher Environmental Consulting was commissioned by AngloGold to undertake a Level 1 Fauna Assessment of the infrastructure corridor route (Petroleum Pipeline Licenses - STP-PLA-0025).

The Fauna Assessment comprised a desktop review, targeted fauna survey and an assessment of significant habitats. The desktop review identified 272 fauna species potentially occurring within the proposed corridor comprising eight frog, 85 reptile, 143 bird, 26 native mammal and 10 introduced mammal species. Of these, a total of 89 fauna species were recorded during the field surveys, comprising 18 reptile, 57 bird, eight native mammal and six introduced mammal species.

Thirteen conservation significant fauna species are expected to occur within the survey corridor. The Malleefowl (EPBC Vulnerable), Slender-billed Thornbill (EPBC Vulnerable) and Long-tailed Dunnart (DPaW Priority 4) are of particular importance, as all have resident populations in areas adjacent to the proposed pipeline. The fauna assemblage expected is also important due to its remoteness and the presence of refugia.

Several significant fauna habitats were recorded from the survey area, including:

- Dense Mulga Woodland (Malleefowl habitat);
- Samphire Shrublands (Slender-billed Thornbill habitat);
- Banded Ironstone Ridges (Long-tailed Dunnart habitat and refugia); and
- Greenstone Hills (a restricted habitat potentially supporting the locally significant reptile species, *Aprasia picturata*).

Overall, impacts of the development upon the local fauna assemblage are anticipated to be low, as the development area is long and narrow, passes through many widespread landscapes, and effects are mostly temporary as the pipeline can be buried and to some extent rehabilitated.

Document Status				
Revision No.	**Author**	**Review**	**Approved for Issue to**	**Date**
1	J. Turpin R. Lloyd	M. Redfern	E. Bamforth	13/02/2014
2	J. Turpin	E. Bamforth	E. Bamforth	22/06/2014
3	J. Turpin	B. Bastow	E. Bamforth	25/07/2014

CONTENTS

1. INTRODUCTION

1.1 Project Background

AngloGold Ashanti Australia (AngloGold) manages the Sunrise Dam Gold Mine, located 55 km south of Laverton, in the Murchison Region of Western Australia. An infrastructure corridor (a gas pipeline with associated infrastructure and an access track – Petroleum Pipeline License STP-PLA-0025) connecting Sunrise Dam with existing infrastructure near Murrin Murrin (50 km south-west of Laverton) is being proposed. The proposed infrastructure corridor extends over 84 km.

As part of the Environmental Impact Assessment for the project, Kingfisher Environmental Consulting (KEC) was commissioned by AngloGold to undertake a Level 1 Fauna Assessment of the proposed infrastructure corridor route. A Level 1 Fauna Assessment is required to identify the fauna values of a site so that impacts upon these from any proposed development can be assessed and, where possible, minimised.

1.2 Fauna Assessment Objectives

Where a project is likely to affect biodiversity, the information gathered for Environmental Impact Assessment (EIA) via desktop studies and fauna surveys should enable the impacts of the proposal and their environmental significance to be determined to an acceptable level. Fauna assessments should provide a sufficient level of detail so that proposals that receive environmental approval by government agencies, meet state, national and international legislative requirements (EPA, 2002). The requirements of fauna surveys and desktop studies associated with the Environmental Impact Assessment are documented in EPA's Guidance Statement 56 (EPA, 2004), Position Statement No. 3 (EPA, 2002), and Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2010). The key objectives of fauna studies are to:

1. Conduct a review of background information (a search of all sources for literature, data and map-based information);
2. Compile an inventory of vertebrate fauna expected to occur within the site in light of fauna habitats present;
3. Identify significant fauna species occurring or likely to utilise habitat within the project area;
4. Document the characteristics of the fauna assemblage of the site including significance at an international, national, state, regional and local level;
5. Delineate key fauna values present in the area and potential sensitivity to impacts;
6. Identify significant or fragile fauna habitats within the project area;
7. Identify any ecological processes in the project area upon which fauna may depend;

8. Identify general patterns of biodiversity within or adjacent to the project area; and
9. Identify potential impacts to fauna and propose recommendations to minimise impacts.

The Murrin Murrin to Sunrise Dam Level 1 Fauna Survey therefore comprised a Desktop Survey, Field Survey (two survey phases) and Fauna Assessment Report (this report). After consultation with AngloGold the specific scope of works for the fauna assessment also included the following objectives:

1. Identify and sample all major vegetation and substrate associations (fauna habitats) present within the survey corridor with a focus on the identification of significant or fragile habitats;
2. Conduct targeted searches for species of conservation significance;
3. Prepare an inventory of species recorded or expected to occur within the survey corridor, based on a data, literature reviews and habitats types present;
4. Map the occurrence and expected extent of conservation significant fauna and their associated habitats;
5. Assess the regional and local significance of the fauna assemblage;
6. Assess the potential impact of construction and operation of the corridor on vertebrate fauna; and
7. Develop strategies for the environmental management of significant species and their habitats.

1.3 Survey Corridor

The survey corridor for the fauna assessment (the "survey area") follows the proposed infrastructure corridor route which links Laverton Road near the Murrin Murrin Nickel Mine (approximately 45 km east of Leonora) to the Sunrise Dam Gold Mine, around the northern and eastern margins of Lake Carey (see Figure 1). The corridor covers approximately 84 km in length and is 100m wide (50m either side of the proposed centreline). The survey area traverses two pastoral leases (Glenorn and Mount Weld Stations) and is situated near the Murrin Murrin, Granny Smith, Mount Morgan and Sunrise Dam mines. As a result, the proposed corridor route extends alongside numerous existing access tracks and through fauna habitats which have suffered some degradation due to pastoral and mining activities.

1.4 Scoping Requirements

This document has been developed in consideration of the following:

1. EPA Position Statement No 3, Terrestrial Biological Surveys as an element of Biodiversity Protection (EPA, 2002);
2. EPA Guidance Statement No 56, Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004); and
3. EPA Technical guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2010).

Figure 1: Project Location – proposed infrastructure corridor connecting Murrin Murrin to Sunrise Dam.

2. BACKGROUND

2.1 Regional Description

The Interim Biogeographic Regionalisation of Australia (IBRA) has identified 26 bioregions in Western Australia (Figure 2). Bioregions are classified on the basis of climate, geology, landforms, vegetation and fauna (Thackway and Cresswell, 1995). IBRA Bioregions are affected by a range of different threatening processes and have varying levels of sensitivity to impact (EPA, 2004)

Murchison Bioregion

The survey area lies within the Murchison Bioregion, which falls within the Bioregion Group 2 classification of EPA (2004). Bioregions within Group 2 are described as having "native vegetation that is largely contiguous but is used for commercial grazing" (EPA, 2004). The Murchison Bioregion contains low hills and mesas separated by flat colluvium and alluvial plains with vegetation dominated by low Mulga (*Acacia aneura*) woodlands. Other vegetation types present include saltbush shrubland on calcareous soils, saline areas with samphire, and hummock grassland on red sandplain (Bastin et. al., 2008).

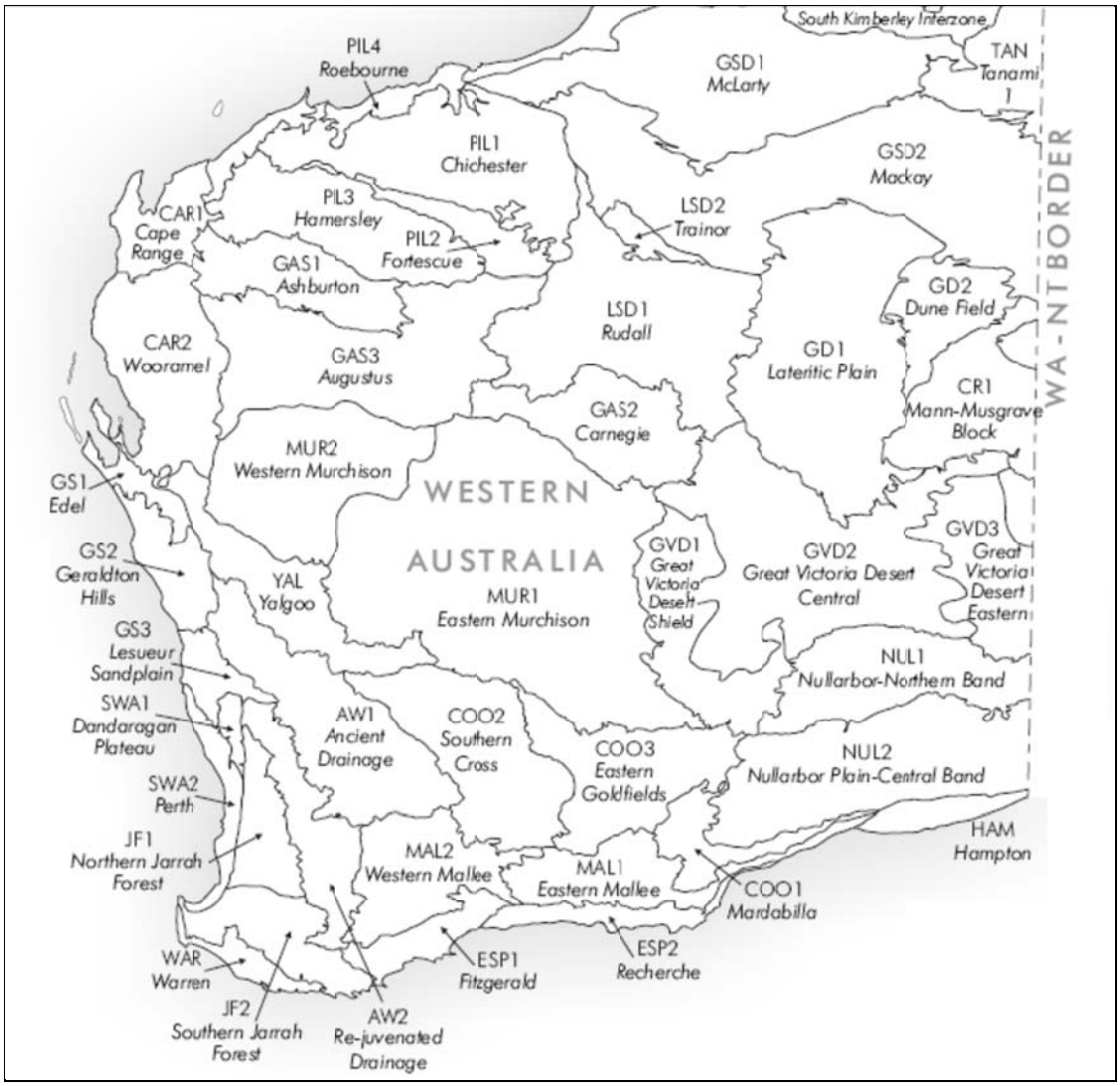
The Murchison Bioregion is further split into subregions. The survey area lies within the Eastern Murchison Subregion (see Figure 2). McKenzie *et al.* (2003) lists the characteristics of the Subregion as:

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

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

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

Figure 2: IBRA Subregions in Western Australia. Note the survey area lies within the Eastern Murchison Subregion.



2.2 Landforms

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

Table 1. Major Land Types traversed by the proposed pipeline.

Land Type	Description
1	Hills and ranges with acacia shrublands
5	Stony plains with acacia or eucalypt woodlands and halophytic shrublands
9	Low hills with eucalypt or acacia woodlands with halophytic undershrubs
10	Low hills and stony plains with acacia shrublands
17	Stony plains with acacia shrublands and halophytic shrublands
31	Wash plains on hardpan with mulga shrublands
32	Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex
36	Alluvial plains with halophytic shrublands
43	Salt lakes and fringing alluvial plains with halophytic shrublands

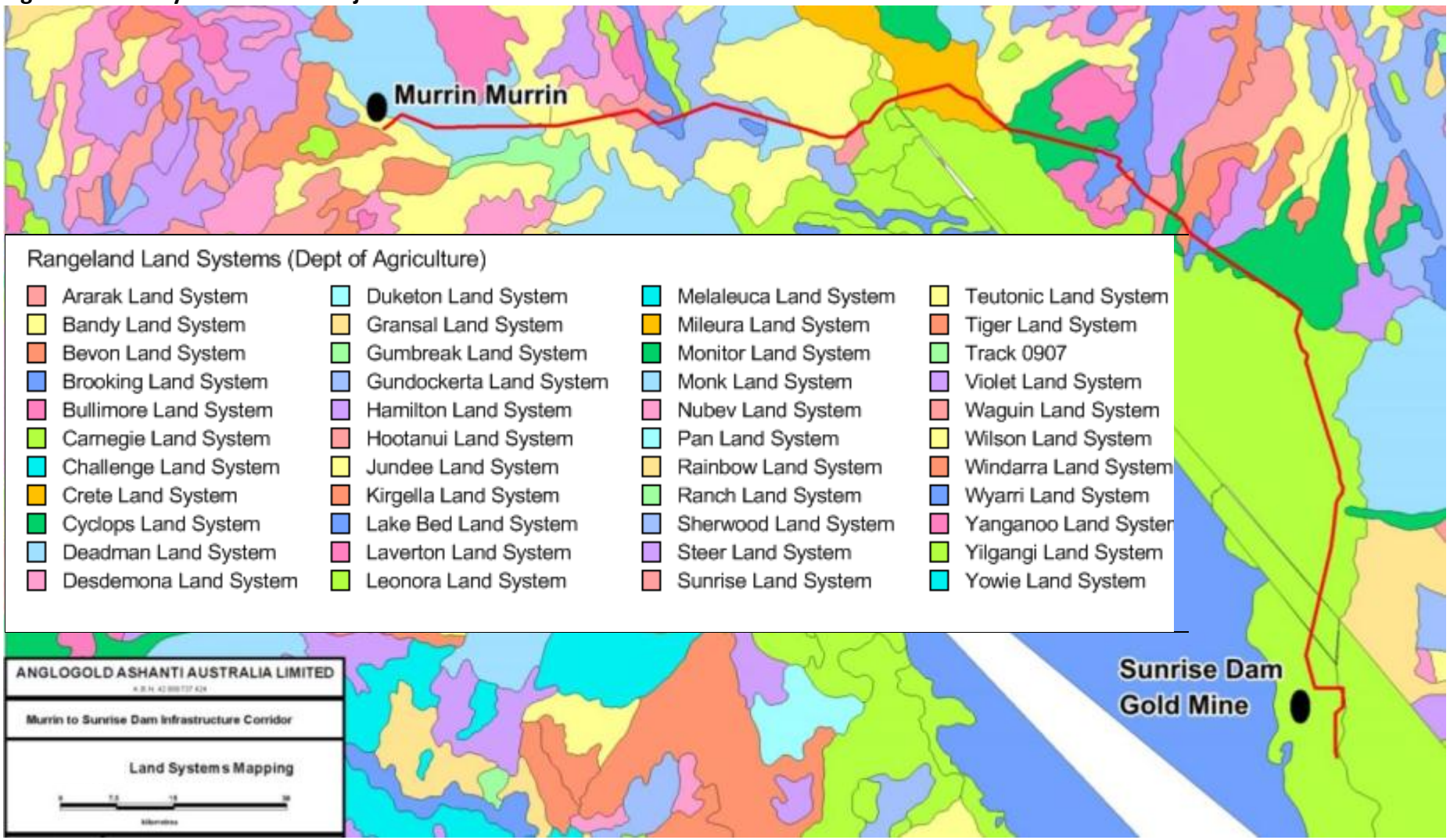
Land Types are further divided into "Land Systems" based on similarities of vegetation, landform and soil. Fourteen Land Systems are present in the survey area and are listed below (see Table 2 and Figure 3). These provide a broad indication of the fauna habitats present.

Five Land Systems dominate much of the survey corridor. These comprise broad plains with vegetation dominated by Mulga or chenopod communities. Most of the southern half of the survey area is composed of the Carnegie Land System, comprising extensive saline plains supporting low halophytic shrublands and scattered acacia shrublands. The Jundee, Monk, Mileura and Monitor Land Systems cover much of the western half of the corridor. These systems comprise hardpan plains with Mulga shrublands and alluvial plains supporting mulga/chenopod shrublands. Smaller areas of banded ironstone and greenstone hills and ridges (with mixed acacia shrublands) also occur.

Table 2. Land Systems traversed by the proposed infrastructure corridor.

Code	Land System	Landform
JUN	Jundee	Hardpan plains with ironstone gravel mantles and occasional sandy banks supporting mulga shrublands.
MOK	Monk	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.
TEU	Teutonic	Hills and stony plains on acid volcanic rocks supporting acacia shrublands.
SUN	Sunrise	Stony plains supporting mulga shrublands.
BRK	Brooking	Prominent ridges of banded iron formation supporting mulga shrublands.
LEO	Leonora	Low greenstone hills and stony plains supporting mixed stony chenopod shrublands.
GUN	Gundockerta	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.
HOO	Hootanui	Breakaways, hills and ridges with extensive saline gravelly and stony lower plains supporting scattered halophytic low shrublands.
MIL	Mileura	Saline and non-saline calcreted river plains, with clayey flood plains interrupted by raised calcrete platforms supporting diverse and tall shrublands, mixed halophytic shrublands and shrubby grasslands.
CAR	Carnegie	Salt lakes with extensively fringing saline plains, dunes and sandy banks, supporting low halophytic shrublands, scattered acacia shrublands; lake beds are highly saline and mainly unvegetated.
MOT	Monitor	Distributary alluvial fans and wash plains supporting mulga - chenopod shrublands.
BEV	Bevon	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.
STE	Steer	Gravelly alluvial plains with halophytic shrublands.
RAI	Rainbow	Hardpan plains supporting mulga shrublands.

Figure 3: Land Systems of the Project Area.

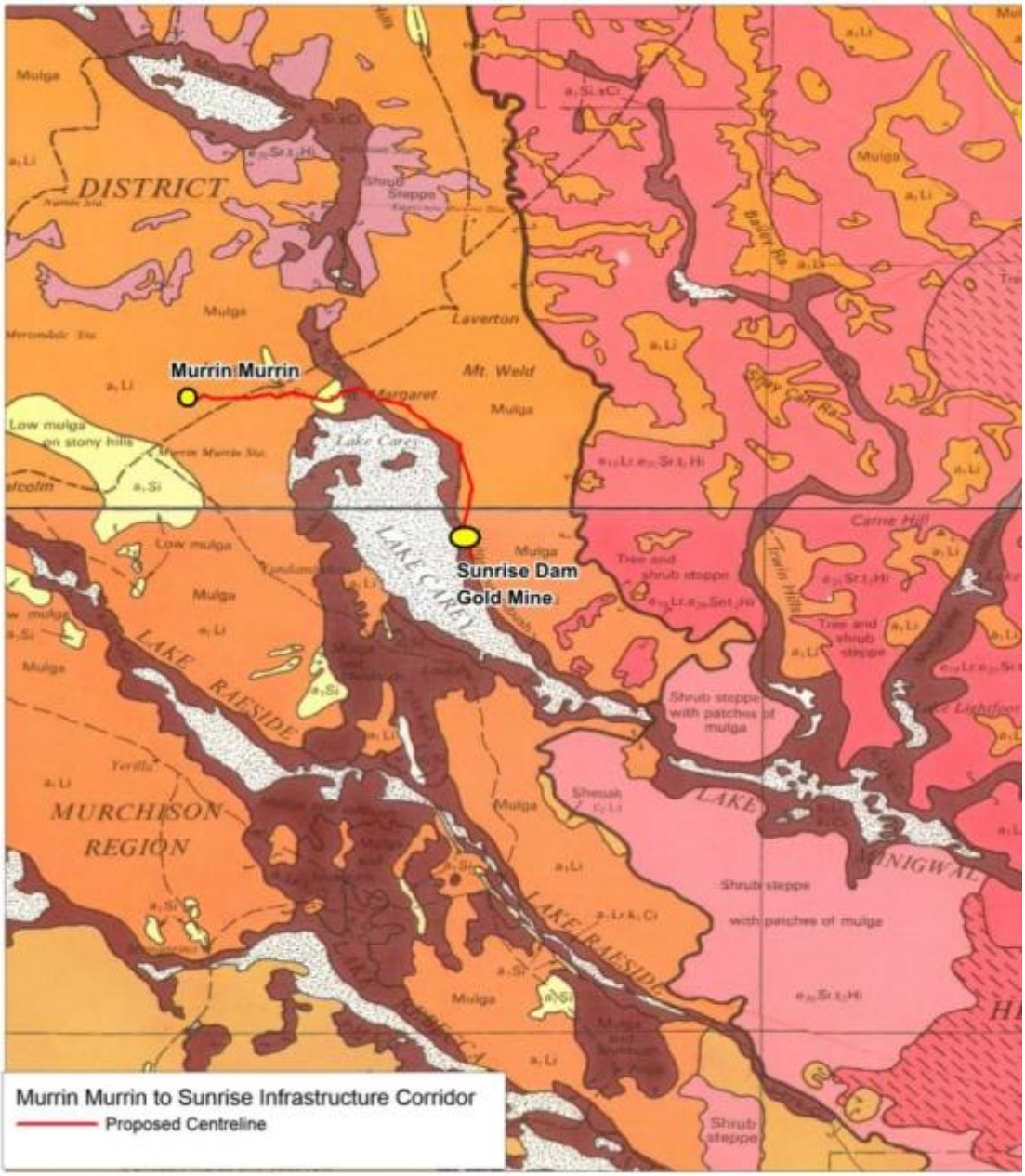


2.3 Vegetation

At a broad scale, Beard (1974) mapped the vegetation of the Laverton region including the survey corridor. Four major vegetation communities mapped by Beard (1974) are traversed by the survey corridor (see Figure 4). These vegetation communities are dominated by Mulga (*Acacia aneura*) and chenopods (eg. *Maireana* spp.) and include:

1. Salt Lake communities (Sl) with fringing samphire shrublands;
2. Mulga (*Acacia aneura*) Low Woodland (a1Li);
3. Open Mulga Shrublands: Mulga scrub on hardpan and stony plains (a1Si); and
4. Open Mulga (*Acacia aneura*) woodland with *Maireana* (bluebush) and *Atriplex* (saltbush) low shrublands (a1LrK2Ci / a1SiKCi).

Figure 4. Beard regional vegetation mapping.



2.4 Previous Survey Work

Several fauna surveys have previously been conducted in the region, as the proposed infrastructure corridor traverses areas close to existing and operational mines. Fauna surveys associated with environmental impact assessment have previously been conducted in the vicinity of the Tropicana Gold Mine, Sunrise Dam Gold Mine, Granny Smith Gold Mine (20 km south of Laverton, 4 km east of the survey corridor) and the Murrin Murrin Nickel Mine (1 km north of the survey corridor). Fauna surveys have also been conducted at Queen Victoria Spring Nature Reserve (approximately 100 km south-east of the survey corridor) and Plumridge Lakes Nature Reserve (25 km south-east of Tropicana, DPaW, 2013).

Several targeted surveys have also been conducted in the greater Tropicana region aimed at collecting information on conservation significant fauna. These include targeted surveys for Malleefowl (URS, 2009; Ninox, 2009), Southern Marsupial Mole (ecologia, 2009), Mulgara (URS, 2009) and the Sandhill Dunnart (Gaikhorst and Lambert, 2008; GHD 2010).

Additionally, AngloGold has previously supported fauna surveys for infrastructure corridors from Pinjin to Tropicana (Turpin, 2008; Ninox, 2009), and Carosue Dam to Pinjin (Biologic, 2010). Kingfisher staff were involved in both the Pinjin Infrastructure Corridor surveys and the Tropicana Fauna Surveys, which have provided useful background information relevant to the Murrin Murrin - Sunrise Dam survey area. The local distribution of conservation significant fauna and their associated habitat types are of particular relevance.

Consequently regional information on fauna is available and relevant for some areas along the proposed corridor. The results of the above fauna surveys are included in the desktop assessment and are detailed in Appendix 3.

2.5 Conservation Significance

Biodiversity in Western Australia is protected, managed and assessed under international, national and state agreements, legislation and policy. For Environmental Impact Assessment, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Wildlife Conservation Act 1950* (WC Act) are of particular relevance to Western Australian fauna.

EPBC Act

At the national level, fauna are protected under the EPBC Act. Schedule 1 of the Commonwealth EPBC Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent. These categories are described in Appendix 1. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN) and reviewed by Mace and Stuart (1994).

Under the provisions of the Commonwealth EPBC Act proposed actions which have the potential to have a significant impact on a matter of national environmental significance must be referred to the Commonwealth Minister for the Environment for a decision as to whether an assessment is required under the provisions of that Act (EPA, 2004).

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals).

Wildlife Conservation Act

At the state level, significant fauna are listed under the *Western Australian Wildlife Conservation Act 1950: Wildlife Conservation (Specially Protected Fauna) Notice 2007.* Threatened species are listed under four schedules:

1) Schedule 1 - Species that are rare and likely to become extinct;
2) Schdeule 2 - Species that area presumed extinct;
3) Schdeule 3 - Migratory species listed under international treaties; and
4) Schdeule 4 - Other specially protected fauna.

The WC Act uses a set of schedules but also classifies species using some of the IUCN categories. These categories and Schedules are described in Appendix 1.

Biodiversity Publications

In addition, the Department of the Environment (DOTE, formerly SEWPaC) has supported the publication of reports on the conservation status of most vertebrate fauna species e.g. fish (Wager and Jackson (1993), reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al*. 1996), rodents (Lee, 1995) and bats (Duncan *et al.* 1999). These publications also use the IUCN categories, although those used by Cogger *et al*. (1993) and Wager and Jackson (1993) differ in some respects as these reports pre-date Mace and Stuart's review (1994).

Priority Fauna

In Western Australia, the Department of Parks and Wildlife (DPaW) has produced a supplementary list of Priority Fauna for species that do not meet the criteria for listing as threatened under Schedule 1 (of the *WC Act*). These species however are often poorly known and/or of conservation dependance. Some Priority species, however, are also assigned to the IUCN 'Conservation Dependent' category. Levels of Priority are described in Appendix 1.

Conservation Significant Fauna

Fauna species included under conservation acts and/or agreements are formally recognised as of conservation significance under state or federal legislation. Species listed only as Priority by DPaW, or that are included in publications such as Garnett and Crowley (2000) and Cogger *et al.* (1993) but not in state or commonwealth acts, are also of recognised conservation significance. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information.

Locally significant fauna are species not listed under Acts or in publications, but considered to be of local significance because of their pattern of distribution. This level may have links to preserving biodiversity at the genetic level (EPA, 2002). For example, if a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as locally significant.

3. SURVEY METHODS

3.1 Approach

This fauna assessment was conducted with reference to guidance and position statements published by the WA Environmental Protection Authority (EPA) on fauna surveys and environmental protection, and commonwealth biodiversity legislation (e.g. EPA, 2002, 2004; EPA and DEC, 2010). The level of fauna assessment required by the EPA is determined by the size and location of the proposed disturbance and the sensitivity of the surrounding environment in which the disturbance is planned. Due to the size and location of the proposed project, AngloGold requested an extended Level 1 Fauna Survey with some additional targeted sampling.

A Level 1 Fauna Survey consists of a desktop study and basic ground truthing through a reconnaissance survey. The EPA (2004) describes a Level 1 survey as:

"Background research or 'desktop' study with the purpose to gather background information on the target area (usually at the locality scale). This involves a search of all sources for literature, data and map-based information".

The purpose of a Reconnaissance Survey is to verify the accuracy of the background study to further delineate and characterise the fauna and faunal assemblages present in the target area and to identify potential impacts.

This involves:

"a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area" (EPA, 2004).

3.2 Survey Area

The survey area for this assessment corresponded to the proposed Murrin Murrin – Sunrise Dam Gold Mine Infrastructure Corridor, which included the specific pipeline route with a 100m buffer, see Figure 1. The proposed pipeline corridor was visually inspected along its entire length. All major fauna habitats within the corridor were assessed as well as some significant fauna habitats occurring immediately adjacent to the corridor route.

3.3 Personnel and Survey Timing

The Murrin Murrin to Sunrise Dam Fauna Assessment was undertaken over two field surveys. The initial survey phase (Phase 1) was conducted from the 7th - 8th October 2013. The second survey phase (Phase 2) was conducted from the 4th - 5th November. The fauna assessment was conducted by the following personnel:

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

This report was prepared by Jeff Turpin and Ray Lloyd.

3.4 Licences and Permits

The field surveys were conducted under DPaW Regulation 17 (Licence to take Fauna for Scientific Purposes), licensed to JM Turpin, licence number SF009500, valid from 07/10/2013 to 07/10/2014.

3.5 Nomenclature and taxonomy

As per the recommendations of EPA and DEC (2010), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum's *Checklist of the Vertebrates of Western Australia*. The authorities used for each vertebrate group are: amphibians and reptiles (Aplin and Smith, 2001), birds (Christidis and Boles, 2008) and mammals (How *et al.* 2001).

Field identification of vertebrate species was based on the following field guides:

Mammals	. . . .	Menkhorst and Knight (2010);
Birds	. . . .	Simpson and Day (2010);
Reptiles	. . . .	Wilson and Swan (2013); and
Amphibians	. . . .	Tyler and Doughty (2009).

3.6 Desktop Survey

Information for this fauna assessment was drawn primarily from the DPaW database "NatureMap" (DPaW, 2013), the BirdLife Australia Atlas Database (BirdLife Australia, 2013), EPBC Protected Matters Search Tool (DOTE, 2013) and the results of fauna surveys conducted in the region (Turpin 2008; Biologic 2010; ecologia 2009; Ninox 2009; GHD 2010; URS 2009). All databases were interrogated in October 2013 (see below, Table 3). This information was supplemented with species expected in the area based on general patterns of distribution. Sources of information used for these general patterns included the above field guides.

Table 3. Sources of information used for the Desktop Survey.

Title	Comments	Area searched / Year
NatureMap	Records of specimens held in the WA Museum and DPaW database records. Includes historical data.	Survey Corridor with a 40 km Buffer.
Birds Australia Atlas Database	Records of bird observations in Australia, 1998-2013.	Species list for the 1 degree grid cells containing the survey corridor.
EPBC Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and conservation estate.	Survey corridor (plus~100 km buffer)
Sunrise Dam Level 2 Fauna Survey	Vertebrate Fauna Assessment of the Sunrise Dam Project Area (Ninox, 1995).	1995
Pinjin Haul Road Fauna Assessment	Opportunistic fauna survey conducted by Jeff Turpin for AngloGold along the proposed Pinjin Infrastructure Corridor (Turpin, 2008).	2008
Pinjin Level 1 Fauna Survey	Level 1 survey for the AngloGold Pinjin Infrastructure Corridor (Ninox, 2009).	2007, 2008
Carosue Dam – Pinjin Level 1 Fauna Survey	Survey for a proposed pipeline from Carosue Dam to Pinjin, conducted by Jeff Turpin (Biologic 2010).	2010
Targeted Sandhill Dunnart Survey	Trapping Survey for the Tropicana Operational Area and Infrastructure Corridor. Contains supplementary mammal, reptile and bird observations (GHD 2010).	2009
Tropicana Vertebrate Fauna Assessment	Level 2 fauna assessment of the Tropicana Operational Area. Survey conducted by Jeff Turpin (ecologia, 2009).	2006, 2007, 2008
URS Malleefowl and Mulgara Survey	Targeted Survey of the Tropicana Gold Project, conducted by URS (URS, 2009a)	2009
URS Marsupial Mole Survey	Targeted Survey of the Tropicana Gold Project, conducted by URS (URS, 2009b)	2009

3.7 Field Survey

The Murrin Murrin to Sunrise Dam Infrastructure Corridor field assessment was undertaken during October and November 2013. During the field survey, the entire pipeline route was visually inspected by vehicle and on foot. Fauna was sampled using a combination of targeted surveying, opportunistic sampling and the use of motion sensitive cameras.

All major fauna habitats occurring along the proposed infrastructure corridor were sampled and assessed for the likelihood of supporting conservation significant fauna. Habitats deemed suitable to support significant fauna were subject to more intensive targeted surveying. While surveying focused on locating evidence of conservation significant fauna, all fauna species observed were recorded.

Surveying included:

- Identification of vegetation and substrate associations (fauna habitats);
- Targeted searches for species of conservation significance;
- Bird census;
- Targeted herpetofauna searches (raking, hand searching, head-torching, linear transects focussing along the centreline of the corridor);
- Motion camera sites;
- Opportunistic surveying;
- Fauna habitat assessment – the suitability of vegetation communities (fauna habitats) to support species of conservation significance.

3.7.1 Vegetation and Substrate Associations (VSAs)

VSAs combine broad vegetation types, soils or other substrates with which they are associated, and the landform type. In the context of a fauna assessment, VSAs are the environments that provide habitats for fauna.

VSAs throughout the survey area were assessed during the desktop review and as part of the field investigations. All major VSAs were identified and surveyed to sample the major fauna habitat types present and to assess the likelihood of conservation significant species being present.

3.7.2 Targeted searching for conservation significant fauna

The current survey builds on methodologies previously employed to successfully detect conservation significant fauna in the region (see Turpin, 2008; Biologic 2010). As several significant fauna species have been recorded from within the region (see Section 2.1) the field surveys employed a combination of survey techniques to maximise the potential for their detection. These are listed in Table 4.

The presence of many conservation significant fauna species can be confirmed by searching for evidence of their activities (e.g. scats, tracks, diggings, burrows, see

Table 4). The Malleefowl, Southern Marsupial Mole, Sandhill Dunnart, Mulgara spp. and Great Desert Skink were of particular interest and specifically targeted during the survey as all are species of high conservation significance known from the region. Surveying focused on searching for:

- Malleefowl – distinctive tracks, mounds, feathers and scats;
- Southern Marsupial Mole – distinctive surface tracks and subsurface tunnels;
- Mulgara spp. - distinctive scats, tracks, foraging signs and burrows;
- Great Desert Skink - distinctive scats (latrine sites) and burrows;
- Australian Bustard – distinctive tracks;
- Bush Stone-Curlew – distinctive tracks.

Searching for evidence of significant fauna was therefore undertaken by walking through habitat considered suitable for such species.

Table 4. Survey methods used to detect conservation significant fauna.

Species	Status	Habitat	Target Search Focus	Other Survey Techniques
Malleefowl	Vulnerable	Dense Acacia, Mallee, Allocasuarina	Mounds, tracks, feathers, scats	Motion cameras
Sandhill Dunnart	Endangered	Yellow sand dunes with mature spinifex	Habitat Assessment	Motion cameras, Elliot Traps, Deep Pitfall Traps
Crest-tailed Mulgara	Vulnerable	Sand dunes and sandplains	Tracks, burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Brush-tailed Mulgara	Priority 4	Spinifex sandplains	Tracks, burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Southern Marsupial Mole	Endangered	Sand Dune fields	Tracks and tunnels	Standardised Mole Trenches
Great Desert Skink	Vulnerable	Spinifex sandplains	Burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Princess Parrot	Vulnerable	Marble Gum Woodland	Direct Observation	Bird Census
Major Mitchell's Cockatoo	Schedule 4	Woodlands, Shrublands	Direct Observation	Bird Census
Central Long-eared Bat	Priority 4	Woodlands, Shrublands	Acoustic Recording	Bat Detectors
Lerista puncticauda	Priority 2	Marble Gum leaf litter	Raking	Pitfall Traps, Funnel Traps
Australian Bustard	Priority 4	Spinifex sandplains	Tracks	Bird Census
Bush Stone-Curlew	Priority 4	Mulga, sandplains	Tracks	Bird Census
Locally significant fauna	Local	Yellow Sandplains	Raking, active searching	Pitfall Traps, Funnel Traps

3.7.3 Opportunistic Survey Sites

To sample all major fauna habitats occurring along the survey corridor, opportunistic surveying was conducted at numerous sites. At each opportunistic survey site, surveying consisted of bird census and targeted herpetofauna searches (see Appendix 2, Figure 5).

3.7.4 Bird Census

Bird surveys consisted of 20 minute meandering transects within each habitat type. These were conducted at each opportunistic survey site however focused mainly on locating species of conservation significance. As a result, bird surveys were biased towards samphire (targeting the Slender-billed Thornbill) and Mulga (targeting Malleefowl and the Bush Stone-Curlew) habitats.

3.7.5 Targeted Herpetofauna Searches

Foraging for herpetofauna (raking through leaf litter, turning over rocks, active searching) was undertaken at each opportunistic site and areas potentially supporting significant fauna. This included raking and hand foraging (turning over rocks) in rocky areas targeting *Aprasia picturata*.

3.7.6 Motion Cameras

Motion sensitive cameras (Bushnell Trophy Cam) were placed at two locations along the survey corridor. Two motion sensitive cameras were placed along a banded ironstone ridge with extensive outcropping (see Appendix 2). Several records of the Long-tailed Dunnart are known from approximately 3 km north of the ridge and so cameras were placed in two areas of suitable habitat aiming to locate the species. Both cameras were baited with universal bait (sardines, peanut butter, rolled oats).

3.7.7 Opportunistic Observations

At all times, observations of fauna were noted when they contributed to the accumulation of information on the local fauna assemblage. These included such casual observations as birds or reptiles seen while travelling through the site.

3.7.8 Habitat Assessment

All fauna habitats present along the survey corridor were inspected and assessed for the suitability of supporting conservation significant fauna, particularly the Malleefowl, Slender-billed Thornbill and Long-tailed Dunnart.

Figure 5. Fauna Survey Sites.

3.8 Limitations

The EPA Guidance Statement 56 (EPA 2004) outlines a number of limitations that may arise during surveying. These survey limitations are addressed below in Table 5.

Table 5. Survey Limitations.

Limitation	Comment
Level of survey.	Level 1 (desktop study, reconnaissance survey).
Competency/experience of the consultant(s) carrying out the survey.	The field personnel/authors have had extensive experience in conducting desktop reviews and fauna surveys. This includes several Level 1 and Level 2 surveys conducted across the region (eg. Turpin 2008; ecologia 2009; Biologic 2010).
Scope. (What faunal groups were sampled and were some sampling methods not able to be employed because of constraints?)	Birds were extensively sampled due to the nature of the survey, and some limited foraging was conducted to sample for reptiles, amphibians and mammals.
Proportion of fauna identified, recorded and/or collected.	All fauna observed were identified.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	Sources include previous reports on the fauna of the region (Ninox 1995, 2009; Turpin 2008; ecologia 2009; Biologic 2010; GHD 2010; URS 2009).); databases (BirdLife Australia, DPaW, , EPBC).
The proportion of the task achieved and further work which might be needed.	Level 1 Survey Complete. Further low level surveying is recommended if the proposed pipeline route is altered.
Timing/weather/season/cycle.	Field surveys conducted October and November 2013.
Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey.	No disturbances affected the survey results. Due to the remote survey location, the survey design was influenced by safety restrictions.
Intensity. (In retrospect, was the intensity adequate?)	Survey intensity was moderate (desktop study, reconnaissance survey with some targeted surveying for conservation significant fauna) however was adequate to satisfy EPA guidelines.
Completeness (e.g. was relevant area fully surveyed).	Desktop study covered infrastructure corridor area and adjacent habitats. The entire infrastructure corridor route was driven and visually inspected and all major fauna habitats sampled. Habitats likely to support conservation significant fauna were subject to

Limitation	Comment
	further intensive sampling on foot.
Resources (e.g. degree of expertise available in animal identification to taxon level).	All species identified to taxon level.
Remoteness and/or access problems.	Due to the remote survey location, the survey design was influenced by safety restrictions. Additionally some survey time was lost due to numerous flat tyres**.**
Availability of contextual (e.g. biogeographic) information on the region.	Regional information was available and was consulted. Dr Patricia Woolley (La Trobe University) was consulted for information on the Mulgara occurring within the Great Victoria Desert and David Pearson (DPaW) was consulted for information on the Yellow Sandplain Priority Ecological Community.

4. RESULTS

4.1 Fauna Habitats

At a broad scale, nine major fauna habitats (or VSAs) were recognised along the survey corridor. These can be grouped into major landform types, extending from low lying salt lake systems to tall rocky ridges. Major fauna habitats occurring along the survey corridor are:

1. Salt Lake Systems:
   a. Salt lakes and saline drainage systems with fringing saline plains supporting halophytic shrublands (*Tecticornia* spp.) and scattered tall acacia;

2. Broad Stony / Hardpan Plains:
   a. Stony alluvial plains supporting low Bluebush (*Maireana* spp.) and Saltbush (*Atriplex* spp.) shrublands;
   b. Stony plains supporting sparse Mulga (*Acacia aneura*) and other mixed acacia shrublands over soft sparse soft grasses;
   c. Broad drainage tracts supporting dense Mulga and mixed acacia shrublands;
   d. Gently undulating gravelly plains and low stony rises supporting mixed acacia (*A. aneura* and *A. ramulosa*) shrublands with areas of patchy halophytic shrublands;
   e. Hardpan clay plains supporting Mulga woodland

3. Sandplains:
   a. Sandplains supporting Mulga woodland over Wanderrie grasses with mixed acacia and *Eremophila* spp. shrubs;

4. Banded Ironstone Hills and Ridges:
   a. Banded Ironstone Formation (BIF) Ridges supporting acacia shrublands (particularly *A. aneura*);

5. Greenstone Hills and Ridges:
   a. Greenstone Hills supporting mixed acacia shrublands (particularly *A. aneura*) with *Eremophila, Senna* and *Ptilotus* species;

These habitats are depicted below (see Plates 1 – 9).

Plate 1. Salt lakes, saline drainage systems with fringing saline plains supporting halophytic shrublands (*Tecticornia* spp.) and scattered tall acacia;

Plate 2. Stony plains supporting low Bluebush (*Maireana* spp.) and Saltbush (*Atriplex* spp.) shrublands;

Plate 3. Stony plains supporting sparse Mulga (*Acacia aneura*) and other mixed acacia shrublands over soft sparse soft grasses and chenopods;

Plate 4. Broad drainage tracts supporting dense Mulga (*Acacia aneura*) and mixed acacia shrublands;

Plate 5. Alluvial plains supporting open Mulga (*Acacia aneura*) shrublands over Saltbush (Atriplex spp.) and / or Bluebush (Maireana spp.) shrublands.

Plate 6. Hardpan clay plains supporting Mulga (*Acacia aneura*) woodland;

Plate 7. Sandplains supporting Mulga (*Acacia aneura*) woodland over Wanderrie grasses with mixed acacia (eg. *A.a ramulosa*) and shrubs (*Eremophila* spp.);

Plate 8. Greenstone Hills supporting acacia shrublands (particularly *A. aneura*) with mixed shrubs (*Eremophila* spp., *Senna* spp. and *Ptilotus* spp.);

Plate 9. Banded Ironstone Formation Ridges supporting acacia shrublands (particularly *A. aneura*);

4.2 Vertebrate Fauna

The desktop survey identified 272 fauna species potentially occurring in the region (listed in Appendix 3). Based on the results of the database searches and literature reviews, eight frog, 85 reptile, 143 bird, 26 native mammal and 10 introduced mammal species may potentially occur (see Table 6, Appendix 3).

Table 6. Vertebrate Fauna Assemblage Expected in the Survey Area.

Taxon	Species Expected	Species Recorded (field survey)	Significant Fauna Expected			Significant Fauna Recorded		
			EPBC WCA	DPaW	Local	EPBC WCA	DPaW	Local
Frogs	8	0	0	0	0	0	0	0
Reptiles	85	18	0	0	1	0	0	0
Birds	143	57	13	2	2	1	0	0
Native Mammals	26	8	0	2	2	0	0	1
Introduced Mammals	10	6	- -	- -	- -	- -	- -	- -
Total	**272**	**89**	**13**	**4**	**5**	**1**	**0**	**1**

A total of 89 fauna species were recorded during the field surveys, comprising 18 reptile, 57 bird, 8 native mammal and six introduced mammal species (see Appendix 3). Several species of conservation significance are expected to occur within the survey corridor and are discussed below (see Section 5).

4.2.2 Amphibians

Eight frog species are expected to occur in the survey area (see Appendix 3). No frog species were recorded during the field surveys, a reflection of the dry seasonal conditions experienced. No frog species expected to occur within the project area are of conservation significance.

4.2.3 Reptiles

Of the 85 reptile species expected to occur in the survey area (see Appendix 3), 18 were recorded during the field surveys (see Appendix 3). Most reptile species recorded are widespread across the Murchison Bioregion, however due to the location of the survey area (on the fringe of two biogeographic regions) several species recorded are near the extreme edge of their range (eg. *Egernia depressa*). No reptile species of conservation significance were recorded however one species of local significance, *Aprasia picturata*, is highly likely to occur within the survey area (see Section 5).

4.2.4 Birds

Of the 143 bird species expected to occur in the survey area, 57 were recorded during the field surveys (see Appendix 3). Most avian species recorded are widespread across the Murchison Bioregion. However, due to the location of the survey area several species recorded are near the extreme edge of their range (eg. Western Bowerbird).

Several species of conservation significance are expected within the survey area. These species are discussed further in Section 5.

4.2.5 Mammals

Twenty six native mammal species and ten introduced mammal species are expected to occur within the survey area (see Appendix 3 and 4). Eight native mammal species and six introduced species were recorded during the field surveys. Although four species of conservation significance were expected to occur within the survey area (see Section 5: Conservation Significant Fauna), Woolley's Pseudantechinus was the only significant species recorded.

4.3 Invertebrate Fauna

Invertebrates in general are beyond the scope of environmental impact assessment because there are so many species and their taxonomy is poorly understood, but it is possible to focus on a small range of taxa including those that are of listed conservation significance, and those that qualify as short-range endemics (SREs). Harvey (2002) notes that the majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish).

The Arid Bronze Azure Butterfly is listed as Critically Endangered under the Wildlife Conservation Act and is currently being assessed for listing under the EPBC Act (T. Gamblin, pers. comm.). It is only known from Barbalin Nature Reserve (in the Wheatbelt region of Western Australia), however was formerly known from the Lake Douglas area near Kalgoorlie. There are no records of this species near the survey area.

The fairy shrimp *Branchinella simplex*, is listed as Priority 1 by DPaW and Vulnerable under the IUCN. Several records come from Lake Carey (DPaW, 2013) and as a result this species may occur within the survey area in salt lake habitat. The fairy shrimp *Branchinella apophysata*, is also listed as Priority 1. It known only from Lake Carey near Mount Margaret, approximately 5 km south of the corridor.

While the majority of habitats traversed by the infrastructure corridor are widespread there are some habitats traversed that have the potential to support SRE invertebrate fauna. These include rare and/or discontinuous habitats such as:

- Isolated rocky ridges such as the banded ironstone formation ridges, and greenstone ridges. Banded ironstone formation ridges are a recognised SRE habitat in the Midwest and Goldfields (DEC, 2007) and support SRE fauna such as mygalomorph spiders (eg. *Idiosoma nigrum*) and millipedes (eg. *Atelomastix bamfordi*);
- Salt lake communities support restricted invertebrate fauna such as *Branchinella* spp; and
- Relictual and long-unburnt mature Mulga patches - likely to support restricted fauna assemblages including SRE invertebrates. Mature Mulga communities often provide substantial shade and produce thick leaf litter, providing habitat supporting SRE invertebrates including mygalomorph spiders and scorpions.

5. CONSERVATION SIGNIFICANT FAUNA

5.1 Conservation Significant Fauna in the Region

Conservation significance includes fauna species listed under federal or state legislation, species listed as Priority Fauna by DPaW, species listed as declining in biodiversity publications and locally significant fauna due to restricted distributions. Thirty three species of conservation significance have been recorded in the local area (sourced from regional database searches and previous surveys). These species are outlined in Table 7 along with their conservation status and expected occurrence in the survey area. This list includes six reptile, 20 bird and seven mammal species.

Table 7 lists the likelihood of significant fauna occurring within the survey area. Fauna species are classified as Recorded (recorded during the current survey), Likely Resident (recorded nearby, suitable habitat present), Seasonal Visitor (expected to occur within the survey area at least on a seasonal basis), Rare Visitor (vagrant), Potential Resident (recorded in region, suitable habitat present), or Unlikely (suitable habitat absent). Thirteen conservation significant fauna species are considered likely to have resident populations within the survey area (see Table 7):

1. Malleefowl (EPBC Vulnerable) - mounds and sightings recorded nearby;
2. Slender-billed Thornbill (EPBC Vulnerable) – recorded at Sunrise Dam;
3. Long-tailed Dunnart (Priority 4) – records from Granny Smith mine;
4. Grey Falcon (WCA Vulnerable) – records from Murrin Murrin;
5. Peregrine Falcon (WCA Schedule 4) – records nearby;
6. Rainbow Bee-eater (EPBC Migratory) - several observed;
7. Australian Bustard (Priority 4) – recorded along Section 2;
8. Bush Stone-curlew (Priority 4) – records from near Leonora;
9. Central Long-eared Bat (Priority 4) - records 70 km from project area;
10. Southern Scrub-robin (locally significant) – recorded along Section 2;
11. *Aprasia picturata* (locally significant) – records 20 km from Section 1;
12. Kultarr (locally significant) – records from Granny Smith mine; and
13. Woolley's Pseudantechinus (locally significant) - scats recorded (this survey).

Of the 13 conservation significant species expected to occur within the survey area, only three species of high conservation significance (Malleefowl, Slender-billed Thornbill, Long-tailed Dunnart) are expected to have significant and resident populations in the local area. Many of the birds are nomadic and are only expected as occasional visitors and therefore would not depend on habitats within the survey corridor. The locally significant *Aprasia picturata* is likely to have a resident population within the survey area, associated with the greenstone hills and potentially other habitats such as banded ironstone ridges and sandplains. Additional conservation significant fauna species have been recorded from the region. However, due to a lack of suitable habitat many of these species are considered unlikely to occur within the survey corridor.

Table 7. Conservation status of significant fauna species expected to occur in the survey area.

Common Name	Species Name	Conservation Status			Local Records	Preferred Habitat Type	Habitat Present in Survey Area	Expected Status in Survey Area	Recorded in Survey Area
REPTILES		**CS1**	**CS2**	**CS3**					
Great Desert Skink	*Liopholis kintorei*	Vul	Vul		40 km east of Laverton	Red spinifex sandplains and sand ridges, paleodrainage lines.	No	Unlikely to occur	
Carpet Python	*Morelia spilota imbricata*	S4	P4		Tropicana	Eucalypt Woodland	No	Unlikely to occur	
Woma	*Aspidites ramsayi*	S4	P1		Neale Junction, Kitchener	Sandplains	No	Unlikely to occur	
Great Victoria Desert Slider	*Lerista puncticauda*		P2		Queen Victoria Spring	Marble Gum Woodland	No	Unlikely to occur	
Buff-snouted Blind Snake	*Ramphotyphlops margaretae*		P2		Neale Junction	Sandplain fringing salt lake systems	Potential	Unlikely to occur	
Black-headed Worm-lizard	*Aprasia picturata*			L	Murrin Murrin	Rocky hills including greenstone with Acacia shrublands	Yes	Likely Resident	Previously Recorded
BIRDS									
Malleefowl	*Leipoa ocellata*	Vul	Vul		Laverton, Murrin Murrin	Acacia shrublands, dense woodlands.	Yes	Potential Resident	Previously Recorded
Princess Parrot	*Polytelis alexandrae*	Vul	P4		Queen Victoria Spring	Marble Gum or Casuarina Woodland	No	Unlikely to occur	
Slender-billed Thornbill	*Acanthiza iredalei*	Vul			Sunrise Dam, Lake Rason	Samphire, Chenopods	Yes	Likely Resident / Visitor	Previously Recorded
Peregrine Falcon	*Falco peregrinus*	S4			Tropicana	Rocky ridges, major drainage lines, woodland	Yes	Potential Resident / Visitor	
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	S4			Queen Victoria Spring	Eucalypt Woodland, Acacia Shrublands	Yes	Potential Visitor	
Night Parrot	*Pezoporus occidentalis*	CrE	CrE		None	Spinifex, Chenopod communities	Yes	Unlikely Resident	
Rainbow Bee-eater	*Merops ornatus*	Mig	S3		Tropicana	Watercourses, woodland	Yes	Regular Migrant	Recorded
Fork-tailed Swift	*Apus pacificus*	Mig	S3		Menangina	Aerial	Yes	Irregular Visitor	
Striated Grasswren	*Amytornis striatus striatus*		P4		Queen Victoria Spring	Long-unburnt Spinifex sandplain with a dense shrub layer	No	Unlikely to occur	
Australian Bustard	*Ardeotis australis*		P4		Tropicana	Plains	Yes	Resident / Visitor	
Bush Stone-curlew	*Burhinus grallarius*		P4		Leonora	Acacia shrublands, Woodlands	Yes	Likely Resident	

Common Name	Species Name	Conservation Status			Local Records	Preferred Habitat Type	Habitat Present in Survey Area	Expected Status in Survey Area	Recorded in Survey Area
Grey Falcon	*Falco hypoleucos*		Vul		Murrin Murrin	Open grasslands and Wooded Watercourses	Yes	Potential Visitor	
Square-tailed Kite	*Lophoictinia isura*			L	Menzies	Woodland and Heath	Yes	Potential Visitor	
Scarlet-chested Parrot	*Neophema splendida*			L	Tropicana	Arid Woodland	Yes	Unlikely to occur	
Regent Parrot	*Polytelis anthopeplus*			L	Tropicana	Eucalypt Forest, Woodland	No	Unlikely to occur	
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*			L	Tropicana	Euclaypt Woodland, Mallee	No	Unlikely to occur	
Rufous Treecreeper	*Climacteris rufus*			L	Neale Junction	Mature Eucalypt Woodland with tree hollows	No	Unlikely to occur	
Chestnut Quail-thrush	*Cinclosoma castanotus*			L	Leonora	Eucalypt Woodland, Mallee	No	Unlikely to occur	
Southern Scrub-robin	*Drymodes brunneopygia*			L	Tropicana	Dense mallee, dense shrublands	Yes	Potential Resident	
EPBC Migratory Waterbirds	*Eg. Ardea modesta, Tringa nebularia*	Mig	S3		Leonora	Wetlands	Yes	Vagrant	
Mammals									
Southern Marsupial Mole	*Notoryctes typhlops*	End	End		Tropicana	Extensive sand dune fields	No	Unlikely to occur	
Sandhill Dunnart	*Sminthopsis psammophila*	End	End		Plumridge Lakes Access Track 33 km south of corridor	Long unburnt spinifex sandplain between yellow sand dunes. (*Triodia basedowii* life stage 2 - 3.5).	No	Unlikely to occur	
Crest-tailed Mulgara	*Dasycercus cristicauda*	Vul			Rawlinna	Sandhill Canegrass Sand dunes or salt lakes with Nitre Bush	No	Unlikely to occur	
Brush-tailed Mulgara	*Dasycercus blythi*		P4		Queen Victoria Spring	Red Spinifex sandplains	No	Unlikely to occur	
Long-tailed Dunnart	*Sminthopsis longicaudata*		P4		Granny Smith – 3 km east of corridor	Banded Ironstone Ridges	Yes	Likely Resident	
Central Long-eared Bat	*Nyctophilus timoriensis*		P4		Tropicana	Woodlands, shrublands	Yes	Resident	
Kultarr	*Antechinomys laniger*			L	Granny Smith – 3 km east of corridor	Stony plains	Yes	Likely Resident / Visitor	
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*			L	Tropicana, Laverton	Rocky Ridges	Yes	Resident	Recorded

Conservation Status Codes:

- CS1: EPBC Act listed species: End = Endangered, Vul = Vulnerable, Mig = Migratory, CrE = Critically Endangered;
- CS2:WC Act listed species: S1 = Schedule 1, S3 = Schedule 3, S4 = Schedule 4, DPaW Priority Species: P1 = Priority 1, P4 = Priority 4;
- CS3: Locally Significant species: L = Locally Significant.

5.2 Conservation Significant Fauna Recorded during the Field Survey

Two species of conservation significance were recorded from the survey area. These were:

- Rainbow Bee-eater (several birds observed in the vicinity of Sunrise Dam); and
- Woolley's Pseudantechinus (scats recorded from the crest of a BIF ridge near Granny Smith mine).

Two additional species were recorded outside the survey area:

- Malleefowl (one mound recorded 20 km east of Sunrise Dam and species previously observed near Murrin Murrin); and
- Australian Bustard (recorded near the Irwin Hills and near Laverton);

5.2.1 Rainbow Bee-eater (*Merops ornatus*)

The Rainbow Bee-eater is listed as Migratory under the EPBC Act. It is an abundant, ground-nesting species that catches insects on the wing over a range of environments. The Rainbow Bee-eater is able to nest in a range of habitat types including disturbed environments such as cleared paddocks and vacant residential blocks (J. Turpin, pers. obs.). It was recorded at several locations along the survey corridor. Due to its widespread occurrence, the presence of the Rainbow Bee-eater in the survey corridor is not considered significant.

5.2.2 Woolley's Pseudantechinus (*Pseudantechinus woolleyae*)

Woolley's Pseudantechinus is listed in this report as locally significant due to its pattern of distribution, habitat limitations and restricted regional occurrence. It occurs in arid Western Australia from the Pilbara south to the Goldfields. Woolley's Pseudantechinus is restricted to rugged, rocky habitats such as rocky ridges and breakaways (DPaW, 2013). It is listed as significantly dependent on banded ironstone formations in the region (DEC 2007).

Woolley's Pseudantechinus was recorded from the survey corridor with several scats located within a rock crevice on the crest of a banded ironstone ridge (from 433161E, 6813533N). This species is also considered likely to occur in areas of rocky outcropping throughout the region.

5.3 Conservation Significant Fauna Expected within the Survey Area

While two conservation significant fauna species were recorded during the field survey, additional species are also expected to occur in the area, based on the available habitats present. Many fauna species are cryptic, nomadic, may be difficult to detect, or may only be active at particular times of the year or present in a given area during favourable conditions. As a result, several additional fauna species not recorded during the field surveys are expected to occur within the survey area. These are discussed below.

5.3.1 Malleefowl (*Leipoa ocellata*)

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

While no Malleefowl mounds were recorded within the survey area, some small areas of suitable habitat (such as dense, litter forming Acacia shrublands) occur (see Figure 6). Furthermore, a recent observation of this species near Murrin Murrin mine suggests the species persists in the local area (DPaW, 2013). One Malleefowl mound was also recorded 20km east of Sunrise Dam.

As a result the Malleefowl is expected to occur within the vicinity of the survey corridor and may forage and potentially breed in the area. Importantly no mounds were recorded along the pipeline route.

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

The Slender-billed Thornbill is listed as Vulnerable under the EPBC Act. It occurs in chenopod shrubland, typically in areas of saltmarsh dominated by Samphire, Bluebush (*Maireana*) or Saltbush (*Atriplex*) around salt lakes or low heath on sandplain (Pavey, 2002). The species occurs in a number of disjunct populations in Western Australia, from Shark Bay to the Nullarbor (Johnstone and Storr, 2004). The Slender-billed Thornbill is considered uncommon and rare (and in some areas locally extinct) in inland Western Australia. The species is declining over much of its range due to the degradation of chenopod vegetation by livestock and rabbits (Johnstone and Storr, 2004). In the Northern Territory, the subspecies is classified as Regionally Extinct (Pavey, 2002).

The Slender-billed Thornbill has been recorded in the local area. Ninox recorded the species at Lake Carey, 2 km west of survey corridor near Sunrise Dam. Several

individuals were recorded from Samphire on a gypsiferous dune system fringing the salt lake (Ninox, 1995).

Several areas of habitat suitable for the Slender-billed Thornbill occur within the survey area (see Figure 6). These include areas of Samphire on saline drainage systems and adjacent saline plains with or without Bluebush (*Maireana*) or Saltbush (*Atriplex*). Such habitat occurs in the areas fringing Lake Carey. Due to the presence of suitable habitat and records in close proximity to the survey area, the Slender-billed Thornbill is likely to occur within the survey area, as a resident or regular visitor.

Plate 11. Slender-billed Thornbill habitat recorded near Sunrise Dam.

5.3.3 Long-tailed Dunnart (*Sminthopsis longicaudata*)

The Long-tailed Dunnart is listed as Priority 4 by DPaW. In Western Australia this species has been recorded from widely separated populations in the Pilbara, Murchison, Gibson Desert and southern Carnarvon Basin (DPaW, 2013), where it appears to be a specialist of rocky habitats (rocky ridges, hills and breakaways) and particularly banded ironstone ridges (DEC, 2007, J. Turpin pers. obs.).

The Long-tailed Dunnart has been recorded in the local area with several records from a banded ironstone ridge near Granny Smith mine, approximately 3 km north of the survey area. The proposed corridor route passes across some linear banded ironstone ridges in this area (an extension of the same habitat containing the Granny Smith population extends into the survey area). As a result a resident population is

highly likely to occur within the survey corridor, particularly the BIF habitat in the vicinity of Granny Smith.

Plate 12. Long-tailed Dunnart habitat recorded near Granny Smith mine.

5.3.4 Grey Falcon (*Falco hypoleucos*)

The Grey Falcon is listed as Vulnerable under the Wildlife Conservation Act and IUCN. It has a distribution centred around ephemeral or permanent drainage lines where it utilises old nests of other bird species situated in the tallest trees along the river systems (Garnett and Crowley 2000). It favours lowland plains (such as sparsely wooded cracking clay plains and acacia shrublands that are crossed by tree-lined watercourses) and frequents wooded arid drainage lines and permanent waterholes (J. Turpin, pers. obs.).

The Grey Falcon has been recorded near Murrin Murrin, 5 km north of the survey area. As a result it is likely to occur within the survey area, however due to a lack of tree-lined watercourses is unlikely to breed in the area. It is likely to occur there as an irregular visitor.

5.3.5 Bush Stone-curlew (*Burhinus grallarius*)

The Bush Stone-curlew is classified as Priority 4 by DPaW. In the Murchison, it is often associated with Acacia woodlands and shrublands (including Mulga), banded ironstone ranges and ephemeral or permanent watercourses (J. Turpin, pers. obs.). However its occurrence near the survey area is limited.

The Bush Stone-curlew has been recorded near Leonora from Mulga woodland (J. Turpin pers. obs.) and several areas of suitable habitat occur within the survey area. It is likely to occur in the Mulga woodlands of the survey area near Murrin Murrin and Sunrise Dam, within the acacia shrublands associated with the banded ironstone ridges near Granny Smith mine and also the dense acacia shrublands associated with the rocky rises east of Sunrise Dam.

5.3.6 Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is listed under Schedule 4 (Other Specially Protected Fauna) of the Wildlife Conservation Act. This species is found in a variety of habitats, including rocky ledges, cliffs, watercourses, open woodland and acacia shrublands (Johnstone and Storr 1998).

The distribution of the Peregrine Falcon is often tied to the abundance of prey as it predates heavily on other birds. The Peregrine Falcon lays its eggs in recesses of cliff faces, tree hollows or in large abandoned nests of other birds (Johnstone and Storr 1998). The Peregrine Falcon mates for life with pairs maintaining a home range of about 20 - 30 km^2. Blakers *et al*. (1984) consider that Australia is one of the strongholds of the species, since it has declined in many other parts of the world. The Peregrine Falcon has been recorded from the vicinity of the project area from Leonora, Queen Victoria Spring and Plumridge Lakes Nature Reserves (BirdLife, 2013). This species is likely to occur within the survey area.

5.3.7 Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)

Major Mitchell's Cockatoo is listed under Schedule 4 of the Wildlife Conservation Act. It is sporadically distributed throughout arid and semi-arid Australia and may occur in sparsely timbered grasslands and shrublands (DEC, 2012). In the Murchison region this species is mostly restricted to the margins of the Murchison River (BirdLife Australia, 2013) where it has been recorded within *Eucalyptus camaldulensis* woodland particularly near water (J Turpin, pers. obs.). Major Mitchell's Cockatoo also occurs in the Great Victoria Desert, with records from Queen Victoria Spring Nature Reserve (DPaW, 2013). Due to a lack of Eucalypt habitat this species is unlikely to breed within the survey area. It is expected in the survey area only as a rare visitor.

5.3.8 Australian Bustard (*Ardeotis australis*)

The Australian Bustard is listed as Priority 4 by DPaW. This species is associated with a variety of grassland, grassy woodland and shrubland habitats, including spinifex grasslands and tussock grasslands. It will also forage in recently burnt areas (BirdLife, 2013).

The Australian Bustard occurs over much of arid Australia. Historical declines have been recorded in southern parts of its range but current populations appear stable,

particularly in the north (BirdLife, 2013). The main threats to its survival include a combination of habitat loss/degradation and predation by feral cats and foxes.

The Australian Bustard has been recorded in the region and it is likely to occur throughout the the survey area.

5.3.9 EPBC Migratory Birds

Several additional bird species listed as Migratory under the EPBC Act are expected to occur within the survey area. This includes the Fork-tailed Swift (expected as a rare and seasonal visitor) and several migratory waterbirds.

Most waterbird species are expected to occur in the survey corridor only as rare visitors, associated with the irregular flooding of the salt lake habitats (Sandpipers, Red-necked Stint, Common Greenshank, Great Egret). The Fork-tailed Swift is an aerial species that is largely independent of terrestrial habitat types and is considered to occur in the region only as a rare visitor.

5.3.10 Southern Scrub-robin (*Drymodes brunneopygia*)

The Southern Scrub-robin is listed in this report as locally significant due to its historical and ongoing patterns of decline, coupled with its fragmented distribution. It is listed as declining in several publications (eg. BirdLife, 2013; Johnstone and Storr, 2004), was listed as a declining species under the Action Plan of Australian Birds (Garnet and Crowley, 2000) and as a declining woodland species by Saunders and Ingram (1995). While not listed under state or national legislation, Johnstone and Storr (2004) also note some local extinctions in the Western Australia Wheatbelt.

The Southern Scrub-robin occurs in dense shrublands, thickets and low scrubs including within the understorey of Eucalypt Woodland and Mallee, sandplain shrublands and thickets on stony hills and breakaways (Johnstone and Storr, 2004). Suitable habitat for this species is mostly absent from survey area, however as this species has only recently been recorded from the region, its potential occurrence within the survey area cannot be discounted.

5.3.11 Central Long-eared Bat (*Nyctophilus timoriensis*)

The central form of the Greater Long-eared Bat is listed as Priority 4 by DEC. This species is regarded as locally common in the Coolgardie Bioregion, where it occurs in Eucalypt Woodlands with a tall shrub understorey and roosts in tree hollows. This species also inhabits Mallee and Acacia shrublands and has been found to the fringes of the Nullarbor Plain (DOTE, 2013). It has been recorded from the woodlands north of Queen Victoria Spring Nature Reserve approximately 70 km south of the survey area and due to the presence of suitable habitat is considered likely to occur within the survey area.

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

While not listed under state or federal legislation, *Aprasia picturata* has a highly restricted distribution and is considered locally significant. It is known only from three specimens from two distinct areas near Leonora (2 specimens) and Wiluna (1 specimen)(DPaw, 2013). The two records from near Leonora come from 20 km south-west of the survey corridor on greenstone ridges supporting low *Acacia* and *Eremophila* shrubland. The Wiluna record comes from *Triodia* hummock grassland (Wilson and Swan, 2013). As greenstone ridges occur within the infrastructure corridor the species is considered likely to occur within the survey area.

5.3.13 Kultarr (*Antechinomys laniger*)

The Kultarr is often associated with stony, granitic plains dominated by Acacia, Eremophila and Senna shrublands (Van Dyck and Strahan, 2008). The Kultarr is uncommon over most of its range, and populations appear to fluctuate seasonally (Van Dyck and Strahan, 2008). This species may occur periodically within the survey area, with records from the Granny Smith area, 3 km east of the survey corridor.

5.4 Conservation Significant Fauna Unlikely to occur within the Survey Area

Additional conservation significant fauna species have been recorded from the region. However, due to a lack of suitable habitat many of these species are considered unlikely to occur within the survey corridor. These include:

- Sandhill Dunnart – lack of Spinifex Grassland and sandplain habitat;
- Southern Marsupial Mole – lack of sand dune habitat;
- Great Desert Skink – lack of Spinifex sandplain habitat;
- Brush-tailed Mulgara – lack of sandplain habitat;
- Crest-tailed Mulgara – lack of sand dune habitat;
- Princess Parrot – lack of Eucalypt trees the species requires for breeding;
- Striated Grasswren – lack of sandplain habitat;
- Rufous Treecreeper - lack of Eucalypt trees the species requires for breeding;
- Chestnut Quail-thrush – lack of woodland habitat;
- Woma – lack of sandplain habitat;
- *Lerista puncticauda* – lack of sandplain habitat;
- Naretha Blue Bonnet – lack of Eucalypt / Casuarina nesting habitat;
- Greater Bilby – considered locally extinct;
- Carpet Python – lack of Eucalypt Woodland habitat;
- Night Parrot – lack of Spinifex habitat, no local records;
- *Ramphotyphlops margaretae* – lack of sandplain habitat, no local records; and
- Locally significant Eucalypt Woodland birds – lack of Eucalypt Woodland habitat. These birds include the Scarlet-chested Parrot, Regent Parrot and Purple-crowned Lorikeet.

5.5 Conservation Significant Habitats

Habitats of conservation significance tend to be those that are both rare across the landscape and that are important for significant species and/or for biodiversity. This includes relictual habitats and refugia. The disturbance of even small amounts of habitat in a localised area can have significant impacts to fauna if roosting, breeding, rare or unusual habitats are disturbed.

The main habitat types occurring within the survey area are described earlier in Section 4. The majority of the infrastructure corridor is comprised of habitats considered widespread and well represented in a regional sense. This includes the sandplain and stony alluvial plain habitats.

However several significant fauna habitats were recorded along the proposed infrastructure corridor (see Figure 6). Significant fauna habitats included those supporting significant fauna and restricted or relictual habitats. These included:

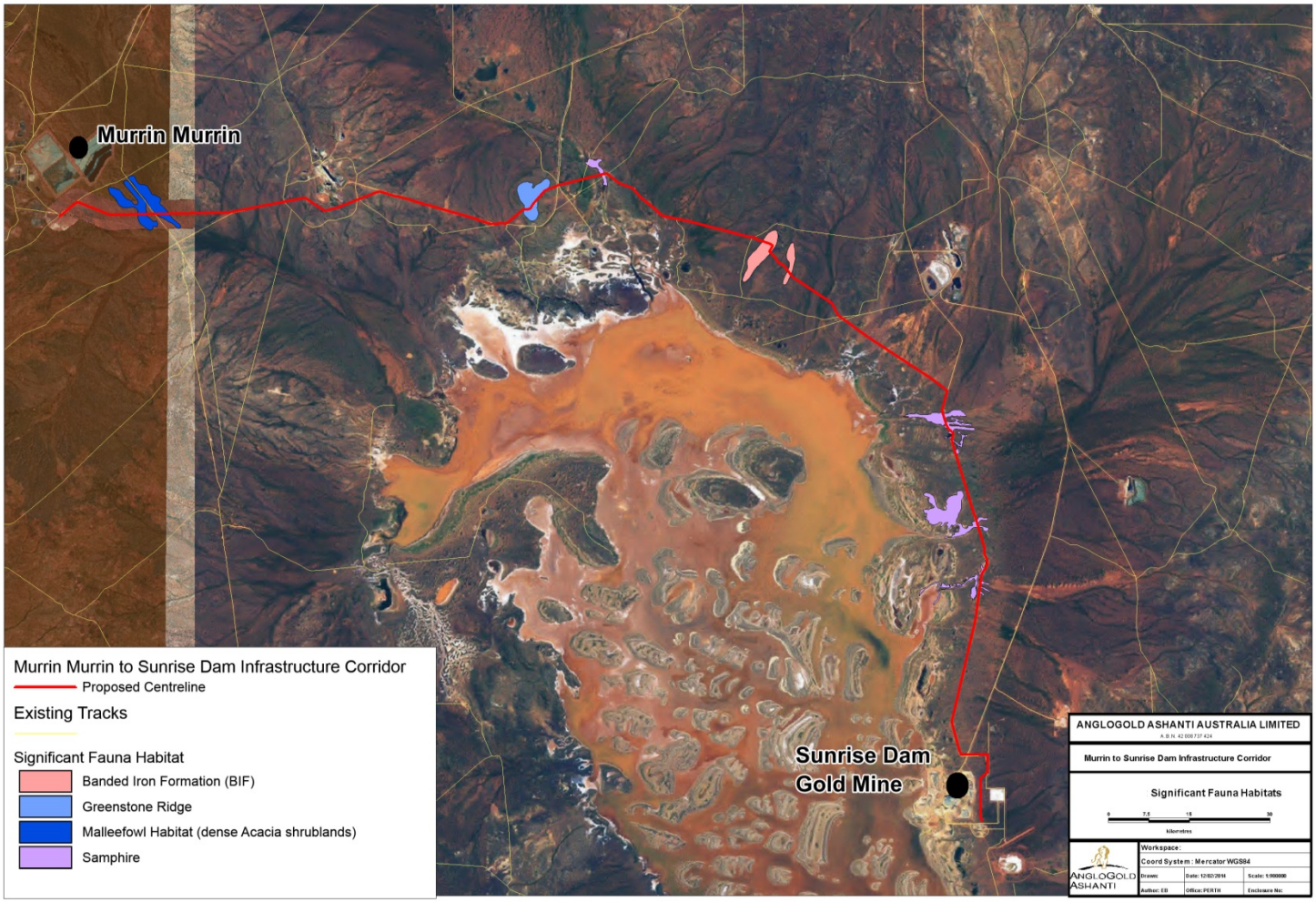
- Mulga Woodland:
  Long-unburnt and dense Mulga woodland is a rare habitat in the region and may potentially support the Malleefowl. Malleefowl habitat was recorded within small areas along the pipeline corridor;
- Banded Ironstone Formation (BIF) Ridges and Hills:
  Three linear ridges are crossed by the infrastructure corridor to the west of Granny Smith mine. This habitat is highly likely to support the conservation significant Long-tailed Dunnart and contains dense Mulga shrublands with the potential to support the Malleefowl. Banded ironstone ranges also contain relictual habitat with the potential to support fauna with restricted ranges;
- Greenstone Hills and Ridges:
  Likely to support the Long-tailed Dunnart and *Aprasia picturata*. Small areas recorded in the vicinity of Mount Margaret; and
- Samphire shrublands fringing salt lakes:
  While most of this habitat occurs outside the corridor some small areas were noted inside. This habitat is highly likely to support the conservation significant Slender-billed Thornbill as there are several local records for the species from Lake Carey.

The above habitats are summarised in Table 8 and mapped in Figure 6.

Table 8: Significant Fauna Habitats occurring within the Survey Area.

Fauna habitat	Description and occurrence in survey corridor	Conservation Significant Fauna Supported	Significance for Biodiversity	Anticipated Impact	Recommended Action
Dense Mulga Woodland on hardpan / rocky ridges	Mulga is widespread in the survey corridor however important areas that may provide habitat for the Malleefowl occur on the slopes of BIF ridges and small areas elsewhere.	Malleefowl, Southern Scrub-robin, Bush Stone-curlew	Likely to support a restricted fauna assemblage.	Minimal occurrence along pipeline route therefore minimal disturbance anticipated.	Avoid dense Mulga woodland where possible (see Figure 6). Avoid disturbance to Malleefowl mounds (however it should be noted that no mounds were located during the surveys). Buffer free disturbance zone around significant Malleefowl habitat (that containing mounds).
Banded Ironstone Formation (BIF) Hills and Ridges	Occurs across a small area west of Granny Smith mine (see Figure 6). Three prominent ridges with extensive ironstone outcropping are crossed by the corridor.	Long-tailed Dunnart, Malleefowl, Bush Stone-curlew	BIF supports a restricted fauna assemblage. A relictual habitat in the region supporting refugia.	Small areas occur along infrastructure corridor. Therefore small area of disturbance anticipated.	Avoid disturbance to BIF ridges where possible (see Figure 6). Avoid disturbance to Malleefowl mounds (however it should be noted that no mounds were located during the surveys). Avoid disturbances to BIF outcropping as this provides habitat for significant and relictual fauna.
Greenstone Hills and Ridges	Small areas recorded in the vicinity of Mount Margaret (see Figure 6).	Long-tailed Dunnart, *Aprasia picturata*	Likely to support a restricted fauna assemblage.	Small areas occur along infrastructure corridor. Therefore small area of disturbance anticipated.	Avoid disturbance to Greenstone Hills where possible (see Figure 6).
Samphire shrublands	Fringing Lake Carey and saline drainage systems to the east of Lake Carey. Most habitat occurs outside the corridor, some small areas noted inside.	Slender-billed Thornbill	Likely to support a restricted fauna assemblage. Also potential for SRE fauna.	Small areas of Samphire occur adjacent to pipeline route.	Avoid clearance of samphire shrubland in the vicinity of Sunrise Dam. Mostly occurs outside disturbance footprint (see Figure 6).

Figure 6: Significant Fauna Habitats occurring within the Survey Area.



5.6 EPBC Listed Fauna

When developments propose to undertake an action that has, will have or is likely to have a significant impact on a species listed under the EPBC Act (such as the Malleefowl or Slender-billed Thornbill) the proposed development is required to be referred to the Australian Government Department of the Environment. The Federal Environment Minister determines whether assessment is required under the EPBC Act (DOTE 2013). Guidelines for a referral involving EPBC listed species have been prepared: Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DOTE, 2013).

The Department of Environment lists a significant impact as:

"an impact which is important, notable, or of consequence, having regard to its context or intensity" (DOTE, 2013).

Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (DOTE, 2013). A significant impact is "likely" if the impact on the environment is a real (or not remote) chance or possibility. An action will require federal approval if the action has, will have, or is likely to have a significant impact on a species listed under the EPBC Act.

Critically Endangered and Endangered Species

An action is likely to have a significant impact on a Critically Endangered or Endangered species (such as the Sandhill Dunnart or Southern Marsupial Mole) if there is a real chance or possibility that it will:

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

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

Vulnerable Species

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

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

Two species occurring or expected in the survey area are listed as Vulnerable under the EPBC Act. These are the Malleefowl and Slender-billed Thornbill.

The Malleefowl has been recorded from the greater area, however no mounds were recorded within the survey corridor and areas of suitable habitat are small. As a result, the survey corridor is unlikely to support an "important population" of Malleefowl.

Similarly, the Slender-billed Thornbill has been recorded from the local area, with several records near Sunrise Dam. However, optimal habitat (Samphire shrubland) is extensive in the local area and occurs mainly adjacent to and outside the survey corridor. As a result, the survey corridor is unlikely to support an "important population" of the Slender-billed Thornbill.

Migratory Species

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

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

The survey corridor is not considered to contain ecologically significant numbers of Migratory waterbirds however some species may occur at Lake Carey which lies outside the project area. The proposed pipeline route avoids ephemeral wetlands such as salt lakes which may provide temporary habitat for some species. Some salt lake habitat does occur within the buffer zone which may provide occasional habitat during periodic flood events. Suitable habitat within the survey area is considered

marginal and may support small numbers or vagrants for a limited period. As a result the habitat within the survey area is not considered to be "important" under the EPBC criteria.

EPBC Summary

Actions considered to be at "low risk" of significant impact include those which avoid habitat removal, adopt and implement best practice mitigation and have a management plan in place to monitor significant populations (DOTE, 2013). To minimise impacts on the EPBC listed fauna, disturbances to significant fauna habitats (see Figure 6), including Mulga woodland, and Samphire shrubland should be minimised and avoided where possible.

The proposed infrastructure corridor contains small areas of habitat for EPBC listed fauna. However such habitat is regionally extensive and lies mostly outside the proposed disturbance footprint (see Table 9).

Table 9. EPBC listed fauna expected in the survey area and criteria for significant impact.

Species	Status	Important Population Expected	Habitat	Significant Disturbance Anticipated		Referral
				Habitat	Significant Impact Criteria Relevant	
Malleefowl	Vul.	No	Dense, long unburnt Mulga woodland	Unlikely – no mounds recorded within survey corridor. May disturb some Acacia shrubland	Roadkill potential. Unlikely to result in population decline, significant impact unlikely provided management measure employed	Not Applicable
Slender-billed Thornbill	Vul.	No	Samphire shrubland and adjacent chenopod shrubland	Unlikely – small areas of Samphire within survey corridor. May disturb some chenopod shrubland	Unlikely to result in population decline, significant impact unlikely provided management measure employed	Not Applicable
Migratory Waterbirds	Mig.	No	Salt Lakes, ephemeral wetlands	Unlikely – wetlands occur outside disturbance area	None	Not Applicable

6. SUMMARY OF FAUNA VALUES

The vertebrate fauna assemblage occurring along the proposed infrastructure corridor is potentially rich (see summary below), because the routes traverse a large and remote area and a variety of habitats. The majority of species expected are widespread however a number of significant species are present or expected and include several listed under the EPBC Act. The survey area does have some notable values:

- Significant fauna habitats including Mulga Woodlands, Samphire Shrublands, Banded Ironstone Ranges and Greenstone Hills;
- Conservation significant fauna species expected to be present include the EPBC listed Malleefowl and Slender-billed Thornbill, DPaW priority species including the Long-tailed Dunnart and Australian Bustard and locally significant fauna such as *Aprasia picturata*; and
- Remote areas containing refugia, supporting intact fauna assemblages.

Overall, impacts of the development and operation of the pipeline upon the fauna assemblage are anticipated to be low, as the development area is long and narrow, passes through many widespread landscapes and effects are mostly temporary because the pipeline will be buried and to some extent rehabilitated.

Impacts to local Malleefowl and Slender-billed Thornbill populations are expected to be low assuming management practises (such as avoidance of important habitat and fire management) are carried out. Impacts are summarised in accordance with EPA Guidance in Table 10.

TABLE 10. Impacts upon the fauna values of the survey area.

Species Name	Nature and significance of likely impact		Suggested Action
	Nature of impact	Significance	
Malleefowl	Roadkill possible. Some loss of habitat. Potential for habitat removal / degradation due to increased fire incidence, fragmentation of habitat.	Low (most habitat will not be affected. Species occurs at low densities).	Avoid disturbance to dense Mulga woodland. Develop a Malleefowl Management Plan to ensure impacts on the local Malleefowl population are minimized. Avoid disturbance to any Malleefowl mounds. Disturbance free buffer zones implemented around active mounds. Develop a fire management plan which accounts for the preservation of Mulga
Slender-billed Thornbill	Loss of habitat.	Low (most Samphire Shrubland lies outside the proposed corridor route)	Avoid disturbance to Samphire Shrubland. Minimise disturbance footprint.
Long-tailed Dunnart	Some loss of habitat.	Moderate - Low (most habitat lies outside disturbance area).	Avoid disturbances to Banded Ironstone ridges, particularly hill crests with outcropping. Minimise disturbance footprint. Manage trench mortality.
Peregrine Falcon	Some loss of habitat.	Low (minimal habitat will be disturbed).	Minimise disturbance footprint.
Grey Falcon	Loss of habitat - possible loss of nesting trees	Low (most habitat should not be affected).	Minimise disturbance footprint.
Bush Stone-curlew	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	Avoid disturbances to Banded Ironstone ridges. Minimise disturbance footprint.
Australian Bustard	Some loss of habitat through clearing.	Low (most habitat should not be affected).	Minimise disturbance footprint.
Central Long-eared Bat	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	Minimise disturbance footprint
EPBC Migratory Species (see Bird section in Results)	Loss or disturbance of roosting habitat	Low (most habitat should not be affected).	Avoid disturbances to wetlands. Minimise hydrological impacts. 50m disturbance free buffer around wetlands
Locally Significant Fauna	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	Minimise disturbance footprint. Avoid disturbance to Mulga Woodland and Greenstone Hills. Develop a fire management plan which accounts for the preservation of Mulga

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Appendix 1. Categories used in the assessment of conservation status.

IUCN categories (based on review by Mace and Stuart 1994) as used for the Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act.

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

Definitions of relevant categories under the EPBC Act.

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

Schedules used in the WA Wildlife Conservation Act.

CATEGORY	DEFINITION
Schedule 1.	Species that are Rare and Likely to become Extinct
Schedule 2.	Species that area presumed Extinct.
Schedule 3	Migratory species listed under international treaties.
Schedule 4.	Other Specially Protected Fauna.

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

CATEGORY	DEFINITION
Priority One (P1)	Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (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 if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	Taxa in need of monitoring Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependant).

Appendix 2: Fauna Survey Sites.

Table 1. Opportunistic Survey Sites

Site	Easting	Northing	Habitat
1	399544	6814944	Mulga Woodland
2	433161	6813533	Banded Ironstone ridge with extensive rock outcropping
3	433393	6813243	Banded Ironstone ridge with extensive rock outcropping
4	444935	6794506	Samphire / Chenopod Shrubland
5	445197	6795043	Samphire / Chenopod Shrubland
6	444984	6798219	Samphire / Chenopod Shrubland
7	443776	6802068	Samphire / Chenopod Shrubland
8	443119	6804194	Samphire / Chenopod Shrubland
9	424307	6817308	Samphire / Chenopod Shrubland
10	437769	6809276	Temporary pool
11	431869	6814045	Mulga Woodland / Greenstone Hill / Minor Acacia Drainage Line
12	420264	6815406	Greenstone Hill

Table 2. Motion Sensitive Camera Sites

Site	Easting	Northing	Habitat	Survey Nights
1	433161	6813533	Banded Ironstone ridge with extensive rock outcropping	7
2	433393	6813243	Banded Ironstone ridge with extensive rock outcropping	7

Appendix 3: Fauna Recorded or Expected to Occur in the Survey Area.

Fauna Recorded from the Survey Area
(Tables 1 to 5).

These lists are derived from the results of database and literature searches and from previous field surveys conducted in the local area. These are:

- NatureMap Database (NM): searched October 2013;
- Birdlife Australia Database (BA): searched October 2013;
- Species recorded from Queen Victoria Spring Nature Reserve (QVS);
- Species recorded from the Tropicana Gold Mine Project Area (TPA) during previous fauna surveys (ecologia 2009);
- Species recorded by Jeff Turpin along the Pinjin Infrastructure Corridor (Turpin 2008 and Biologic 2010);
- Species recorded by Ninox Wildlife Consulting along the Pinjin Infrastructure Corridor (Ninox 2009);
- Species recorded by GHD during the trapping program along the Pinjin Infrastructure Corridor (GHD 2010);
- Species recorded by Ninox during the Level 2 fauna survey of Sunrise Dam (Ninox, 1995);
- Species recorded from the current survey - Kingfisher Environmental Consulting (KEC 2013).

Key:
Note the conservation status of significant taxa is also listed under “Status”. This includes species listed under the EPBC and Wildlife Conservation Acts, DPAW Priority Fauna and Locally Significant Fauna:

- EPBC Act listed species: End = Endangered, Vul = Vulnerable, Mig = Migratory, CrE = Critically Endangered;
- WC Act listed species: S1 = Schedule 1, S3 = Schedule 3, S4 = Schedule 4;
- DPaW Priority Species: P1 = Priority 1, P2 = Priority 2, P4 = Priority 4;
- Locally Significant species: L = Locally Significant.

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

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	TPA	KEC 2013
HYLIDAE									
Sheep Frog	*Cyclorana maini*		X						
Water-holding Frog	*Cyclorana platycephala*		X		X				
Little Red Tree Frog	*Litoria rubella*		X						
LIMNODYNASTIIDAE									
Kunapalari Frog	*Neobatrachus kunapalari*		X	X					
Desert Trilling Frog	*Neobatrachus sudellae*		X						
Shoemaker Frog	*Neobatrachus sutor*		X	X	X				
Wilsmore's Frog	*Neobatrachus wilsmorei*		X		X				
MYOBATRACHIDAE									
Western Toadlet	*Pseudophryne occidentalis*		X						
TOTAL	8		8	2	3	0	0	0	0

TABLE 2. Reptiles expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2013
AGAMIDAE										
Long-nosed Dragon	*Amphibolurus longirostris*								X	
Ring-tailed Dragon	*Ctenophorus caudicinctus*		X							
Mallee Military Dragon	*Ctenophorus fordi*		X	X	X	X			X	X
Central Netted Dragon	*Ctenophorus nuchalis*		X	X	X			X	X	
Western Netted Dragon	*Ctenophorus reticulatus*		X			X			X	
Claypan Dragon	*Ctenophorus salinarum*		X		X	X				
Lozenge-marked Dragon	*Ctenophorus scutulatus*		X			X	X			X
Mulga Dragon	*Diporiphora amphiboluroides*								X	
Thorny Devil	*Moloch horridus*			X	X		X	X	X	X
Bearded Dragon	*Pogona minor*		X	X				X	X	X
Pebble Dragon	*Tympanocryptis cephalus*		X		X					
DIPLODACTYLIDAE										
Fat-tailed Gecko	*Diplodactylus conspicillatus*			X						
Western Stone Gecko	*Diplodactylus granariensis*		X					X	X	
Beautiful Gecko	*Diplodactylus pulcher*		X		X					

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2013
Beaded Gecko	*Lucasium damaeum*		X	X				X	X	
Main's Ground Gecko	*Lucasium maini*			X						
Mottled Ground Gecko	*Lucasium squarrosum*		X					X		
Sand-plain Gecko	*Lucasium stenodactylum*									
Beaked Gecko	*Rhynchoedura ornata*		X	X	X			X	X	X
Thorn -tailed Gecko	*Strophurus assimilis*		X	X						
Ring-tailed Gecko	*Strophurus strophurus*		X						X	
Western Shield Spiny-tailed Gecko	*Strophurus wellingtonae*		X							
CARPHODACTYLIDAE										
Smooth Knob-tailed Gecko	*Nephrurus levis levis*			X				X	X	
Barking Gecko	*Nephrurus milii*		X							
Midline Knob-tail	*Nephrurus vertebralis*		X							
GEKKONIDAE										
Purplish Dtella	*Gehyra purpurascens*		X	X				X	X	
Tree Dtella	*Gehyra variegata*		X	X	X	X	X	X	X	X
Bynoe's Gecko	*Heteronotia binoei*		X		X	X			X	X
PYGOPODIDAE										
Black-headed Worm Lizard	*Aprasia picturata*	L	X							
Unbanded Dema	*Delma butleri*		X	X				X	X	
Burton's Legless-Lizard	*Lialis burtonis*		X	X			X		X	
Western Hooded Scaly-foot	*Pygopus nigriceps*		X	X					X	
SCINCIDAE										
Inland Snake-eyed Skink	*Cryptoblepharus australis*		X							
Buchanan's Snake-eyed Skink	*Cryptoblepharus buchananii*		X		X					
Brooks' Wedge-snout Ctenotus	*Ctenotus brooksi*		X	X				X	X	
Grand Ctenotus	*Ctenotus grandis*								X	
Greer's Ctenotus	*Ctenotus greeri*		X		X				X	
Dusky Ctenotus	*Ctenotus helenae*		X			X		X	X	
Leonhard's Ctenotus	*Ctenotus leonhardii*		X		X	X			X	X
Panther Skink	*Ctenotus pantherinus*		X	X			X	X	X	X
Barred Wedge-snouted Ctenotus	*Ctenotus schomburgkii*		X	X	X	X	X	X	X	X
Rock Ctenotus	*Ctenotus severus*		X							
Spotted Ctenotus	*Ctenotus uber*		X							
Spinifex Slender Blue-tongue	*Cyclodomorphus melanops*		X	X					X	
Pygmy Spiny-tailed Skink	*Egernia depressa*		X		X	X				X

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2013
Goldfields Crevice Skink	*Egernia formosa*			X	X					
Broad-banded Sandswimmer	*Eremiascincus richardsonii*		X	X				X	X	
North-western Sandslider	*Lerista bipes*		X	X	X			X	X	X
Central Deserts Robust Slider	*Lerista desertorum*		X	X	X			X	X	
Common Mulch Lerista	*Lerista kingi*					X				
Southern Robust Slider	*Lerista picturata*			X						
Common Mulch Lerista	*Lerista timda*		X						X	
Desert Skink	*Liopholis inornata*		X	X				X	X	X
Night Skink	*Liopholis striata*			X					X	
Common Dwarf Skink	*Menetia greyii*		X	X				X	X	X
Woodland Dark Fleck Skink	*Morethia butleri*		X	X	X			X	X	
Centralian Blue-tongue	*Tiliqua multifasciata*							X	X	
Western Blue-tongue	*Tiliqua occipitalis*		X	X		X			X	
Bobtail	*Tiliqua rugosa*					X				
VARANIDAE										
Short-tailed Pygmy Monitor	*Varanus brevicauda*				X				X	
Pygmy Mulga Monitor	*Varanus caudolineatus*		X		X					
Pygmy Desert Monitor	*Varanus eremius*							X	X	
Perentie	*Varanus giganteus*								X	
Sand Monitor	*Varanus gouldii*		X	X		X	X	X	X	X
Yellow-spotted Monitor	*Varanus panoptes rubidus*		X							X
Racehorse Monitor	*Varanus tristis tristis*							X	X	X
TYPHLOPIDAE										
Dark-spinned Blind Snake	*Ramphotyphlops bicolor*									
Prong-snouted Blind Snake	*Ramphotyphlops bituberculatus*		X							
Interior Blind Snake	*Ramphotyphlops endoterus*		X						X	
Northern Hook-Snouted Blind Snake	*Ramphotyphlops hamatus*		X							
Common Beaked Blind Snake	*Ramphotyphlops waitii*		X						X	
BOIDAE										
Pygmy Python	*Antaresia perthensis*		X							
Stimson's Python	*Antaresia stimsoni*		X							
ELAPIDAE										
Desert Death Adder	*Acanthophis pyrrhus*								X	
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*			X					X	
Yellow-faced Whipsnake	*Demansia psammophis*			X					X	X

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2013
Moon Snake	*Furina ornata*		X							
Black-naped Snake	*Neelaps bimaculatus*		X						X	
Monk Snake	*Parasuta monachus*		X	X	X				X	
Mulga Snake	*Pseudechis australis*		X	X	X	X			X	
Spotted Mulga Snake	*Pseudechis butleri*		X							
Ringed Brown Snake	*Pseudonaja modesta*								X	
Western Brown Snake	*Pseudonaja mengdeni*				X	X			X	
Jan's Banded Snake	*Simoselaps bertholdi*		X	X	X				X	
Rosen's Snake	*Suta fasciata*		X		X					
Total Number of Species Expected: 85										
Total Recorded:		**1**	**61**	**35**	**25**	**16**	**7**	**25**	**52**	**18**

TABLE 3. Birds expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
CASUARIIDAE										
Emu	*Dromaius novaehollandiae*		X	X	X	X	X		X	X
PHASIANIDAE										
Stubble Quail	*Coturnix pectoralis*		X							
MEGAPODIIDAE										
Malleefowl	*Leipoa ocellata*	Vul				X	X		X	
ANATIDAE										
Musk Duck	*Biziura lobata*		X							
Black Swan	*Cygnus atratus*		X		X	X				
Australian Shelduck	*Tadorna tadornoides*		X		X	X				
Australian Wood Duck	*Chenonetta jubata*		X		X	X				
Pacific Black Duck	*Anas superciliosa*		X		X	X				
Pink-eared Duck	*Malacorhynchus membranaceus*		X		X	X				
Grey Teal	*Anas gracilis*		X		X	X				
Australasian Shoveler	*Anas rhynchotis*		X		X					
Hardhead	*Aythya australis*		X			X				
PODICIPEDIDAE										
Australasian Grebe	*Tachybaptus novaehollandiae*		X		X	X				
Hoary-headed Grebe	*Poliocephalus poliocephalus*		X			X			X	
COLUMBIDAE										
Common Bronzewing	*Phaps chalcoptera*		X	X	X	X	X	X	X	X
Crested Pigeon	*Ocyphaps lophotes*		X		X	X	X		X	X
Diamond Dove	*Geopelia cuneata*								X	
PODARGIDAE										
Tawny Frogmouth	*Podargus strigoides*		X	X		X			X	
EUROSTOPODIDAE										
Spotted Nightjar	*Eurostopodus argus*		X			X				X
AEGOTHELIDAE										
Australian Owlet-nightjar	*Aegotheles cristatus*		X		X	X	X		X	X
APODIDAE										
Fork-tailed Swift	*Apus pacificus*	Mig								
ARDEIDAE										
White-faced Heron	*Egretta novaehollandiae*		X		X					
White-necked Heron	*Ardea pacifica*		X							
Eastern Great Egret	*Ardea modesta*	Mig								
ACCIPITRIDAE										
Black-shouldered Kite	*Elanus axillaris*		X							

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
Square-tailed Kite	*Lophoictinia isura*									
Black-breasted Buzzard	*Hamirostra melanosternon*									
Whistling Kite	*Haliastur sphenurus*		X							
Black Kite	*Milvus migrans*									
Brown Goshawk	*Accipiter fasciatus*		X		X		X	X		
Collared Sparrowhawk	*Accipiter cirrocephalus*		X						X	
Spotted Harrier	*Circus assimilis*									
Wedge-tailed Eagle	*Aquila audax*		X	X	X	X	X	X	X	X
Little Eagle	*Hieraaetus morphnoides*		X			X	X		X	
FALCONIDAE										
Nankeen Kestrel	*Falco cenchroides*		X	X	X	X	X	X	X	X
Brown Falcon	*Falco berigora*		X	X	X	X	X	X	X	X
Australian Hobby	*Falco longipennis*		X		X		X		X	X
Peregrine Falcon	*Falco peregrinus*	Sc4	X		X				X	
Grey Falcon	*Falco hypoleucos*	Vul								
RALLIDAE										
Eurasian Coot	*Fulica atra*		X		X	X			X	
Black-tailed Native-hen	*Tribonyx ventralis*		X							
OTIDIDAE										
Australian Bustard	*Ardeotis australis*	P4	X	X		X	X	X	X	
BURHINIDAE										
Bush Stone-curlew	*Burhinus grallarius*	P4								
RECURVIROSTRIDAE										
Red-necked Avocet	*Recurvirostra novaehollandiae*					X				
Black-winged Stilt	*Himantopus himantopus*		X			X				
Banded Stilt	*Cladorhynchus leucocephalus*				X					
CHARADRIIDAE										
Red-capped Plover	*Charadrius ruficapillus*		X							X
Black-fronted Dotterel	*Elseyornis melanops*		X		X	X				
Red-kneed Dotterel	*Erythrogonys cinctus*		X							
Inland Dotterel	*Charadrius australis*		X	X						
Oriental Plover	*Charadrius veredus*	Mig								
Banded Lapwing	*Vanellus tricolor*		X		X	X			X	
SCOLOPACIDAE										
Common Greenshank	*Tringa nebularia*	Mig	X			X				
Wood Sandpiper	*Tringa glareola*	Mig	X			X				
Red-necked Stint	*Calidris ruficollis*	Mig	X							
Sharp-tailed Sandpiper	*Calidris acuminata*	Mig								

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
Curlew Sandpiper	*Calidris ferruginea*	Mig								
Common Sandpiper	*Actitis hypoleucos*	Mig								
TURNICIDAE										
Little Button-quail	*Turnix velox*		X	X						
LARIDAE										
Silver Gull	*Larus novaehollandiae*									
CACATUIDAE										
Galah	*Eolophus roseicapillus*		X		X	X	X	X	X	X
Little Corella	*Cacatua sanguinea*									
Cockatiel	*Nymphicus hollandicus*		X		X				X	X
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	Sc4		X						
PSITTACIDAE										
Australian Ringneck	*Barnardius zonarius*		X	X		X	X	X	X	X
Mulga Parrot	*Psephotus varius*		X	X	X	X	X		X	X
Budgerigar	*Melopsittacus undulatus*		X		X				X	X
Bourke's Parrot	*Neopsephotus bourkii*		X		X					
Scarlet-chested Parrot	*Neophema splendida*	L		X				X	X	
Night Parrot	*Pezoporus occidentalis*	CrE								
CUCULIDAE										
Horsfield's Bronze-Cuckoo	*Chalcites basalis*		X		X	X			X	X
Black-eared Cuckoo	*Chalcites osculans*		X					X	X	
Pallid Cuckoo	*Cacomantis pallidus*		X			X			X	
STRIGIDAE										
Southern Boobook	*Ninox novaeseelandiae*		X	X		X	X			
TYTONIDAE										
Eastern Barn Owl	*Tyto alba*									
HALCYONIDAE										
Red-backed Kingfisher	*Todiramphus pyrrhopygius*		X					X	X	X
Sacred Kingfisher	*Todiramphus sanctus*		X							
MEROPIDAE										
Rainbow Bee-eater	*Merops ornatus*	Mig	X			X	X	X	X	X
CLIMACTERIDAE										
White-browed Treecreeper	*Climacteris affinis*		X		X	X			X	
PTILONORHYNCHIDAE										
Western Bowerbird	*Ptilonorhynchus guttatus*		X							X
MALURIDAE										
Splendid Fairy-wren	*Malurus splendens*		X	X	X	X	X		X	X
White-winged Fairy-wren	*Malurus leucopterus*		X		X	X				X

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
Variegated Fairy-wren	*Malurus lamberti*		X							
ACANTHIZIDAE										
Rufous Fieldwren	*Calamanthus campestri*									
Redthroat	*Pyrrholaemus brunneus*		X	X	X	X	X	X	X	X
Weebill	*Smicrornis brevirostris*		X	X		X	X	X	X	
Western Gerygone	*Gerygone fusca*		X					X		
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X	X	X	X	X		X	X
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		X	X	X	X	X		X	X
Slaty-backed Thornbill	*Acanthiza robustirostris*		X		X			X	X	X
Inland Thornbill	*Acanthiza apicalis*		X	X	X	X	X	X	X	X
Slender billed Thornbill	*Acanthiza iredalei*	Vul	X		X					
Southern Whiteface	*Aphelocephala leucopsis*		X		X	X			X	X
PARDALOTIDAE										
Striated Pardalote	*Pardalotus striatus*		X	X		X			X	
MELIPHAGIDAE										
Pied Honeyeater	*Certhionyx variegatus*		X							
Singing Honeyeater	*Lichenostomus virescens*		X	X	X	X	X		X	X
White-plumed Honeyeater	*Lichenostomus penicillatus*		X							
Grey-fronted Honeyeater	*Lichenostomus plumulus*		X	X		X	X	X	X	
White-fronted Honeyeater	*Purnella albifrons*		X	X	X	X	X		X	X
Yellow-throated Miner	*Manorina flavigula*		X	X	X	X	X	X	X	X
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X	X	X	X	X		X	X
Crimson Chat	*Epthianura tricolor*		X	X	X				X	X
White-fronted Chat	*Epthianura albifrons*		X		X	X				
Orange Chat	*Epthianura aurifrons*									
Black Honeyeater	*Sugomel niger*		X							
Brown Honeyeater	*Lichmera indistincta*		X	X		X	X	X	X	
Brown-headed Honeyeater	*Melithreptus brevirostris*					X		X		
POMATOSTOMIDAE										
White-browed Babbler	*Pomatostomus superciliosus*		X		X	X	X	X	X	X
PSOPHODIDAE										
Chestnut-breasted Quail-thrush	*Cinclosoma castaneothorax*		X							
Chiming Wedgebill	*Psophodes occidentalis*		X							
NEOSITTIDAE										
Varied Sittella	*Daphoenositta chrysoptera*								X	
CAMPEPHAGIDAE										
Ground Cuckoo-shrike	*Coracina maxima*		X	X		X			X	

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		X	X	X	X	X	X	X	X
White-winged Triller	*Lalage sueurii*		X					X		X
PACHYCEPHALIDAE										
Rufous Whistler	*Pachycephala rufiventris*		X	X	X	X	X	X	X	X
Grey Shrike-thrush	*Colluricincla harmonica*		X	X	X	X	X	X	X	X
Crested Bellbird	*Oreoica gutturalis*		X	X	X	X	X	X	X	X
ARTAMIDAE										
Masked Woodswallow	*Artamus personatus*		X	X					X	X
Black-faced Woodswallow	*Artamus cinereus*		X				X	X	X	X
Little Woodswallow	*Artamus minor*		X							X
Grey Butcherbird	*Cracticus torquatus*		X	X	X	X	X		X	X
Pied Butcherbird	*Cracticus nigrogularis*		X	X	X	X	X	X	X	X
Australian Magpie	*Cracticus tibicen*		X		X	X		X	X	X
Grey Currawong	*Strepera versicolor*		X	X		X	X		X	X
RHIPIDURIDAE										
Grey Fantail	*Rhipidura albiscapa*		X			X		X		
Willie Wagtail	*Rhipidura leucophrys*		X		X	X	X	X	X	X
CORVIDAE										
Little Crow	*Corvus bennetti*		X	X	X	X	X		X	
Torresian Crow	*Corvus orru*		X		X			X		X
Australian Raven	*Corvus coronoides*					X				
MONARCHIDAE										
Magpie-lark	*Grallina cyanoleuca*		X		X	X			X	X
PETROICIDAE										
Red-capped Robin	*Petroica goodenovii*		X	X	X	X	X	X	X	X
Hooded Robin	*Melanodryas cucullata*		X			X	X		X	X
Jacky Winter	*Microeca fascinans*		X			X	X	X	X	
Southern Scrub-robin	*Drymodes brunneopygia*	L								
MEGALURIDAE										
Rufous Songlark	*Cincloramphus mathewsi*		X							
Brown Songlark	*Cincloramphus cruralis*		X		X					
HIRUNDINIDAE										
White-backed Swallow	*Cheramoeca leucosterna*		X		X	X			X	X
Welcome Swallow	*Hirundo neoxena*		X		X	X				X
Fairy Martin	*Petrochelidon ariel*		X			X				X
Tree Martin	*Petrochelidon nigricans*		X						X	X
NECTARINIIDAE										
Mistletoebird	*Dicaeum hirundinaceum*		X	X	X	X	X	X	X	X

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
ESTRILDIDAE										
Zebra Finch	*Taeniopygia guttata*		X		X	X			X	X
MOTACILLIDAE										
Australasian Pipit	*Anthus novaeseelandiae*		X		X	X	X		X	X
Total Number of Species Expected: 143										
Total Recorded:		**20**	**115**	**40**	**64**	**77**	**45**	**36**	**70**	**57**

TABLE 4. Mammals expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
TACHYGLOSSIDAE										
Echidna	*Tachyglossus aculeatus*		X		X	X	X	X	X	X
DASYURIDAE										
Ride's Ningaui	*Ningaui ridei*		X	X						
Kultarr	*Antechinomys laniger*	CS3	X							
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*	CS3								X
Fat-tailed Dunnart	*Sminthopsis crassicaudata*		X						X	
Little Long-tailed Dunnart	*Sminthopsis dolichura*		X	X				X	X	
Long-tailed Dunnart	*Sminthopsis longicaudata*		X							
Stripe-faced Dunnart	*Sminthopsis macruora*		X							
Ooldea Dunanrt	*Sminthopsis ooldea*			X					X	
MACROPODIDAE										
Euro	*Macropus robustus*		X			X	X		X	X
Red Kangaroo	*Macropus rufus*		X		X		X		X	X
EMBALLONURIDAE										
Hill's Sheathtail Bat	*Taphozous hilli*								X	
MOLOSSIDAE										
Inland Freetail Bat	*Mormopterus sp. 3*								X	X
Southern Freetail Bat	*Mormopterus sp. 4*			X						
White-striped Freetail Bat	*Tadarida australis*			X		X			X	X
VESPERTILIONIDAE										
Gould's Wattled Bat	*Chalinolobus gouldii*			X					X	X
Chocolate Wattled Bat	*Chalinolobus morio*		X							
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X	X	X				X	X
Greater Long-eared Bat	*Nyctophilus timoriensis*	CS2							X	
Inland Broad-nosed Bat	*Scotorepens balstoni*			X					X	
Southern Forest Bat	*Vespadelus regulus*			X						
Inland forest bat	*Vespadelus baverstocki*		X							
Inland Cave Bat	*Vespadelus finlaysoni*		X						X	
MURIDAE										
Spinifex Hopping Mouse	*Notomys alexis*		X	X				X	X	
Desert Mouse	*Pseudomys desertor*								X	
Sandy Inland Mouse	*Pseudomys hermannsburgensis*		X	X				X	X	

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2013
INTRODUCED MAMMALS										
Dingo / Dog	*Canis lupus*				X		X	X	X	X
European Red Fox	*Vulpes vulpes*				X	X			X	
Feral Cat	*Felis catus*		X		X		X	X	X	X
Rabbit	*Oryctolagus cuniculus*		X		X	X	X		X	X
House Mouse	*Mus musculus*		X	X				X	X	X
Goat	*Capra hircus*									X
Horse	*Equus caballus*									X
Dromedary Camel	*Camelus dromedarius*					X	X	X	X	
Cattle	*Bos taurus*					X				X
Sheep	*Ovis aries*					X				
Total Number of Native Species: 26		**3**	**15**	**11**	**3**	**3**	**3**	**4**	**17**	**8**
Total Number of Introduced Species: 10			**3**	**1**	**4**	**5**	**4**	**4**	**6**	**7**

Appendix 4: Fauna species recorded on Motion Cameras

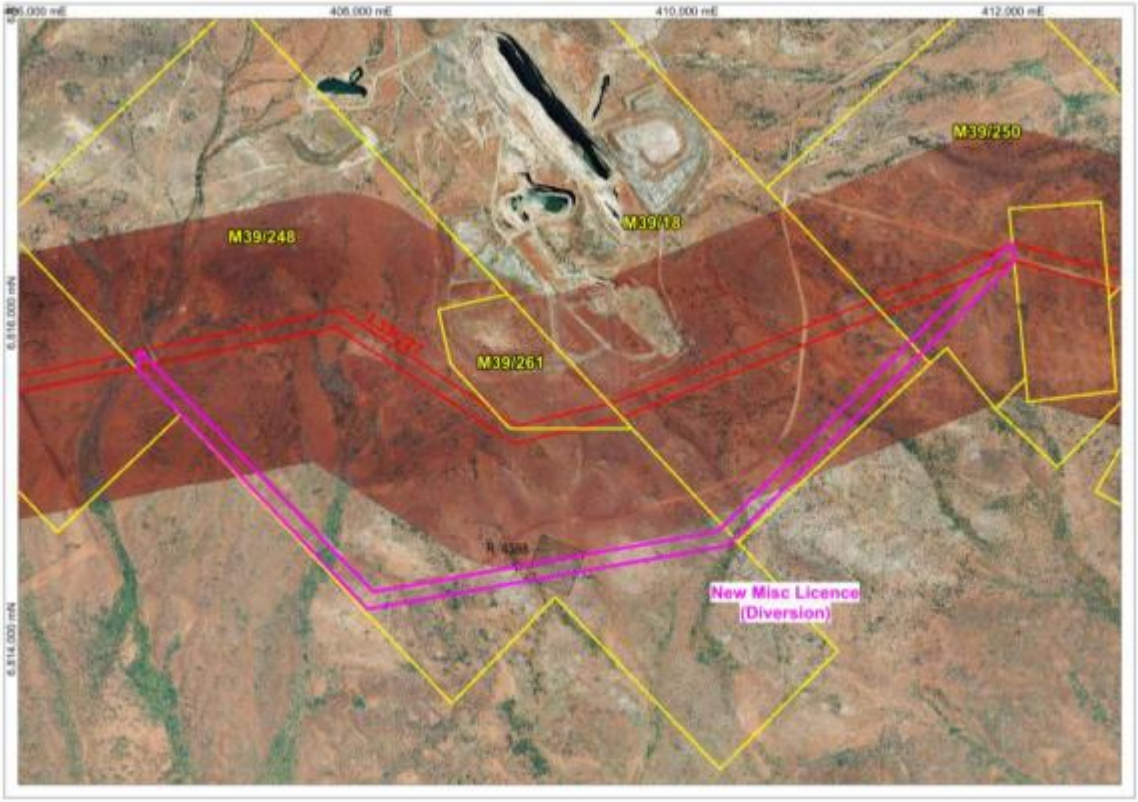
Species	Number	Comments
Torresian Crow	2	Recorded from BIF Ridge
Feral Cat	2	Recorded from BIF Ridge
House Mouse	1	Recorded from BIF Ridge

Appendix 5. Mount Morgan Re-alignment – Desktop Assessment

Introduction

A change in the infrastructure corridor alignment between Murrin Murrin and Sunrise Dam, around the Mt Morgan mine, may be required. The modification extends over approximately 7km and diverts to the south of the original corridor alignment surveyed (see Figure 7). A desktop assessment of the Mount Morgan area was conducted to account for the change in alignment of the infrastructure corridor.

Figure 7. Mount Morgan Re-alignment (new alignment shown in pink).



The desktop assessment was undertaken to ascertain the fauna values of the re-aligned corridor and to investigate the potential for conservation significant fauna in the local area. The assessment involved a review of fauna databases (see Section 2), land systems and vegetation mapping, an inspection of satellite imagery and a review of fauna habitats recorded nearby within the original survey corridor.

Results

The re-alignment follows alongside 2 km of an existing road and then is diverted across undisturbed vegetation. Vegetation recorded from the local area during the field surveys included:

1. Open Acacia (including *Acacia aneura*) shrublands on undulating stony plains, hardpan and stony rises;
2. Minor drainage lines supporting dense Acacia shrublands; and
3. Open stony plains supporting chenopod shrublands (*Atriplex* and *Maireana* spp).

These three vegetation types appear to also cover the Mount Morgan re-alignment.

Three Land Systems are traversed by the re-alignment:

1. Sunrise: Stony plains supporting mulga shrublands;
2. Jundee: Hardpan plains with ironstone gravel mantles and occasional sandy banks supporting mulga shrublands; and
3. Gundockerta: Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.

Several species of conservation significance are known from the region. Those with the potential to occur in the local Mount Morgan area are summarised in Table 11. Of the species listed only the Bush Stone-curlew, Australian Bustard, *Aprasia picturata*, Central Long-eared Bat and Kultarr are expected to regularly reside in the area. Habitat for the EPBC listed Malleefowl and Slender-billed Thornbill appears lacking and as a result these species are not expected to occur. Although the Malleefowl may be a rare foraging visitor. EPBC migratory waterbirds are unlikely to occur due to a lack of wetland habitat.

The significant fauna habitats (those with the potential to support conservation significant fauna) recorded from the original survey area appear absent from the Mount Morgan re-alignment. Dense Mulga Woodlands appear lacking as Acacia shrublands occur mostly in small areas or flanking minor drainage lines. Samphire shrublands associated with saline drainages also appear absent and the area contains minor relief and no significant rocky hills. Further, seasonal wetlands and salt lake habitat appear absent from the area.

Conclusions:
The proposed re-alignment appears to contain mostly widespread fauna habitats dominated by open Acacia Shrublands and low Chenopod shrublands. Few conservation significant fauna species are likely to occur and habitat to support EPBC listed taxa is mostly absent. As such, an EPBC referral is not considered necessary.

Overall, impacts of the development and operation of the pipeline upon the fauna assemblage are anticipated be low, as the development area is narrow, passes through many widespread landscapes and effects are mostly temporary because the pipeline will be buried and to some extent rehabilitated.

Several management recommendations are listed (see Recommendations and Table 10 in main report) to minimise the potential impacts of the development onto local fauna and fauna habitats. Impacts to local Malleefowl and Slender-billed Thornbill populations are expected to be negligible assuming management practises (such as avoidance of important habitat and fire management) are carried out. Management recommendations should also take into account some specific environmental policy relating to the project. Impacts are summarised in accordance with EPA Guidance in Table 10.

An inspection of satellite imagery reveals the area contains some previously disturbed vegetation and tracks. Efforts should be made to restrict the pipeline route to previously cleared areas where possible.

Table 11. Conservation Significant Fauna in the Mount Morgan area.

Common Name	Species Name	Conservation Status			Preferred Habitat Type	Mount Morgan Re-alignment Corridor		
						Habitat Present	Expected Status	Comments
REPTILES		**CS1**	**CS2**	**CS3**				
Great Desert Skink	*Liopholis kintorei*	Vul	Vul		Red spinifex sandplains and sand ridges, paleodrainage lines.	No	Unlikely to occur	
Carpet Python	*Morelia spilota imbricata*	S4	P4		Eucalypt Woodland	No	Unlikely to occur	
Woma	*Aspidites ramsayi*	S4	P1		Sandplains	No	Unlikely to occur	
Great Victoria Desert Slider	*Lerista puncticauda*		P2		Marble Gum Woodland	No	Unlikely to occur	
Buff-snouted Blind Snake	*Ramphotyphlops margaretae*		P2		Sandplain fringing salt lake systems	No	Unlikely to occur	
Black-headed Worm-lizard	*Aprasia picturata*			L	Rocky hills including greenstone with Acacia shrublands	Potential	Potential Resident	Low stony rises appear present however greenstone hills are absent
BIRDS								
Malleefowl	*Leipoa ocellata*	Vul	Vul		Dense Acacia shrublands, dense woodlands.	Potential	Potential Visitor	Areas of dense Mulga appear lacking, dense Acacia appears restricted to the margins of minor drainage lines and are not expected to contain Malleefowl mounds.
Princess Parrot	*Polytelis alexandrae*	Vul	P4		Marble Gum or Casuarina Woodland	No	Unlikely to occur	
Slender-billed Thornbill	*Acanthiza iredalei*	Vul			Samphire, Chenopods associated with salt lakes	No	Unlikely to occur	
Peregrine Falcon	*Falco peregrinus*	S4			Rocky ridges, major drainage lines, woodland	Yes	Potential Visitor	Breeding habitat appears absent
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	S4			Eucalypt Woodland, Acacia Shrublands	Yes	Unlikely to occur	
Night Parrot	*Pezoporus occidentalis*	CrE	CrE		Spinifex, Chenopod communities	Yes	Unlikely Resident	
Rainbow Bee-eater	*Merops ornatus*	Mig	S3		Watercourses, woodland	Yes	Regular Migrant	Expected to be a regular visitor to area
Fork-tailed Swift	*Apus pacificus*	Mig	S3		Aerial	Yes	Irregular Visitor	Expected to be an irregular visitor to area
Striated Grasswren	*Amytornis striatus striatus*		P4		Long-unburnt Spinifex sandplain with a dense shrub layer	No	Unlikely to occur	
Australian Bustard	*Ardeotis australis*		P4		Plains	Yes	Resident / Visitor	Expected to be a regular visitor to area
Bush Stone-curlew	*Burhinus grallarius*		P4		Acacia shrublands, Woodlands	Yes	Likely Resident	Expected to be a regular visitor to area or resident.

Common Name	Species Name	Conservation Status			Preferred Habitat Type	Mount Morgan Re-alignment Corridor		
						Habitat Present	Expected Status	Comments
Grey Falcon	*Falco hypoleucos*		Vul		Open grasslands and Wooded Watercourses	Yes	Potential Visitor	Expected to be an irregular visitor to area
Square-tailed Kite	*Lophoictinia isura*			L	Woodland and Heath	Yes	Potential Visitor	Expected to be an irregular visitor to area
Scarlet-chested Parrot	*Neophema splendida*			L	Arid Woodland	No	Unlikely to occur	
Regent Parrot	*Polytelis anthopeplus*			L	Eucalypt Forest, Woodland	No	Unlikely to occur	
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*			L	Eucalypt Woodland, Mallee	No	Unlikely to occur	
Rufous Treecreeper	*Climacteris rufus*			L	Mature Eucalypt Woodland with tree hollows	No	Unlikely to occur	
Chestnut Quail-thrush	*Cinclosoma castanotus*			L	Eucalypt Woodland, Mallee	No	Unlikely to occur	
Southern Scrub-robin	*Drymodes brunneopygia*			L	Dense mallee, dense shrublands	Yes	Unlikely to occur	
EPBC Migratory Waterbirds	*Eg. Ardea modesta, Tringa nebularia*	Mig	S3		Wetlands	Yes	Unlikely to occur	
Mammals								
Southern Marsupial Mole	*Notoryctes typhlops*	End	End		Extensive sand dune fields	No	Unlikely to occur	
Sandhill Dunnart	*Sminthopsis psammophila*	End	End		Long unburnt spinifex sandplain between yellow sand dunes.	No	Unlikely to occur	
Crest-tailed Mulgara	*Dasycercus cristicauda*	Vul			Sandhill Canegrass Sand dunes or salt lakes with Nitre Bush	No	Unlikely to occur	
Brush-tailed Mulgara	*Dasycercus blythi*		P4		Red Spinifex sandplains	No	Unlikely to occur	
Long-tailed Dunnart	*Sminthopsis longicaudata*		P4		Banded Ironstone Ridges	No	Unlikely to occur	
Central Long-eared Bat	*Nyctophilus timoriensis*		P4		Woodlands, shrublands	Yes	Resident	Expected to be an irregular visitor to area
Kultarr	*Antechinomys laniger*			L	Stony plains	Yes	Potential Visitor	Expected to be an irregular visitor to area
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*			L	Rocky Ridges	No	Unlikely to occur	

Level 1 Flora and Vegetation Survey of the proposed Gas pipeline from Murrin Murrin to Sunrise Dam Gold Mine

Tenements: L38/105, L39/227 & L39/228

Petroleum Pipeline Licence: STP-PLA-0025

July 2014
Draft 1

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Disclaimer

Quality Assurance

An internal quality review process has been implemented to each project task undertaken by BC. Each document and its contents is carefully reviewed by core members of the Consultancy team and signed off at Director Level prior to issue to the client. Draft documents are submitted to the client for comment and acceptance prior to final production.

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Executive Summary

Botanica Consulting was commissioned by AngloGold Ashanti Australia to undertake a Level 1 flora and vegetation survey of an 84km proposed gas pipeline route extending from the Laverton Leonora Road, near Murrin Murrin Nickel Cobalt Mine, to Sunrise Dam Gold Mine operated by AngloGold Ashanti Australia located approximately 50km south-east of Laverton Western Australia. The initial survey was conducted from the 28th to 30th October 2013, covering an area of approximately 3,339 ha (of which 8 ha has been previously disturbed). Additional surveys were conducted along the pipeline route from the 3rd of April 2014 following high summer rainfall. Twenty five vegetation communities were identified within the Murrin Murrin to Sunrise Dam survey area (survey area). These twenty five vegetation communities were represented by a total of 37 Families, 83 Genera and 214 taxa (including sub-species and variants).

No Declared Rare Flora/Threatened Flora, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were identified within the survey area. One Priority Flora, *Grevillea inconspicua* (P4), as listed by the Department of Parks and Wildlife was identified within the survey area. Three unrecognised taxa of *Tecticornia* (as identified by K.A Shepherd 867) were also identified in the area and are considered to be of Conservation Significance.

No State or Commonwealth listed Threatened Ecological Communities were recorded within the survey area. However, the proposed pipeline route traverses through the buffer zone of two Priority Ecological Communities; *Mount Jumbo Range Vegetation Complex* and *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station,* which are listed by Department of Parks and Wildlife as a Priority 3 and Priority 1 Ecological Community respectively. One of the vegetation communities identified within the survey area; Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill, was representative of vegetation that characterizes the *Mount Jumbo Range Vegetation Complex* as defined by Keighery, Hall and Milewski (1994). Vegetation representative of the *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station* Priority Ecological Community as described by Pringle (1994) was not identified within the survey area. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *Environment Protection* and *Biodiversity Conservation Act 1999*.

The survey area is not located in an Environmentally Sensitive Area however approximately 16ha of the survey area (800m length of pipeline) is located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. This Schedule 1 Area is centered on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south-west of Mt Morgan.

The survey area is not located within any conservation reserves listed by the Department of Parks and Wildlife or proposed by the Environmental Protection Authority Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the twenty five vegetation communities surveyed by Botanica Consulting were rated as being in 'good' health. The remaining fifteen vegetation communities were rated as being in 'very good' health. The majority of the survey area has been subjected to pastoral land use and exploration/mining activities with numerous access tracks within the area.

Five introduced taxa were identified within the survey area:

1. *Cenchrus ciliaris* (Buffel Grass);
2. *Centaurea melitensis* (Maltese Cockspur);
3. *Lysimachia arvensis* (Blue Pimpernel);
4. *Salvia verbenaca* (Wild Sage); and
5. *Sonchus oleraceus* (Common Sowthistle).

According to the Department of Agriculture and Food Western Australia, none of these taxa are listed as a Declared Plant under the *Biosecurity and Agriculture Management Act 2007*.

1 Introduction

1.1 Project Description

Botanica Consulting (BC) was commissioned by AngloGold Ashanti Australia (AGAA) to undertake a Level 1 flora and vegetation survey of an 84km proposed gas pipeline route. Tenement L38/105 to the north of Sunrise Dam will be utilised in conjunction with L39/227 & L39/228 (Currently Pending) and Petroleum Pipeline Licence (PPL) STP-PLA-0025 for the gas pipeline corridor (Figure 1) which extends from the Laverton Leonora Road, near Murrin Murrin Nickel Cobalt Mine, to the Sunrise Dam Gold Mine operated by AGAA (the survey area). The survey aimed to meet the requirements of EPA Guidance Statement No 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in WA* and included production of vegetation maps (Appendix 2), taxa list (Appendix 3) as well as document and map locations of any Threatened Ecological Communities (TEC), Priority Ecological Communities (PEC), Declared Rare Flora (DRF)/Threatened or Priority Flora within the survey area.

The survey area is located approximately 50km south-east of Laverton, Western Australia and covered an area of approximately 3,339 ha (of which 8 ha has been previously disturbed). BC conducted the initial survey from the 28th to 30th October 2013. Additional surveys of the pipeline route were conducted from the 3rd of April 2014 following high summer rainfall. Figure 2 provides a regional location map of the survey area.

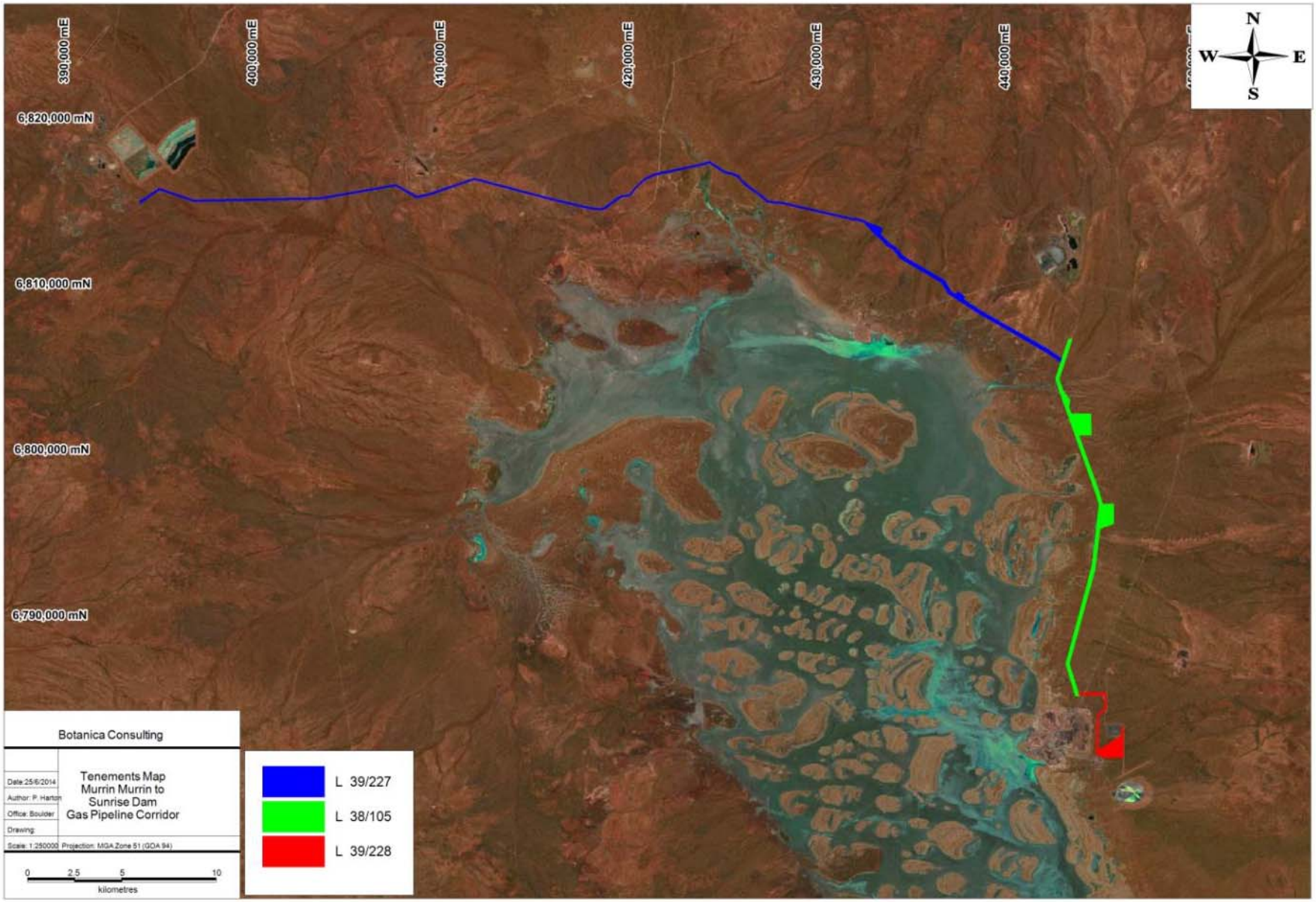

Figure 1: Tenement Map Murrin Murrin to Sunrise Dam

Figure 2: Regional map of the Murrin Murrin to Sunrise Dam survey area (survey area not to scale)

1.2 Previous relevant flora surveys

1.2.1 *The Biological survey of the Eastern Goldfields of Western Australia Part 10: Sandstone-Sir Samuel and Laverton-Leonora Study Areas,* Western Australian Museum 1994

Vegetation surveys of the Eastern Goldfields were conducted from January 1980 to August 1982 by A.V. Milewski and G.J. Keighery. Subsequent work was conducted by G.J. Keighery in October 1987 and September 1992. The Laverton-Leonora Study Area is situated between latitudes 28°00'S and 29"00'S and longitudes l20º 45'E and I23°00'E. Twelve landform units were recognized within the Laverton-Leonora Study Area:

1. Breakaways;
2. Drainage Lines;
3. Dunefields;
4. Granite Exposure;
5. Hill: Granite,
6. Hill: Banded Ironstone
7. Hill: Greenstone
8. Salt Lake Features: Saline flats, Lake Floors, Lake Slopes, Lake Margins and Salt Lake Dunes;
9. Calcareous plains;
10. Sandplains;
11. Undulating Plains: Greenstone; and
12. Broad Valley.

The most extensive were identified as being Sandplains and Broad Valleys. Salt Lake Features, Calcareous Plains bordering salt lakes, and Undulating Plains. Small areas of Dunefields, Breakaways and Granite Exposures were scattered throughout the Study Areas while Hills and Drainage Lines occur largely within Undulating Plains.

The main vegetation communities identified by this early survey were low woodlands of *Acacia aneura* (Mulga). *Eucalyptus* taxa with an understorey of hummock grasses *(Triodia)* were dominant on deep sands. Tall and low shrublands occurred in limited areas, generally in association with salt lakes and dunes.

Vascular flora identified comprised of 7 taxa of ferns and 777 taxa of flowering plants, including 303 taxa recorded from Wanjarri Nature Reserve. Exhaustive floristic lists for 31 sample sites, representing most of the Study Areas surface lithologies. No taxa of Declared Rare Flora (DRF) were recorded within the Study Areas.

The Murrin Murrin to Sunrise Dam survey area is located within the Laverton-Leonora Study Area.

1.2.2 *Technical Bulletin: An inventory and condition survey of the north-eastern Goldfields Western Australia (No. 87),* Department of Agriculture WA, 1994

This survey was undertaken by a joint team from the Department of Agriculture and the Department of Land Administration during 1988-1990 with the support of the Department of Conservation and Land Management (H.J.R. Pringle, A.M.E. Van Vreeswyk and S.A. Gilligan). The area surveyed covers about 100,570km^2 and includes all of the Menzies, Edjudina, Leonora, Laverton, Sir Samuel and Duketon areas. The area encompassed most or all of the following salt lake systems: Lake Ballard, Lake Rebecca, Lake Marmion, Lake Raeside, Lake Darlot and Lake Carey. Nine land surface types comprised of sixty land systems, six soil groups (and 25 soil subgroups) and 36 site types were described for this survey area. The land surface types include:

1. Hills and Ridges;
2. Breakaways and lower plains;
3. Erosional surfaces of low relief (<20m);
4. Hardpan wash plains;
5. Plains with deeper coarser soils than hardpans;
6. Plains with saline alluvium;
7. Depositional plains with calcareous red earths;
8. Lake Country; and
9. Sandplains.

The major plant forms encountered were ephemeral grasses and forbs, perennial grasses, low <1 m tall) and mid shrubs (1 to 2 m tall), tall shrubs (> 2 m tall), mallees and trees. Eight site type groups (comprised of 36 site types) were identified within the survey area:

1. Sandplain spinifex hummock grasslands;
2. Acacia shrublands on deep sandy soils;
3. Woodlands/shrublands on groundwater calcretes associated with ancient drainage valleys;
4. Mixed halophytic low shrublands on depositional plains;
5. Chenopod low or mid shrublands on hillsides and stony plains;
6. Acacia, Eremophila and Cassia dominated shrublands on shallow soils;
7. Mulga shrublands with sparse sclerophyll understoreys associated with hardpan plains; and
8. Miscellaneous site types (with little in common with other types).

The Murrin Murrin to Sunrise Dam survey is located within the North-Eastern Goldfields survey area.

1.2.3 *Murrin Murrin Nickel-Cobalt Project Consultative Environmental Review,* Dames and Moore Pty Ltd, 1996 & *Murrin Murrin Expansion Project, Public Environmental Review,* Dames and Moore Pty Ltd, 1998.

Vegetation surveys of the Murrin Murrin Nickel-Cobalt Project (Project Area) including the expansion identified a total of 45 plant communities and vegetation mapping units from seven broad community types:

1. Acacia woodlands;
2. Acacia shrublands;
3. Eucalypt woodlands;
4. Chenopod shrublands;
5. Hummock grasslands;
6. Hakea woodlands; and
7. Mosaics.

Five of the plant communities identified in the Project Area were identified as both locally and regionally significant based on recommendations made by Pringle *et. al* (1994) in the North-Eastern Goldfields survey.

The Murrin Murrin to Sunrise Dam corridor survey is located directly south of the Murrin Murrin Nickel-Cobalt Project Area with the gas pipeline originating from this site.

1.2.4 *Flora and Vegetation Survey of Sunrise Dam Mining Area,* Mattiske Consulting, 2010

Mattiske Consulting Pty Ltd (Mattiske) was commissioned by AGAA to update and integrate the previous flora and vegetation surveys within the Sunrise Dam operational areas. Additionally, a flora and vegetation survey of a mining tenement and water borefield lease area was conducted by three experienced botanists during September 2010.

A total of 343 vascular plant taxa from 133 plant genera and 48 plant families were recorded within Sunrise Dam operational areas between 1994 and 2010. The majority of taxa was recorded within the Chenopodiaceae (60 taxa), Fabaceae (44 taxa), Asteraceae (42 taxa), Poaceae (27 taxa) and Scrophulariaceae (22 taxa) families.

A total of 19 introduced (exotic) taxa were recorded within Sunrise Dam operational areas since 1994. Of these none are Declared Plants taxa pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* according to the Western Australian Department of Agriculture and Food (DAFWA).

No plant taxa gazetted as DRF pursuant to subsection (2) of section 23F of the Western Australian *Wildlife Conservation (WC) Act 1950* or listed as Threatened pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* have been recorded within Sunrise Dam operational areas between 1994 and 2010.

Two plant taxa listed as Priority Flora have been recorded within Sunrise Dam operational areas between 1994 and 2010. These were the Priority 1 taxa, *Tecticornia mellaria* and the Priority 3 taxa*, Gunniopsis propinqua***.**

No TECs as defined by the *EPBC Act* 1999 were observed in Sunrise Dam operational areas. No PECs were found within Sunrise Dam operational areas.

Twenty three vegetation communities have been defined and mapped for the Sunrise Dam operational areas from 1994 to 2010. A total of 1 - Melaleuca woodland, 1 - Eucalypt woodland, 13 - Acacia woodlands and 8 - Chenopod shrublands were defined and mapped. Many of the described vegetation communities are well represented within the Austin Botanical District and therefore not considered to be significant on a regional scale.

The southern section of the Murrin Murrin to Sunrise Dam survey corridor is located within the Sunrise Dam Mining Area flora and vegetation survey.

2 Regional Biophysical Environment

2.1 Regional Environment

The Murrin Murrin to Sunrise Dam gas pipeline corridor survey area lies within the Austin Botanical District of the Eremaean Province of WA. The Austin Botanical District consists predominantly of Mulga low woodland on plains and reduces to scrub on hills (Beard, 1990). Based on the Interim Biogeographic Regionalisation of Australia (IBRA) the Eremaean Province is divided into bioregions with the survey area located within the Murchison bioregion of Western Australia (Figure 3). The Murchison bioregion is further divided into subregions, with the survey area located within the Murchison 1-Eastern Murchison subregion (Cowan, 2001). The survey area is also located approximately 18km west of the Shield subregion (GVD1) of the Great Victoria Desert Region. A map of the survey area in relation to IBRA subregions is provided in Figure 4 below.

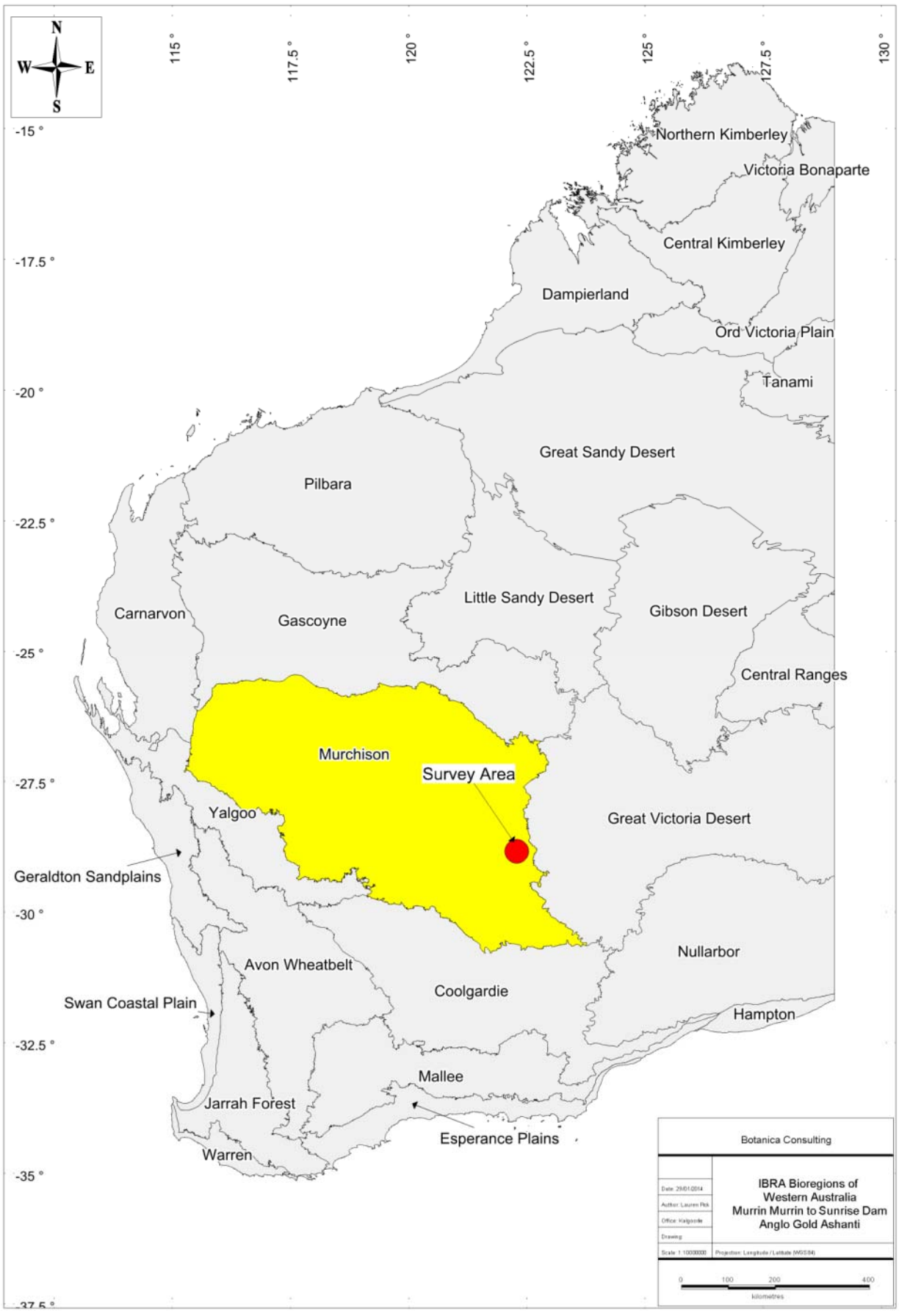

Figure 3: Western Australian IBRA bioregions in relation to the Murrin Murrin to Sunrise Dam survey area

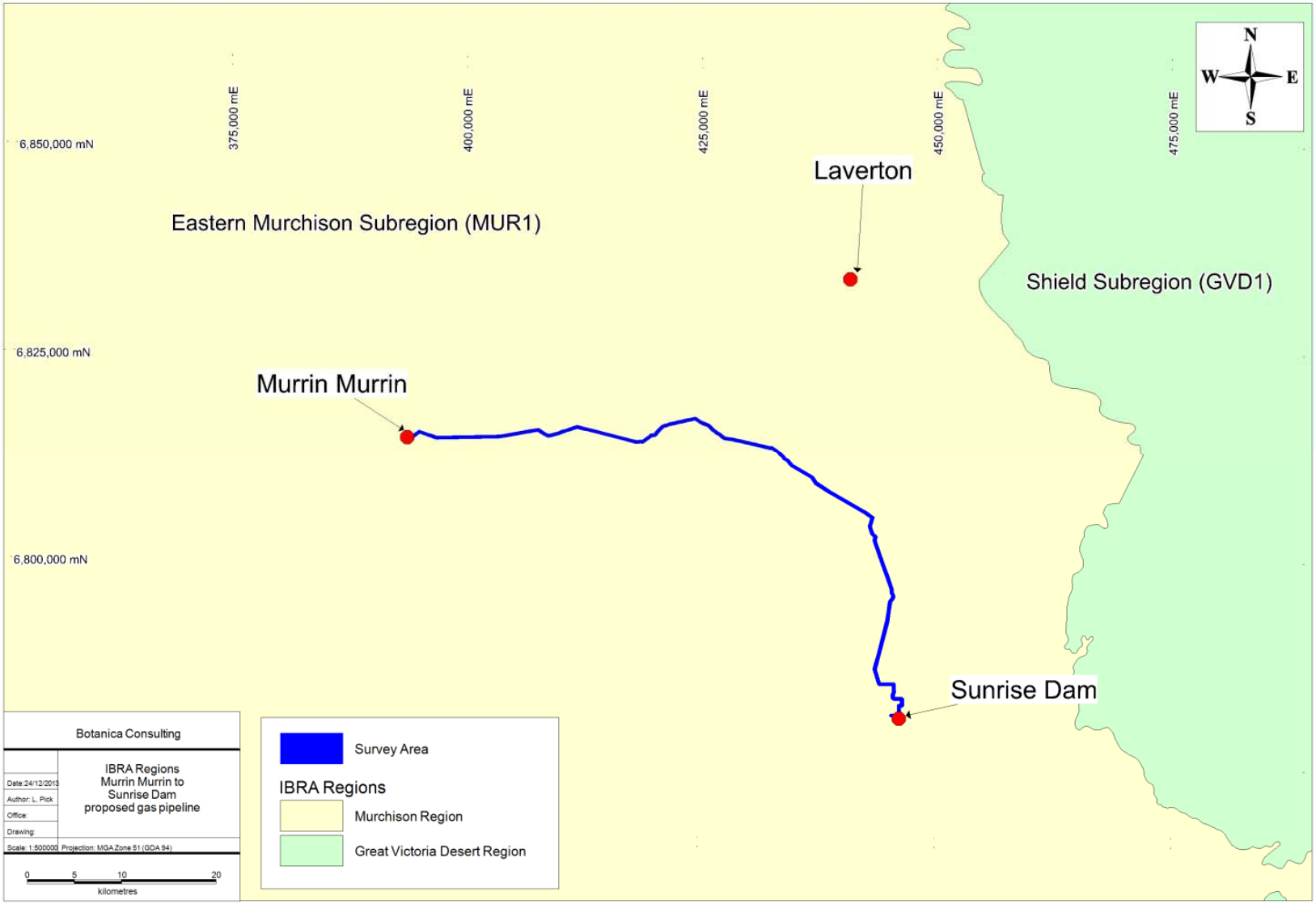

Figure 4: Map of IBRA subregions in the vicinity of the Murrin Murrin to Sunrise Dam survey area

2.2 Topography & Soils

The landscape of the Murchison IBRA bioregion comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains (Commonwealth Government, 2008a). It is dominated by the Archaean (over 2500 million years ago) granite greenstone terrain of the Yilgarn Craton (Commonwealth Government, 2008a). Alluvial soils and sands mantle the granitic and greenstone units of the Yilgarn Craton. These soils are shallow, sandy and infertile. Underlying the soils in low areas is a red-brown siliceous hard pan (Curry *et al*. 1994). The soils in the eastern half of the bioregion are typically red sands, lithosols, calcareous red earth soil, duplex soil and clays.

The Eastern Murchison subregion lies on the northern parts of the 'Southern Cross' and 'Eastern Goldfields' Terrains of the Yilgarn Craton. This subregion is characterised by its internal drainage and extensive area of elevated red desert sandplains (Cowan, 2001). Calcrete aquifers located in the northern part of the subregion are known to support a wide range of subterranean fauna. Another important feature of the system is the salt lake systems associated with the occluded Paleodrainage system. Beard (1990) describes the topography of the region as undulating with occasional ranges of low hills and extensive sandplains located in the East. The dominant soil type is a shallow earthy loam, overlying red-brown hardpan. Red earthy sands can be found on the sandplains (Cowan, 2001).

2.3 Vegetation

Vegetation of the Eastern Murchison subregion in the Austin Botanical District is predominantly Mulga low woodlands on plains, often rich in ephemerals, which reduce to scrub on hills. It is also characterised by hummock grasslands, Saltbush shrublands and Halosarcia shrublands (Beard, 1990; Cowan, 2001).

The DAFWA GIS file (2011) indicates that the survey area is located within Pre-European Beard vegetation associations Laverton 18, 39 and 389. The extent of these vegetation associations as described by the DAFWA is provided in Table 1.

Table 1: Remaining Beard Vegetation Associations within Western Australia (DAFWA, 2011)

Vegetation association	Pre-European Extent (ha)	Current Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DPaW managed lands	Vegetation Description (Beard, 1990)
Laverton 18	2536021.06	2520869.47	99.40	1.52	Low woodland; mulga (*Acacia aneura*)
Laverton 39	155416.64	151580.18	97.53	0	Shrublands; mulga scrub
Laverton 389	105136.10	103855.58	98.78	0	Succulent steppe with open low woodland; mulga over saltbush

Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated taxa loss, while areas with less than 10% are considered "endangered". Clearing within the survey area will not significantly reduce the extent of these vegetation associations.

2.4 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with mainly winter rainfall and annual rainfall of approximately 200mm (Beard, 1990; Cowan, 2001). Average weather conditions can be interpreted from weather data collected from the closest Bureau of Meteorology weather station: the Laverton weather station (#12045) located approximately 50m north-east of the survey area. A summary of climatic data is provided in Table 2 and Figure 5 below.

Table 2: Summary of monthly climatic data for Laverton (BOM, 2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Laverton												
Mean maximum temperature (°C)	35.8	34.8	31.9	27.2	22.1	18.5	17.8	20.0	24.5	28.0	32.1	34.9
Mean minimum temperature (°C)	20.5	20.0	18.0	13.9	9.5	6.6	5.2	6.4	9.5	12.8	16.6	19.3
Mean rainfall (mm)	25.0	31.1	29.4	22.1	23.2	23.6	16.5	13.0	9.1	9.3	14.6	17.9
2013 rainfall (mm)	65.4	0.0	36.1	14.8	22.6	15.6	10.6	0	28.6	0	10.4	40.8
2014 rainfall (mm)	75.2	66.2	6.4	33.8	51.8							
Mean number of days of rain ≥ 1 mm	2.4	2.7	2.7	2.6	3.1	3.4	3.0	2.4	1.4	1.5	2.0	2.3

red = highest value blue = lowest value. Laverton data from 1900-2014

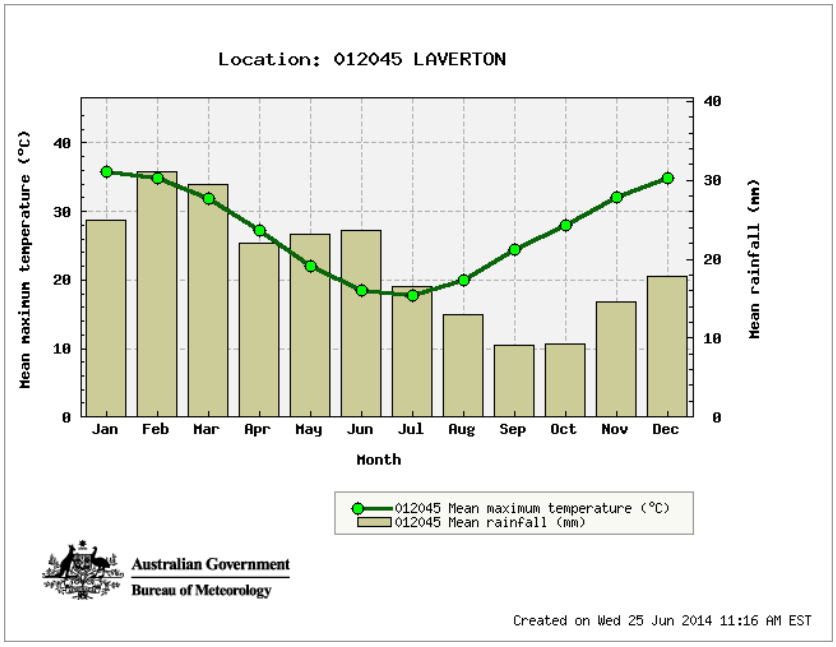

Figure 5: Mean Monthly rainfall and maximum temperature for the Laverton weather station (#12045) (BOM, 2014) Laverton data from 1900-2014.

2.5 Land Use

The dominant land uses of the Eastern Murchison subregion have been defined as grazing – native pastures (85.47%), Unallocated Crown Land (UCL) and Crown Reserves (11.34%), mining (1.79%) and conservation which accounts for 1.4% of the land use (Cowan, 2001).

3 Survey Methodology

3.1 Survey Objectives

The objectives of the survey were to:

- Compile a broad scale vegetation community flora map and taxa list of the survey area (Appendix 2 & 3);
- Document and map locations of any Threatened or Priority Flora identified (Appendix 2 and 4);
- Assess the regional and local conservation status of plant taxa and ecological communities within the survey area; and
- Identify and map occurrences of any "Declared and Environmental" weeds within the survey area.

3.2 Desktop Assessment

Prior to the field survey, the results of the combined search of the DPaW Flora of Conservation Significance databases (DPaW, 2013a), were obtained. These significant flora were examined on the Western Australian Herbarium's web page (WAHERB, 2014) prior to the survey to familiarise staff with their appearance. Locations of Threatened Flora and Priority Flora obtained from the database search were overlaid on aerial photography of the area. Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the survey area and all areas of occurrence were traversed on foot specifically searching for the Threatened flora associated with that vegetation description. Table 3 lists the definitions of Threatened and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2014).

3.3 Sampling and Analysis Methods

BC was commissioned by AGAA to undertake a Level 1 flora and vegetation survey of an 84km proposed gas pipeline route extending from the Laverton Leonora Road, near Murrin Murrin Nickel Cobalt Mine, to the Sunrise Dam Gold Mine, located approximately 50km south-west of Laverton, WA. The initial survey was conducted from the 28th to 30th October 2013, covering an area of approximately 3,339 ha (of which 8 ha has been previously disturbed). The objective of the survey was to document all observed "Declared Rare and Priority Flora" taxa encountered and the occurrences of any "Environmental or Declared Weeds" observed within or adjacent to the survey area. Additional surveys were conducted along the pipeline route from the 3rd of April 2014 following high summer rainfall. The survey area was traversed by four people via all-terrain vehicle and on foot. Figure 6 provides a map of the area traversed throughout the survey.

Table 3: **Definitions of Threatened and Priority Flora taxa (WAHERB, 2014)**

T: Schedule 1 Threatened Flora under the *Wildlife Conservation Act 1950*
taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X: Declared Rare flora – Presumed Extinct taxa
Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
1: Priority One – Poorly known taxa
taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2: Priority Two – Poorly Known taxa
taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3: Priority Three – Poorly known taxa
Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four – Rare, Near Threatened and other taxa in need of monitoring
1. Rare. taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. 2. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. 3. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.
5: Priority 5 – Conservation Dependent taxa
Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. An aerial flyover using a light aircraft was also conducted in order to identify visual differences in vegetation along the route and identify potential access tracks. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the co-ordinates of the boundaries between existing vegetation communities.

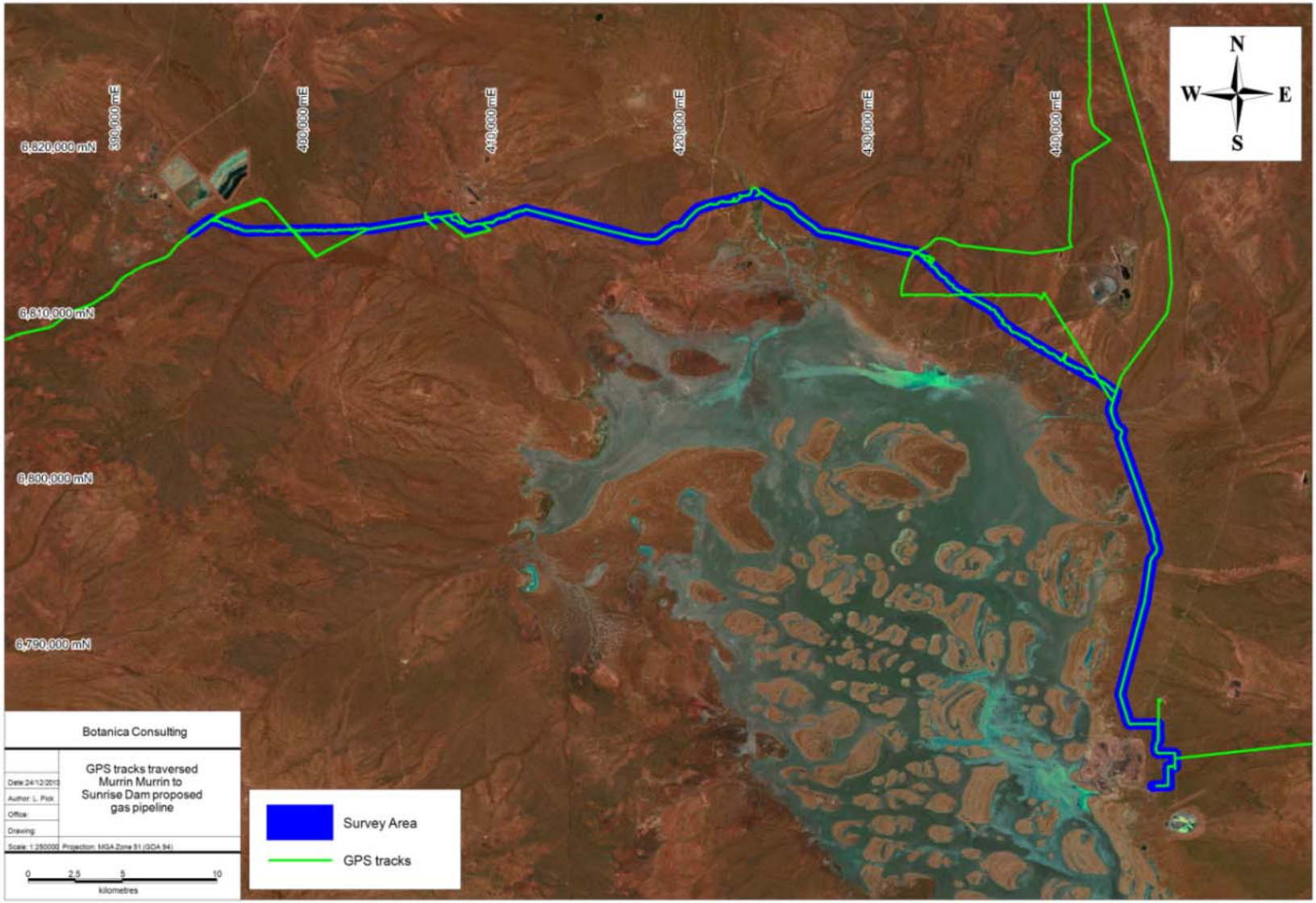

Figure 6: GPS tracks traversed throughout the Murrin Murrin to Sunrise Dam survey area

At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of Threatened Flora/Priority Flora if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and the Western Australian Herbarium. Presence/absence data of taxa from sample sites of similar vegetation was then compiled forming the best representative vegetation communities. Vegetation communities were classified according to Muir (1977) Life Form/Height Class Classifications (Appendix 6). Similar vegetation communities were recognised visually in the field.

3.3.1 Personnel involved

Jim Williams - Environmental Consultant/Botanist (Diploma of Horticulture)
Lauren Pick - Environmental Consultant (BSc Ecology & Conservation Biology)
Pat Harton - Environmental Consultant (Bachelor of Environmental Science)
Matthew Newlands - Environmental Technician

3.3.2 Scientific licences

Table 4: Scientific licences of Botanica staff coordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	SL0010574	25-04-2015
Lauren Pick	SL0010573	25-04-2015

3.4 Data Analysis Tools

Once the survey was completed the data obtained was analysed to generate a vegetation map (Appendix 2).

3.5 Flora survey limitations and constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 5 below.

Table 5: Limitations and constraints associated with the flora and vegetation survey.

Variable	Potential Impact on Survey	Impact on Survey outcomes
Access	Not a constraint	The survey was conducted via all-terrain vehicle and on foot. BC staff were able to easily access the area along the proposed pipeline.
Experience levels	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Botanist:** Jim Williams **Field Staff:** Jim Williams & Lauren Pick & Pat Harton **Data Interpretation:** Jim Williams & Lauren Pick
Timing of survey, weather & season	Minor constraint	Fieldwork was carried out in Spring within the EPA's recommended timing for flora surveys. However due to below average winter rainfall (Table 2) much of the vegetation was not in flower. There was however 32 annual species (excluding weeds) identified during the survey. Additional flora survey work was completed in Autumn 2014 following high summer rainfall however flowering specimens were still limited.
Sources of information	Not a constraint	BC was able to obtain information about the area from previous research conducted by BC within the area which enabled adequate background information about the region.
Mapping reliability	Not a constraint	BC was able to obtain high quality ortho aerial images in order to reliably determine changes in vegetation within the survey area.
Area disturbance	Minor constraint	The survey area has been subject to disturbance from grazing by cattle, mining and exploration activities. Approximately 8 ha of the survey area has been previously cleared (excluding access tracks and roads).
Survey Intensity	Not a constraint	Survey intensity was moderate and appropriate for the impact area with a Level 1 survey conducted over two stages; the initial survey was conducted in spring and the additional survey was conducted in autumn (following high summer rainfall)..
Resources	Not a constraint	The DPaW provided threatened flora information which was used to complete the survey.
Completeness	Minor constraint	In the opinion of BC the survey area was covered sufficiently in order to identify vegetation assemblages. However during the initial survey conducted in spring many of the plants were not in flower due to below average winter rainfall received. Despite this, broad vegetation communities were able to be determined and assessed. An additional survey was conducted in autumn 2014 following above average summer rainfall however the occurrence of flowing specimens remained low. Much of the vegetation comprised of Mulga (*Acacia aneura)* which is currently undergoing taxonomic revision. In order to fully identify between different Mulga taxa flower and seeds specimens are required. At the time of the survey much of the Mulga was not in flower/seed limiting full identification. The vegetation communities for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities outside the study area is not known, however vegetation communities identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2014).

4 Results

4.1 Summary

Twenty five vegetation communities were identified within the survey area. These twenty five vegetation communities were represented by a total of 37 Families, 83 Genera and 214 Taxa (including sub-taxa and variants) (Appendix 3).

No DRF/Threatened Flora, pursuant to subsection (2) of section 23F of the *WC Act 1950,* the Commonwealth *EPBC Act 1999* and as listed by the DPaW were identified within the survey area. One Priority Flora, *Grevillea inconspicua* (P4)*,* as listed by the DPaW was identified within the survey area. Three unrecognised taxa of *Tecticornia* (as identified by K.A Shepherd 867) were also identified in the survey area, which are considered to be of Conservation Significance (CS).

No TEC pursuant to Commonwealth legislation or as listed by the DPaW were recorded within the survey area. However the proposed pipeline route traverses through the buffer zone of two PEC's; *Mount Jumbo Range Vegetation Complex* and *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station,* which are listed by DPaW as a Priority 3 and Priority 1 Ecological Communities respectively (Appendix 1). One of the vegetation communities identified within the survey area; Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill, was representative of vegetation that characterizes the *Mount Jumbo Range Vegetation Complex* PEC as defined by Keighery, Hall and Milewski (1994). Vegetation representative of the *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station* PEC as described by Pringle (1994) was not identified within the survey area. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*.

The survey area is not located in an ESA however approximately 16 Ha of the survey area (800m length of pipeline) is located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. This Schedule 1 Area is centered on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south-west of Mt Morgan (Appendix 1). The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the twenty five vegetation communities surveyed by BC were rated as being in 'good' health. The remaining fifteen vegetation communities were rated as being in 'very good' health. The majority of the survey area has been

subjected to pastoral land use and exploration/mining activities with numerous access tracks within the area.

Five introduced taxa were identified within the survey area:

1. *Cenchrus ciliaris* (Buffel Grass);
2. *Centaurea melitensis* (Maltese Cockspur);
3. *Lysimachia arvensis* (Blue Pimpernel);
4. *Salvia verbenaca* (Wild Sage);
5. *Sonchus oleraceus* (Common Sowthistle).

According to the DAFWA, none of these taxa are listed as a Declared Plant under the *Biosecurity and Agriculture Management (BAM) Act 2007*.

4.2 Desktop Assessment

The results of the combined search of the DPaW's Flora of Conservation Significance databases (DPaW, 2013a) revealed no DPaW listings of Threatened or Priority Flora within the survey area. There was however twenty-two Priority Flora taxa listed within a 50km radius of the survey area. Eighteen of these Priority Flora have the potential to occur within the survey area as they occur in similar habitats and vegetation communities to those identified within the survey area. The nearest DPaW known population is located approximately 1.4km south of the survey area. Table 6 identifies the DPaW listed Priority Flora potentially occurring within the survey area.

Table 6: **Priority Flora with the potential to occur within the Murrin Murrin to Sunrise Dam survey area (WAHERB, 2014)**

Taxa	Conservation Code	Description (WAHERB, 2014)
Acacia websteri	1	Shrub, 1.2-5 m high, bark fibrous. Fl. yellow. Red sand, clay or loam. Low-lying areas, flats.
Angianthus prostratus	3	Prostrate annual, herb. Fl. white-yellow, Jul to Sep. Red clay or loamy soils. Saline Depressions.
Calytrix praecipua	3	Shrub, 0.3-0.7 m high. Fl. pink-white, Jun to Jul or Sep to Nov. Skeletal sandy soils over granite or laterite. Breakaways, outcrops.
Cratystylis centralis	3	Much-branched, brittle, greyish shrub, to 1 m high. Red sandy loam with ironstone gravel. Flat plains, breakaway country.
Eremophila annosocaulis	3	Small, slightly aromatic shrub to 0.8 m tall with one or a number of branches arising from ground level
Goodenia lyrata	3	Prostrate herb, with lyrate leaves. Fl. yellow, Aug. Red sandy loam. Near claypan.
Gunniopsis propinqua	3	Prostrate annual or perennial, herb, 0.03-0.1 m high. Fl. white/pink, Aug to Sep. Stony sandy loam. Lateritic outcrops, winter-wet sites.
Hemigenia exilis	4	Erect, multi-stemmed shrub, 0.5-2 m high. Fl. blue-purple/white, Apr or Sep to Nov. Laterite. Breakaways, slopes
Hybanthus floribundus subsp. *chloroxanthus*	3	Multi-stemmed shrub, to 0.7 m high. Fl. blue & white, Aug to Oct. Dark red-brown soil, never sandy, rich in iron oxide, laterite. Rocky areas, creek banks, along drainage lines
Melaleuca apostiba	3	Spreading shrub, to 2 m high, with grey fissured bark and dull green leaves. Fl. red, Jun.
Olearia mucronata	3	Densely branched, unpleasantly aromatic shrub, 0.6-1 m high. Fl. white & yellow, Aug to Dec or Jan. Schistose hills, along drainage channels
Phyllanthus baeckeoides	3	Shrub, 0.5-1.5 m high. Fl. white-yellow/green-yellow, Jul to Sep. Red lateritic & sandy clay soils. Granite outcrops
Placynthium nigrum	3	Lichen: active growth phase, chocolate when dry, fruiting bodies present; growing in sheltered positions on soil.
Ptilotus tetrandrus	1	Annual, herb, 0.15-0.3 m high. Fl. Oct. Loamy sand.
Tecticornia cymbiformis	3	Erect, perennial shrub, 0.3-0.5 m high. Saline soils. Along the edge of creeklines
Tecticornia mellaria	1	Erect, perennial shrub, 0.2-0.4 m high. Well-drained red gypseous sand, clay. Gypseous dunes, margins of playa lakes, on clay pans.
Tecticornia sp. Lake Way (P. Armstrong 05/961)	1	Shrub to 50 cm, dense succulent, foliage yellow and green.
Triglochin protuberans	3	Annual, herb, 0.03-0.13 m high. Red loam, grey mud over clay. Winter-wet sites, claypans, near salt lakes, margins of pools
Vittadinia cervicularis var. *oldfieldii*	1	Annual, herb, 0.1-0.3 m high. Fl. white-purple-blue, Aug to Sep. Alluvium.

4.3 Flora of conservation significance

No Threatened Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013), were identified within the survey area. One Priority Flora, *Grevillea inconspicua* (P4), as listed by the DPaW was identified within the survey area. Three unrecognised taxa of *Tecticornia* (as identified by K.A Shepherd 867) were also identified in the area and are considered to be of Conservation Significance.

4.3.1 *Grevillea inconspicua* (P4)

Grevillea inconspicua is described as an intricately branched, spreading shrub, which grows between 0.6-2 m high (Plate 1). It produces white/pink-white flowers from June to August. It occurs on loam, gravel soils along drainage lines on rocky outcrops and creeklines (WAHERB, 2014). It was not listed by the DPaW as occurring within a 50km radius of the survey area with the nearest DPaW known occurrence located approximately 100km north-west of the survey area. Twelve locations of this species were recorded within the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database. *Grevillea inconspicua* (P4) was identified within two vegetation communities:

1. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam soils; and
2. Open Low Woodland to Woodland of *Acacia caesaneura, Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils.

GPS locations of this species identified in the survey area are provided in Appendix 5.

Plate 1: *Grevillea inconspicua* (P4)

4.3.2 *Tecticornia* sp. (unrecognised taxon, K.A. Shepherd 867) CS

Three unrecognised *Tecticornia* taxon (determined by K.A. Shepherd 867) were identified in the survey area (spring 2013 and autumn 2014):

1. unrecognised taxon believed to be allied to *T. halocnemoides*;
2. unrecognised taxon believed to be allied to *T. undulata*; and
3. unrecognised taxon believed to be allied to *T. pergranulata*

These taxa are considered to be of Conservation Significance. These taxa were identified as the dominant understorey species in the Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over dwarf scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A. Shepherd 867) on claypan/lake shoreline vegetation community. Seven populations of the taxa were identified within the survey area. GPS locations of these taxa identified within the survey area are provided in Appendix 5. No image is available for these taxa. During the additional survey (autumn 2014) specimens of this undescribed taxon were collected and submitted to K.A Shepherd at the WAHERB for taxonomic identification. The specimens collected were sterile and could not be further identified. An additional seven sterile entities were identified by K. A. Shepherd 867 some of which may represent new taxa.

4.4 Vegetation Communities

Twenty five vegetation communities were identified within the survey area. These vegetation communities were represented by a total of 37 Families, 83 Genera and 214 Taxa (including sub-taxa and variants) (Appendix 3). These vegetation communities belong to five broad landform types and five vegetation groups (according to the National Vegetation Information System (NVIS) classifications). A map showing the vegetation communities present in the survey area is provided in Appendix 2. The area (ha and percentage) and mapping code of each vegetation community is listed in Table 7. Vegetation communities were classified according to Muir (1977) Life Form/Height Class Classifications (Appendix 6).

Table 7: Summary of vegetation communities and the area covered

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (ha)	% area
Clay-Loam Plains	Acacia Forests and Woodlands	Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils	CLP-AFW1	30	0.9
		Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils	CLP-AFW2	34	1.02
		Low Forest of *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp. *forrestii* in clay-loam soils	CLP-AFW3	8	0.24
		Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	CLP-AFW4	270	8.09
		Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana* and *Maireana pyramidata* in clay-loam soils	CLP-AFW5	8	0.24
	Acacia Open Woodland	Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils	CLP-AOW1	344	10.30
		Open Low Woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils	CLP-AOW2	204	6.11
		Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils	CLP-AOW3	41	1.23

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (ha)	% area
		Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam	CLP-AOW4	814	24.38
	Casuarina Forests and Woodlands	Low Woodland of *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils	CLP-CFW1	14	0.42
	Chenopod Shrublands, Samphire Shrublands and Forblands	Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils	CLP-CSSSF1	354	10.60
	Other Shrublands	Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod species in clay-loam soils	CLP-OS1	17	0.51
Rocky Plain	Acacia Open Woodland	Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay with quartz pebbles	RP-AOW1	87	2.61
		Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles	RP-AOW2	83	2.49
Sandy-Loam Plain	Acacia Forests and Woodlands	Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils	SLP-AFW1	12	0.36
		Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana*, *Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils	SLP-AFW2	64	1.92

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (ha)	% area
	Acacia Open Woodland	Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils.	SLP-AOW1	12	0.36
		Open Low Woodland to Woodland of *Acacia caesaneura, Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils	SLP-AOW2	384	11.5
Closed Depression	Chenopod Shrublands, Samphire Shrublands and Forblands	Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over dwarf scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K. Shepherd) on claypan/lake shoreline	CD-CSSSF1	128	3.83
Open Depression	Acacia Open Woodland	Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae*, *Maireana triptera* and *Eragrostis laniflora* in drainage line	OD-AOW1	103	3.08
		Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline	OD-AOW2	19	0.57
Ridge	Acacia Open Woodland	Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges	R-AOW1	141	4.22
Rocky Slope	Acacia Forests and Woodlands	Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope	RS-AFW1	72	2.16

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (ha)	% area
		Low woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise	RS-AFW2	45	1.35
		Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill	RS-AFW3	43	1.29
N/A	N/A	Disturbed Vegetation (excluding roads/access tracks)	DV	8	0.24
Total Area				**3339**	**100**

4.5 Clay-Loam Plain: *Acacia* Forests and Woodlands

4.5.1 Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 14 Genera and 20 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils (Plate 2). The taxa in the upper storey included *Acacia caesaneura, Acacia quadrimarginea* and *Brachychiton gregorii.* The mid-storey taxa included *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Eremophila margarethae* and *Eremophila miniata.* The understorey taxa included *Ptilotus obovatus*, *Solanum lasiophyllum, Maireana triptera* and *Atriplex bunburyana.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 8.

Table 8: Vegetation assemblage for Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	30-70%	*Acacia caesaneura* *Acacia quadrimarginea*
Shrub 1-1.5m	10-30%	*Acacia tetragonophylla* *Eremophila margarethae* *Senna artemisioides* subsp. *helmsii*
Shrub <0.5m	10-30%	*Maireana triptera* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 2: Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils

4.5.2 Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 6 Genera and 6 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils (Plate 3). The taxa in the upper storey comprised of *Acacia caesaneura.* The mid-storey taxa included *Atriplex bunburyana, Eremophila alternifolia* and *Maireana sedifolia.* The understorey taxa included *Aristida contorta* and *Ptilotus albidus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 9.

Table 9: Vegetation assemblage for Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	30-70%	*Acacia caesaneura*
Shrub 0.5-1m	10-30%	*Atriplex bunburyana*
Bunch Grass <0.5m	70-100%	*Aristida contorta*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 3: Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils

4.5.3 Low Forest of Acacia incurvaneura over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. x *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp. *forrestii* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 7 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Forest *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp*. forrestii* in clay-loam soils (Plate 4)*.* The upper storey consisted of *Acacia incurvaneura, Acacia craspedocarpa* and *Acacia ayersiana.* The mid-storey included *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra* and *Senna artemisioides* subsp. x *artemisioides.* The understorey taxa included *Eremophila jucunda, Eremophila forrestii* subsp. *forrestii, Ptilotus schwartzii* and *Solanum lasiophyllum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 10.

Table 10: Vegetation assemblage for Low Forest *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp*. forrestii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia incurvaneura*
Shrub >2m	10-30%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	10-30%	*Eremophila latrobei* subsp. *glabra* *Senna artemisioides* subsp. *x artemisioides*
Shrub 0.5-1m	30-70%	*Eremophila forrestii* subsp. *forrestii* *Eremophila jucunda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 4: Low Forest *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp. *forrestii* in clay-loam soils

4.5.4 Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 3 Families, 4 Genera and 7 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were identified within this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils (Plate 5). The taxa in the upper storey included *Acacia aptaneura* and *Acacia caesaneura.* The mid-storey taxa included *Acacia victoriae, Grevillea deflexa* and *Grevillea berryana.* The understorey taxa included *Maireana sedifolia* and *Senna artemisioides* subsp*. filifolia.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 11.

Table 11: Vegetation assemblage for Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* in clay-loam soil within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	10-30%	*Acacia aptaneura* *Acacia caesaneura*
Shrub 1.5-2m	2-10%	*Acacia victoriae*
Shrub 1-1.5m	2-10%	*Grevillea berryana* *Grevillea reflexa*
Shrub 0.5-1m	30-70%	*Maireana sedifolia* *Senna artemisioides* subsp*. filifolia.*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 5: Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils

4.5.5 Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana* and *Maireana pyramidata* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 7 Genera and 10 taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana and Maireana pyramidata* (Plate 6). The taxa in the upper storey included *Acacia aptaneura, Acacia victoriae* and *Pittosporum angustifolium*. The mid-storey taxa included *Acacia colletioides* and *Senna artemisioides* subsp. *filifolia*. The understorey taxa included *Atriplex bunburyana, Maireana pyramidata, Maireana sedifolia* and *Lycium australis.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 12.

Table 12: Vegetation assemblage for Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana and Maireana pyramidata* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	10-30%	*Acacia aptaneura*
Shrub >2m	30-70%	*Hakea preissii*
Shrub 1.5-2m	30-70%	*Acacia colletioides*
Shrub 0.5-1m	10-30%	*Atriplex bunburyana* *Maireana pyramidata*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 6: Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana and Maireana pyramidata* in clay-loam soils

4.6 Clay-Loam Plain: *Acacia* Open Woodlands

4.6.1 Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 22 Genera and 31 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils (Plate 7). The upper storey taxa included *Acacia aptaneura, Hakea preissii, Acacia victoriae* and *Santalum spicatum.* The mid-storey taxa included *Eremophila alternifolia, Senna artemisioides* subsp. *filifolia* and *Senna artemisioides* subsp. *helmsii, Pittosporum angustifolium* and *Eremophila glabra.* The understorey taxa included *Maireana pyramidata, Atriplex bunburyana, Cratystylis subspinescens*, *Grevillea acuaria, Tecticornia disarticulata, Disphyma crassifolium* and *Maireana georgei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 13.

Table 13: Vegetation assemblage for Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Acacia aptaneura*
Shrub 1.5-2m	2-10%	*Eremophila pantonii*
Shrub 0.5-1m	70-100%	*Atriplex bunburyana* *Cratystylis subspinescens* *Maireana pyramidata*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 7: Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils

4.6.2 Open Low Woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 16 Genera and 25 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Low woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils (Plate 8). The taxa in the upper storey included *Acacia incurvaneura, Hakea preissii, Eremophila oldfieldii* subsp. *angustifolia, Acacia oswaldii* and *Amyema gibberula* var. *tatei.* The mid storey taxa included *Maireana sedifolia*, *Eremophila pantonii, Maireana pyramidata, Scaevola spinescens, Senna artemisioides* subsp. *helmsii* and *Eremophila longifolia*. The understorey taxa included *Maireana glomerifolia, Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Sclerolaena diacantha*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 14.

Table 14: Vegetation assemblage for Open Low woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Acacia incurvaneura* *Hakea preissii*
Shrub 1-1.5m	2-10%	*Maireana pyramidata*
Shrub 0.5-1m	10-30%	*Eremophila pantonii* *Maireana sedifolia*
Shrub <0.5m	30-70%	*Maireana glomerifolia* *Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 8: Open Low woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils

4.6.3 Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 21 Families, 32 Genera and 59 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. Four introduced taxa were recorded in this vegetation community *Cenchrus ciliaris* (Buffel Grass), *Salvia verbenaca* (Wild Sage), *Lysimachia arvensis* (Blue Pimpernel) and *Sonchus oleraceus* (Common Sowthistle). According to the DAFWA (2014) none of these taxa are listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of an Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils (Plate 9). The taxa in the upper storey included *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana*. The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Senna artemisioides* subsp. x *artemisioides, Santalum spicatum, Eremophila margarethae* and *Acacia victoriae*. The understorey taxa included *Eremophila forrestii* subsp. *forrestii, Ptilotus obovatus* and *Maireana triptera*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 15.

Table 15: Vegetation assemblage for Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	30-70%	*Acacia caesaneura* *Acacia macraneura* *Acacia ayersiana*
Shrub 1.5-2m	2-10%	*Acacia ramulosa* var. *ramulosa* *Eremophila margarethae*
Shrub <0.5m	30-70%	*Eremophila forrestii* subsp. *forrestii* *Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 9: Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils

4.6.4 Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 21 Families, 33 Genera and 61 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the Commonwealth *EPBC Act 1999* and as listed by the DPaW (Smith 2013), were identified within the survey area. One Priority Flora taxa, *Grevillea inconspicua* (P4) was identified within this vegetation community. Four introduced taxa were recorded in this vegetation community; *Cenchrus ciliaris* (Buffel Grass), *Salvia verbenaca* (Wild sage), *Lysimachia arvensis* (Blue Pimpernel) and *Sonchus oleraceus* (Common Sowthistle). According to the DAFWA (2014) none of these taxa are listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam soils (Plate 10). The taxa in the upper storey included *Acacia caesaneura, A. ayersiana, A. caesaneura, A. incurvaneura* and *A. macraneura.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Eremophila margarethae, Acacia tetragonophylla, Eremophila clarkei, Senna artemisioides* subsp. *x artemisioides* and *Santalum spicatum.* The understorey taxa included *Eremophila forrestii* subsp. *forrestii, Maireana triptera, Eragrostis laniflora, Eragrostis eriopoda, Solanum lasiophyllum* and *Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 16.

Table 16: Vegetation assemblage for Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii*, *Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam soils within the survey area

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Acacia macraneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	2-10%	*Eremophila margarethae* *Acacia tetragonophylla*
Shrub 0.5-1m	2-10%	*Eremophila forrestii* subsp. *forrestii*
Shrub <0.5m	10-30%	*Maireana triptera*
Bunch Grass <0.5m	30-70%	*Eragrostis laniflora*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to National Vegetation Information System (NVIS) this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014).

Plate 10: Open Woodland of *Acacia caesaneura, Acacia* macraneura and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam soils

4.7 Clay-loam Plains: *Casuarina* Forests and Woodlands

4.7.1 Low Woodland of *Casuarina pauper* over *Acacia victoriae*, *Exocarpos sparteus*, *Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 10 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this

vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils (Plate 11). The taxa in the upper storey included *Casuarina pauper* and *Pittosporum angustifolium*. The mid-storey taxa included *Acacia victoriae, Exocarpos sparteus* and *Eremophila glabra.* The understorey taxa included *Tecticornia halocnemoides, Atriplex bunburyana, Sclerolaena cuneata* and *Cratystylis subspinescens.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 17.

Table 17: Vegetation assemblage for *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Casuarina pauper*
Shrub >2m	2-10%	*Acacia victoriae*
Shrub <0.5m	10-30%	*Tecticornia halocnemoides*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Casuarina forests and woodlands vegetation group (DoE, 2014b).

Plate 11: *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils

4.8 Clay-loam Plains: Chenopod Shrublands, Samphire Shrublands and Forblands

4.8.1 Shrubland of Chenopod taxa with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 23 Families, 46 Genera and 100 taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Shrubland of Chenopod taxa with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils (Plate 12). The upper storey comprised of *Acacia ayersiana* and *Acacia caesaneura*. The mid-storey taxa included *Acacia kalgoorliensis, Hakea preissii, Atriplex bunburyana, Maireana sedifolia* and *Maireana pyramidata.* The understorey taxa included *Maireana appressa, Maireana atkinsiana, Maireana tomentosa, Maireana trichoptera, Maireana triptera, Sclerolaena diacantha* and *Sclerolaena eriacantha.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 18.

Table 18: Vegetation assemblage for Shrubland of Chenopod taxa with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	2-10%	*Acacia caesaneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia kalgoorliensis* *Hakea preissii*
Shrub 1-1.5m	30-70%	*Atriplex bunburyana* *Maireana pyramidata* *Maireana sedifolia*
Shrub <0.5m	30-70%	*Maireana georgei* *Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Chenopod shrublands, samphire shrublands and forblands vegetation group (DoE, 2014b).

Plate 12: Shrubland of Chenopod taxa with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils

4.9 Clay-loam Plains: Other Shrublands

4.9.1 Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod taxa in clay-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 18 Families, 30 Genera and 41 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod taxa in clay-loam soils (Plate 13). The upper storey comprised of *Acacia tysonii, Hakea preissii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium*. The mid-storey taxa included *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia.* The understorey taxa included *Aristida holathera* var. *holathera, Solanum orbiculatum* subsp. *orbiculatum, Ptilotus obovatus, Sclerolaena diacantha* and *Sclerolaena eriacantha.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 19.

Table 19: Vegetation assemblage for Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod taxa in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	10-30%	*Acacia tysonii* *Hakea preissii*
Shrub 1.5-2m	10-30%	*Eremophila miniata* *Exocarpos aphyllus* *Pimelea microcephala* subsp. *microcephala* *Pittosporum angustifolium*

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub 1-1.5m	10-30%	*Cratystylis subspinescens* *Rhagodia drummondii* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	30-70%	*Atriplex vesicaria* *Ptilotus obovatus* *Solanum orbiculatum* subsp. *orbiculatum* *Sclerolaena diacantha* *Sclerolaena eriacantha*
Bunch Grass <0.5m	30-70%	*Aristida holathera* var. *holathera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Other Shrublands vegetation group (DoE, 2014b).

Plate 13: Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod taxa in clay-loam soils

Rocky-Plains: *Acacia* Open Woodland

4.9.2 Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay-loam soil with quartz pebbles

Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 17 Genera and 32 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. Two introduced taxa were recorded in this vegetation community, *Salvia verbenaca (*Wild Sage*)* and *Centaurea melitensis* (Maltese cockspur). According to the DAFWA (2014) neither of these taxa are listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay with quartz pebbles (Plate 14). The taxa in the upper storey included *Acacia caesaneura, Eremophila oldfieldii* subsp. *angustifolia, Pittosporum angustifolium* and *Acacia burkittii.* The mid-storey taxa included *Eremophila pantonii, Acacia ramulosa* var. *ramulosa, Scaevola spinescens, Maireana pyramidata, Senna artemisioides* subsp. *filifolia* and *Rhagodia eremaea.* The understorey taxa included *Ptilotus obovatus, Maireana triptera, Eragrostis eriopoda, Enneapogon caerulescens* and *Sclerolaena densiflora.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 20.

Table 20: Vegetation assemblage for Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay-loam soil with quartz pebbles within the survey area
(Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Acacia caesaneura*
Shrub 1.5-2m	10-30%	*Eremophila pantonii*
Shrub 0-0.5m	70-100%	*Ptilotus obovatus* *Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DOE, 2014).

Plate 14: Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay-loam soil with quartz pebbles

4.9.3 Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay-loam soil with quartz and ironstone pebbles

Flora

The flora recorded within this vegetation community was represented by a total of 20 Families, 32 Genera and 57 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles (Plate 15). The upper storey comprised of *Acacia ayersiana, Acacia caesaneura, Acacia aptaneura* and *Acacia caesaneura.* The mid-storey taxa included *Eremophila margarethae, Acacia tetragonophylla, Dodonaea rigida,*

Eremophila granitica and *Eremophila latrobei* subsp. *latrobei.* The understorey taxa included *Brachyscome ciliaris, Eragrostis eriopoda, Erodium cygnorum, Surreya diandra* and *Wahlenbergia gracilenta.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 21.

Table 21: Vegetation assemblage for Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay-loam soil with quartz and ironstone pebbles within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Acacia ayersiana* *Acacia caesaneura*
Shrub 1.5-2m	2-10%	*Acacia tetragonophylla* *Eremophila margarethae*
Bunch Grass <0.5m	30-70%	*Eragrostis eriopoda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 15: Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay-loam soil with quartz and ironstone pebbles

4.10 Sandy-Loam Plain: *Acacia* Forests and Woodlands

4.10.1 Low Forest of *Acacia aptaneura, A. caesaneura and A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 14 Genera and 20 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora were identified within this vegetation community. One introduced taxa, *Sonchus oleraceus* (Common Sowthistle) was recorded within this vegetation community. According to the DAFWA (2014) this taxa is not listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils (Plate 16). The taxa in the upper storey included *Acacia aptaneura, A. caesaneura and A. incurvaneura, A. aneura, A. macraneura* and *A. ayersiana* .The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Acacia tetragonophylla, Eremophila clarkei, Eremophila gilesii* subsp. *variabilis* and *Scaevola spinescens.* The understorey taxa included *Eragrostis eriopoda, Eremophila margarethae, Triodia basedowii, Dianella revoluta, Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Cryptandra connata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 22.

Table 22: Vegetation assemblage for Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree < 5m	30-70%	*Acacia aptaneura* *Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	10-30%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	10-30%	*Eremophila forrestii* subsp. *forrestii* *Eremophila latrobei* subsp. *latrobei*
Shrub 0.5-1m	10-30%	*Eremophila margarethae*
Shrub <0.5m	30-70%	*Maireana triptera* *Ptilotus obovatus*
Hummock Grass <0.5m	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DOE, 2014).

Plate 16: Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils

4.10.2 Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana, Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 18 Genera and 24 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana, Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils (Plate 17). The upper storey comprised of *Acacia caesaneura* and *Acacia incurvaneura*. The mid-storey taxa included *Atriplex bunburyana, Hakea kippistiana, Scaevola spinescens, Senna artemisioides* subsp. *stuartii, Acacia tetragonophylla* and *Rhagodia eremaea.* The understorey taxa included *Aristida contorta, Ptilotus obovatus, Maireana triptera, Solanum lasiophyllum* and *Frankenia setosa.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 23.

Table 23: Vegetation assemblage for Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana, Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	10-30%	*Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	10-30%	*Acacia tetragonophylla* *Hakea kippistiana*
Shrub 1-1.5m	10-30%	*Atriplex bunburyana* *Scaevola spinescens*
Bunch Grass <0.5m	30-70%	*Aristida contorta*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 17: Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana, Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils

4.11 Sandy-Loam Plain: *Acacia* Open Woodlands

4.11.1 Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils.

Flora

The flora recorded within this vegetation community was represented by a total of 15 Families, 23 Genera and 56 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils (Plate 18). The taxa in the upper storey included. The upper storey taxa include *Acacia caesaneura* and *Acacia ayersiana*. The mid-storey taxa included *Grevillea berryana, Acacia ramulosa* var. *ramulosa, Atriplex nummularia* subsp. *spathulata, Eremophila longifolia* and *Eremophila forrestii* subsp. *forrestii.* The understorey taxa include *Triodia basedowii, Eriachne pulchella, Frankenia pauciflora, Maireana georgei, Ptilotus obovatus* and *Rhagodia eremaea.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 24.

Table 24: Vegetation assemblage for Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Acacia ayersiana*
Shrub 1-1.5m	10-30%	*Grevillea berryana*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 18: Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils

4.11.2 Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils

Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 14 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa *Grevillea inconspicua* (P4) was identified within this vegetation community. One introduced taxa, *Sonchus oleraceus* (Common Sowthistle) was recorded within this vegetation community. According to the DAFWA (2014) this taxa is not listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp. *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils (Plate 19). The taxa in the upper storey included *Acacia caesaneura*, *A. aptaneura, A. ayersiana, A. caesaneura* and *A. incurvaneura*. The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Acacia tetragonophylla, Eremophila clarkei, Eremophila gilesii* subsp. *variabilis* and *Scaevola spinescens.* The understorey taxa included *Eragrostis eriopoda, Eremophila margarethae, Triodia basedowii, Dianella revoluta, Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Cryptandra connata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 25.

Table 25: Vegetation assemblage for Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp. *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree < 5m	30-70%	*Acacia ayersiana* *Acacia caesaneura*
Shrub 1.5-2m	10-30%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	10-30%	*Eremophila forrestii* subsp. *forrestii* *Eremophila latrobei* subsp. *latrobei*
Shrub <0.5m	30-70%	*Eremophila margarethae* *Maireana triptera* *Ptilotus obovatus*

Bunch Grass <0.5m	30-70%	*Eragrostis eriopoda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DOE, 2014).

Plate 19: Open Low Woodland to Woodland of *Acacia caesaneura, Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp. *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils

4.12 Closed Depression: Chenopod Shrublands, Samphire Shrublands and Forblands

4.12.1 Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over Dwarf Scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A Shepherd 867) on claypan/lake shoreline

Flora

The flora recorded within this vegetation community was represented by a total of 3 Families, 5 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. Three undescribed taxa of *Tecticornia* were identified within this community (identified by K.A. Shepherd 867) which are considered taxa of Conservation Significance. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over Dwarf Scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis*, *Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A. Shepherd 867) on claypan/lake shoreline (Plate 20). The taxa in the mid storey included *Cratystylis subspinescens, Atriplex bunburyana* and *Jacksonia arida.* The understorey taxa included *Tecticornia halocnemoides, Tecticornia syncarpa, Tecticornia laevigata, Tecticornia peltata, Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. Engligh KS552), *Tecticornia pergranulata, Tecticornia calyptrata, Tecticornia indica* subsp. *bidens, Tecticornia* sp. (unrecognised taxon, K.A Shepherd 867) and *Atriplex vesicaria.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 26.

Table 26: Vegetation assemblage for Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over Dwarf Scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis*, *Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A Shepherd 867) on claypan/lake shoreline within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub 0.5-1m	2-10%	*Cratystylis subspinescens* *Atriplex bunburyana*
Shrub <0.5m	70-100%	*Tecticornia calyptrata* *Tecticornia halocnemoides* *Tecticornia indica* subsp. *bidens* *Tecticornia laevigata* *Tecticornia peltata*

Life Form/Height Class	Canopy Cover	Dominant taxa present
		Tecticornia pergranulata *Tecticornia* sp. (undescribed taxon, K.A. Shepherd 867) CS

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Chenopod Shrublands, Samphire Shrublands and Forblands vegetation group (DoE, 2014b).

Plate 20: Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over Dwarf Scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis*, *Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A Shepherd 867)

4.13 Open Depression: *Acacia* Open Woodland

4.13.1 Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line.

Flora

The flora recorded within this vegetation community was represented by a total of 22 Families, 34 Genera and 64 Taxa (Appendix 3).

No Threatened Flora, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the Commonwealth *EPBC Act 1999* and as listed by the DPaW (Jacob 2013), were identified within the survey area. No Priority Flora were identified within this vegetation community during the survey. Four introduced taxa were recorded in this vegetation community; *Cenchrus ciliaris* (Buffel Grass), *Salvia verbenaca* (Wild Sage), *Lysimachia arvensis* (Blue Pimpernel) and *Sonchus oleraceus* (Common Sowthistle). According to the DAFWA (2014) none of these taxa are listed as a Declared Plant under Section 22 of the *BAM Act 2007.*

Vegetation

The flora recorded in this vegetation community was representative of Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line (Plate 21). The taxa in the upper storey included *Acacia caesaneura, Acacia aptaneura, A. caesaneura, A. incurvaneura*, *A. macraneura* and *A. ayersiana.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Eremophila margarethae, Acacia tetragonophylla, Eremophila clarkei, Senna artemisioides* subsp. *x artemisioides* and *Santalum spicatum.* The understorey taxa included *Eremophila forrestii* subsp. *forrestii, Maireana triptera, Eragrostis laniflora, Eragrostis eriopoda, Solanum lasiophyllum* and *Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 27.

Table 27: Vegetation assemblage for Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii*, *Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line within the survey area

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Acacia macraneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	2-10%	*Eremophila margarethae* *Acacia tetragonophylla*

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub 0.5-1m	2-10%	*Eremophila forrestii* subsp. *forrestii*
Shrub <0.5m	10-30%	*Maireana triptera*
Bunch Grass <0.5m	30-70%	*Eragrostis laniflora*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the *Acacia* open woodlands vegetation group (DOE, 2014).

Plate 21: Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line

4.13.2 Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline

Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 7 Genera and 12 taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline (Plate 22). The upper storey comprised of *Acacia aptaneura* and *Acacia incurvaneura*. The mid-storey taxa included *Acacia tetragonophylla* and *Acacia craspedocarpa.* The understorey taxa included C*ratystylis subspinescens, Eremophila glutinosa, Atriplex bunburyana, Maireana pyramidata* and *Eremophila serrulata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 28.

Table 28: Vegetation assemblage for Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	2-10%	*Acacia aptaneura* *Acacia incurvaneura*
Shrub 1.5-2m	2-10%	*Acacia craspedocarpa* *Acacia tetragonophylla* *Eremophila margarethae*
Shrub	30-70%	*Atriplex bunburyana* *Cratystylis subspinescens*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014b).

Plate 22: Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline

4.14 Ridge: *Acacia* Open Woodland

4.14.1 Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges

Flora

The flora recorded within this vegetation community was represented by a total of 17 Families, 21 Genera and 47 taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges (Plate 23). The upper storey comprised of *Acacia ayersiana* and *Acacia tysonii.* The mid-storey taxa included *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Acacia desertorum* var. *desertorum* and *Acacia tetragonophylla.* The understorey taxa included *Atriplex vesicaria, Aristida contorta, Solanum lasiophyllum, Enchylaena tomentosa* var. *tomentosa* and *Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 29.

Table 29: Vegetation assemblage for Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	2-10%	*Acacia caesaneura* *Acacia tysonii*
Shrub >2m	2-10%	*Hakea kippistiana*
Shrub 1-1.5m	10-30%	*Cratystylis subspinescens* *Eremophila miniata*
Shrub <0.5m	30-70%	*Atriplex vesicaria* *Solanum lasiophyllum*
Bunch Grass <0.5m	30-70%	*Aristida contorta (A)*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia open woodlands vegetation group (DoE, 2014).

Plate 23: Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges

4.15 Rocky Slope: *Acacia* Forest and Woodlands

4.15.1 Low woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise

Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise (Plate 24). The taxa in the upper storey included *Acacia aptaneura, Acacia grasbyi* and *Acacia victoriae.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Senna artemisioides* subsp. *helmsii, Scaevola spinescens* and *Maireana pyramidata*. The understorey taxa included *Aristida contorta, Sclerolaena diacantha, Maireana triptera* and *Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 30.

Table 30: Vegetation assemblage for *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia aptaneura* *Acacia grasbyi*
Shrub 1.5-2m	10-30%	*Acacia ramulosa* var. *ramulosa*
Bunch Grass <0.5m	70-100%	*Aristida contorta*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 24: Low Woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise

4.15.2 Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope

Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 13 Genera and 19 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. ramulosa over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope (Plate 25). The taxa in the upper storey included *Acacia quadrimarginea, Acacia ramulosa* var. *ramulosa, Santalum lanceolatum* and *Brachychiton gregorii.* The mid-storey taxa included *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Dodonaea rigida* and *Eremophila jucunda.* The understorey taxa included *Ptilotus obovatus, Maireana georgei* and *Solanum lasiophyllum*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 31.

Table 31: Vegetation assemblage for Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. ramulosa over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia incurvaneura* *Acacia quadrimarginea* *Acacia ramulosa over Ptilotus obovatus* *Acacia incurvaneura*
Shrub >2m	30-70%	*Acacia quadrimarginea* *Acacia ramulosa* var. *ramulosa*
Shrub 0.5-1m	2-10%	*Eremophila forrestii* subsp. *forrestii* *Senna artemisioides* subsp. *helmsii*
Shrub 0-0.5m	10-30%	*Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 25: Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. ramulosa over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope

4.15.3 Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. x *artemisioides, Senna artemisioides* subsp. *helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill

Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

Vegetation

The flora recorded in this vegetation community was representative of the Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill within the survey area (Plate 26). The taxa in the upper storey included *Acacia caesaneura, Acacia incurvaneura, Psydrax latifolia and Grevillea berryana.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa*, *Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii* and *Senna cardiosperma.* The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Scaevola spinescens, Eragrostis eriopoda* and *Maireana triptera.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 32.

Table 32: Vegetation assemblage for Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	10-30%	*Acacia ramulosa* var. *ramulosa* *Dodonaea rigida*
Shrub 1-1.5m	10-30%	*Senna artemisioides* subsp. *artemisioides* *Senna artemisioides* subsp. *helmsii* *Senna cardiosperma*
Shrub <0.5m	10-30%	*Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia forests and woodlands vegetation group (DoE, 2014b).

Plate 26: Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill

4.16 Vegetation of Conservation Significance

No TEC pursuant to Commonwealth legislation and as listed by the DPaW were recorded within the survey area. However the proposed pipeline route traverses through the buffer zone of two PEC's; *Mount Jumbo Range Vegetation Complex* and *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station,* which are listed by DPaW as a Priority 3 and Priority 1 Ecological Community respectively (Appendix 1). The definition of the *Mount Jumbo vegetation complex* PEC is as follows:

> *A banded ironstone hill near Mt Jumbo south-west of Laverton in the south-eastern corner of the Laverton-Leonora Study Area supported Acacia aneura Low Woodland. Growing on the slopes with Acacia aneura were sparse trees of Casuarina cristata and Grevillea nematophylla. Shrubs and ephemerals commonly recorded on banded ironstone hills included Acacia ramulosa, Eremophila latrobei, Eriostemon brucei, Euphorbia boophthona, Maireana georgei, Sida filiformis, Symphyobasis macroplectra, Trachymene ornata and Wurmbea deserticola.*

This vegetation description was derived from studies conducted by Keighery, Hall and Milewski (1994) of Laverton-Leonora (Keighery *et. al.*, 1994). One of the vegetation communities identified within the survey area; Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill, was representative of vegetation that characterizes the *Mount Jumbo Range Vegetation Complex* PEC.

The definition of the *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station* PEC is as follows:

> *Perennial plant cover is generally scattered 10 moderately dose (10-25% PFC) woodland, occasionally mid or tall shrubland, and rarely low shrub land. The shrub strata are nearly always well defined, and tree and perennial grass strata are often absent. The following taxa (by strata) are dominant and/or common:*
> *Trees: Casuarina cristata and Eucalyptus clelandii.*
> *Tall Shrubs: Acacia tetragonophylla, Acacia aneura, A. burkittii, A. colletioides, A. grasbyi, A. oswaldii and Melaleuca sheathiana.*
> *Mid shrubs: Lycium australe, Eremophila pantonii, E. scoparia, Cassia nemophila.*
> *Low shrubs: Maireana trichoptera, Ptilotus obovatus, and Lycium australe.*
> *Perennial grasses: Austrostipa elegantissima.*

Vegetation representative of the *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station* PEC as described by Pringle (1994) was not identified within the survey area.

The DPaW have also identified other communities under threat (described by Pringle, 1994) in the Murchison Region which are not formally protected as PEC or TEC which were represented within the survey area. These include:

- Plain mixed halophyte low shrublands of the north-east Goldfields;
- Mixed Chenopod shrublands with Mulga (*Acacia aneura*) overstorey of the north-east Goldfields; and
- Mulga (*Acacia aneura*) shrublands with scattered Chenopod low shrubs of the north-east Goldfields.

During the survey three specimens believed to be a currently unrecognised taxa allied to *T. halocnemoides, T. pergranulata* and *T. undulata* (determined by K.A. Shepherd 867) were identified as the dominant understorey taxa in the Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over dwarf scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K.A. Shepherd 867) on claypan/lake shoreline vegetation community. These taxa are considered to be of Conservation Significance and require further identification which is currently being undertaken by *Tecticornia* specialist K. A. Shepherd. As these taxa have only been identified as occurring within the claypan/salt lake community of the survey area this vegetation community should be considered to be of conservation significance. Further consultation with the WAHERB and DPaW is required regarding these taxa. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*.

The survey area is not located in an ESA however approximately 16ha of the survey area (800m length of pipeline) is located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. This Schedule 1 Area is centered on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south-west of Mt Morgan (Appendix 1). The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

4.17 Vegetation condition

Based on Keighery's (1994) vegetation health rating scale (Appendix 7), ten of the twenty five vegetation communities within the survey area were rated as being in 'good' health while the remaining fifteen vegetation communities were rated as being in 'very good' heath (Table 33).

A 'good' health rating depicts that although the vegetation structure has been affected by multiple disturbances, in this instance as a result of pastoral land use, weed infestations, mining and exploration; it retains its basic structure and has the ability to regenerate. A 'very good' health condition is defined as vegetation that has been altered due to obvious signs of disturbance, in this instance as a result of mining and exploration. Figure 7 below provides a map of the health condition across the survey area. Approximately 1,600 ha of the survey area was rated as being in 'good health', 1,731 ha rated as being in 'very good' heath and the remaining 8 Ha was disturbed.

Table 33: Health condition rating of vegetation communities within the Murrin Murrin to Sunrise Dam survey area (Keighery, 1994)

Vegetation Community	Health Rating (Keighery, 1994)
Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam	good
Open Low Woodland to Woodland of *Acacia caesaneura, Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils	good
Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils	very good
Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae*, *Maireana triptera* and *Eragrostis laniflora* in drainage line	good
Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay with quartz pebbles	good
Open Low Woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils	very good
Low woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise	very good
Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils	very good
Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils	very good
Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana* and *Maireana pyramidata* in clay-loam soils	very good

Vegetation Community	Health Rating (Keighery, 1994)
Low Woodland of *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils	very good
Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over dwarf scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K. Shepherd) on claypan/lake shoreline	very good
Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	very good
Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils	very good
Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope	very good
Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill	very good
Low Forest of *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp. *forrestii* in clay-loam soils	very good
Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils	good
Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline	good
Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana*, *Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils	good
Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay loam soils	very good
Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges	very good
Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod species in clay-loam soils	good
Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles	good
Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils.	good

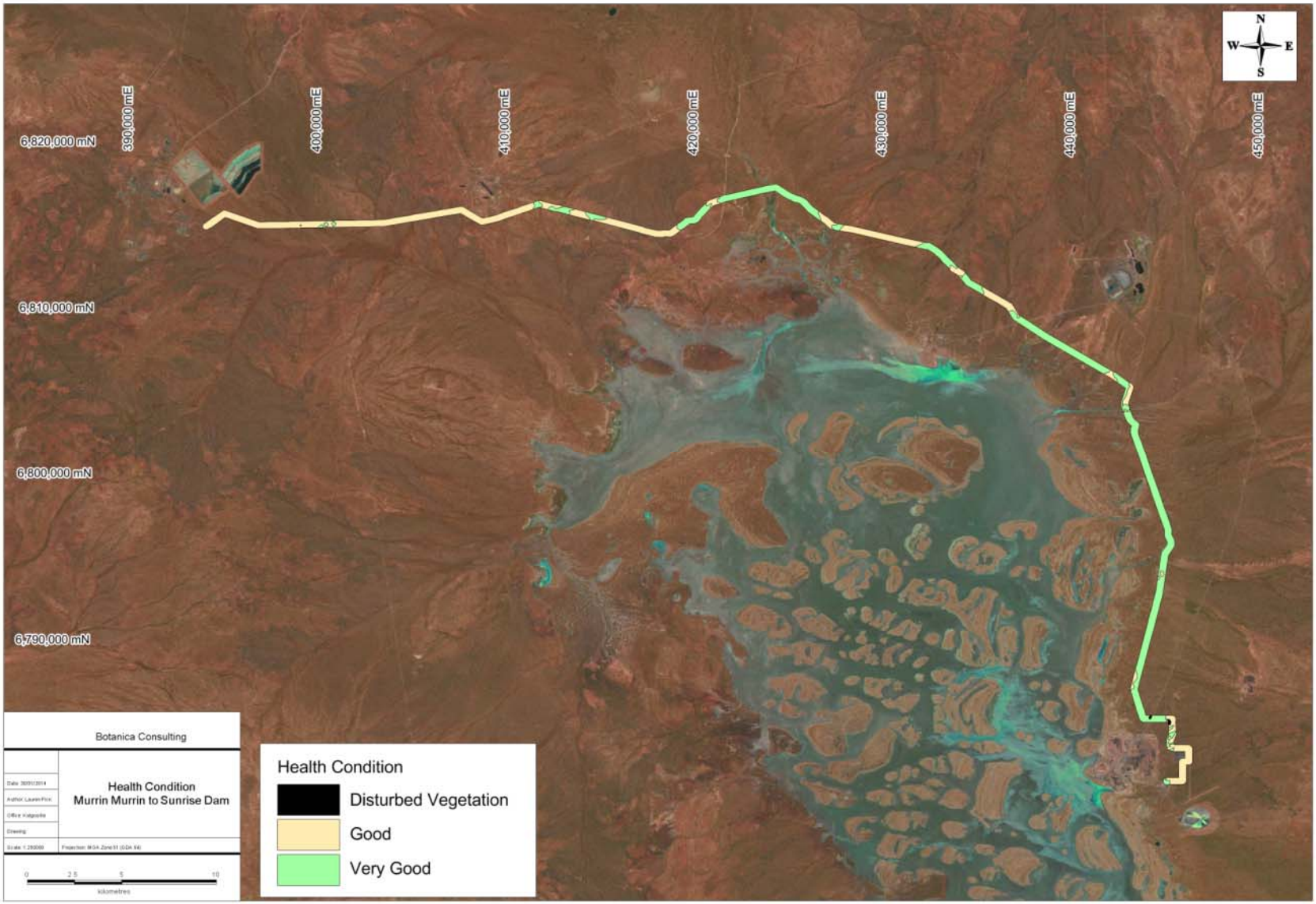

Figure 7: Map of Health Condition across the Murrin Murrin to Sunrise Dam survey area

4.18 Introduced Plant taxa

Five introduced taxa were identified within the survey area:

1. *Cenchrus ciliaris* (Buffel Grass);
2. *Centaurea melitensis* (Maltese Cockspur);
3. *Lysimachia arvensis* (Blue Pimpernel);
4. *Salvia verbenaca* (Wild Sage); and
5. *Sonchus oleraceus* (Common Sowthistle).

According to the DAFWA, none of these taxa are listed as a Declared Plant under the *BAM Act 2007*.

4.18.1 *Cenchrus ciliaris* (Buffel Grass)

This taxa is described as a tufted or sometimes stoloniferous perennial, grass-like or herbaceous plant which grows between 0.2-1.5 m high (Plate 27). It produces purple flowers from February to October. It occurs on white, red or brown sand, stony red loam, black cracking clay soils (WAHERB, 2014). According to the DPaW (1999) Buffel Grass is rated as a high priority Weed of National Significance due to its invasiveness, wide distribution and ability to change the structure, composition and function of ecosystems (environmental impacts). It was identified within three vegetation communities:

1. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam;
2. Open Woodland of *Acacia caesaneura, Acacia macraneura and Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line; and
3. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa*, *Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils

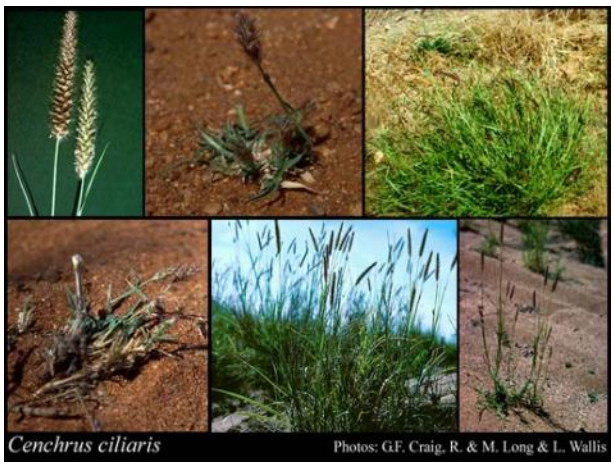

Plate 27: *Cenchrus ciliaris* (Buffel Grass) (WAHERB, 2014)

4.18.2 *Centaurea melitensis* (Maltese Cockspur)

This taxa is described as an erect annual or biennial herb that can grow between 0.2-1m high (Plate 28). It has yellow flowers from September to December, or January to March. It is a weed of roadsides, cultivated areas and other disturbed areas (WAHERB, 2014). According to the DPaW (1999) this taxa is rated as a moderate priority Weed of National Significance due to its invasiveness and wide distribution however its environmental impacts are limited. *Centaurea melitensis* was identified in one vegetation community; Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera.*

Plate 28: *Centaurea melitensis* (Maltese Cockspur)

4.18.3 *Lysimachia arvensis* (Blue Pimpernel)

No description is available for this taxa. This species is not listed by the DPaW (1999) as a Weed of National Significance. *Lysimachia arvensis* was identified within three vegetation communities:

1. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam;
2. Open Woodland of *Acacia caesaneura, Acacia macraneura and Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line; and
3. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay loam soils.

Plate 29: *Lysimachia arvensis* (Blue Pimpernel)

4.18.4 *Salvia verbenaca* (Wild Sage)

This taxa is described as being a slight aromatic perennial herb that can grow between 0.1-1m high (Plate 30). It has blue-pink-purple flowers in April, or July to October. It is often found along roadsides (WAHERB, 2014). According to the DPaW (1999) this species is listed as a Low Priority Environmental Weed due to its low invasiveness, limited distribution and limited environmental impacts. *Salvia verbenaca* was recorded within four vegetation communities:

1. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. ramulosa, Eremophila forrestii subsp. forrestii, *Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam;
2. Open Woodland of *Acacia caesaneura, Acacia macraneura and Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line;
3. Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera*; and
4. Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay loam soils.

Plate 30: *Salvia verbenaca* (Wild Sage)

4.18.5 *Sonchus oleraceus* (Common Sowthistle)

This taxa is described as an erect annual, herbaceous plant which grows up to 1.5 m high (Plate 31). It produces yellow flowers from January to December and occurs on a variety of soils. It is commonly a weed of waste places and disturbed ground (WAHERB, 2014). According to the DPaW (1999) this taxa is rated as a moderate priority Weed of National Significance due to its invasiveness and wide distribution but is not considered to cause major environmental impacts. It was identified within three vegetation communities:

1. Open Woodland of *Acacia aneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam;
2. Open Woodland of *Acacia aneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in drainage line; and
3. Open Woodland of *Acacia aneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils.

Plate 31: *Sonchus oleraceus* (Common Sowthistle)

5 Relevant Legislation and Compliance with Recognised Standards

5.1 Commonwealth Legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The aim of this Act is to protect matters of national environmental significance and is used by the Commonwealth DOE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The survey area does not have national environmental significance in relation to vegetation or flora under the *EPBC Act 1999 as* there are no TEC or Threatened Flora as listed under the *EPBC Act 1999* identified within the survey area.

5.2 State Legislation

5.2.1 Environmental Protection Act

The *EP Act 1986* includes requirements relating to the protection of DRF and TEC, and to the assessment of applications for clearing permits. TEC and DRF are protected even where exemptions for a clearing permit may apply. The *EP Act 1986* enforces both financial and/or imprisonment penalties on those who unlawfully damage a TEC. Under Schedule 5 of the *EP Act 1986* there are ten principles for clearing of native vegetation. These clearing principles (relevant to flora and vegetation) are outlined in Section 5.4 of the report.

The survey area does not contain any TEC or Threatened Flora as listed under the *EPBC Act 1999* or by the DPaW.

5.2.2 *Wildlife Conservation Act WA 1950*

The DPaW uses the provisions of this Act to list flora taxa as protected and the level of protection assigned to such flora. Flora taxa are classified as DRF when their populations are geographically restricted or are threatened by local processes. Under this Act, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties pursuant to the Act can be imposed if threatened plant taxa are collected without an appropriate licence.

5.2.3 DPaW Priority lists

The DPaW lists 'Priority' flora taxa which are under consideration for declaration as Threatened Flora. Taxa classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 taxa are considered to have been adequately surveyed but may become vulnerable or rare in future years. Priority 4 taxa are also taxa that have been removed from the threatened taxa list in the past 5 years. Priority 5 taxa are those taxa which are not currently threatened but are likely to become threatened within 5 years if not subject to a specific conservation program. The DPaW also lists PEC as a mechanism for identifying communities that may need monitoring before possible nomination for TEC status. These priority taxa and communities have no formal legal protection until they are endorsed by the Minister as being Threatened Flora and TEC respectively.

5.3 EPA Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia and the plans for the future to ensure protection and ecological sustainability of environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability and the protection of natural resources. Two position statements are relevant to this flora and vegetation survey and are described below.

5.3.1 Position Statement No. 2

Environmental Protection of Native Vegetation in Western Australia (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include comparison of all proposal options; avoidance of taxa and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the "threshold level" of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

The survey area does not contain any Threatened Flora or TEC suggesting that clearing within the survey area will meet the EPA standards outlined in Position statement No. 2. According to DAFWA (2011), the survey area occurs in pre-European Beard vegetation association Laverton 18, 39 and 389 of which >97% of the original vegetation extent remains in each of these vegetation associations.

5.3.2 Position Statement No. 3

Terrestrial Biological Surveys as an Element of Biodiversity Protection establishes that the EPA has adopted the definition and principles of biological diversity as defined in the *National Strategy for the*

Conservation of Australia's Biological Diversity (Commonwealth of Australia, 1996), and has stipulated the following requirements:

- The quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and
- The IBRA regionalisations should be used as the largest unit for environmental impact assessment (EIA) decision-making in relation to the conservation of biodiversity.

Pursuant to the IBRA regionalisation's, 26 bioregions in WA, which are affected by a range of different threatening processes and have varying levels of sensitivity to impact, have been identified. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological functional values within the context of proposals and the results of surveys should be publicly available.

The flora survey of the study area was planned and implemented as far as practicable according to the EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also, the IBRA regionalisations have been used in preparing the report to identify the conservation status of the area and identify the main threats to the biodiversity of plant taxa in the region.

6 Conclusions

6.1 Conclusions

Twenty five vegetation communities were identified within the survey area. These twenty five vegetation communities were represented by a total of 37 Families, 83 Genera and 214 Taxa (including sub-taxa and variants) (Appendix 3).

No DRF/Threatened Flora, pursuant to subsection (2) of section 23F of the *WC Act 1950,* the Commonwealth *EPBC Act 1999* and as listed by the DPaW were identified within the survey area. One Priority Flora, *Grevillea inconspicua* (P4)*,* as listed by the DPaW was identified within the survey area. Three unrecognised taxa of *Tecticornia* (as identified by K.A Shepherd 867) were also identified in the area, which are considered to be of Conservation Significance.

No TEC pursuant to Commonwealth legislation or as listed by the DPaW were recorded within the survey area. However the proposed pipeline route traverses through the buffer zone of two PEC's; *Mount Jumbo Range Vegetation Complex* and *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station,* which are listed by DPaW as a Priority 3 and Priority 1 Ecological Community respectively (Appendix 1). One of the vegetation communities identified within the survey area; Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill, was representative of vegetation that characterizes the *Mount Jumbo Range Vegetation Complex* PEC as defined by Keighery, Hall and Milewski (1994). Vegetation representative of the *Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station* PEC as described by Pringle (1994) was not identified within the survey area. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*.

The survey area is not located in an ESA however approximately 16 ha of the survey area (800m length of pipeline) is located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. This Schedule 1 Area is centered on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south-west of Mt Morgan (Appendix 1). The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the twenty five vegetation communities surveyed by BC were rated as being in 'good' health. The remaining fifteen vegetation communities were rated as being in 'very good' health. The majority of the survey area has been

subjected to pastoral land use and exploration/mining activities with numerous access tracks within the area.

Five introduced taxa were identified within the survey area:

1. *Cenchrus ciliaris* (Buffel Grass);
2. *Centaurea melitensis* (Maltese Cockspur);
3. *Lysimachia arvensis* (Blue Pimpernel);
4. *Salvia verbenaca* (Wild Sage);
5. *Sonchus oleraceus* (Common Sowthistle).

According to the DAFWA, none of these taxa are listed as a Declared Plant under the *BAM Act 2007*.

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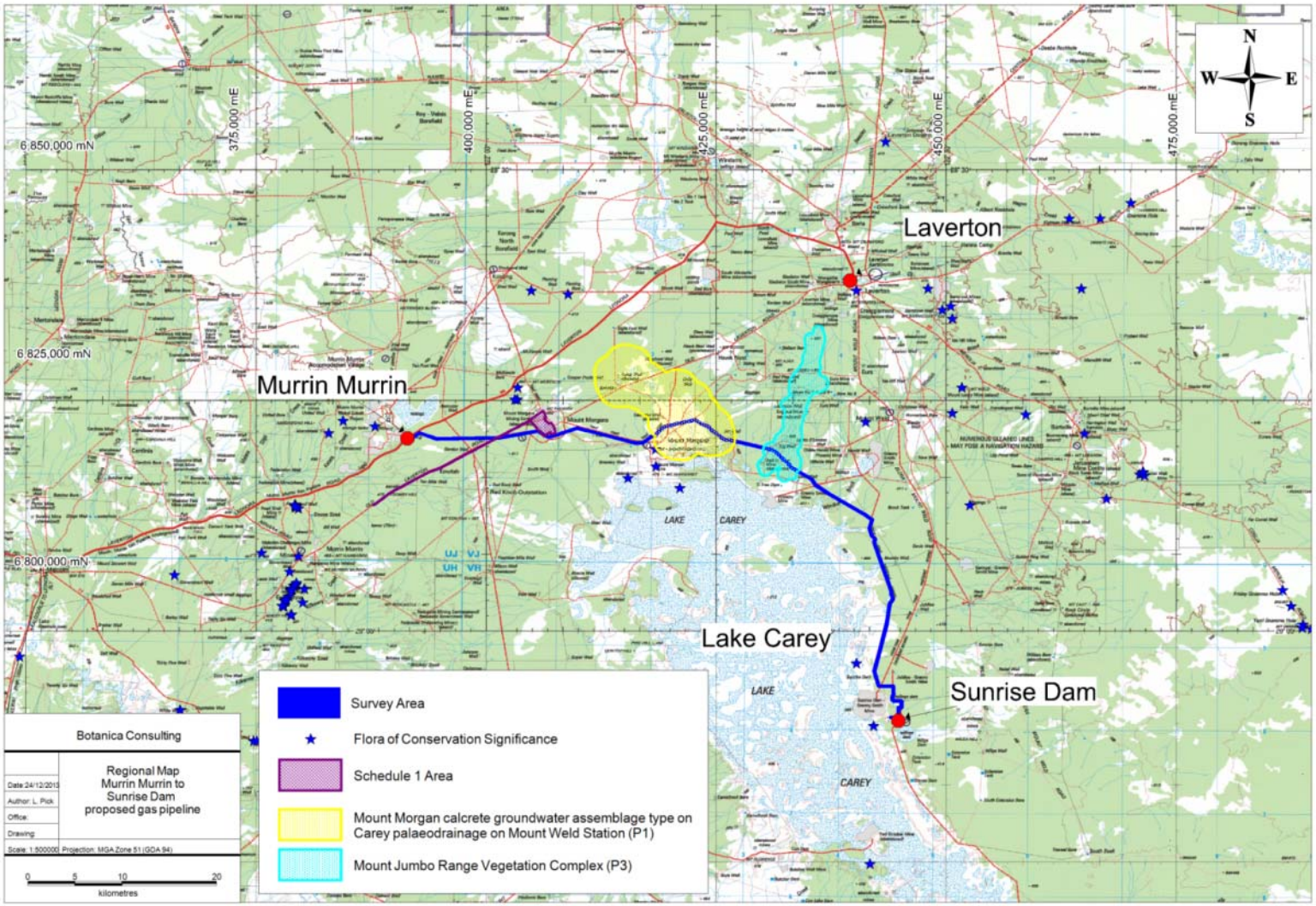
8 Appendices

Appendix 1: Regional map of the Murrin Murrin to Sunrise Dam survey area including DEC locations of Flora of Conservation Significance, PEC's and Schedule 1 Areas



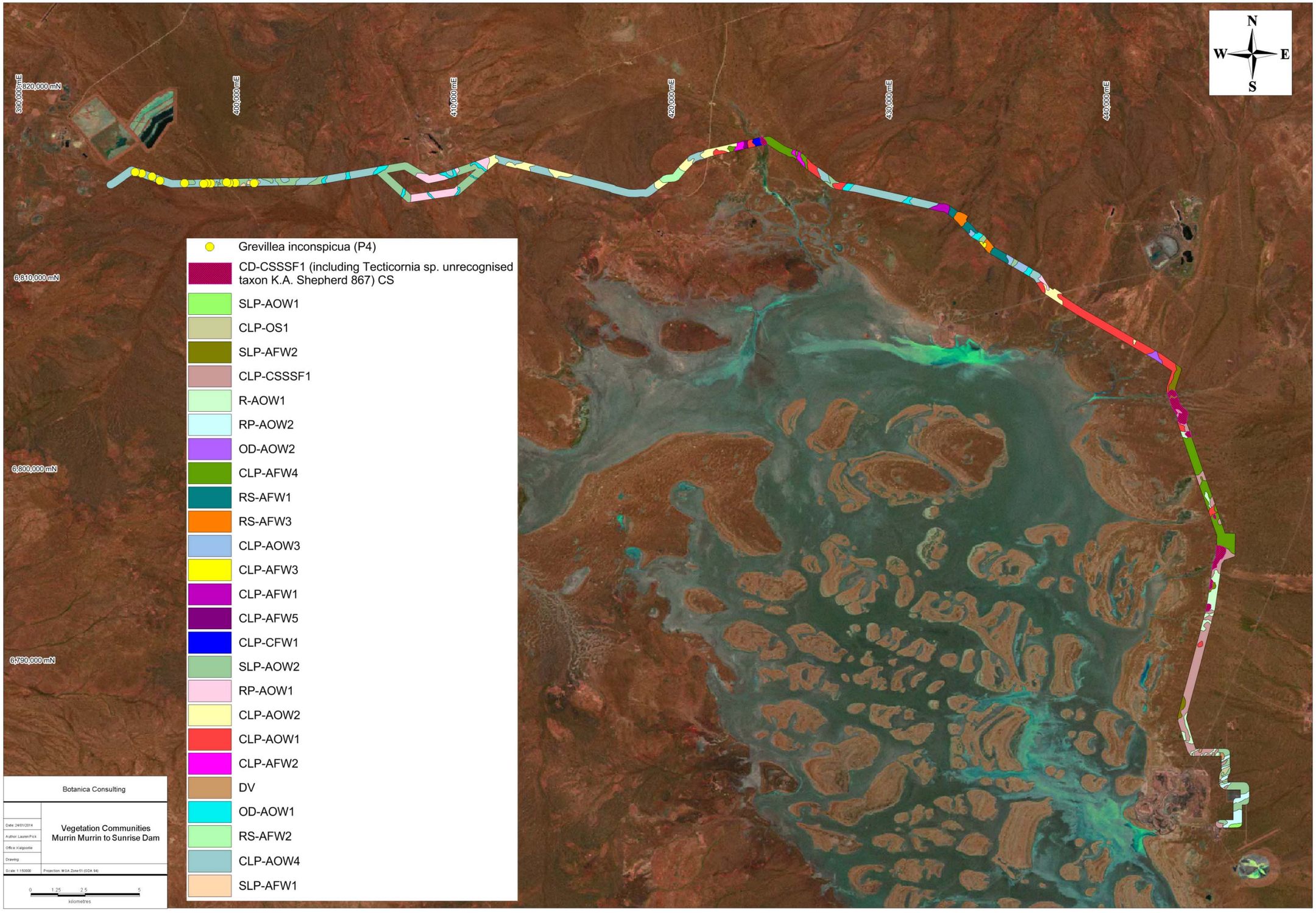
Appendix 2: Vegetation maps of the Murrin Murrin to Sunrise Dam survey area

Landform	NVIS Vegetation Group	Vegetation Community	Veg Code
Clay-Loam Plains	Acacia Forests and Woodlands	Low Forest of *Acacia caesaneura* and *Acacia quadrimarginea* over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla, Acacia burkittii, Eremophila margarethae, Ptilotus obovatus, Solanum lasiophyllum* and *Maireana triptera* in clay-loam soils	CLP-AFW1
		Low Forest of *Acacia caesaneura* over *Atriplex bunburyana* and *Aristida contorta* in clay-loam soils	CLP-AFW2
		Low Forest of *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Eremophila latrobei* subsp. *glabra, Senna artemisioides* subsp. *artemisioides, Eremophila jucunda* and *Eremophila forrestii* subsp. *forrestii* in clay-loam soils	CLP-AFW3
		Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over *Acacia victoriae, Grevillea berryana, Grevillea reflexa, Maireana sedifolia* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	CLP-AFW4
		Low Woodland of *Acacia aptaneura* over *Hakea preissii, Acacia colletioides, Atriplex bunburyana* and *Maireana pyramidata* in clay-loam soils	CLP-AFW5
	Acacia Open Woodland	Open Low Woodland of *Acacia aptaneura* over *Eremophila pantonii, Atriplex bunburyana, Cratystylis subspinescens* and *Maireana pyramidata* in clay-loam soils	CLP-AOW1
		Open Low Woodland of *Acacia incurvaneura* and *Hakea preissii* over *Eremophila pantonii, Maireana pyramidata, Maireana sedifolia, Maireana glomerifolia* and *Maireana triptera* in clay-loam soils	CLP-AOW2
		Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae* and *Maireana triptera* in clay-loam soils	CLP-AOW3
		Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae, Maireana triptera* and *Eragrostis laniflora* in red loam	CLP-AOW4

Landform	NVIS Vegetation Group	Vegetation Community	Veg Code
	Casuarina Forests and Woodlands	Low Woodland of *Casuarina pauper* over *Acacia victoriae, Exocarpos sparteus, Eremophila glabra* and *Tecticornia halocnemoides* in brown loam soils	CLP-CFW1
	Chenopod Shrublands, Samphire Shrublands and Forblands	Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay loam soils	CLP-CSSSF1
	Other Shrublands	Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* over *Aristida holathera* var. *holathera* and *Solanum orbiculatum* subsp. *orbiculatum* and low Chenopod species in clay-loam soils	CLP-OS1
Rocky Plain	Acacia Open Woodland	Open Low Woodland of *Acacia caesaneura* over *Eremophila pantonii, Ptilotus obovatus* and *Maireana triptera* in clay with quartz pebbles	RP-AOW1
		Open Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles	RP-AOW2
Sandy-Loam Plain	Acacia Forests and Woodlands	Low Forest of *Acacia aptaneura, A. caesaneura* and *A. incurvaneura* over *Acacia tetragonophylla, Eremophila margarethae* and *Triodia basedowii* in sandy-loam soils	SLP-AFW1
		Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over *Atriplex bunburyana*, *Scaevola spinescens, Acacia tetragonophylla, Hakea kippistiana* and *Aristida contorta* in sandy-loam soils	SLP-AFW2
	Acacia Open Woodland	Open Low Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Grevillea berryana* and *Triodia basedowii* in sandy-loam soils.	SLP-AOW1

Landform	NVIS Vegetation Group	Vegetation Community	Veg Code
		Open Low Woodland to Woodland of *Acacia caesaneura, Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp*. latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils	SLP-AOW2
Closed Depression	Chenopod Shrublands, Samphire Shrublands and Forblands	Low Scrub of *Cratystylis subspinescens* and *Atriplex bunburyana* over dwarf scrub of *Tecticornia calyptrata, Tecticornia halocnemoides, Tecticornia pergracilis, Tecticornia indica* subsp. *bidens* and *Tecticornia* sp. (unrecognised taxon, K. Shepherd) on claypan/lake shoreline	CD-CSSSF1
Open Depression	Acacia Open Woodland	Open Woodland of *Acacia caesaneura, Acacia macraneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Eremophila forrestii* subsp. *forrestii, Eremophila margarethae*, *Maireana triptera* and *Eragrostis laniflora* in drainage line	OD-AOW1
		Open Low Woodland of *Acacia aptaneura* and *Acacia incurvaneura* over *Acacia craspedocarpa, Acacia tetragonophylla, Eremophila margarethae, Atriplex bunburyana* and *Cratystylis subspinescens* in creekline	OD-AOW2
Ridge	Acacia Open Woodland	Open Woodland of *Acacia ayersiana* and *Acacia tysonii* over *Eremophila miniata, Cratystylis subspinescens, Hakea preissii, Atriplex vesicaria* and *Solanum lasiophyllum* over *Aristida contorta* in red loamy soils on ridges	R-AOW1
Rocky Slope	Acacia Forests and Woodlands	Low Forest of *Acacia incurvaneura, Acacia quadrimarginea* and *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Ptilotus obovatus* on rocky slope	RS-AFW1
		Low woodland of *Acacia aptaneura* and *Acacia grasbyi* over *Acacia ramulosa* var. *ramulosa* and *Aristida contorta* on rocky rise	RS-AFW2

Landform	NVIS Vegetation Group	Vegetation Community	Veg Code
		Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa, Dodonaea rigida, Senna artemisioides* subsp. *artemisioides, Senna artemisioides* subsp. *helmsii Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill	RS-AFW3
N/A	N/A	Disturbed Vegetation (excluding roads/access tracks)	DV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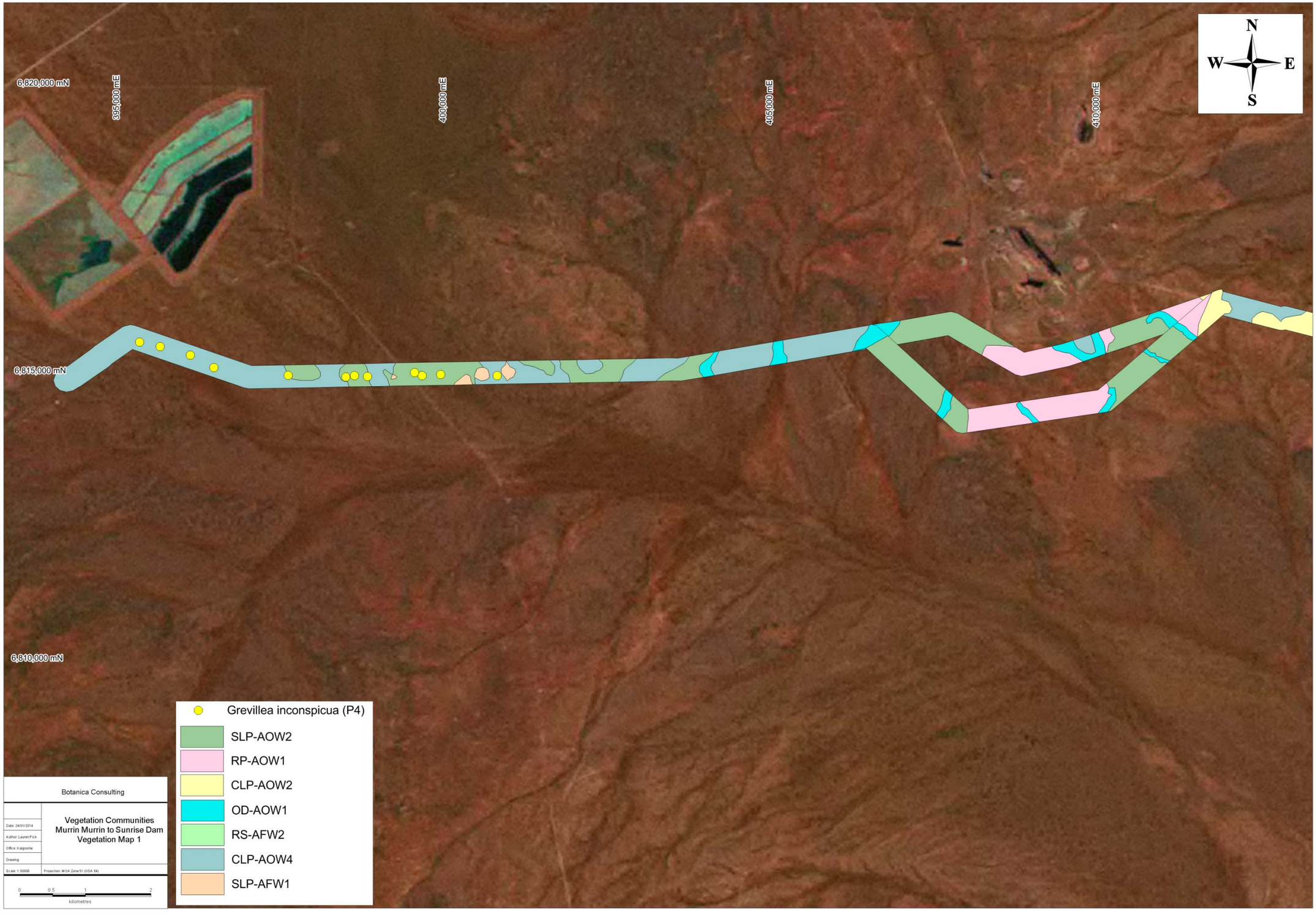
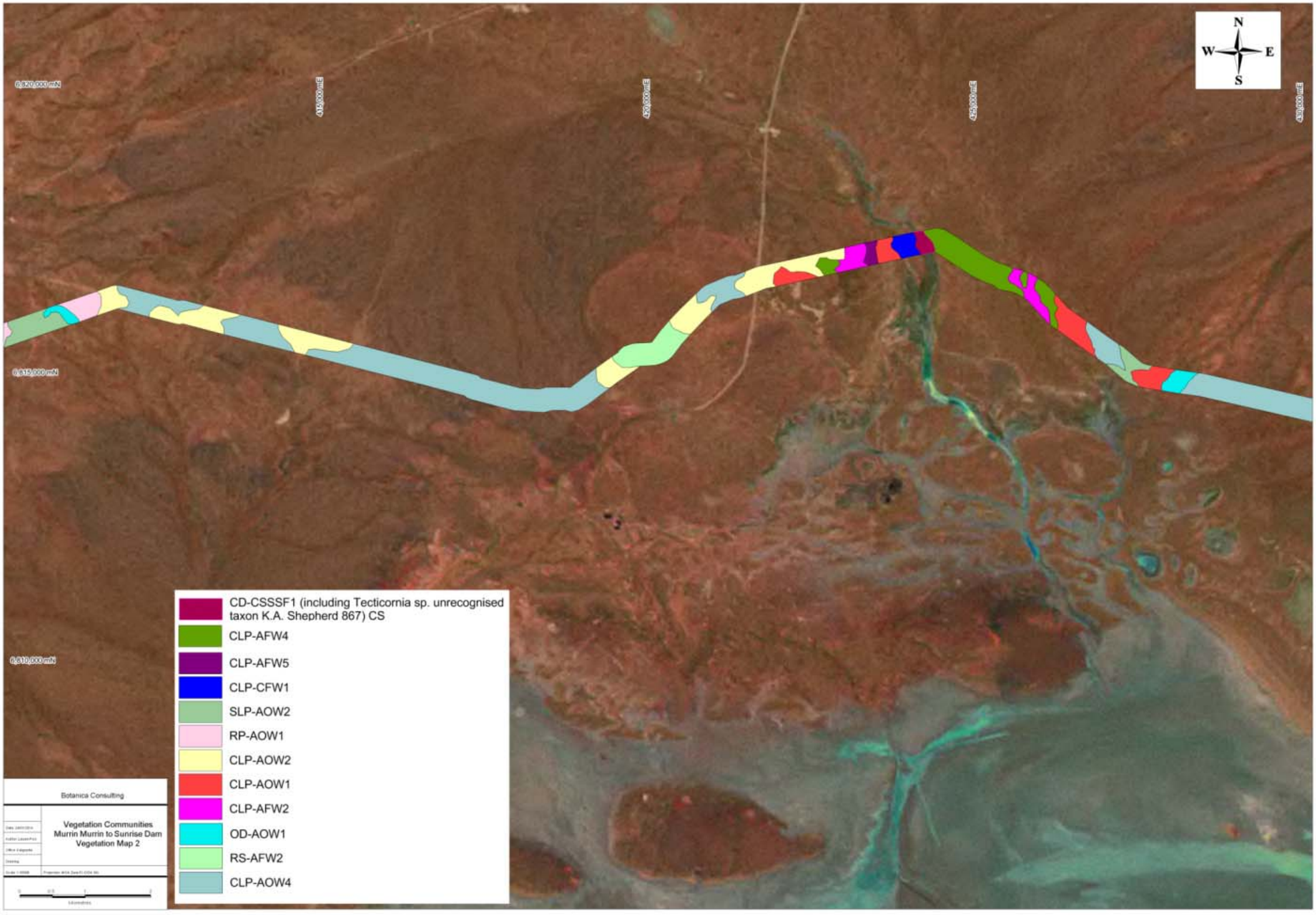
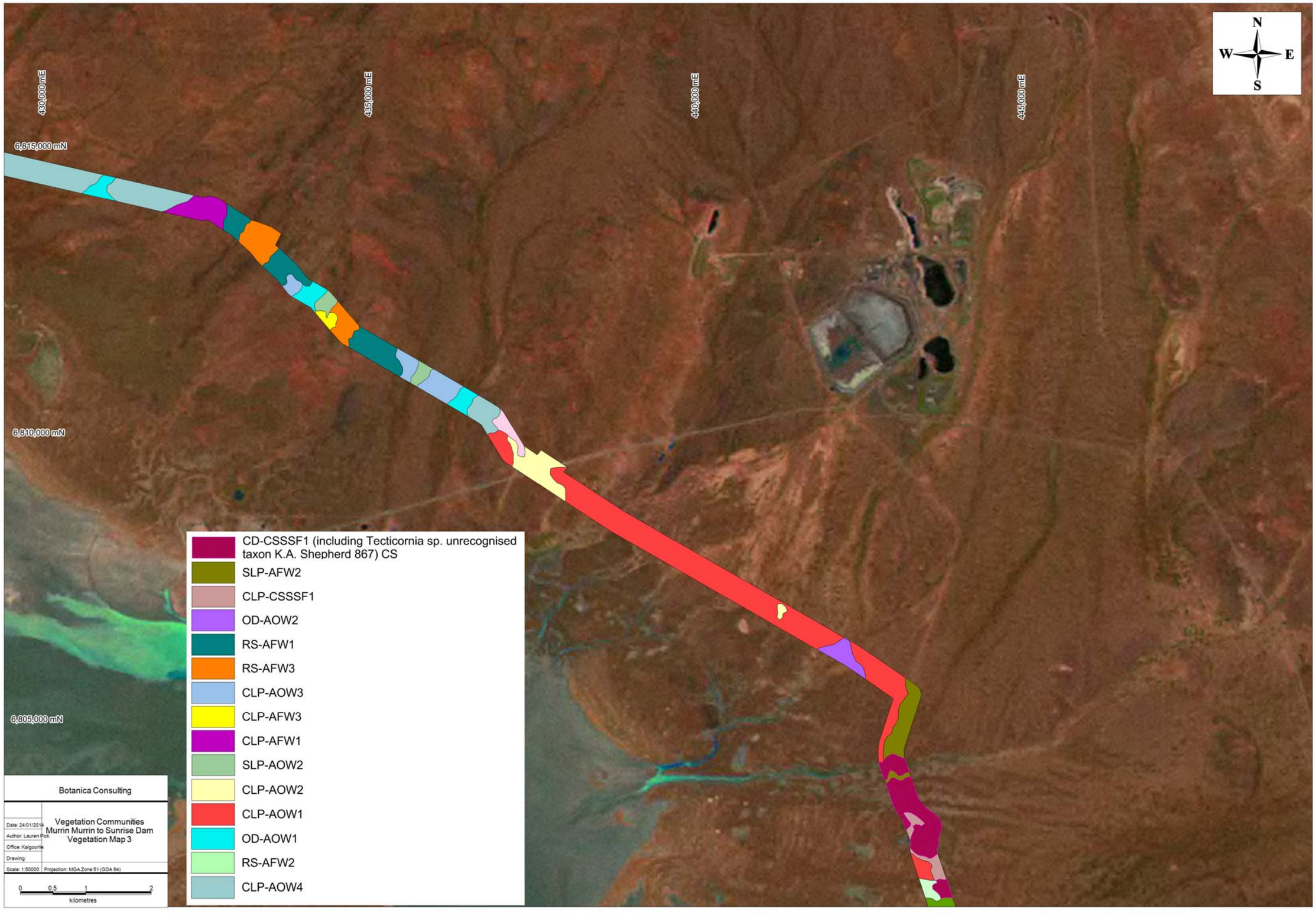
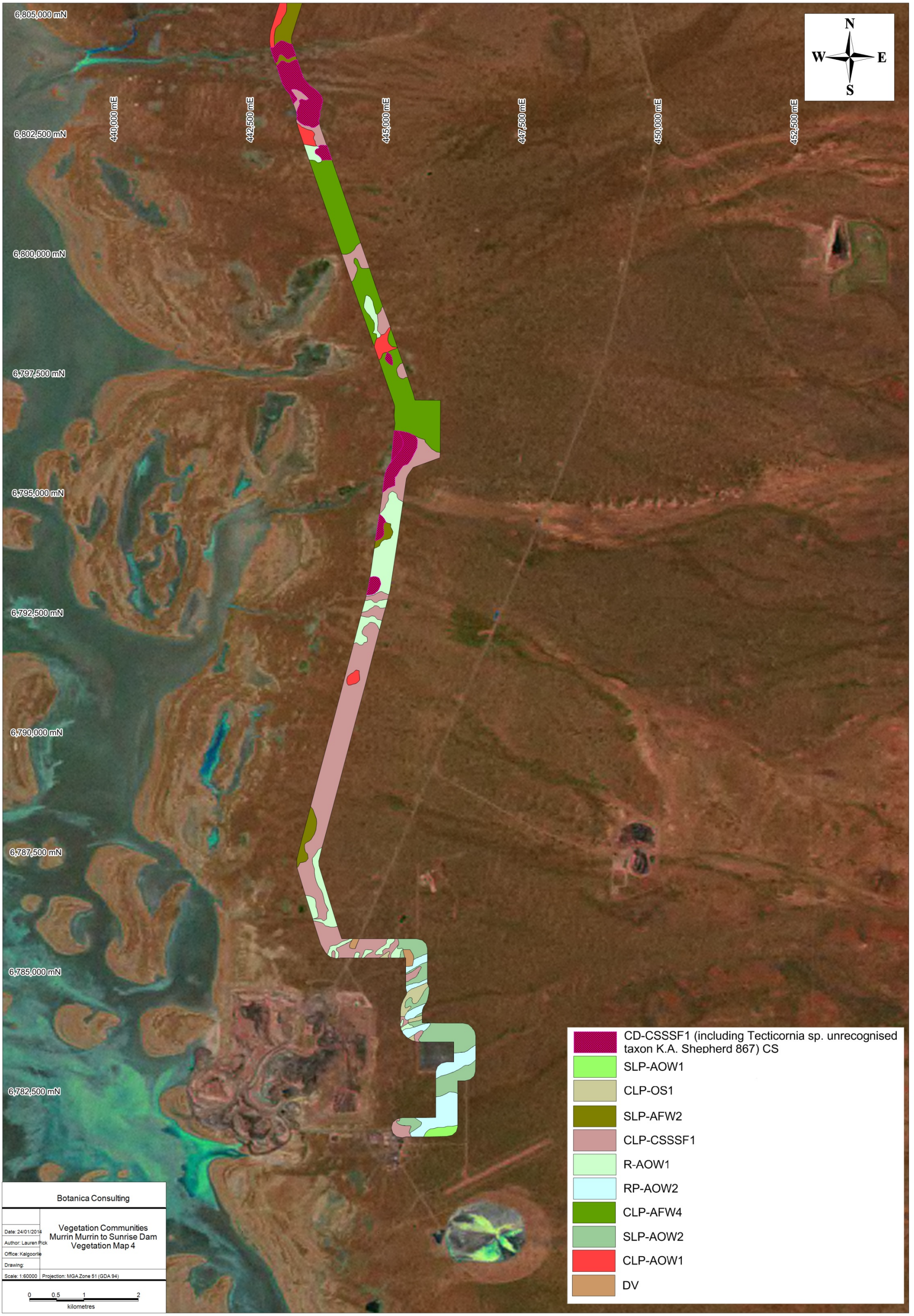
W
E
S
Grevillea inconspicua (P4)
CD-CSSSF1 (including Tecticornia sp. unrecognised taxon K.A. Shepherd 867) CS
SLP-AOW1
CLP-OS1
SLP-AFW2
CLP-CSSSF1
R-AOW1
RP-AOW2
OD-AOW2
CLP-AFW4
RS-AFW1
RS-AFW3
CLP-AOW3
CLP-AFW3
CLP-AFW1
CLP-AFW5
CLP-CFW1
SLP-AOW2
RP-AOW1
CLP-AOW2
CLP-AOW1
CLP-AFW2
DV
OD-AOW1
RS-AFW2
CLP-AOW4
SLP-AFW1
Botanica Consulting
Vegetation Communities
Murrin Murrin to Sunrise Dam
Date: 24/01/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:150000
Projection: MGA Zone 51 (GDA 94)
0
1.25
2.5
5
kilometres


N
W
E
S
6,820,000 mN
6,815,000 mN
6,810,000 mN
395,000 mE
400,000 mE
405,000 mE
410,000 mE
Grevillea inconspicua (P4)
SLP-AOW2
RP-AOW1
CLP-AOW2
OD-AOW1
RS-AFW2
CLP-AOW4
SLP-AFW1
Botanica Consulting
Vegetation Communities
Murrin Murrin to Sunrise Dam
Vegetation Map 1
Date: 24/01/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: MGA Zone 51 (GDA 94)
0
0.5
1
2
kilometres


N
W
E
S
6,820,000 mN
6,815,000 mN
6,810,000 mN
415,000 mE
420,000 mE
425,000 mE
430,000 mE
CD-CSSSF1 (including Tecticornia sp. unrecognised taxon K.A. Shepherd 867) CS
CLP-AFW4
CLP-AFW5
CLP-CFW1
SLP-AOW2
RP-AOW1
CLP-AOW2
CLP-AOW1
CLP-AFW2
OD-AOW1
RS-AFW2
CLP-AOW4
Botanica Consulting
Vegetation Communities
Murrin Murrin to Sunrise Dam
Vegetation Map 2


N
W
E
S
430,000 mE
435,000 mE
440,000 mE
445,000 mE
6,815,000 mN
6,810,000 mN
6,805,000 mN
CD-CSSSF1 (including Tecticornia sp. unrecognised taxon K.A. Shepherd 867) CS
SLP-AFW2
CLP-CSSSF1
OD-AOW2
RS-AFW1
RS-AFW3
CLP-AOW3
CLP-AFW3
CLP-AFW1
SLP-AOW2
CLP-AOW2
CLP-AOW1
OD-AOW1
RS-AFW2
CLP-AOW4
Botanica Consulting
Vegetation Communities
Murrin Murrin to Sunrise Dam
Vegetation Map 3
Date: 24/01/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: MGA Zone 51 (GDA 94)
0
0.5
1
2
kilometres


6,805,000 mN
6,802,500 mN
6,800,000 mN
6,797,500 mN
6,795,000 mN
6,792,500 mN
6,790,000 mN
6,787,500 mN
6,785,000 mN
6,782,500 mN
440,000 mE
442,500 mE
445,000 mE
447,500 mE
450,000 mE
452,500 mE
N
W
E
S
CD-CSSSF1 (including Tecticornia sp. unrecognised taxon K.A. Shepherd 867) CS
SLP-AOW1
CLP-OS1
SLP-AFW2
CLP-CSSSF1
R-AOW1
RP-AOW2
CLP-AFW4
SLP-AOW2
CLP-AOW1
DV
Botanica Consulting
Vegetation Communities
Murrin Murrin to Sunrise Dam
Vegetation Map 4
Date: 24/01/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:60000
Projection: MGA Zone 51 (GDA 94)
0
0.5
1
2
kilometres

Appendix 3: List of taxa identified within each vegetation community

(A) Denotes Annual taxa; (W) & Green highlight Denotes a weed taxa; (P) Denotes a Priority/Conservation Significant taxa. Listed on Florabase (WAHERB, 2014)

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Aizoaceae	*Disphyma*	*crassifolium*						*																			
Aizoaceae	*Gunniopsis*	*quadrifida*						*					*											*			
Aizoaceae	*Trianthema*	*triquetrum* (A)						*																			
Amaranthaceae	*Ptilotus*	*aervoides* (A)								*	*											*					
Amaranthaceae	*Ptilotus*	*albidus*		*																			*				
Amaranthaceae	*Ptilotus*	*gaudichaudii* (A)						*																			
Amaranthaceae	*Ptilotus*	*helipteroides* (A)											*														
Amaranthaceae	*Ptilotus*	*macrocephalus* (A)																				*					
Amaranthaceae	*Ptilotus*	*nobilis* (A)								*	*		*		*							*					
Amaranthaceae	*Ptilotus*	*obovatus*	*					*	*	*	*		*	*	*	*		*	*			*		*	*	*	*
Amaranthaceae	*Ptilotus*	*schwartzii*			*					*	*		*			*						*					*
Apocynaceae	*Marsdenia*	*australis* (A)								*	*		*	*			*		*	*		*	*	*			
Asphodelaceae	*Bulbine*	*semibarbata* (A)											*														
Asteraceae	*Angianthus*	*tomentosus* (A)														*											
Asteraceae	*Brachyscome*	*ciliaris* (A)											*			*											
Asteraceae	*Brachyscome*	*ciliocarpa* (A)														*											
Asteraceae	*Centaurea*	*melitensis* (W)													*												
Asteraceae	*Cephalipterum*	*drummondii* (A)											*														
Asteraceae	*Cratystylis*	*subspinescens*						*	*			*	*	*				*			*		*	*			
Asteraceae	*Gnephosis*	*arachnoidea* (A)											*														
Asteraceae	*Olearia*	*pimelioides*											*			*											
Asteraceae	*Podolepis*	*capillaris* (A)											*	*				*						*			
Asteraceae	*Podolepis*	*lessonii* (A)											*	*										*			
Asteraceae	*Rhodanthe*	*charsleyae* (A)								*	*		*									*					
Asteraceae	*Sonchus*	*oleraceus* (W)								*	*											*					
Asteraceae	*Waitzia*	*acuminata* (A)											*														
Brassicaceae	*Lepidium*	*platypetalum*								*	*											*					

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Campanulaceae	*Wahlenbergia*	*gracilenta* (A)											*			*											
Casuarinaceae	*Casuarina*	*pauper*										*															
Chenopodiaceae	*Atriplex*	*bunburyana*	*	*			*	*	*			*	*			*		*	*		*		*				
Chenopodiaceae	*Atriplex*	*nana*												*										*			
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*											*						*					*			
Chenopodiaceae	*Atriplex*	*vesicaria*										*	*	*					*		*			*			
Chenopodiaceae	*Dissocarpus*	*paradoxus*	*																								
Chenopodiaceae	*Dysphania*	*kalpari* (A)												*			*			*							
Chenopodiaceae	*Dysphania*	*melanocarpa* (J.M.Black) Mosyakin & Clemants forma *melanocarpa* (A)						*																			
Chenopodiaceae	*Enchylaena*	*lanata*								*	*		*					*				*					
Chenopodiaceae	*Enchylaena*	*tomentosa* var. *tomentosa*											*						*					*			
Chenopodiaceae	*Maireana*	*aphylla*																						*			
Chenopodiaceae	*Maireana*	*appressa*											*														
Chenopodiaceae	*Maireana*	*atkinsiana*											*														
Chenopodiaceae	*Maireana*	*brevifolia*						*																			
Chenopodiaceae	*Maireana*	*carnosa*								*	*											*					
Chenopodiaceae	*Maireana*	*convexa*								*	*											*					
Chenopodiaceae	*Maireana*	*eriosphaera*												*										*			
Chenopodiaceae	*Maireana*	*georgei*	*					*	*	*	*		*		*	*			*			*				*	
Chenopodiaceae	*Maireana*	*glomerifolia*							*				*	*					*								
Chenopodiaceae	*Maireana*	*pentatropis*																						*			
Chenopodiaceae	*Maireana*	*planifolia*																	*								
Chenopodiaceae	*Maireana*	*pyramidata*					*	*	*				*	*	*	*		*	*				*		*		
Chenopodiaceae	*Maireana*	*sedifolia*		*		*	*	*	*				*		*	*			*					*			
Chenopodiaceae	*Maireana*	*thesioides*								*	*											*		*			
Chenopodiaceae	*Maireana*	*tomentosa*											*			*			*								
Chenopodiaceae	*Maireana*	*trichoptera*											*						*								
Chenopodiaceae	*Maireana*	*triptera*	*						*	*	*		*		*	*		*	*			*			*	*	*
Chenopodiaceae	*Rhagodia*	*drummondii*											*	*										*			
Chenopodiaceae	*Rhagodia*	*eremaea*	*							*	*		*		*			*	*			*		*			

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Chenopodiaceae	*Rhagodia*	*spinescens*												*		*											
Chenopodiaceae	*Salsola*	*australis* (A)								*	*											*					
Chenopodiaceae	*Sclerolaena*	*cuneata*	*						*			*	*	*	*				*						*		
Chenopodiaceae	*Sclerolaena*	*densiflora*								*	*				*							*					
Chenopodiaceae	*Sclerolaena*	*diacantha*							*	*	*		*	*		*						*			*		
Chenopodiaceae	*Sclerolaena*	*eriacantha*								*	*		*						*			*					
Chenopodiaceae	*Sclerolaena*	*eurotioides*						*																			
Chenopodiaceae	*Sclerolaena*	*fusiformis*						*																*			
Chenopodiaceae	*Sclerolaena*	*obliquicuspis*																						*			
Chenopodiaceae	*Tecticornia*	*calyptrata*																			*						
Chenopodiaceae	*Tecticornia*	*disarticulata*						*					*														
Chenopodiaceae	*Tecticornia*	*halocnemoides*										*		*							*						
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*																			*						
Chenopodiaceae	*Tecticornia*	*indica* subsp. *leiostachya*																			*						
Chenopodiaceae	*Tecticornia*	*pergranulata*																			*						
Chenopodiaceae	*Tecticornia*	*pruinosa*																			*						
Chenopodiaceae	*Tecticornia*	sp. (Sterile)																			*						
Chenopodiaceae	*Tecticornia*	sp. (unrecognised taxon K.A. Shepherd 867) CS																			*						
Cleomaceae	*Cleome*	*viscosa* (A)																				*					
Convolvulaceae	*Duperreya*	*sericea*												*		*								*			
Euphorbiaceae	*Euphorbia*	*australis*																						*			
Euphorbiaceae	*Euphorbia*	*drummondii*								*	*		*	*								*					
Euphorbiaceae	*Euphorbia*	*tannensis* (A)																				*					
Fabaceae	*Acacia*	*aneura*											*	*		*			*					*			
Fabaceae	*Acacia*	*aptaneura*				*	*	*		*	*		*		*	*	*			*		*	*		*		
Fabaceae	*Acacia*	*ayersiana*			*								*			*		*						*			
Fabaceae	*Acacia*	*burkittii*	*							*	*		*		*	*						*					
Fabaceae	*Acacia*	*caesaneura*	*	*		*				*	*		*		*	*	*	*	*	*		*					*
Fabaceae	*Acacia*	*colletioides*					*																				
Fabaceae	*Acacia*	*desertorum* var. *desertorum*																	*					*			
Fabaceae	*Acacia*	*craspedocarpa*			*					*	*		*			*			*			*	*				

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Fabaceae	*Acacia*	*erinacea*								*	*											*					
Fabaceae	*Acacia*	*grasbyi*																							*		
Fabaceae	*Acacia*	*incurvaneura*			*				*	*	*		*		*	*	*	*	*	*		*	*			*	*
Fabaceae	*Acacia*	*kalgoorliensis*											*			*			*								
Fabaceae	*Acacia*	*kempeana*													*												
Fabaceae	*Acacia*	*macraneura*											*			*			*								
Fabaceae	*Acacia*	*masliniana*											*														
Fabaceae	*Acacia*	*mulganeura*											*			*											
Fabaceae	*Acacia*	*oswaldii*							*										*								*
Fabaceae	*Acacia*	*pteraneura*													*												
Fabaceae	*Acacia*	*quadrimarginea*	*							*	*											*				*	
Fabaceae	*Acacia*	*ramulosa* var. *linophylla*																	*								
Fabaceae	*Acacia*	*ramulosa* var. *ramulosa*			*								*		*	*	*		*	*					*	*	*
Fabaceae	*Acacia*	*rigens*											*														
Fabaceae	*Acacia*	*tetragonophylla*	*							*	*		*	*	*	*	*	*	*	*		*	*	*	*	*	
Fabaceae	*Acacia*	*tysonii*												*										*			
Fabaceae	*Acacia*	*victoriae*				*	*	*		*	*	*	*		*			*				*			*		
Fabaceae	*Jacksonia*	*arida*																			*						
Fabaceae	*Kennedia*	*prorepens*									*																
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*				*	*	*	*	*	*		*	*	*	*		*	*			*					*
Fabaceae	*Senna*	*artemisioides* subsp. *helmsii*	*					*	*	*	*											*			*	*	*
Fabaceae	*Senna*	*artemisioides* subsp. x *artemisioides*			*					*	*		*			*						*					
Fabaceae	*Senna*	*artemisioides* subsp. x *stuartii*																*									
Fabaceae	*Senna*	*cardiosperma*											*			*										*	*
Fabaceae	*Senna*	*pleurocarpa* var. *angustifolia*								*	*				*							*					
Frankeniaceae	*Frankenia*	*cinerea*																			*						
Frankeniaceae	*Frankenia*	*interioris*											*														
Frankeniaceae	*Frankenia*	*pauciflora*											*						*								
Frankeniaceae	*Frankenia*	*setosa*						*	*				*	*				*									
Geraniaceae	*Erodium*	*cygnorum* (A)											*			*											
Goodeniaceae	*Brunonia*	*australis* (A)								*	*											*					

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Goodeniaceae	*Goodenia*	*havilandii* (A)											*			*											
Goodeniaceae	*Scaevola*	*spinescens*	*						*				*		*	*	*	*	*	*				*	*	*	*
Goodeniaceae	*Velleia*	*rosea* (A)														*	*			*							
Hemerocallidaceae	*Dianella*	*revoluta*								*	*						*			*		*					
Lamiaceae	*Salvia*	*verbenaca* (W)								*	*				*							*					
Lamiaceae	*Spartothamnella*	*teucriiflora*	*													*	*		*	*							
Loranthaceae	*Amyema*	*fitzgeraldii*								*	*								*			*					
Loranthaceae	*Amyema*	*gibberula var. tatei*							*																		
Loranthaceae	*Amyema*	*miquelii*														*											
Loranthaceae	*Amyema*	*preissii*																	*								
Loranthaceae	*Lysiana*	*murrayi*														*											
Malvaceae	*Abutilon*	*cryptopetalum*														*											
Malvaceae	*Abutilon*	*malvifolium*											*														
Malvaceae	*Abutilon*	*oxycarpum* subsp. Prostrate (A.A. Mitchell PRP 1266)											*			*											
Malvaceae	*Brachychiton*	*gregorii*	*							*	*											*				*	
Malvaceae	*Lawrencia*	*chrysoderma*											*														
Malvaceae	*Lawrencia*	*helmsii*												*													
Malvaceae	*Lawrencia*	*squamata*																						*			
Malvaceae	*Sida*	*calyxhymenia*											*	*										*			
Malvaceae	*Sida*	sp. Excedentifolia (J.L. Egan 1925)	*						*	*	*			*	*	*						*			*		
Myrtaceae	*Cryptandra*	*connata*															*			*							
Myrtaceae	*Eucalyptus*	*eremicola*								*	*											*					
Nyctaginaceae	*Boerhavia*	*coccinea* (A)						*																			
Pittosporaceae	*Pittosporum*	*angustifolium*					*	*				*	*	*	*									*			
Poaceae	*Aristida*	*contorta* (A)		*					*	*	*		*	*	*			*				*		*	*	*	*
Poaceae	*Aristida*	*holathera* var. *holathera* (A)											*	*										*			
Poaceae	*Austrostipa*	*elegantissima*														*											
Poaceae	*Austrostipa*	*scabra* subsp. *scabra*											*														
Poaceae	*Cenchrus*	*ciliaris* (W)								*	*											*					

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Poaceae	*Chloris*	*truncata*						*					*					*		*							
Poaceae	*Enneapogon*	*avenaceus* (A)																				*					
Poaceae	*Enneapogon*	*caerulescens*						*		*	*		*	*	*							*					*
Poaceae	*Eragrostis*	*dielsii* (A)											*						*								
Poaceae	*Eragrostis*	*eriopoda*								*	*				*	*	*		*	*		*					*
Poaceae	*Eragrostis*	*laniflora*												*					*								
Poaceae	*Eriachne*	*pulchella* (A)											*						*							*	
Poaceae	*Paspalidium*	*clementii* (A)																				*					
Poaceae	*Poaceae*	*sp.* (sterile)			*							*															
Poaceae	*Themeda*	*triandra*								*	*											*			*		
Poaceae	*Triodia*	*basedowii*														*	*		*	*							
Polygonaceae	*Muehlenbeckia*	*florulenta*														*			*								
Portulacaceae	*Calandrinia*	*eremaea* (A)								*	*		*			*	*			*		*					
Portulacaceae	*Calandrinia*	*translucens*									*																
Portulacaceae	*Portulaca*	*oleracea* (A)						*																			
Primulaceae	*Lysimachia*	*arvensis* (W)								*	*											*					
Proteaceae	*Grevillea*	*acuaria*						*												*							
Proteaceae	*Grevillea*	*berryana*			*	*				*	*								*			*					*
Proteaceae	*Grevillea*	*deflexa*				*																					
Proteaceae	*Grevillea*	*inconspicua* (P4)									*									*							
Proteaceae	*Grevillea*	*nematophylla* subsp. *supraplana*																	*								
Proteaceae	*Grevillea*	*sarissa* subsp. *sarissa*																	*					*			
Proteaceae	*Hakea*	*kippistiana*					*	*	*						*			*									
Proteaceae	*Hakea*	*preissii*											*	*					*					*			
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*											*			*										*	
Rubiaceae	*Psydrax*	*attenuata* var. *tenella*																	*								
Rubiaceae	*Psydrax*	*latifolia*								*	*											*					*
Rubiaceae	*Psydrax*	*rigidula*														*											
Rubiaceae	*Psydrax*	*suaveolens*																	*								
Santalaceae	*Exocarpos*	*aphyllus*										*	*	*					*					*			
Santalaceae	*Exocarpos*	*sparteus*										*															
Santalaceae	*Santalum*	*acuminatum*																*									

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Santalaceae	*Santalum*	*lanceolatum*							*	*	*											*				*	
Santalaceae	*Santalum*	*spicatum*						*		*	*		*			*						*		*			
Sapindaceae	*Dodonaea*	*lobulata*											*														
Sapindaceae	*Dodonaea*	*rigida*														*										*	*
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*											*	*				*									
Scrophulariaceae	*Eremophila*	*alternifolia*		*				*																			
Scrophulariaceae	*Eremophila*	*clarkei*								*	*						*			*		*					
Scrophulariaceae	*Eremophila*	*falcata*											*														
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*			*					*	*		*				*		*	*		*				*	
Scrophulariaceae	*Eremophila*	*georgei*											*			*											
Scrophulariaceae	*Eremophila*	*gilesii* subsp. *variabilis*											*				*			*							
Scrophulariaceae	*Eremophila*	*glabra* subsp. *glabra*						*				*						*						*			
Scrophulariaceae	*Eremophila*	*glutinosa*																					*				
Scrophulariaceae	*Eremophila*	*granitica*											*			*			*								
Scrophulariaceae	*Eremophila*	*jucunda*			*																					*	
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *glabra*			*								*						*								
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*								*	*					*			*			*					
Scrophulariaceae	*Eremophila*	*longifolia*	*						*				*			*			*								
Scrophulariaceae	*Eremophila*	*maculata*											*						*								
Scrophulariaceae	*Eremophila*	*margarethae*	*							*	*		*				*		*	*		*	*		*		
Scrophulariaceae	*Eremophila*	*metallicorum*											*			*											
Scrophulariaceae	*Eremophila*	*miniata*	*										*	*		*											
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*							*				*		*												
Scrophulariaceae	*Eremophila*	*oppositifolia* subsp. *angustifolia*											*														
Scrophulariaceae	*Eremophila*	*paisleyi* subsp. *paisleyi*								*	*											*					
Scrophulariaceae	*Eremophila*	*pantonii*							*						*												
Scrophulariaceae	*Eremophila*	*scoparia*											*	*													
Scrophulariaceae	*Eremophila*	*serrulata*																					*				
Scrophulariaceae	*Eremophila*	*youngii*											*														
Solanaceae	*Lycium*	*australis*					*							*										*			

Family	Genus	Taxa	CLP-AFW1	CLP-AFW2	CLP-AFW3	CLP-AFW4	CLP-AFW5	CLP-AOW1	CLP-AOW2	CLP-AOW3	CLP-AOW4	CLP-CFW1	CLP-CSSSF1	CLP-OS1	RP-AOW1	RP-AOW2	SLP-AFW1	SLP-AFW2	SLP-AOW1	SLP-AOW2	CD-CSSSF1	OD-AOW1	OD-AOW2	R-AOW1	RS-AFW2	RS-AFW1	RS-AFW3
Solanaceae	*Solanum*	*lasiophyllum*	*		*			*	*	*	*		*	*	*	*		*	*			*		*	*	*	*
Solanaceae	*Solanum*	*nummularium*											*														
Solanaceae	*Solanum*	*orbiculatum*											*	*					*					*			
Solanaceae	*Solanum*	*plicatile*								*	*											*					
Thymelaeaceae	*Pimelea*	*microcephala* subsp. *microcephala*												*													
Zygophyllaceae	*Zygophyllum*	*aurantiacum* (A)											*	*										*			

Appendix 4: DPaW Threatened Flora Database search results within 50km of Murrin Murrin to Sunrise Dam

survey area (DPaW 2013a)

Taxa	Conservation Code	Description (WAHERB, 2014)
Acacia websteri	1	Shrub, 1.2-5 m high, bark fibrous. Fl. yellow. Red sand, clay or loam. Low-lying areas, flats.
Angianthus prostratus	3	Prostrate annual, herb. Fl. white-yellow, Jul to Sep. Red clay or loamy soils. Saline Depressions.
Calytrix praecipua	3	Shrub, 0.3-0.7 m high. Fl. pink-white, Jun to Jul or Sep to Nov. Skeletal sandy soils over granite or laterite. Breakaways, outcrops.
Cratystylis centralis	3	Much-branched, brittle, greyish shrub, to 1 m high. Red sandy loam with ironstone gravel. Flat plains, breakaway country.
Eremophila annosocaulis	3	Small, slightly aromatic shrub to 0.8 m tall with one or a number of branches arising from ground level
Goodenia lyrata	3	Prostrate herb, with lyrate leaves. Fl. yellow, Aug. Red sandy loam. Near claypan.
Gunniopsis propinqua	3	Prostrate annual or perennial, herb, 0.03-0.1 m high. Fl. white/pink, Aug to Sep. Stony sandy loam. Lateritic outcrops, winter-wet sites.
Hemigenia exilis	4	Erect, multi-stemmed shrub, 0.5-2 m high. Fl. blue-purple/white, Apr or Sep to Nov. Laterite. Breakaways, slopes
Hybanthus floribundus subsp. *chloroxanthus*	3	Multi-stemmed shrub, to 0.7 m high. Fl. blue & white, Aug to Oct. Dark red-brown soil, never sandy, rich in iron oxide, laterite. Rocky areas, creek banks, along drainage lines
Melaleuca apostiba	3	Spreading shrub, to 2 m high, with grey fissured bark and dull green leaves. Fl. red, Jun.
Olearia mucronata	3	Densely branched, unpleasantly aromatic shrub, 0.6-1 m high. Fl. white & yellow, Aug to Dec or Jan. Schistose hills, along drainage channels
Phyllanthus baeckeoides	3	Shrub, 0.5-1.5 m high. Fl. white-yellow/green-yellow, Jul to Sep. Red lateritic & sandy clay soils. Granite outcrops
Placynthium nigrum	3	Lichen: active growth phase, chocolate when dry, fruiting bodies present; growing in sheltered positions on soil.
Ptilotus tetrandrus	1	Annual, herb, 0.15-0.3 m high. Fl. Oct. Loamy sand.
Tecticornia cymbiformis	3	Erect, perennial shrub, 0.3-0.5 m high. Saline soils. Along the edge of creeklines
Tecticornia mellaria	1	Erect, perennial shrub, 0.2-0.4 m high. Well-drained red gypseous sand, clay. Gypseous dunes, margins of playa lakes, on clay pans.
Tecticornia sp. Lake Way (P. Armstrong 05/961)	1	Shrub to 50 cm, dense succulent, foliage yellow and green.
Triglochin protuberans	3	Annual, herb, 0.03-0.13 m high. Red loam, grey mud over clay. Winter-wet sites, claypans, near salt lakes, margins of pools
Vittadinia cervicularis var. *oldfieldii*	1	Annual, herb, 0.1-0.3 m high. Fl. white-purple-blue, Aug to Sep. Alluvium.

Appendix 5: Locations of Priority Flora taxa (GDA94) identified within the Murrin Murrin to Sunrise Dam survey area

Taxa	Zone	Easting	Northing	Estimated No. plants
Grevillea inconspicua (P4)	51 J	398904	6814903	100
	51 J	398705	6814919	5
	51 J	398571	6814891	2
	51 J	397689	6814912	100
	51 J	396550	6815036	20
	51 J	396190	6815252	20
	51 J	395724	6815398	20
	51 J	395410	6815472	20
	51 J	400887	6814938	30
	51 J	400023	6814946	5
	51 J	399736	6814928	2
	51 J	399625	6814978	5
Estimated population size				**329**
Tecticornia sp. (unrecognised taxon K.A. Shepherd 867)-allied to *T. halocnemoides/T. pergranulataT. undulata* (CS)	51 J	424252	6817261	>100 (dominant understorey)
	51 J	443056	6804372	>100 (dominant understorey)
	51 J	443242	6803785	>100 (dominant understorey)
	51 J	443846	6801845	>100 (dominant understorey)
	51 J	445287	6795494	>100 (dominant understorey)
	51 J	445085	6794180	>100 (dominant understorey)
	51 J	444901	6792811	>100 (dominant understorey)
Estimated population size				**>700**

Appendix 6: Muir Life Form/Height Class (Muir, 1977).

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% - 100%	**MID DENSE 30% -70%**	**SPARSE 10% -30%**	**VERY SPARSE 2% -10%**
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch grass >0.5m Bunch grass < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Grass Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 7: Keighery Health rating scale (1994).

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual taxa
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected multiple disturbances. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native taxa

Sunrise Dam Gold Mine to Tropicana Gold Mine Gas Pipeline
Level 1 Flora and Vegetation Survey

Tenement: L39/226 & L39/229

Petroleum Pipeline License - STP-PLA-0025

July 2014

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Executive Summary

Botanica Consulting was commissioned by AngloGold Ashanti Australia to undertake a Level 1 flora and vegetation survey of a 208km proposed gas pipeline route extending from the Sunrise Dam Gold Mine owned and operated by AngloGold Ashanti Australia located approximately 50km south-east of Laverton, Western Australia to the Tropicana Gold Mine which is a joint venture between AngloGold Ashanti Australia (70% and Manager) and the Independence Group NL, located approximately 330km east north-east of Kalgoorlie-Boulder, Western Australia. The initial survey was conducted from the 30th October to 5th November 2013, covering an area of approximately 14,060ha. Approximately 50km of the 208km proposed gas pipeline route was unable to be surveyed due to access constraints. Additional surveys were conducted along the entire pipeline route from the 31st March to the 2nd April 2014 following high summer rainfall. One hundred and four vegetation communities were identified within the Sunrise Dam to Tropicana survey area (survey area). These vegetation communities were represented by a total of 43 Families, 114 Genera and 281 Taxa.

No Declared Rare Flora/Threatened Flora, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as listed by the Department of Parks and Wildlife were identified within the survey area. Seven Priority Flora taxa, as listed by the Department of Parks and Wildlife, were identified within the survey area:

1. *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3);
2. *Caesia talingka* (P2);
3. *Dicrastylis cundeeleensis* (P4);
4. *Grevillea secunda* (P4)
5. *Labichea eremaea* (P3);
6. *Melaleuca apostiba* (P3); and
7. *Olearia arida* (P4).

None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *Environment Protection* and *Biodiversity Conservation Act 1999*. No Threatened Ecological Communities pursuant to Commonwealth legislation and as listed by the State Department of Parks and Wildlife were recorded within the survey area. No Priority Ecological Communities as listed by the Department of Parks and Wildlife were recorded within the survey area. However the *Mount Linden Range banded ironstone ridge vegetation complex* Priority 3 Ecological Community is located approximately 26km south of the pipeline route (Sunrise Dam Gold Mine end) and the *Yellow Sandplain Communities of the Great Victoria Desert* Priority 3 Ecological Community is located approximately 20km south of the pipeline route (Tropicana Gold Mine end). None of the vegetation communities identified within the survey area are representative of vegetation that characterises the *Mount Linden Range banded ironstone ridge vegetation complex Priority Ecological Community*. One of the vegetation communities identified within the survey area; Occasional Shrub Mallee of *Eucalyptus*

youngiana over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune, however was representative of vegetation that characterizes the *Yellow Sandplain Communities of the Great Victoria Desert Priority Ecological Community* as defined by Pearson (1994).

The survey area is not located in an Environmentally Sensitive Area or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. The survey area is not located within any conservation reserves listed by the Department of Parks and Wildlife or proposed by the Environmental Protection Authority Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the one hundred and four vegetation communities surveyed by Botanica Consulting were rated as being in 'good' health. The remaining ninety-four vegetation communities were rated as being in 'very good' health. The majority of the survey area remains undisturbed with minimal access tracks, mining and exploration activities within the area. No introduced taxa were identified within the survey area.

1 Introduction

1.1 Project Description

Botanica Consulting (BC) was commissioned by AngloGold Ashanti Australia (AGAA) to undertake a Level 1 flora and vegetation survey (the survey) of a 208km proposed gas pipeline route within Tenement L39/226 & L39/229 (Currently Pending) / Petroleum Pipeline license - STP-PLA-0025 as shown in Figure 1 extending from the Sunrise Dam Gold Mine owned and operated by AGAA approximately 50km south-east of Laverton, Western Australia to the Tropicana Gold Mine which is a joint venture between AGAA (70% and Manager) and the Independence Group NL, located approximately 330km east north-east of Kalgoorlie-Boulder, Western Australia. The aim of the survey was to produce a vegetation map (Appendix 2) and taxa list (Appendix 3) as well as to document and map locations of any Threatened Ecological Communities (TEC), Priority Ecological Communities (PEC), Declared Rare Flora (DRF)/Threatened or Priority Flora within the survey area.

The survey covered an area of approximately 14,060ha. BC conducted the initial survey from the 30th October to 5th November 2013. Approximately 50km the 208km proposed gas pipeline route was unable to be surveyed due to access constraints. Additional surveys of the entire pipeline route were conducted from the 31st March to the 2nd April 2014 following high summer rainfall. Figure 2 provides a regional location map of the survey area.

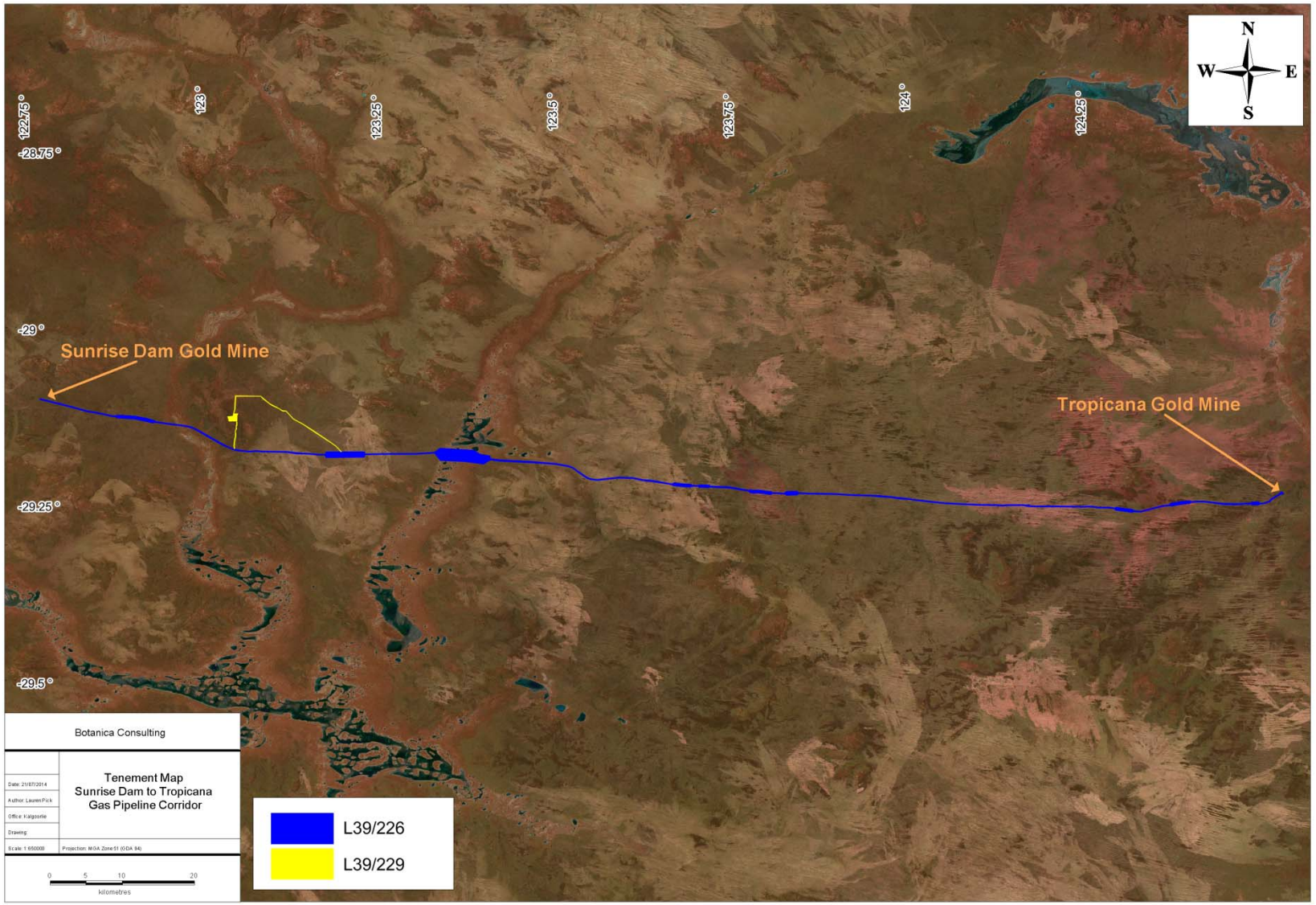

Figure 1: Tenement Map Sunrise Dam to Tropicana Gold Mine (L39/226/L39/229/STP-PLA-0025)

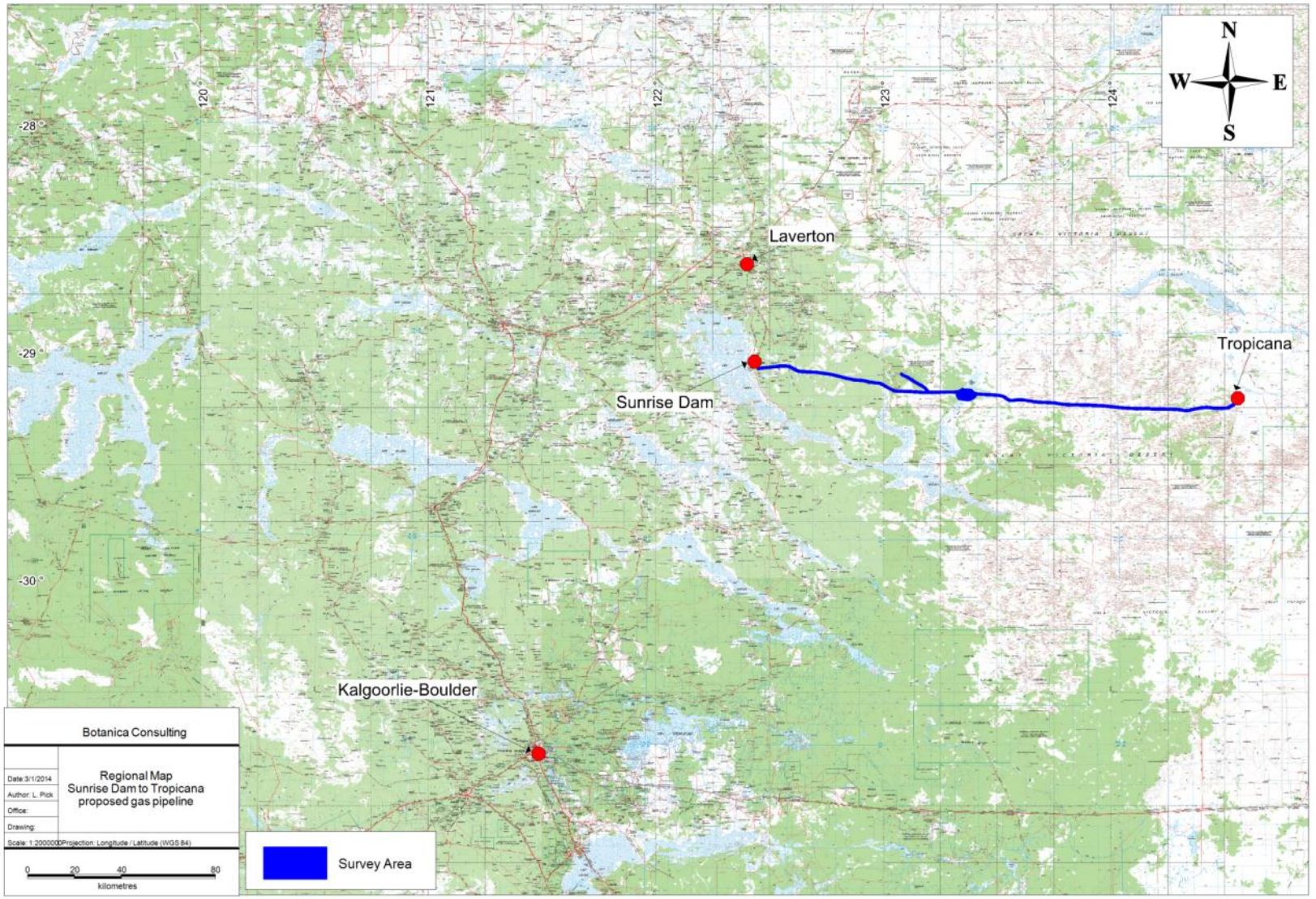

Figure 2: Regional location map of the Sunrise Dam to Tropicana survey area (survey area not to scale)

1.2 Previous relevant flora surveys

1.2.1 *The Biological survey of the Eastern Goldfields of Western Australia Part 10: Sandstone-Sir Samuel and Laverton-Leonora Study Areas,* Western Australian Museum, 1994

Initial vegetation surveys of the study area were conducted from January 1980 to August 1982 by A.V. Milewski and G.J. Keighery. Subsequent work was conducted by G.J. Keighery in October 1987 and September 1992. The Laverton-Leonora Study Area is situated between latitudes 28°00'S and 29"00'S and longitudes l20º 45'E and l23°00'E. Twelve landform units were recognized within the Study Area:

1. Breakaways;
2. Drainage Lines;
3. Dunefields;
4. Granite Exposure;
5. Hill: Granite,
6. Hill: Banded Ironstone
7. Hill: Greenstone
8. Salt Lake Features: Saline flats, Lake Floors, Lake Slopes, Lake Margins and Salt Lake Dunes;
9. Calcareous plains;
10. Sandplains;
11. Undulating Plains: Greenstone; and
12. Broad Valley.

The most extensive are Sandplains and Broad Valleys. Salt Lake Features, Calcareous Plains bordering salt lakes, and Undulating Plains. Small areas of Dunefields, Breakaways and Granite Exposures are scattered throughout the Study Areas while Hills and Drainage Lines occur largely within Undulating Plains.

The main vegetation communities are low woodlands of *Acacia aneura* (Mulga). *Eucalyptus* taxa with an understorey of hummock grasses *(Triodia)* are dominant on deep sands. Tall and low shrublands occur in limited areas, generally in association with salt lakes and dunes.

Vascular flora identified comprised of 7 taxa of ferns and 777 taxa of flowering plants, including 303 taxa recorded from Wanjarri Nature Reserve. Exhaustive floristic lists for 31 sample sites, representing most of the Study Areas' surface lithologies. No taxa of Declared Rare Flora (DRF) were recorded within the Study Areas.

The Sunrise Dam region of the survey area is located within the Laverton-Leonora Study Area.

1.2.2 *Technical Bulletin: An inventory and condition survey of the north-eastern Goldfields Western Australia (No. 87),* Department of Agriculture WA, 1994

The survey was undertaken by a joint team from the Department of Agriculture and the Department of Land Administration during 1988-1990 with the support of the Department of Conservation and Land Management (H.J.R. Pringle, A.M.E. Van Vreeswyk and S.A. Gilligan). The area surveyed covers about 100,570km^2 and includes all of the Menzies, Edjudina, Leonora, Laverton, Sir Samuel and Duketon. The area encompassed most or all of the following salt lake systems: Lake Ballard, Lake Rebecca, Lake Marmion, Lake Raeside, Lake Darlot and Lake Carey. Nine land surface types comprised of sixty land systems, six soil groups (and 25 soil subgroups) and 36 site types were described for this survey area. The land surface types include:

1. Hills and Ridges;
2. Breakaways and lower plains;
3. Erosional surfaces of low relief (<20m);
4. Hardpan wash plains;
5. Plains with deeper coarser soils than hardpans;
6. Plains with saline alluvium;
7. Depositional plains with calcareous red earths;
8. Lake Country; and
9. Sandplains

The major plant forms encountered were ephemeral grasses and forbs, perennial grasses, low <1 m tall) and mid shrubs (1 to 2 m tall), tall shrubs (> 2 m tall), mallees and trees. Eight site type groups (comprised of 36 site types) were identified within the survey area:

1. Sandplain spinifex hummock grasslands;
2. Acacia shrublands on deep sandy soils;
3. Woodlands/shrublands on groundwater calcretes associated with ancient drainage valleys;
4. Mixed halophytic low shrublands on depositional plains;
5. Chenopod low or mid shrublands on hillsides and stony plains;
6. Acacia, Eremophila and Cassia dominated shrublands on shallow soils;
7. Mulga shrublands with sparse sclerophyll understoreys associated with hardpan plains; and
8. Miscellaneous site types (with little on common with other types)

The Sunrise Dam region of the survey area is located within the North-Eastern Goldfields survey area.

1.2.3 *The Vegetation and Flora of Queen Victoria Spring Nature Reserve (QVSNR), Western Australia,* David Pearson, 1994.

This study of the flora and vegetation of Queen Victoria Spring Nature Reserve (QVSNR) in Western Australia (located approximately 112km south of the proposed pipeline route) was undertaken to develop a comprehensive understanding of the flora of the area, and to classify and map the distribution of vegetation communities within the reserve. The edaphic factors affecting the distribution and composition of vegetation communities were examined through detailed soil sampling and landscape description. Pearson (1994) revealed that the QVSNR has a remarkable rich and varied flora, with a total of 552 vascular plant taxa. The QVSNR has similar total taxa richness as semi-arid regions to the south (Widgiemooltha-Zanthus) and west (Kalgoorlie-Kurnalpi), but the flora is spread over a much larger area, resulting in comparatively lower values for the number of taxa per area.

1.2.1 *Desert Discovery Inc. Plumridge Lakes Project Report,* Hewitt, 2002

The Plumridge Lakes Project Report documented a field trip undertaken by members of the Desert Discovery Inc. in 2002 (Hewitt, 2002). Up to 86 people were involved in the project over the three week period. The aim was to document taxa opportunistically encountered. Approximately 83 taxa were recorded in the Plumridge Lakes Nature Reserve. The Plumridge Lakes nature Reserve lies approximately 18km south-east of the Tropicana Gold Mine.

1.2.2 *Tropicana Gold Project Assessment of the Flora and Vegetation of the Operational Area and its Surroundings,* Ecologia, 2009.

As part of the Tropicana Gold Mine Public Environmental Review (PER) Ecologia conducted a quadrat based flora and vegetation assessment of the Tropicana Gold Project in November 2006 and again in June and July 2007 covering an area of 1,356km^2.

A total of 57 families, 162 genera and 437 taxa were recorded. One DRF/Threatened Flora listed under the *EPBC Act 1999* and *Wildlife Conservation Act 1950* was identified; *Conospermum toddii.* This species was delisted as Threatened and is currently listed as a Priority 4 species. Fourteen Priority Flora taxa as listed by the Department of Environment and Conservation (now known as DPaW) were identified within the area[1]:

1. *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) No longer Priority listed (WAHERB, 2013);
2. *Baeckea* sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963) P3;
3. *Dampiera eriantha* P1;
4. *Dicrastylis nicholasii* P4;
5. *Malleostemon* sp. Officer Basin (D. Pearson 350) P2;

[1] Priority levels are based on current ratings (WAHERB, 2013)

6. *Olearia arida* P4;
7. *Grevillea secunda* P4;
8. *Acacia eremophila* numerous-nerved variant (A.S. George 11924) P3;
9. *Acacia eremophila* var. *variabilis* P3;
10. *Dicrastylis cundeeleensis* P4;
11. *Microcorys macredieana* No longer Priority listed (WAHERB, 2014);
12. *Micromyrtus stenocalyx* No longer Priority listed (WAHERB, 2014);
13. *Daviesia purpurascens* No longer Priority listed (WAHERB, 2014); and
14. *Lepidobolus deserti* No longer Priority listed (WAHERB, 2014).

Eleven major vegetation communities incorporating a further eighteen vegetation sub-types were identified:

1. **Mixed Eucalypt woodlands over mixed open shrubs and *Triodia basedowii:***
   (i) Open to sparse *E. youngiana, E. trivalva or E. leptopoda* over an open tall shrub stratum of *Acacia murrayana* over open to moderately dense *Triodia basedowii*
   (ii) Open *E. youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii*
   (iii) *E. trivalva* over Acacia and Eremophila dominated shrubland over sparse to open *Triodia basedowii*
2. ***E. gongylocarpa* over *Triodia desertorum* or *T. basedowii:***
   (i) *E. gongylocarpa* over open shrubland over open *Dodonaea viscosa* subsp. *angustissima/Eremophila platythamnos* subsp. *platythamnos* shrubland over *Triodia desertorum* or *Triodia basedowii*
   (ii) *E. gongylocarpa/E. youngiana/E. concinna* over open mixed shrubland over *Triodia desertorum*
3. **Dunes: Scattered *E. gongylocarpa* over mixed shrubs and *Triodia desertorum* or *T. basedowii***
   (i) Occasional *E. gongylocarpa* over mixed upper stratum over *Daviesia grahamii/Pityrodia loricata/Chrysocephalum puteale* low shrubland over sparse to open *Triodia desertorum or T. basedowii* and *Lomandra leucocephala* subsp. *robusta*
   (ii) Occasional *E. gongylocarpa over Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii*
4. **Undulating Plains: Open Mallee *E. concinna* over sparse to open low shrubs over open *Triodia scariosa***
5. **Major saline clay complex**
   (i) White clay pans and marginal vegetation: *Callitris preissii* over isolated shrubs and sparse herbs
   (ii) Grey to brown clay pans: Dwarf scrub dominated by *Tecticornia* spp. Over *Eragrostis pergracilis*

(iii) Broad, shallow, pale brown, sandy-clay pans: Open *Chenopodium nitrariaceum/Muehlenbeckia florulenta* shrubland over moderately dense grasses and sedges

(iv) Pale orange to orange clay pans: Low open to sparse scrub dominated by *Frankenia cinerea/Atriplex vesicaria* over sparse cover of *Eragrostis pergracilis/Aristida contorta*

(v) Shallow depressions and areas fringing some claypans: Moderately dense *Melaleuca interioris* shrubland over sparse chenopods and soft grasses

(vi) Plains and gentle hillslopes at margins of saline complex: Sparse to open *Casuarina pauper* ± mallee *Eucalypts* over *Dodonaea viscosa* subsp. *angustissima/Senna artemisioides* subsp. *petiolaris* over Chenopod taxa and soft grasses

6. **Minor Clay Pan: Scattered *Acacia nyssophylla/Grevillea sarissa* over open herbs and grasses**
7. **Clay-loam Plains: *Acacia aneura* woodlands over soft grasses and *Triodia basedowii***

(i) Open *Acacia aneura/Eucalyptus* spp. Woodland/shrubland over sparse mixed shrubs over soft grasses and *Triodia basedowii*

(ii) Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses

(iii) Open to moderately dense *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata/Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii*

8. **Open to moderately dense *Casuarina pauper* woodland over open mixed shrubs and scattered soft grasses and/or *Triodia scariosa***
9. **Isolated *Acacia* spp. over open low shrubs and moderately dense tussock grasslands**

(i) Isolated *Acacia* spp. Over *Ptilotus obovatus/Maireana* spp./*Solanum* spp. Over moderately dense tussock grasses

(ii) Isolated to sparse *Acacia* spp. Over mixed low shrubs over moderately dense tussock grasses

10. **Rocky breakaways and associated slopes: Open *Acacia quadrimarginea/Dodonaea rigida* over sparse mixed shrubs over mixed soft grasses**
11. **Narrow drainage channel: Sparse *Acacia aneura* over sparse to open shrubs and moderately dense tussock grasses**

Three weed taxa were recorded in the area; *Sonchus oleraceus, Spergularia rubra* and *Erodium aureum.*

1.2.3 *Tropicana Gold Project Minigwal Trough Water Supply Area and Pipeline Corridor Vegetation and Flora survey,* Botanica Consulting, 2009

The Tropicana Joint Venture commissioned BC to undertake a Level 1 Flora and Vegetation survey of the proposed bore field and the 100m wide pipeline corridor which covered an area of approximately 44,300 Ha. The survey area lies approximately 350km north-east of Kalgoorlie and 187km south-east of Laverton within tenement L39/150.

Thirteen vegetation communities from five vegetation types were identified within the survey area.

1. **Longitudinal red sand dunes**
   E1: Scattered *Eucalyptus gongylocarpa* over mixed shrubs over *Triodia basedowii*
2. **Sandy Flats and Swales**

E2: *Eucalyptus gongylocarpa* over mixed *Acacia* over mixed moderately open to moderately dense shrubs over *Triodia basedowii*

E3: Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa* / *E. youngiana* over mixed open shrubs and *Triodia basedowii*

E4: Open mallee *Eucalyptus concinna over sparse to open Triodia basedowii*

A1: Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii*

T1: Open to moderately open mixed shrubs over *Triodia basedowii*

C1: Moderately open to moderately dense *Casuarina pauper* woodland over open mixed shrubs over scattered *Triodia basedowii*

A2: Open to moderately open *Acacia aneura* over *Aluta maisonneuvei* subsp*. auriculata* over scattered *Triodia basedowii*

3. **Rocky Breakaway and Stony Rise:**
   A3: Open mixed *Acacia* over mixed shrubs and scattered soft grasses

A4: Moderately dense to dense *Acacia aneura* over mixed moderately dense shrubs dominated by *Eremophila latrobei* subsp. *filiformis* over *Caustis dioica*

A5: Moderately dense to dense Mixed *Acacia* woodland over mixed shrubs dominated by *Eremophila latrobei* subsp*. filiformis* over *Caustis dioica*

4. **Lake Edge Community**

E5: Moderately dense *Eucalyptus mannensis* subsp*. mannensis* over isolated shrubs and scattered *Triodia basedowii*

5. **Dry clay pan**
   E6: Sparse *Eucalyptus horistes over low mixed shrubs dominated by Atriplex vesicaria*

A combined total of 35 Families, 81 Genera and 179 taxa were recorded within these vegetation communities. No DRF/Threatened Flora taxa, pursuant to the *EPBC Act 1999* or subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* were recorded in the survey area.

Four Priority Flora from the DEC database search were located and recorded within the survey area[2]:

1. *Dicrastylis cundeeleensis* P4;
2. *Dicrastylis nicholasii* P4;
3. *Lepidobolus deserti* No longer Priority listed (WAHERB, 2014); and
4. *Olearia arida* P4.

Three other Priority Flora not listed on the DEC databases search were also located within the survey area:

1. *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813);
2. *Daviesia purpurascens*; and
3. *Microcorys macredieana*.

Each of these three taxa are no longer listed as Priority Flora by the DPaW (WAHERB, 2014).

1.2.4 *Flora and Vegetation Survey of Sunrise Dam Mining Area,* Mattiske Consulting, 2010

Mattiske Consulting Pty Ltd (Mattiske) was commissioned by AGAA to update and integrate the previous flora and vegetation surveys within the Sunrise Dam operational areas. Additionally, a flora and vegetation survey of a mining tenement and water borefield lease area was conducted.
A total of 343 vascular plant taxa from 133 plant genera and 48 plant families were recorded within Sunrise Dam operational areas between 1994 and 2010. The majority of taxa was recorded within the Chenopodiaceae (60 taxa), Fabaceae (44 taxa), Asteraceae (42 taxa), Poaceae (27 taxa) and Scrophulariaceae (22 taxa) families.

A total of 19 introduced (exotic) taxa were recorded within Sunrise Dam operational areas since 1994. Of these none are Declared Plants taxa pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* according to the Western Australian Department of Agriculture and Food (DAFWA).

[2] Priority levels are based on current ratings (WAHERB, 2013)

No plant taxa gazetted as DRF pursuant to subsection (2) of section 23F of the Western Australian *Wildlife Conservation (WC) Act 1950* or listed as Threatened pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* have been recorded within Sunrise Dam operational areas between 1994 and 2010.

Two Priority Flora have been recorded within Sunrise Dam operational areas between 1994 and 2010. These were the Priority 1 taxa, *Tecticornia mellaria* and the Priority 3 taxa*, Gunniopsis propinqua***.**

No TECs as defined by the *EPBC Act* 1999 were observed in Sunrise Dam operational areas. No PECs were found within Sunrise Dam operational areas.

Twenty three vegetation communities have been defined and mapped for the Sunrise Dam operational areas from 1994 to 2010. A total of 1 - Melaleuca woodland, 1 - Eucalypt woodland, 13 - Acacia woodlands and 8 - Chenopod shrublands were defined and mapped. Many of the described vegetation communities are well represented within the Austin Botanical District and therefore not considered to be significant on a regional scale.

The far western section of the Sunrise Dam to Tropicana survey area is located within the Sunrise Dam vegetation survey area.

2 Regional Biophysical Environment

2.1 Regional Environment

The survey area lies within the Austin Botanical District and Helms Botanical District of the Eremaean Province of WA. The Austin Botanical District consists of predominantly of Mulga low woodland on plains and reduces to scrub on hills (Beard, 1990). The Helms Botanical District is described as Mulga low woodland on hardpan soils between dunes. Where this is not prominent tree steppes of *Eucalyptus gongylocarpa, E. youngiana* and *Triodia basedowii* occur (Beard, 1990). Based on the Interim Biogeographic Regionalisation of Australia (IBRA) the Eremaean Province is divided into IBRA regions with the survey area located within the Murchison and Great Victoria Desert bioregion of Western Australia (Figure 3). These bioregions are further divided into subregions, with the western extremity of the survey area (Sunrise Dam end) located within the Murchison 1-Eastern Murchison subregion (Cowan, 2001). The Helms Botanical District is also divided into subregions with the survey area located within the Shield subregion (GVD1) and the Central (GVD2) subregion of the Great Victoria Desert Region (Figure 4).

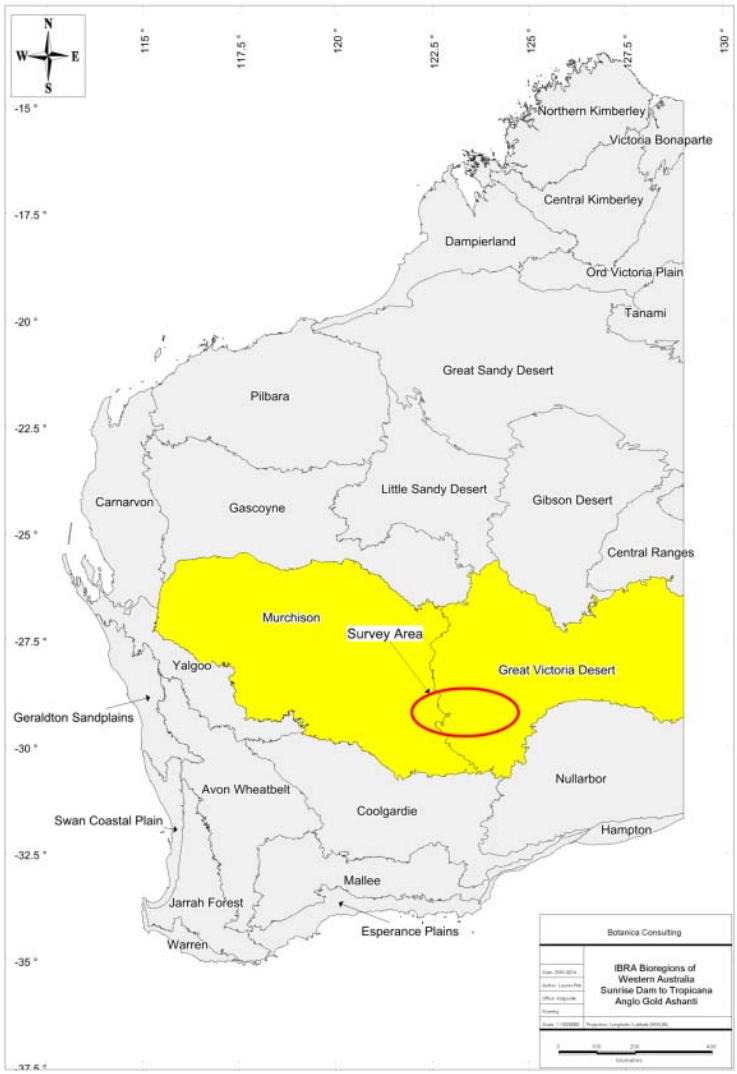

Figure 3: Western Australian IBRA bioregions in relation to the Sunrise Dam to Tropicana survey area

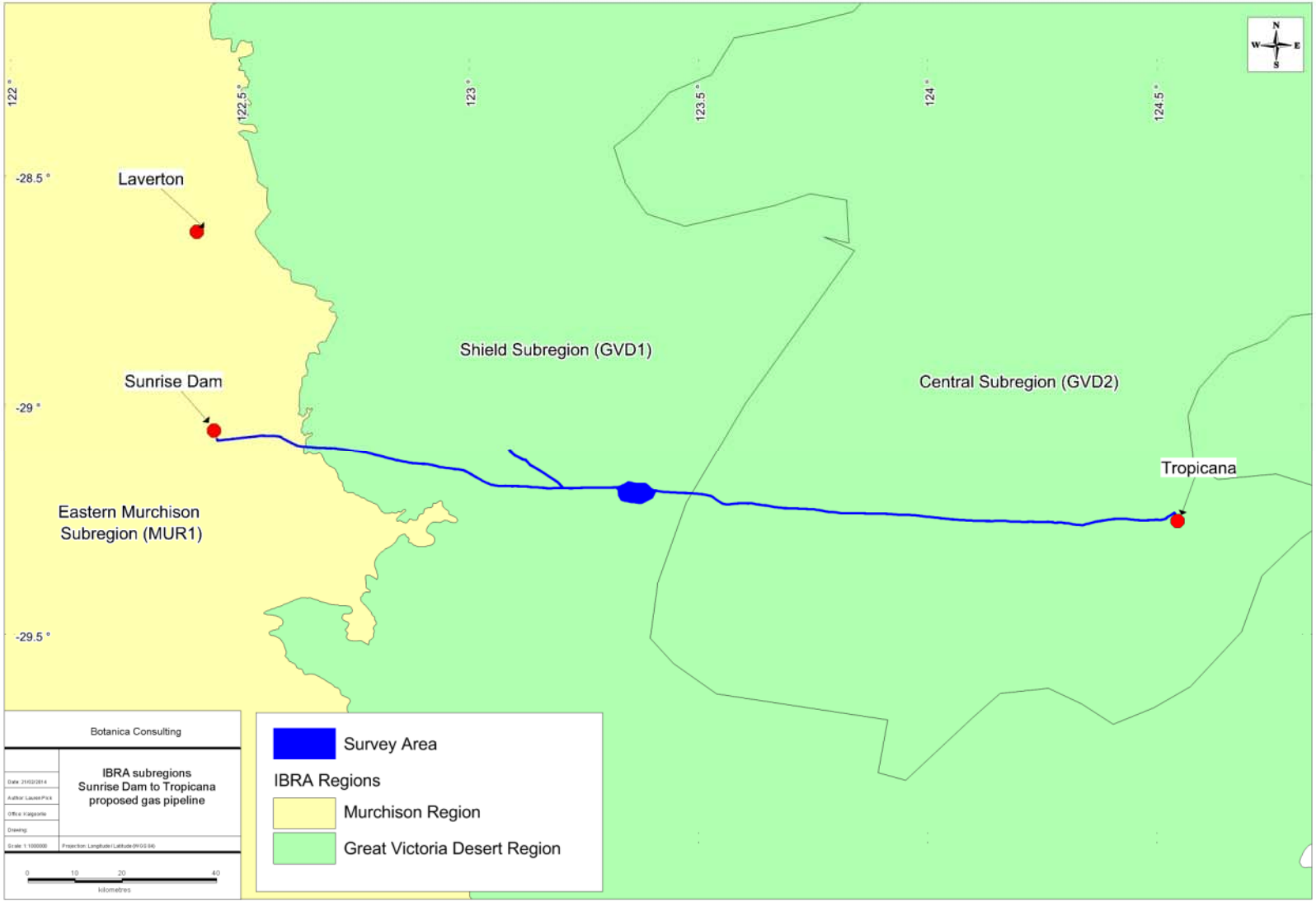

Figure 4: Map of IBRA subregions in the vicinity of the Sunrise Dam to Tropicana survey area

2.2 Topography & Soils

The landscape of the Murchison region comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains (Commonwealth Government, 2008a). It is dominated by the Archaean (over 2500 million years ago) granitegreenstone terrain of the Yilgarn Craton (Commonwealth Government, 2008a). Alluvial soils and sands mantle the granitic and greenstone units of the Yilgarn Craton. These soils are shallow, sandy and infertile. Underlying the soils in low areas is a red-brown siliceous hard pan (Curry *et al*. 1994). The soils in the eastern half of the bioregion are typically red sands, lithosols, calcareous red earth soil, duplex soil and clays.

The Eastern Murchison subregion lies on the northern parts of the 'Southern Cross' and 'Eastern Goldfields' Terrains of the Yilgarn Craton. This subregion is characterised by its internal within drainage and extensive area of elevated red desert sandplains (Cowan, 2001). Calcrete aquifers located in the northern part of the subregion are known to support a wide range of subterranean fauna. Another important feature of the system is the salt lake systems associated with the occluded Paleodrainage system. Beard (1990) describes the topography of the region as undulating with occasional ranges of low hills and extensive sandplains located in the East. The dominant soil type is a shallow earthy loam, overlying red-brown hardpan. Red earthy sands can be found on the sandplains (Cowan, 2001).

The Great Victoria Desert Region forms the southern part of the anti-clockwise whorl of dunefields of Australia. The dominating landforms are dunes and swales. There are local occurrences of playa lakes, associated lee-sided mounds (lunettes) and rocky prominences (Commonwealth Government, 2008b). Playa lakes are a minor, but locally significant landform in the desert, occurring in topographically low-lying regions and many represent the dried remnants of former drainage channels (Shephard, 1995). It consists of active sand-ridge desert of deep Quaternary (less than 65 million years ago) aeolian sands overlying Permian (251 – 298 million years ago) and Mesozoic (65 - 251 million years ago) units of the Office Basin (Commonwealth Government, 2008b). The GVD is underlain on its eastern, western and northern margins by an ancient crystalline basement comprising rocks at least 1000 million years old (Shephard, 1995).

The western end of the Shield subregion is underlain by Yilgarn Craton. There is a higher proportion of sandplains in comparison to the entire bioregion. To the east is an arid active sand-ridge desert of deep Quaternary aeolian sands overlying Permian and Mesozoic strata of the Officer Basin. Landforms consist of salt lakes and major valley floors with lake derived dunes. Sandplains with patches of seif dunes running east-west. Areas of moderate relief with out-cropping and silcrete-capped mesas and plateaus (breakaways). The subregion contains major a paleochannel of Ponton Creek (Cowan, 2001).

The Central subregion is characterised as an Arid active sand-ridge desert with extensive dune fields of deep Quaternary aeolian sands overlying Permian strata of the Gunbarrel Basin. Landforms consist of salt lakes and major valley floors with lake derived dunes.

Sand plains with extensive seif dunes running east west, occasional outcropping (breakaways) and quartzite hills provide minor relief (Barton & Cowan, 2001).

2.3 Vegetation

Vegetation of the Eastern Murchison subregion in the Austin Botanical District is predominantly Mulga low woodlands on plains, often rich in ephemerals, which reduce to scrub on hills. It is also characterised by hummock grasslands, Saltbush shrublands and Halosarcia shrublands (Beard, 1990; Cowan, 2001).

Vegetation of the Shield subregion in the Helms Botanical District comprises of Spinifex (*Triodia spp*) and mallee (*Eucalypt*us *kingsmillii, E. youngiana*) over hummock grassland dominated by *Triodia basedowii* occur on the aeolian sand plain. Scattered marble gum (*E. gongylocarpa*) and native pine (*Callitris*) occur on the deeper sands of the sand plains. Mulga and acacia woodlands occur mainly on the colluvial and residual soils. Halophytes such as salt bush (*Atriplex*), Bluebush (*Kochia*), and samphire (*Arthrocnemum*) occur, margins of salt lakes and in saline drainage areas (Cowan, 2001).

Vegetation of the Central subregion is primarily a Tree steppe of *Eucalyptus gongylocarpa*, Mulga and *E. youngiana* over hummock grassland dominated by *Triodia basedowii* on the Aeolian sands. The *Acacia* dominates colluvial soils with *Eremophila* and *Santalum* spp., halophytes are confined to edges of salt lakes and saline drainage systems (Barton & Cowan, 2001).

The DAFWA GIS file (2011) indicates that the survey area is located within Pre-European Beard vegetation associations Laverton 18 and Great Victoria Desert 18, 19, 84, 389 and 1239. The extent of these vegetation associations (per subregion) as described by the DAFWA is provided in Table 1.

Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated taxa loss, while areas with less than 10% are considered “endangered”. Clearing within the survey area will not significantly reduce the extent of these vegetation associations.

Table 1: Remaining Beard Vegetation Associations within Western Australia (DAFWA, 2011)

IBRA subregion	Vegetation Association	Pre-European Extent (ha)	Current Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DPaW managed lands	Vegetation Description (Beard, 1990)
Eastern Murchison	Laverton 18	2536021.06	2520869.47	99.40	1.52	Low woodland; mulga (*Acacia aneura*)
Shield	Great Victoria Desert 18	497636.98	497636.98	100.00	0.24	Low woodland; mulga (*Acacia aneura*)
	Great Victoria Desert 389	13144.15	13144.15	100.00	0	Succulent steppe with open low woodland; mulga over saltbush
	Great Victoria Desert 1239	1393810.04	1393810.04	100.00	2.46	Hummock grasslands, open medium tree & mallee steppe; marble gum & mallee (*E. youngiana*) over hard spinifex *Triodia basedowii* on sandplain
Central	Great Victoria Desert 18	1370478.23	1370478.23	100.00	13.05	Low woodland; mulga (*Acacia aneura*)
	Great Victoria Desert 19	2566664.11	2566664.11	100.00	0	Low woodland; mulga between sandridges
	Great Victoria Desert 84	904685.26	904685.26	100.00	3.67	Hummock grasslands, open low tree & mallee steppe; marble gum & mallee (*Eucalyptus youngiana*) over hard spinifex *Triodia basedowii* between sandhills
	Great Victoria Desert 1239	814393.24	814393.24	100.00	28.29	Hummock grasslands, open medium tree & mallee steppe; marble gum & mallee (*E. youngiana*) over hard spinifex *Triodia basedowii* on sandplain

2.4 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with mainly winter rainfall and annual rainfall of approximately 200mm (Beard, 1990; Cowan, 2001). The climate of the Shield and Central subregion is arid, with summer and winter rain averaging 150 –190mm per annum (Cowan, 2001; Barton & Cowan, 2001). Average weather conditions can be interpreted from weather data collected from the closest Bureau of Meteorology weather stations: the Laverton weather station (#12045) located approximately 50m north-east of the survey area and Kalgoorlie-Boulder weather station (#12038) located approximately 300km south-west of the survey area. A summary of climatic data for these two locations is provided in Table 2 and Figure 5 and 6 below.

Table 2: Summary of monthly climatic data for Laverton and Kalgoorlie (BOM, 2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Laverton												
Mean maximum temperature (°C)	35.8	34.8	31.9	27.2	22.1	18.5	17.8	20.0	24.5	28.0	32.1	34.9
Mean minimum temperature (°C)	20.5	20.0	18.0	13.9	9.5	6.6	5.2	6.4	9.5	12.8	16.6	19.3
Mean rainfall (mm)	25.0	31.1	29.4	22.1	23.2	23.6	16.5	13.0	9.1	9.3	14.6	17.9
2013 rainfall (mm)	65.4	0.0	36.1	14.8	22.6	15.6	10.6	0	28.6	0	10.4	40.8
2014 rainfall (mm)	75.2	66.2	6.4	33.8	51.8							
Mean number of days of rain ≥ 1 mm	2.4	2.7	2.7	2.6	3.1	3.4	3.0	2.4	1.4	1.5	2.0	2.3
Kalgoorlie												
Mean maximum temperature (°C)	33.6	32.0	29.4	25.3	20.7	17.5	16.7	18.6	22.3	25.8	29.0	32.0
Mean minimum temperature (°C)	18.3	17.8	16.0	12.7	8.7	6.2	5.0	5.6	8.0	11.1	14.1	16.6
Mean rainfall (mm)	26.1	30.9	25.8	20.6	26.2	28.2	25.1	20.8	14.3	15.2	18.1	16.2
2013 rainfall (mm)	59.2	13.0	124.8	10.8	38.2	9.8	32.0	10.6	28.2	11.0	24.2	11.8
2014 rainfall (mm)	177.4	1.8	12.4	20.4	18.7							
Mean number of days of rain ≥ 1 mm	2.4	2.9	2.7	3.3	4.0	4.9	4.8	3.9	3.0	2.7	2.6	2.5

red = highest value blue = lowest value. Laverton data from 1900-2013; Kalgoorlie data from 1939-2013.

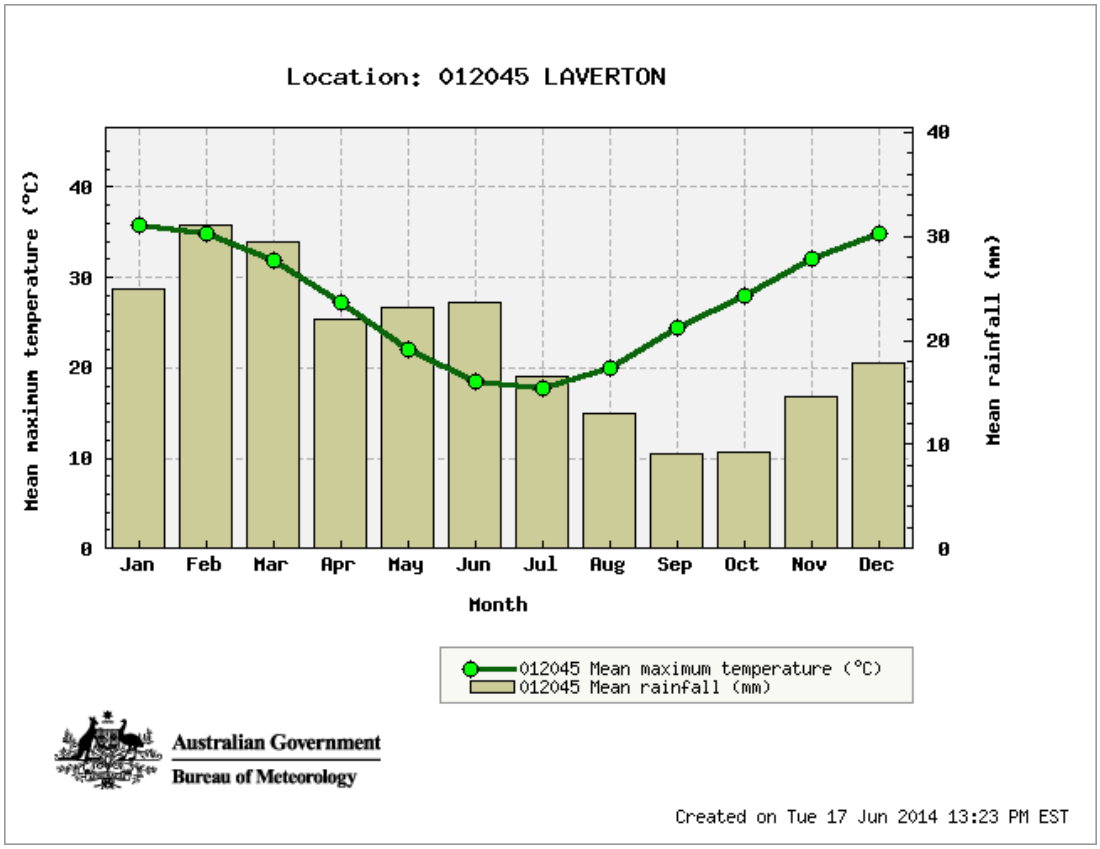

Figure 5: Mean Monthly rainfall and maximum temperature for the Laverton weather station (#12045) (BOM, 2014) Laverton data from 1900-2014.

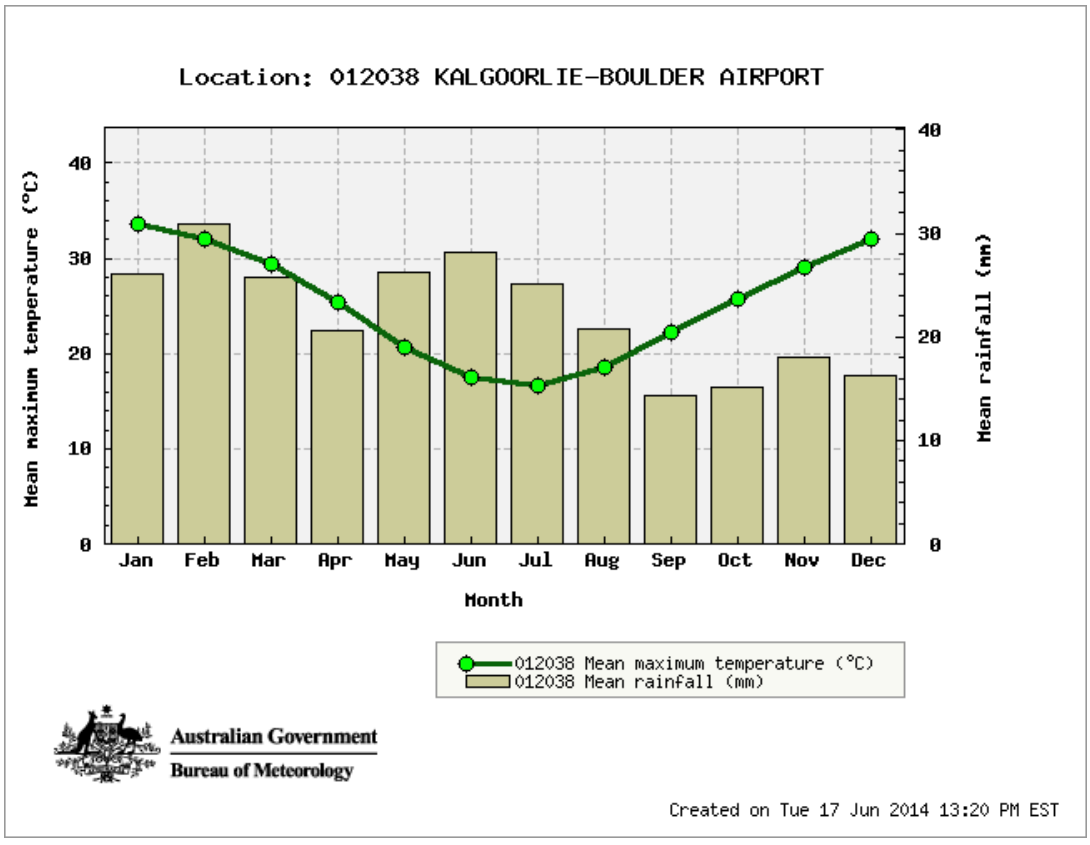

Figure 6: Mean Monthly rainfall and maximum temperature for the Kalgoorlie weather station (#12038) (BOM, 2014). Kalgoorlie data from 1939-2014.

2.5 Land Use

The dominant land uses of the Eastern Murchison subregion have been defined as grazing – native pastures (85.47%), Unallocated Crown Land (UCL) and Crown Reserves (11.34%), mining (1.79%) and conservation which accounts for 1.4% of the land use (Cowan, 2001). The Shield subregion dominant land uses include; aboriginal reserve (12.3%), Conservation Reserves (7%), grazing-native pastures (24.8%), UCL and Crown Reserves (55.7%) and other-lake and major watercourse (0.1%). The Central subregion dominant land uses include; aboriginal reserve (7.4%), Conservation Reserves (9.1%), grazing-native pastures (4.4%), UCL and Crown Reserves (78.9%) and other-lake and major watercourse (0.2%).

3 Survey Methodology

3.1 Survey Objectives

The objectives of the survey were to:

- Compile a broad scale vegetation community flora map and taxa list of the survey area (Appendix 2 and 3);
- Document and map locations of any Threatened or Priority Flora identified (Appendix 5);
- Assess the regional and local conservation status of plant taxa and ecological communities within the survey area; and
- Identify and map occurrences of any "Declared and Environmental" weeds within the survey area.

3.2 Desktop Assessment

Prior to the field survey, the results of the combined search of the DPaW Flora of Conservation Significance databases (DPaW, 2013a), were obtained by BC. These significant flora were examined on the Western Australian Herbarium's web page (WAHERB, 2014) prior to the survey to familiarise staff with their appearance. Locations of Threatened Flora and Priority Flora revealed in the databases search were overlaid on aerial photography of the area. Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the survey area and all areas of occurrence were traversed on foot specifically looking for the Threatened flora associated with that vegetation description. Table 3 lists the definitions of Threatened and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2014).

3.3 Sampling and Analysis Methods

BC was commissioned by AGAA to undertake a Level 1 flora and vegetation survey of an 208km proposed gas pipeline route extending from the Sunrise Dam Gold Mine to the Tropicana Gold Mine both operated by AGAA, located approximately 50km south-west of Laverton and 330km east north-east of Kalgoorlie-Boulder, WA respectively. The initial survey was conducted from the 30th October to 5th November 2013, covering an area of approximately 14,060Ha. This included surveying the pipeline route to a width of 500m, surveying a 15km (500m width) proposed access track into the centre of the pipeline route and surveying the mid-region salt lake to a maximum width of 5km. Approximately 50km of the 208km proposed gas pipeline route was unable to be surveyed in November 2013 due to access constraints. Additional surveys were conducted along the entire pipeline route from the 31st March to the 2nd April 2014 following high summer rainfall. The survey area was traversed by four people via all-terrain vehicle and on foot. Figure 7 provides a map of the area traversed throughout the survey.

Table 3: **Definitions of Threatened and Priority Flora taxa (WAHERB, 2014)**

T: Schedule 1 Threatened Flora under the *Wildlife Conservation Act 1950*
taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X: Declared Rare flora – Presumed Extinct taxa
taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
1: Priority One – Poorly known taxa
taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2: Priority Two – Poorly Known taxa
taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3: Priority Three – Poorly known taxa
taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four – Rare, Near Threatened and other taxa in need of monitoring
1. Rare. taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. 2. Near Threatened. taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. 3. taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.
5: Priority 5 – Conservation Dependent taxa
taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

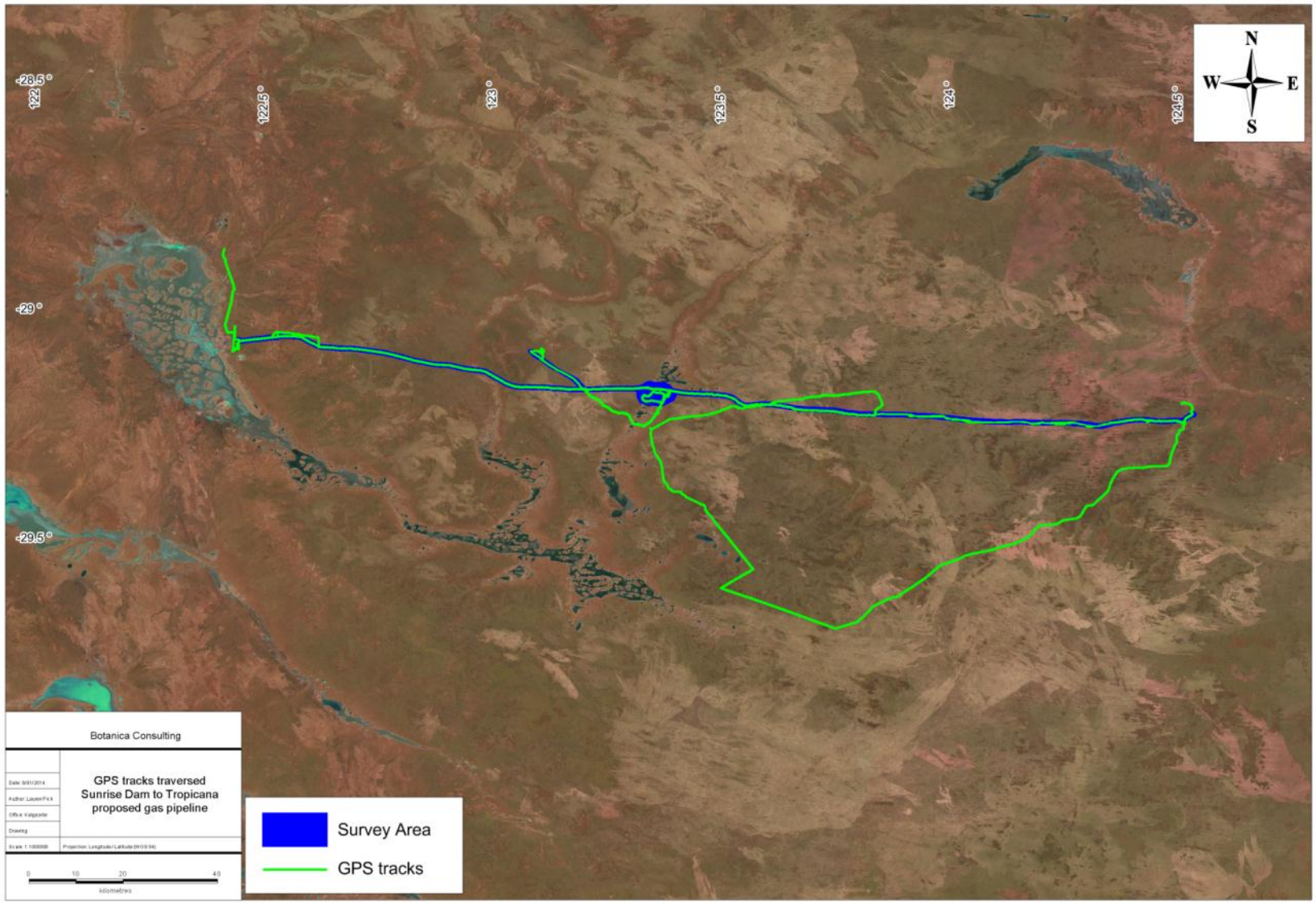

Figure 7: GPS tracks traversed throughout the Sunrise Dam to Tropicana survey area

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. An aerial flyover using a light aircraft was also conducted in order to identify visual differences in vegetation along the route and identify potential access tracks. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the co-ordinates of the boundaries between existing vegetation communities.

At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of Threatened Flora/Priority Flora if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and the Western Australian Herbarium. Presence/absence data of taxa from sample sites of similar vegetation was then compiled forming the best representative vegetation communities. Vegetation communities were classified according to Muir (1977) Life Form/Height Class Classifications (Appendix 6). Similar vegetation communities were recognised visually in the field.

3.3.1 Personnel involved

Jim Williams	- Environmental Consultant/Botanist (Diploma of Horticulture)
Lauren Pick	- Environmental Consultant (BSc Ecology & Conservation Biology)
Pat Harton	-Environmental Consultant (Bachelor of Environmental Science)
Matthew Newlands	-Environmental Technician
Mike Hislop	-Taxonomical identifications Western Australian Herbarium

3.3.2 Scientific licences

Table 4: Scientific licences of Botanica staff coordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	SL0010574	21-05-2015
Lauren Pick	SL0010573	21-05-2015

3.4 Data Analysis Tools

Once the survey was completed the data obtained was analysed to generate vegetation maps (Appendix 2).

3.5 Flora survey limitations and constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 5 below.

Table 5: Limitations and constraints associated with the flora and vegetation survey.

Variable	Potential Impact on Survey	Impact on Survey outcomes
Access challenges	Not a constraint	The survey was conducted via all-terrain vehicle and on foot. Access throughout the survey area was limited however all the survey area was covered during the Autumn survey
Experience levels	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Botanist:** Jim Williams **Field Staff:** Jim Williams, Lauren Pick, Pat Harton and Matthew Newlands **Data Interpretation:** Jim Williams & Lauren Pick
Timing of survey, weather & season	Minor constraint	Fieldwork was carried out in Spring within the EPA's recommended timing for flora surveys. However due to below average autumn and winter rainfall received for Laverton and intermittent below average rainfall received for Kalgoorlie (Table 2) much of the vegetation was not in flower. There was however 23 annual taxa identified during the survey, majority of which occurred in regrowth areas. Additonal fieldwork was conducted in Autumn following high summer rainfall (Table 2) yet flowering specimens were still limited.
Sources of information	Minor constraint	There has been limited survey work or research within the eastern region of the area with the exception of the area surrounding Tropicana Gold Mine.
Mapping reliability	Not a constraint	BC was able to obtain high quality ortho aerial images in order to reliably determine changes in vegetation within the survey area.
Area disturbance	Minor constraint	The western region of the survey area (near Sunrise Dam Gold Mine) has been subject to disturbance from grazing by cattle, mining and exploration activities. The eastern region however has been relatively undisturbed with minimal access tracks, exploration and mining.
Survey Intensity	Not a constraint	Survey intensity was moderate and appropriate for the impact area with a Level 1 survey conducted over two stages; the initial survey was conducted in spring and the additional survey was conducted in autumn (following high summer rainfall).
Resources	Not a constraint	The DPaW provided threatened flora information which was used to complete the survey.
Completeness	Minor constraint	In the opinion of BC the survey area was covered sufficiently in order to identify vegetation assemblages. However during the initial survey conducted in spring many of the plants were not in flower due to below average autumn/winter rainfall received. Despite the below average rainfall 23 annual taxa identified during the survey, majority of which occurred in regrowth areas. An additonal survey was conducted in Autumn following above average summer rainfall however occurance of flowering specimens remained low. Annual taxa identified in spring were still present. Despite the low flowering rate broad vegetation communities were able to be determined and assessed. Much of the vegetation comprised of Mulga (*Acacia aneura)* which has recently undergone taxonomic revision. In order to fully identify between different Mulga taxa flower and seeds specimens are required. At the time of the surveys much of the Mulga was not in flower/seed limiting full identification. The vegetation communities for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities outside the study area is not known, however vegetation communities identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2014).

4 Results

4.1 Summary

One hundred and four vegetation communities were identified within the survey area. These vegetation communities were represented by a total of 43 Families, 114 Genera and 281 Taxa (including sub-species and variants) (Appendix 3).

No DRF/Threatened Flora, pursuant to subsection (2) of section 23F of the *WC Act 1950,* the Commonwealth *EPBC Act 1999* and as listed by the DPaW were identified within the survey area. Seven Priority Flora taxa, as listed by the DPaW were identified within the survey area:

1. *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3);
2. *Caesia talingka* (P2);
3. *Dicrastylis cundeeleensis* (P4);
4. *Grevilliea secunda* (P4);
5. *Labichea eremaea* (P3);
6. *Melaleuca apostiba* (P3); and
7. *Olearia arida* (P4).

None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or as listed by the DPaW were recorded within the survey area. No PEC as listed by the DPaW were recorded within the survey area. However the *Mount Linden Range banded ironstone ridge vegetation complex* Priority 3 Ecological Community and *Yellow Sandplain Communities of the Great Victoria Desert* Priority 3 Ecological Community are located approximately 26km south of the western end of the survey corridor (Sunrise Dam Gold Mine end) and 20km south of the far eastern end of the survey corridor (Tropicana Gold Mine end) respectively. None of the vegetation communities identified within the survey area are representative of vegetation that characterises the *Mount Linden Range banded ironstone ridge vegetation complex*. One of the vegetation communities identified within the survey area; Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune however was representative of vegetation that characterizes the *Yellow Sandplain Communities of the Great Victoria Desert* as defined by Pearson (1994).

The survey area is not located in an Environmentally Sensitive Area (ESA) or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the houndred and four vegetation communities and sub-communities surveyed by BC were rated as being in 'good' health. The remaining ninety-four vegetation communities were rated as being in 'very good' health. The majority of the survey area remains undisturbed with minimal access tracks, mining and exploration activities within the area. No introduced taxa were identified within the survey area.

4.2 Desktop Assessment

The results of the combined search of the DPaW's Flora of Conservation Significance databases (DPaW, 2013a) identified one Priority Flora taxa listed by DPaW within the survey area: *Dicrastylis cundeeleensis* (P4). An additional eighteen Priority Flora listed by DPaW database are recorded within a 50km radius of the survey area. Each of these Priority Flora have the potential to occur within the survey area as they occur in similar habitats and vegetation communities to those identified within the survey area. Table 6 identifies the DPaW listed Priority Flora potentially occurring within the survey area.

Table 6: **Priority Flora with the potential to occur within the Sunrise Dam to Tropicana survey area (WAHERB, 2014)**

taxa	Conservation Code	Description (WAHERB, 2014)
Acacia eremophila numerous-nerved variant (A.S. George 11924)	3	Dense, spreading shrub, 1-2 m high. Fl. yellow, Sep. Sandy soils. Flats.
Acacia eremophila var. *variabilis*	3	Shrub, 1-1.6 m high. Fl. yellow, Sep. Sandy or sandy-loam.
Baeckea sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)	3	Upright shrub, ca 1 m high. Fl. white, Oct. Orange sand. Flats.
Caesia rigidifolia	1	Rhizomatous, tufted perennial, herb, to 0.45 m high. Fl. green-white, Oct.
Caesia talingka	2	No information available
Comesperma viscidulum	4	Shrub, to ca 0.7 m high.
Conospermum toddii	4	Spreading shrub, 1.2-2 m high. Fl. white/white-yellow, Jul to Oct. Yellow sand. Sand dunes.
Dampiera eriantha	1	Erect perennial, herb, to 0.6 m high.
Dicrastylis cundeeleensis	4	Woolly shrub, 0.2-0.5 m high. Yellow sand, red or reddish-yellow sand. Sandplains.
Eremophila arachnoides subsp. *tenera*	1	Broom-like shrub, to 3 m high, branches with tubercules often elongated & coalescing. Fl. white/blue-purple.
Eremophila aureivisca	1	Dense much-branched shrub, ca 1 m high. Fl. blue-purple, Sep. Stony, skeletal red clay. Between breakways & claypans.
Eucalyptus nigrifunda	4	Tree, 5-7 m high, bark rough & black on trunk. Sandy clay. Breakaways of decomposing granite.
Eucalyptus pimpiniana	3	Straggly shrubby mallee, 0.7-2 m high, bark smooth. Fl. white, May to Oct. Red sand. Sand dunes & plains.
Grevillea secunda	4	Low spreading shrub, 0.3-0.8 m high. Fl. red, Sep to Oct. Yellow or red sand. Sand dunes, sandplains.

taxa	Conservation Code	Description (WAHERB, 2014)
Malleostemon sp. Officer Basin (D. Pearson 350)	2	Shrub, 1-3 m high. Fl. white, Dec. Yellow sand. Dune slopes. No image available
Melaleuca apostiba	3	Spreading shrub, to 2 m high, with grey fissured bark and dull green leaves. Fl. red, Jun.
Olearia arida	4	Erect shrub, to 0.4 m high. Fl. white, Jul to Sep. Red or yellow sand. Undulating low rises.
Physopsis chrysotricha	2	Erect shrub, 1-5 m high. Fl. yellow/yellow-orange, Sep to Dec or Jan. Red or yellow sandy soils. Sandplains.
Thryptomene nealensis	3	Shrub, ca 0.3 m high. Fl. pink, Oct. Lateritic breakaways.

4.3 Flora of conservation significance

No Threatened Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013), were identified within the survey area. Seven Priority Flora taxa, as listed by the DPaW, were identified within the survey area:

1. *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3);
2. *Caesia talingka* (P2);
3. *Dicrastylis cundeeleensis* (P4);
4. *Grevillea secunda* (P4);
5. *Labichea eremaea* (P3);
6. *Melaleuca apostiba* (P3); and
7. *Olearia arida* (P4).

Labichea eremaea (P3) was the only Priority Flora taxa identified within the survey area that was not listed on the DPaW Flora of Conservation Significance database as occurring within a 50km radius of the survey area. Maps of all Priority Flora identified in the survey area are provided in Figure 8a-8d.

4.3.1 *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3)

This taxon is described as a dense, spreading shrub, which grows between 1-2 m high. It produces yellow flowers in September (Plate 1). This taxon commonly occurs on sandy soils in flats (WAHERB, 2014). Three locations of this taxon were identified within the Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils vegetation community. No locations of this taxon were listed on the DPaW database as occurring within the survey area; however this taxon was listed by DPaW as occurring within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database.

Plate 1: *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3)

4.3.2 *Caesia talingka* (P2)

There is no description available for this taxon (Plate 2). One location was identified within the Occasional *E. gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune vegetation community. This location is not listed on the DPaW database; however this taxon was listed by DPaW as occurring within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database. GPS locations are provided in Appendix 5.

Plate 2: *Caesia talingka* (P2)

4.3.3 *Dicrastylis cundeeleensis* (P4)

Dicrastylis cundeeleensis is described as a woolly shrub, which grows between 0.2-0.5 m high (Plate 3). It occurs on yellow sand, red or reddish-yellow sand in sandplains (WAHERB, 2014). Five locations were identified in five vegetation communities:

1. Low Woodland of *Eucalyptus gongylocarpa* over moderately dense mallee of *E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils;
2. Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils;
3. Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils;
4. Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils; and
5. Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils

Two locations were previously listed by DPaW; the other three locations are not listed on the DPaW database. A specimen of this plant and location details will be provided to the DPaW to update their database. GPS locations are provided in Appendix 5.

Plate 3: *Dicrastylis cundeeleensis* (P4)

4.3.4 *Grevillea secunda* (P4)

This taxon is described as a low spreading shrub, which grows between 0.3-0.8 m high (Plate 4). It produces red flowers from September to October. It occurs on yellow or red sands of sand dunes and sandplains (WAHERB, 2014). 30 locations of this taxon were identified in four vegetation communities:

1. Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils;
2. Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy soils;
3. Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils; and
4. Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils.

No locations of this taxon were listed on the DPaW database as occurring within the survey area; however this taxon was listed by DPaW as occurring within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database.

Plate 4: *Grevillea secunda* (P4)

4.3.5 *Labichea eremaea* (P3)

This taxon is described as a compact, rigid shrub, which grows between 0.3-0.8 m high and 0.3-1 m wide (Plate 5). It produces yellow flowers from August to September. It occurs on red sand (WAHERB, 2014). One location of this taxon was identified within the Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils vegetation community. This location is not listed on the DPaW database and there is no DPaW record of this taxon within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database. GPS locations are provided in Appendix 5.

Plate 5: *Labichea eremaea* (P3)

4.3.6 *Melaleuca apostiba* (P3)

This taxon is described as a spreading shrub, which grows to 2 m high (Plate 6). It has grey fissured bark and dull green leaves. It produces red flowers in June (WAHERB, 2014). This taxon was identified at seven locations and comprised the dominant mid-storey of the Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge vegetation community. No locations of this taxon were listed on the DPaW database as occurring within the survey area; however this species was listed by DPaW as occurring within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database.

Plate 6: *Melaleuca apostiba* (P3)

4.3.7 *Olearia arida* (P4)

Olearia arida is described as an erect shrub, which grows up to 0.4 m high (Plate 7). It produces white flowers from July to September. It occurs on red or yellow sand on undulating low rises (WAHERB, 2014). Seventeen locations of this taxon were identified within nine vegetation communities:

1. Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils;
2. Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils;
3. Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils;
4. Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils;
5. Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils;
6. Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils;

7. Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy soils;
8. Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils; and
9. Occasional *E. gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune vegetation community.

None of these locations were listed on the DPaW database; however this taxon was listed by DPaW as occurring within a 50km radius of the survey area. A specimen of this plant and location details will be provided to the DPaW to update their database. GPS locations are provided in Appendix 5.

Plate 7: *Olearia arida* P4

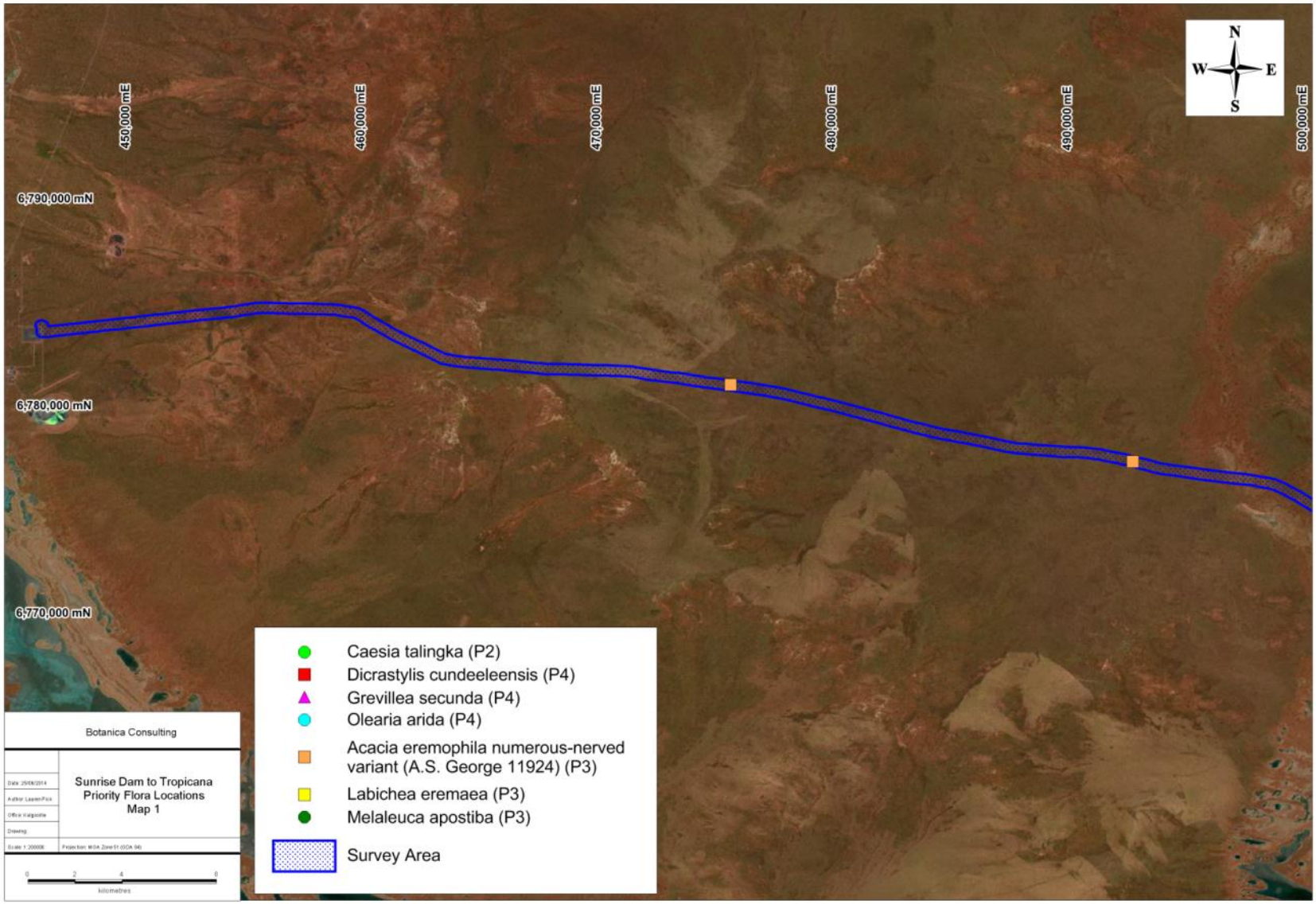

Figure 8a: Map of Priority Flora species identified by BC within the Sunrise Dam to Tropicana survey area

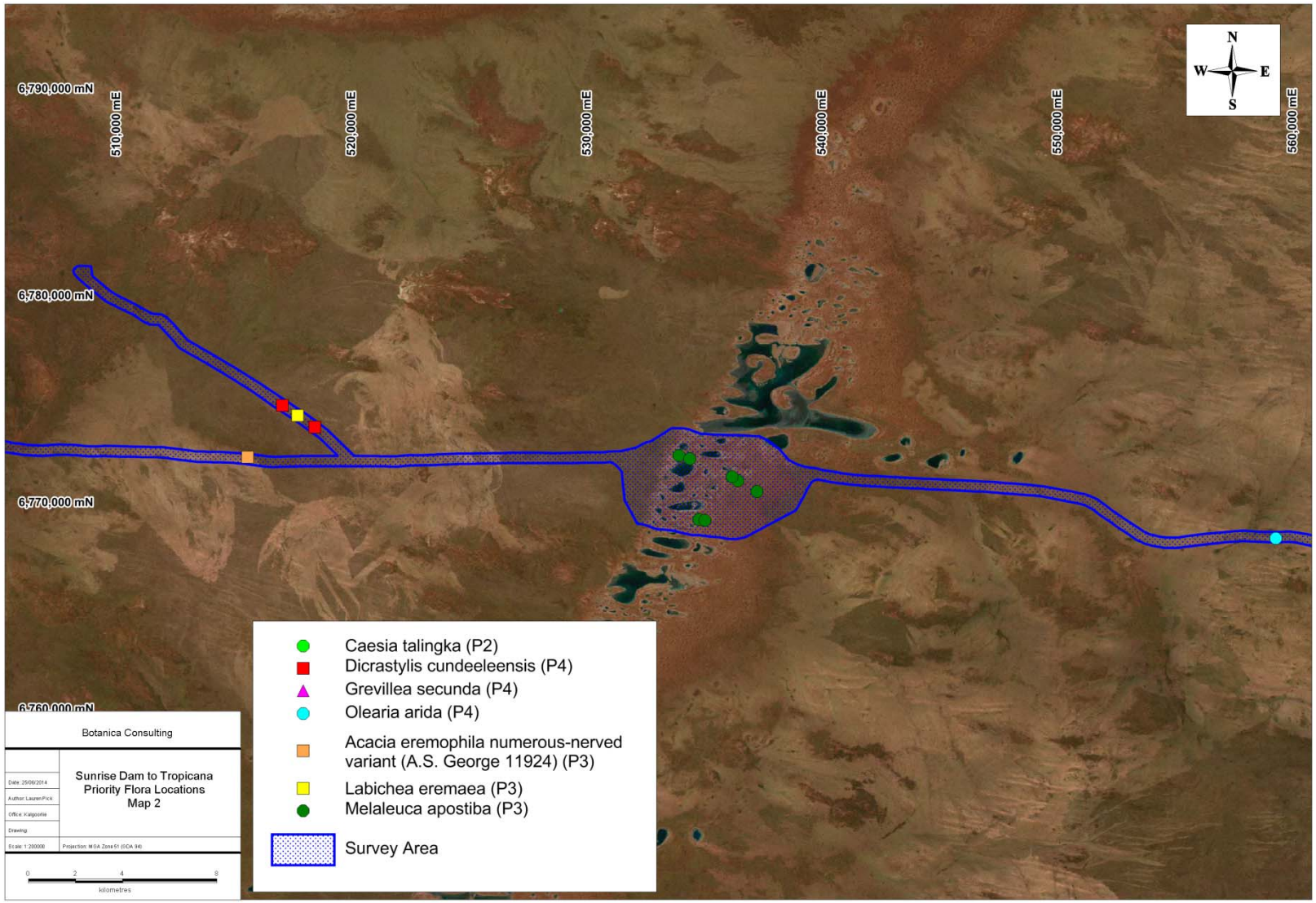

Figure 8b: Map of Priority Flora species identified by BC within the Sunrise Dam to Tropicana survey area

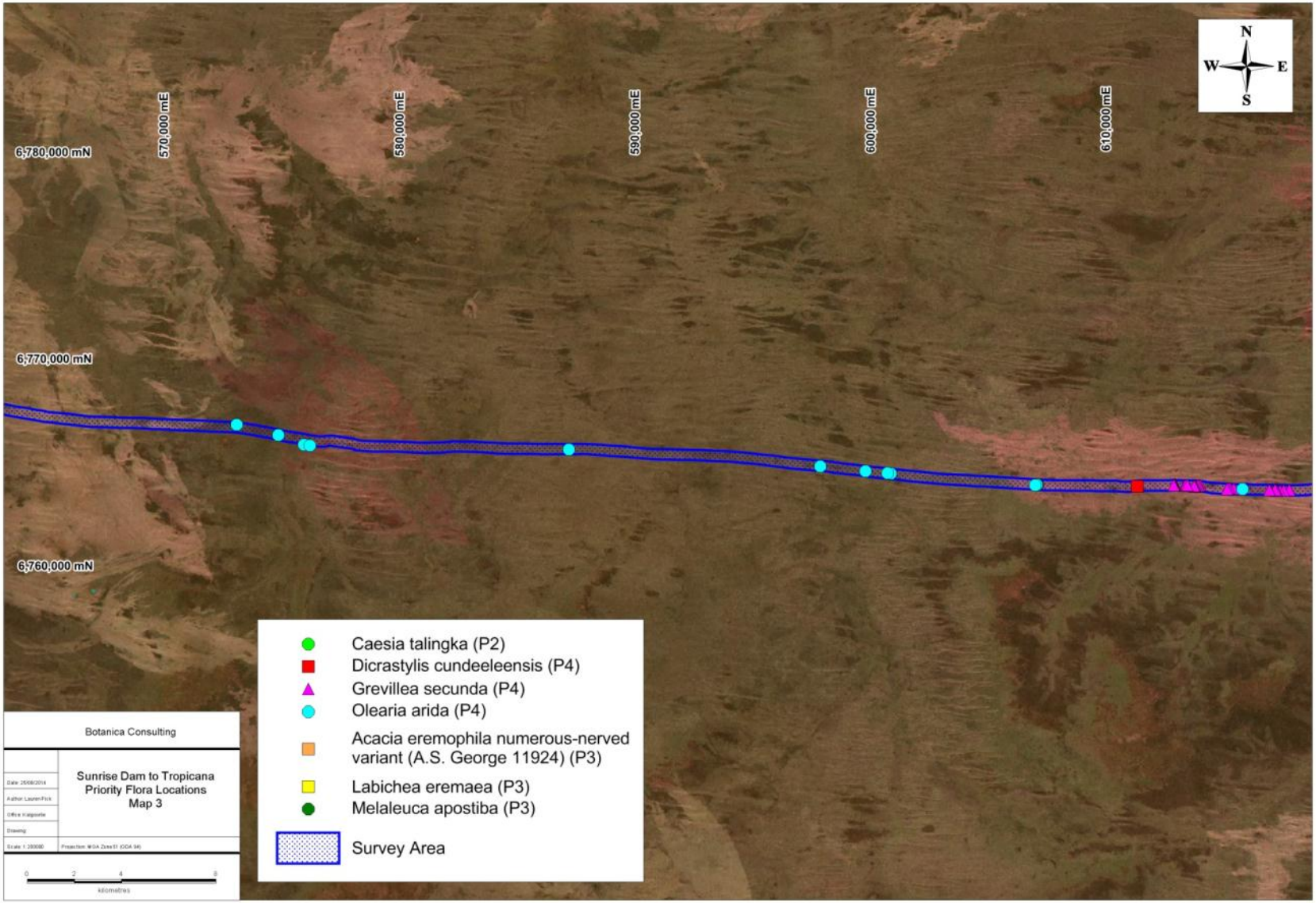

Figure 8c: Map of Priority Flora species identified by BC within the Sunrise Dam to Tropicana survey area

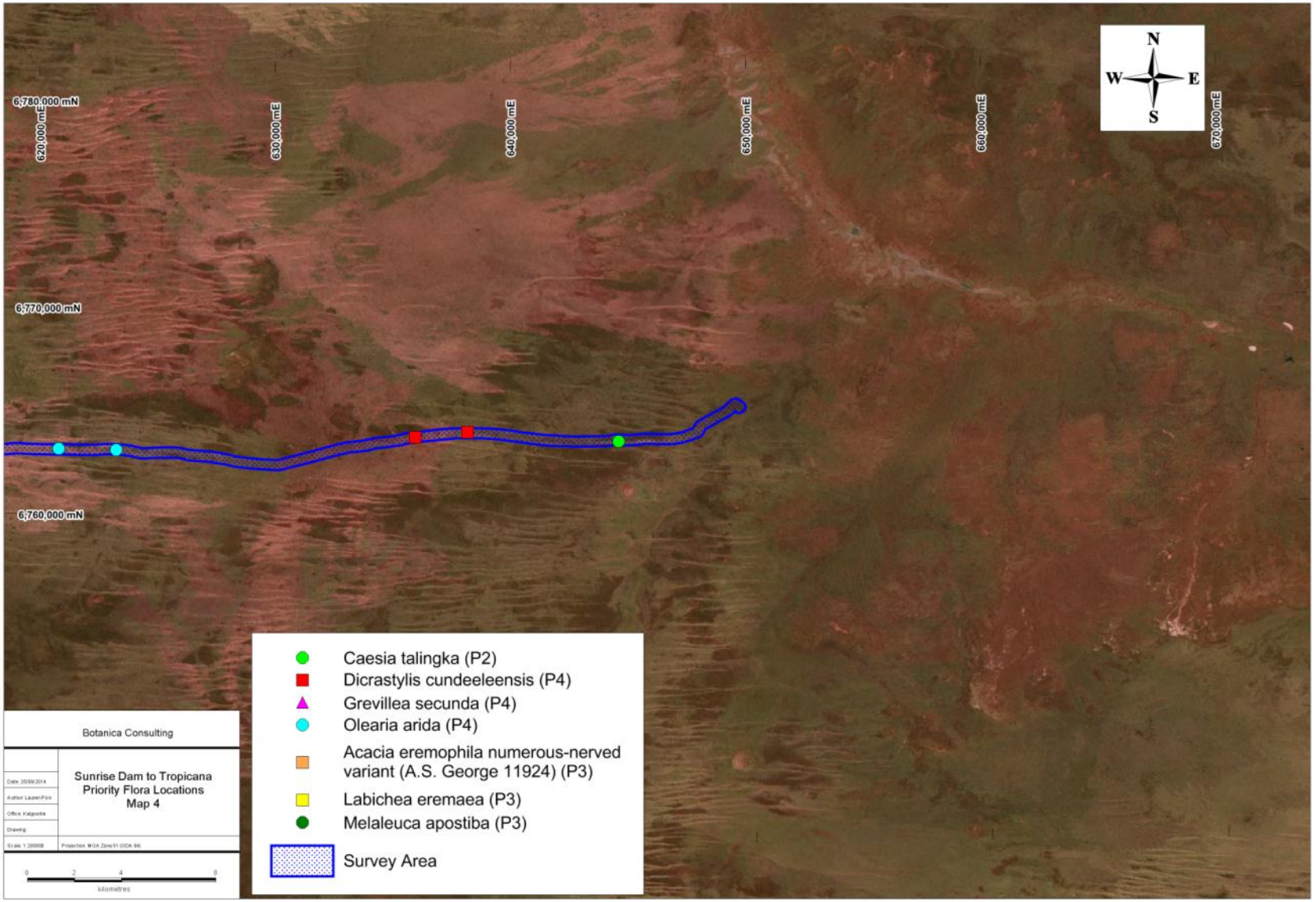

Figure 8d: Map of Priority Flora species identified by BC within the Sunrise Dam to Tropicana survey area

4.4 Vegetation Communities

One hundred and four vegetation communities were identified within the survey area. These vegetation communities were represented by a total of 43 Families, 114 Genera and 281 Taxa (including sub-species and variants) (Appendix 3). A map showing the vegetation communities present in the survey area is located in Appendix 2. The area (ha and percentage) of each vegetation community is listed in Table 7 below. These vegetation communities belong to five broad landform types and 12 broad vegetation groups (according to the National Vegetation Information System (NVIS) classifications) as listed in Table 7 below. Vegetation communities were classified according to Muir (1977) Life Form/Height Class Classifications (Appendix 6).

Table 7: Summary of vegetation communities and the area covered

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
Breakaway	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop	B-CFW1	15	0.11
	Mallee Woodlands and Shrublands	Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* on breakaway outcrop	B-MWS1	5	0.04
Clay-loam Plains	Acacia Forests and Woodlands	Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	CLP-AFW1	3	0.02
		Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. *x artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	CLP-AFW2	129	0.92
		Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils	CLP-AFW3	171	1.22
		Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils	CLP-AFW4	152	1.08
		Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils	CLP-AFW5	73	0.52
		Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	CLP-AFW6	62	0.44

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils	CLP-AFW7	54	0.38
		Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils	CLP-AFW8	13	0.09
		Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp. *angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils	CLP-AFW9	772	5.49
		Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils	CLP-AFW10	2	0.01
		Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils	CLP-AFW11	15	0.11
		Low Woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei* subsp. *auriculata/Acacia ramulosa* var. *ramulosa* and *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii* in sandy-loam soils	CLP-AFW12	306	2.18
	Acacia Open Woodlands	Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	CLP-AOW1	27	0.19
		Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils	CLP-AOW2	11	0.08
		Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma,* A*triplex bunburyana* and *Ptilotus obovatus* in clay-loam soils	CLP-AOW3	34	0.24
	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain	CLP-CFW1	38	0.27
		Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* over sparse *Triodia basedowii* in clay-loam soils	CLP-CFW2	104	0.74
		Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils	CLP-CFW3	222	1.58

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
	Chenopod shrublands, samphire shrublands and forblands	Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils.	CLP-CSSSF1	36	0.26
	Eucalypt Woodlands	Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils	CLP-EW1	10	0.07
	Mallee Woodlands and Shrublands	Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils	CLP-MWS1	8	0.06
		Very Open Shrub Mallee of *Eucalyptus youngiana* with occasional *E. gongylocarpa* over moderately dense scrub of *Acacia desertorum* var. *desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils	CLP-MWS2	182	1.29
		Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	CLP-MWS3	8	0.06
		Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	CLP-MWS4	19	0.14
	Regrowth, modified native vegetation	Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	CLP-RMNV1	117	0.83
		Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils	CLP-RMNV2	394	2.80
		Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils	CLP-RMNV3	200	1.42
Closed Depression	Acacia Forests and Woodlands	Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge	CD-AFW1	42	0.30
	Acacia Shrublands	Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia sp.* (Sterile) in clay drainage depression	CD-AS1	67	0.48
		Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia sp.* (Sterile) in	CD-AS2	460	3.27

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		clay drainage depression			
		Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression	CD-AS3	292	2.08
	Other Shrublands	Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression	CD-OS1	231	1.64
Dunes	Eucalypt Woodlands	Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune	D-EW1	9	0.06
		Occasional *E. gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune	D-EW2	67	0.48
	Mallee Woodlands and Shrublands	Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune	D-MWS1	235	1.67
	Other Shrublands	Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune	D-OS1	13	0.09
Interdune Swales and Sandplain	Acacia Forests and Woodlands	Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW1	7	0.05
		Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW2	18	0.13
		Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils	ISSP-AFW3	340	2.42
		Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW4	100	0.71

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils.	ISSP-AFW5	194	1.38
	Eucalypt Woodlands/Mallee Woodland and Shrublands	Low Woodland of *Eucalyptus gongylocarpa* over moderately dense mallee of *E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS1	682	4.85
		Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS2	320	2.28
		Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii, A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS3	42	0.30
		Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	ISSP-EW/MWS4	106	0.75
		Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS5	742	5.28
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS6	40	0.28
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS7	25	0.18
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp. *elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS8	30	0.21
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS9	30	0.21
	Eucalypt Open Woodlands/Mallee Woodland and Shrublands	Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy soils	ISSP-EOW/MWS1	525	3.73

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils	ISSP-EOW/MWS2	300	2.13
	Eucalyptus Woodlands	Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW1	1020	7.25
		Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils	ISSP-EW2	81	0.58
		Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti, Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW3	178	1.27
		Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils	ISSP-EW4	175	1.24
		Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW5	16	0.11
		Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW6	6	0.04
	Heathlands	Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils	ISSP-H1	110	0.78
		Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils	ISSP-H2	16	0.11
	Mallee Woodlands and Shrublands	Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils	ISSP-MWS1	27	0.19
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS2	17	0.12
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS3	81	0.58

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS4	24	0.17
		Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS5	95	0.68
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS6	8	0.06
		Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS7	154	1.10
		Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils	ISSP-MWS8	1720	12.23
		Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils	ISSP-MWS9	13	0.09
		Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura, Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS10	112	0.80
		Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS11	120	0.85
		Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils	ISSP-MWS12	38	0.27
		Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigida* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS13	135	0.96
		Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS14	19	0.14

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS15	22	0.16
		Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS16	200	1.42
		Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS17	60	0.43
		Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS18	460	3.27
		Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils	ISSP-MWS19	43	0.31
		Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS20	4	0.03
		Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS21	5	0.04
		Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS22	30	0.21
		Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS23	75	0.53
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS24	15	0.11
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS25	32	0.23

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS26	30	0.21
		Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS27	15	0.11
	Regrowth, modified native vegetation	Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa subsp. oleosa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV1	24	0.17
		Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV2	28	0.20
		Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV3	91	0.65
		Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV4	8	0.06
		Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils	ISSP-RMNV5	40	0.28
		Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV6	15	0.11
		Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV7	15	0.11
Rocky Hillslope	Acacia Forests and Woodlands	Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope	RH-AFW1	24	0.17
		Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise	RH-AFW2	37	0.26
		Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma,* A*triplex bunburyana* and *Ptilotus obovatus* on quartz low slope	RH-AFW3	95	0.68

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code	Area (Ha)	Area (%)
		Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	RH-AFW4	77.5	0.55
		Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	RH-AFW5	17.5	0.12
		Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise	RH-AFW6	2	0.01
		Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles.	RH-AFW7	61	0.43
	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise	RH-CFW1	10	0.07
		salt lake	N/A	260	2.21
TOTAL				**14,060**	

BREAKAWAY: CASUARINA FORESTS AND WOODLANDS

4.5 Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop

4.5.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 14 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.5.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop (Plate 8). The taxa in the upper storey comprised of *Casuarina pauper.* Mid-storey taxa included *Dodonaea lobulata, Bossiaea walkeri, Eremophila oldfieldii* subsp. *oldfieldii, Acacia colletioides, Alyxia buxifolia, Exocarpos aphyllus* and *Senna artemisioides* subsp. x *artemisioides.* The understorey taxa included *Atriplex vesicaria, Olearia muelleri, Westringia rigida, Austrostipa elegantissima* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 8.

Table 8: Vegetation assemblage for Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Casuarina pauper*
Shrub 1-1.5m	10-30%	*Dodonaea lobulata*
Shrub 0.5-1m	10-30%	*Bossiaea walkeri*
Shrub <0.5m	10-30%	*Westringia rigida*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Casuarina Forests and Woodlands vegetation group (DoE 2014b).

Plate 8: Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop

BREAKAWAY: MALLEE WOODLANDS AND SHRUBLANDS

4.6 Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp*. latrobei* and *Scaevola spinescens* on breakaway outcrop

4.6.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 7 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.6.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp*. latrobei* and *Scaevola spinescens* on breakaway outcrop (Plate 9). The taxa in the upper storey included *Eucalyptus youngiana, Acacia caesaneura* and *Acacia ayersiana*. The mid-storey taxa included *Acacia tetragonophylla, Scaevola spinescens* and *Acacia ligulata.* The understorey taxa consisted of *Eremophila latrobei* subsp. *latrobei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 9.

Table 9: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp*. latrobei* and *Scaevola spinescens* on breakaway outcrop within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee <5m	2-10%	*Eucalyptus youngiana*
Tree <5m	30-70%	*Acacia ayersiana* *Acacia caesaneura*
Shrub 1.5-2m	10-30%	*Scaevola spinescens*
Shrub 1-1.5m	10-30%	*Eremophila latrobei* subsp. *latrobei*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 9: Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp*. latrobei* and *Scaevola spinescens* on breakaway outcrop

CLAY-LOAM PLAINS: ACACIA FORESTS AND WOODLANDS

4.7 Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils

4.7.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 13 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.7.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils (Plate 10). The taxa in the upper storey included *Acacia burkittii, Acacia incurvaneura, Hakea lorea* and *Grevillea berryana*. The mid-storey taxa included *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Scaevola spinescens* and *Acacia ligulata*. The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Maireana georgei* and *Maireana triptera.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 10.

Table 10: Vegetation assemblage for Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	30-70%	*Acacia burkittii*
Shrub 1.5-2m	30-70%	*Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	30-70%	*Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 10: Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils

4.8 Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. x *artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils

4.8.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 12 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.8.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest *of Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. x *artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils (Plate 11). The taxa in the upper storey included *Acacia caesaneura, Acacia incurvaneura, Acacia aptaneura* and *Grevillea berryana.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Senna artemisioides* subsp. x *artemisioides*. The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Spartothamnella teucriiflora* and *Maireana georgei*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 11.

Table 11: Low Forest *of Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. x *artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia caesaneura* *Acacia incurvaneura* *Acacia aptaneura*
Shrub 1-1.5m	10-30%	*Senna artemisioides* subsp. *filifolia* *Senna artemisioides* subsp. x *artemisioides*
Shrub <0.5m	10-30%	*Ptilotus obovatus* *Solanum lasiophyllum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 11: Low Forest *of Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. x *artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils

4.9 Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils

4.9.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.9.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils (Plate 12). The taxa in the upper storey included *Acacia caesaneura* and *Eremophila longifolia*. The mid-storey taxa included *Acacia incurvaneura, Acacia tetragonophylla, Scaevola spinescens* and *Acacia burkittii.* The understorey taxa included *Aristida contorta, Maireana triptera, Maireana georgei* and *Atriplex stipitata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 12.

Table 12: Vegetation assemblage for Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	30-70%	*Acacia caesaneura*
Shrub 1.5-2m	30-70%	*Acacia incurvaneura*
Bunch Grass <0.5m	70-100%	*Aristida contorta*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 12: Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils

4.10 Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils

4.10.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 17 Genera and 21 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.10.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils (Plate 13). The taxa in the upper storey comprised of *Acacia caesaneura.* Mid-storey taxa included *Grevillea oncogyne, Santalum spicatum, Cratystylis subspinescens, Eremophila miniata, Rhagodia eremaea* and *Dodonaea viscosa* subsp. *angustissima.* The understorey taxa included *Olearia subspicata, Maireana georgei, Atriplex stipitata, Solanum orbiculatum* and *Aristida holathera.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 13.

Table 13: Vegetation assemblage for Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree >5m	30-70%	*Acacia caesaneura*
Shrub >2m	10-30%	*Eremophila miniata*
Shrub 1-1.5m	10-30%	*Cratystylis subspinescens* *Rhagodia eremaea*
Bunch Grass <0.5m	30-70%	*Aristida holathera (A)*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 13: Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils

4.11 Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils

4.11.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 18 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.11.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils (Plate 14). The taxa in the upper storey comprised of *Acacia caesaneura.* Mid-storey taxa included *Grevillea oncogyne, Santalum spicatum, Cratystylis subspinescens, Eremophila miniata, Rhagodia eremaea* and *Dodonaea viscosa* subsp. *angustissima.* The understorey taxa included *Olearia subspicata, Maireana georgei, Atriplex stipitata, Solanum orbiculatum* and *Aristida holathera.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 14.

Table 14: Vegetation assemblage for Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree >5m	30-70%	*Acacia caesaneura*
Shrub >2m	10-30%	*Eremophila miniata*
Shrub 1-1.5m	10-30%	*Cratystylis subspinescens* *Rhagodia eremaea*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 14: Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils

4.12 Low Woodland *of Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils

4.12.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 11 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.12.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland *of Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils (Plate 15). The upper storey consisted of *Acacia caesaneura and Acacia incurvaneura.* The mid-storey consisted of *Acacia burkittii, Acacia kempeana, Acacia ligulata, Eremophila alternifolia* and *Scaevola spinescens.* The understorey taxa included *Senna artemisioides* subsp. x *artemisioides, Solanum lasiophyllum, Senna artemisioides* subsp. *filifolia, Maireana sedifolia, Ptilotus obovatus* and and *Dodonaea lobulata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 15.

Table 15: Vegetation assemblage for Low Woodland *of Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	30-70%	*Acacia burkittii* *Acacia kempeana* *Acacia ligulata*
Shrub 0.5-1m	30-70%	*Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 15: Low Woodland *of Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp*. filifolia* in clay-loam soils

4.13 Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils

4.13.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 15 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.13.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils (Plate 16). The taxa in the upper storey included *Acacia incurvaneura*, *A. caesaneura, A. burkittii, A. ligulata* and *Hakea kippistiana.* The mid-storey taxa included *Senna artemisioides* subsp. *filifolia, Dodonaea lobulata, Rhagodia eremaea, Scaevola spinescen*s and *Acacia jennerae.* The understorey taxa included *Ptilotus obovatus, Sida* sp. *Excedentifolia, Maireana sedifolia, Sclerolaena diacantha* and *Solanum lasiophyllum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 16.

Table 16: Vegetation assemblage for Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	10-30%	*Acacia incurvaneura*
Shrub 1-1.5m	30-70%	*Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*
Shrub 0-0.5m	30-70%	*Ptilotus obovatus* *Sida* sp. Excedentifolia (J.L. Egan 1925)

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 16: Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils

4.14 Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils

4.14.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 10 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.14.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils (Plate 17). The upper storey consisted of *Acacia caesaneura, Brachychiton gregorii, Eremophila oldfieldii* subsp. *angustifolia, Eucalyptus concinna* and *Santalum spicatum*. The mid-story included *Eremophila latrobei* subsp. *latrobei, Dodonaea rigida, Acacia kempeana, Acacia ramulosa, Scaevola spinescens* and *Allocasuarina helmsii.* The understorey taxa included *Triodia basedowii* and *Prostanthera althoferi.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 17.

Table 17: Vegetation assemblage for Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	30-70%	*Dodonaea rigida* *Eremophila latrobei subsp. latrobei* *Scaevola spinescens*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 17: Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils

4.15 Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp*. angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils

4.15.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 13 Genera and 19 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.15.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp*. angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils (Plate 18). The upper storey comprised of *Acacia caesaneura* and *Casuarina pauper*. The mid-storey taxa included *Eremophila scoparia, Acacia burkittii, Eremophila pantonii, Dodonaea viscosa* subsp. *angustissima,* and *Eremophila miniata.* The understorey taxa included *Cratystylis subspinescens, Scaevola spinescens, Acacia colletioides, Olearia muelleri, Frankenia setosa* and *Maireana sedifolia.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 18.

Table 18: Vegetation assemblage for Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp*. angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Casuarina pauper*
Shrub 1.5-2m	30-70%	*Dodonaea viscosa* subsp. *angustissima* *Eremophila miniata* *Eremophila scoparia*
Shrub 0.5-1m	30-70%	*Cratystylis subspinescens*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 18: Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp*. angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils

4.16 Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils

4.16.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 18 Genera and 27 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.16.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils (Plate 19). The upper storey taxa included *Acacia caesaneura, Casuarina pauper*, *Eucalyptus oleosa* subsp. *oleosa* and *Eucalyptus eremicola.* The mid-storey taxa included *Daviesia benthamii, Eremophila scoparia, Scaevola spinescens, Eremophila platythamnos* subsp. *platythamnos, Acacia colletioides, A. burkittii* and *Santalum spicatum.* The understorey taxa included *Maireana triptera, Atriplex stipitata, Maireana georgei, Ptilotus obovatus, Olearia subspicata* and *Olearia muelleri.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 18.

Table 19: Vegetation assemblage for Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura* *Casuarina pauper*
Shrub 1-1.5m	30-70%	*Eremophila scoparia* *Scaevola spinescens*
Shrub <0.5m	<10%	*Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 19: Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils

4.17 Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils

4.17.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 8 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.17.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils (Plate 20). The upper storey taxa included *Acacia caesaneura.* The mid-storey taxa included *Eremophila latrobei* subsp. *latrobei, Aluta maisonneuvei* subsp. *auriculata, Acacia ramulosa* subsp. *ramulosa* and *Eremophila platycalyx* subsp. *platycalyx.* The understorey taxa included *Solanum lasiophyllum, Solanum plicatile, Triodia basedowii, Monachather paradoxus, Eragrostis eriopoda* and *Aristida contorta.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 20.

Table 20: Vegetation assemblage for Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	<10%	*Aluta maisonneuvei* subsp. *auriculata* *Eremophila latrobei* subsp. *latrobei* *Eremophila platycalyx* subsp. *platycalyx*
Hummock Grass	10-30%	*Triodia basedowii*
Bunch Grass <0.5m	10-30%	*Aristida contorta* *Eragrostis eriopoda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 20: Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils

4.18 Low woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei subsp. auriculata/Acacia ramulosa* var*. ramulosa* and *Eremophila forrestii* subsp*. forrestii* over *Triodia basedowii* in sandy-loam soils

4.18.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 6 Genera and 11 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.18.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei subsp. auriculata/Acacia ramulosa* var*. ramulosa* and *Eremophila forrestii* subsp*. forrestii* over *Triodia basedowii* in sandy-loam soils (Plate 21).The upper storey taxa included *Acacia caesaneura* and *E. youngiana.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, A. sibina, Aluta maisonneuvei* subsp. *auriculata, Eremophila forrestii* subsp. *forrestii* and *Prostanthera sericea.* The understorey taxa included *Triodia basedowii, Triodia desertorum* and *Eragrostis eriopoda.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 21.

Table 21: Vegetation assemblage for Low woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei subsp. auriculata/Acacia ramulosa* var*. ramulosa* and *Eremophila forrestii* subsp*. forrestii* over *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura*
Shrub >2m	10-30%	*Acacia ramulosa* subsp. *ramulosa*
Shrub 1-1.5	10-30%	*Aluta maisonneuvei* subsp. *auriculata*
Shrub 0.5-1m	30-70%	*Eremophila forrestii* subsp. *forrestii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 21: Low woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei subsp. auriculata/Acacia ramulosa* var*. ramulosa* and *Eremophila forrestii* subsp*. forrestii* over *Triodia basedowii* in sandy-loam soils

CLAY-LOAM PLAINS: ACACIA OPEN WOODLANDS

4.19 Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp*. filifolia* and *Ptilotus obovatus* in clay-loam soils

4.19.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.19.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp*. filifolia* and *Ptilotus obovatus* in clay-loam soils (Plate 22)*.* The taxa in the upper storey included *Acacia ayersiana, Acacia oswaldii* and *Casuarina pauper.* The mid-storey taxa included *Senna artemisioides* subsp. *filifolia, Eremophila pantonii, Dodonaea lobulata* and *Acacia kempeana.* The understorey taxa included *Atriplex bunburyana, Maireana pyramidata, Ptilotus obovatus, Sclerolaena diacantha* and *Solanum lasiophyllum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 22.

Table 22: Vegetation assemblage for Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp*. filifolia* and *Ptilotus obovatus* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Acacia ayersiana* *Casuarina pauper*
Shrub 1-1.5m	30-70%	*Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	10-30%	*Ptilotus obovatus* *Sclerolaena diacantha*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Open Woodlands vegetation group (DoE, 2014b).

Plate 22: Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp*. filifolia* and *Ptilotus obovatus* in clay-loam soils

4.20 Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils

4.20.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 19 Taxa (Appendix 3).

No Threatened Flora, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the Commonwealth *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013), were identified within the survey area. No Priority Flora was identified within this vegetation community during the survey. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were identified within this survey area.

4.20.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils (Plate 23). The taxa in the upper storey included *Acacia caesaneura, Acacia aptaneura* and *Acacia oswaldii*. The mid-storey taxa included *Hakea preissii, Maireana pyramidata, Cratystylis subspinescens* and *Muehlenbeckia florulenta.* The understorey taxa included *Atriplex vesicaria, Tecticornia disarticulata, Frankenia setosa, Solanum lasiophyllum, Ptilotus obovatus* and *Maireana georgei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 23.

Table 23: Vegetation assemblage for Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils within the survey area

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	2-10%	*Acacia aptaneura* *Acacia caesaneura*
Shrub 1.5-2m	2-10%	*Acacia tetragonophylla* *Hakea preissii*
Shrub <0.5m	30-70%	*Atriplex vesicaria* *Tecticornia disarticulata*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Open Woodlands vegetation group (DoE, 2014b).

Plate 23: Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils

4.21 Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils

4.21.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 27 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.21.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils (Plate 24). The taxa in the upper storey included *Acacia caesaneura, Acacia burkittii, Acacia ayersiana* and *Casuarina pauper*. The mid-storey taxa included *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Santalum lanceolatum* and *Scaevola spinescens.* The understorey taxa include *Ptilotus obovatus, Solanum lasiophyllum, Sclerolaena densiflora* and *Atriplex bunburyana.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 24.

Table 24: Vegetation assemblage for Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree < 5m	2-10%	*Acacia caesaneura*
Shrub 1-1.5m	30-70%	*Maireana sedifolia* *Senna artemisioides* subsp. x *artemisioides* *Senna cardiosperma*
Shrub <0.5m	30-70%	*Atriplex bunburyana* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Open Woodlands vegetation group (DoE, 2014b).

Plate 24: Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils

CLAY-LOAM PLAINS: CASUARINA FORESTS AND WOODLANDS

4.22 Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain

4.22.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 10 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.22.2 Vegetation

The flora recorded in this vegetation community was representative Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain (Plate 25). The taxa in the upper storey included *Casuarina pauper, Acacia ayersiana, Acacia oswaldii* and *Acacia incurvaneura*. The mid-storey taxa included *Eremophila pantonii, Alectryon oleifolius, Acacia burkittii, Maireana pyramidata* and *Maireana sedifolia.* The understorey taxa included *Sclerolaena densiflora, Frankenia setosa, Ptilotus obovatus* and *Maireana glomerifolia.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 25.

Table 25: Vegetation assemblage for Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Casuarina pauper*
Shrub 1-1.5m	2-10%	*Eremophila pantonii*
Shrub 0.5-1m	30-70%	*Maireana pyramidata* *Maireana sedifolia*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Casuarina Forests and Woodlands vegetation group (DoE, 2014b).

Plate 25: Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain

4.23 Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp*. filifolia* over sparse *Triodia basedowii* in clay-loam soils

4.23.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 17 Genera and 23 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.23.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp*. filifolia* over sparse *Triodia basedowii* in clay-loam soils (Plate 26). The upper storey comprised of *Casuarina pauper.* The mid-storey taxa included *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Eremophila miniata, Exocarpos aphyllus, Dodonaea viscosa* subsp. *angustissima* and *Santalum spicatum.* The understorey taxa included *Olearia subspicata, Frankenia setosa, Ptilotus obovatus, Maireana triptera, Maireana georgei* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 26.

Table 26: Vegetation assemblage for Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp*. filifolia* over sparse *Triodia basedowii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree >5m	10-30%	*Casuarina pauper*
Shrub 1-1.5m	30-70%	*Eremophila scoparia* *Senna artemisioides* subsp. *filifolia*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Casuarina Forests and Woodlands vegetation group (DoE, 2014b).

Plate 26: Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp*. filifolia* over sparse *Triodia basedowii* in clay-loam soils

4.24 Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils

4.24.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 20 Genera and 23 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.24.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils (Plate 26). The upper storey comprised of *Casuarina pauper.* The mid-storey taxa included *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Eremophila miniata, Exocarpos aphyllus, Dodonaea viscosa* subsp. *angustissima* and *Santalum spicatum.* The understorey taxa included *Olearia subspicata, Frankenia setosa, Ptilotus obovatus, Maireana triptera, Maireana georgei* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown inTable 27.

Table 27: Vegetation assemblage for Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree >5m	10-30%	*Casuarina pauper*
Shrub 1-1.5m	30-70%	*Eremophila scoparia*
Shrub 0.5-1m	10-30%	*Scaevola spinescens*
Shrub <0.5m	10-30%	*Olearia muelleri*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Casuarina Forests and Woodlands vegetation group (DoE, 2014b).

Plate 27: Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils

CLAY-LOAM PLAINS: CHENOPOD SHRUBLANDS, SAMPHIRE SHRUBLANDS AND FORBLANDS

4.25 Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils

4.25.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 6 Genera and 13 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.25.2 Vegetation

The flora recorded in this vegetation community was representative of Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils (Plate 28). The upper storey comprised of *Acacia ayersiana* and *Acacia caesaneura*. The mid-storey taxa included *Acacia kalgoorliensis, Hakea preissii, Atriplex bunburyana, Maireana sedifolia* and *Maireana pyramidata.* The understorey taxa included *Maireana appressa, Maireana atkinsiana, Maireana tomentosa, Maireana trichoptera, Maireana triptera, Sclerolaena diacantha* and *Sclerolaena eriacantha.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 28.

Table 28: Vegetation assemblage for Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	2-10%	*Acacia caesaneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia kalgoorliensis* *Hakea preissii*
Shrub 1-1.5m	30-70%	*Atriplex bunburyana* *Maireana pyramidata* *Maireana sedifolia*
Shrub <0.5m	30-70%	*Maireana georgei* *Maireana triptera*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Chenopod Shrublands, Samphire Shrublands and Forblands vegetation group (DoE, 2014b).

Plate 28: Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils

CLAY-LOAM PLAINS: EUCALYPT WOODLANDS

4.26 Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils

4.26.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 9 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.26.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils (Plate 29). The taxa in the upper storey comprised of *Eucalyptus salubris.* The mid-storey taxa included *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Acacia tetragonophylla, Scaevola spinescens* and *Acacia kempeana.* The understorey taxa included *Ptilotus obovatus, Triodia basedowii, Maireana triptera, Sclerolaena diacantha, Maireana georgei* and *Atriplex vesicaria.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 29.

Table 29: Vegetation assemblage for Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees 5-15m	10-30%	*Eucalyptus salubris*
Shrub 1.5-2m	10-30%	*Eremophila scoparia*
Shrub <0.5m	10-30%	*Atriplex vesicaria* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalyptus Woodlands vegetation group (DoE, 2014b).

Plate 29: Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils

CLAY-LOAM PLAINS: MALLEE WOODLANDS AND SHRUBLANDS

4.27 Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils

4.27.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 13 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.27.2 Vegetation

The flora recorded in this vegetation community was representative of Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils (Plate 30)*.* The upper storey comprised of *Eucalyptus oleosa.* The mid-storey taxa included *Senna artemisioides* subsp. *filifolia, Dodonaea lobulata, Scaevola spinescens, Alyxia buxifolia* and *Acacia pachyacra.* The understorey taxa included *Triodia basedowii, Olearia muelleri, Westringia rigida, Ptilotus obovatus* and *Austrostipa elegantissima.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 30.

Table 30: Vegetation assemblage for Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	10-30%	*Eucalyptus oleosa* subsp. *oleosa*
Shrub 1-1.5m	30-70%	*Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	10-30%	*Olearia muelleri*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 30: Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp*. filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils

4.28 Very Open Shrub Mallee of *Eucalyptus youngiana* with occasional *E. gongylocarpa* over moderately dense scrub of *Acacia desertorum* var. *desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils

4.28.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 13 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.28.2 Vegetation

The flora recorded in this vegetation community was representative of Very Open Shrub Mallee of *Eucalyptus youngiana* over moderately dense scrub of *Acacia desertorum* var*. desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils (Plate 31). The upper storey taxa included *Eucalyptus youngiana, E. gongylocarpa, Allocasuarina campestris* and *Callitris preissii.* The mid-storey taxa included *Acacia desertorum* var*. desertorum, Leptospermum roei, Grevillea juncifolia* subsp. *juncifolia, Hakea francisiana* and *Exocarpos aphyllus.* The understorey taxa included *Triodia desertorum, Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Aluta maisonneuvei* subsp. *auriculata, Leptosema chambersii* and *Persoonia coriacea.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 31.

Table 31: Vegetation assemblage for Very Open Shrub Mallee of *Eucalyptus youngiana* over moderately dense scrub of *Acacia desertorum* var*. desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	<10%	*Eucalyptus youngiana*
Shrub 1-1.5m	30-70%	*Callitris preissii*
Shrub 0.5-1m	30-70%	*Acacia desertorum* var*. desertorum* *Leptospermum roei*
Shrub <0.5m	30-70%	*Aluta maisonneuvei* subsp. *auriculata*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 31: Very Open Shrub Mallee of *Eucalyptus youngiana* over moderately dense scrub of *Acacia desertorum* var*. desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils

4.29 Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils

4.29.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 8 Genera and 10 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.29.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils (Plate 31). The upper storey taxa included *Eucalyptus concinna, E. gracilis* and *Acacia caesaneura.* The mid-storey taxa included *Eremophila scoparia, Senna artemisioides* subsp. *filifolia* and *A. incurvaneura.* The understorey taxa included *Scaevola spinescens, Ptilotus obovatus* and *Olearia muelleri.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 32.

Table 32: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus concinna*
Tree <5m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	10-30%	*Eremophila scoparia*
Shrub 0.5-1m	10-30%	*Scaevola spinescens*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 32: Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils

4.30 Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils

4.30.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 13 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.30.2 Vegetation

The flora recorded in this vegetation community was representative of Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils (Plate 33). The taxa in the upper storey included *Eucalyptus oleosa* subsp. *oleosa* and *Casuarina pauper.* The mid-storey taxa included *Eremophila scoparia*, *Exocarpos aphyllus, Eremophila oldfieldii.* subsp. *oldfieldii, Acacia tetragonophylla, Alyxia buxifolia* and *A. colletioides.* The understorey taxa included *Scaevola spinescens, Olearia muelleri, Ptilotus obovatus, Westringia rigida, Acacia hemiteles and Triodia desertorum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 33.

Table 33: Vegetation assemblage for Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	10-30%	*Eucalyptus oleosa* subsp. *oleosa*
Shrub 1-1.5m	30-70%	*Eremophila scoparia*
Shrub 0.5-1m	10-30%	*Scaevola spinescens*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 33: Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils

CLAY-LOAM PLAINS: REGROWTH, MODIFIED NATIVE VEGETATION

4.31 Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils

4.31.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 11 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.31.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils (Plate 34). The taxa in the upper storey included *Acacia caesaneura, Acacia incurvaneura, Acacia aptaneura* and *Grevillea berryana.* The mid-storey has been burnt out by fire. The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Spartothamnella teucriiflora* and *Maireana georgei*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 34.

Table 34: Vegetation assemblage for Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia caesaneura* *Acacia incurvaneura* *Acacia aptaneura*
Shrub <0.5m	10-30%	*Ptilotus obovatus* *Solanum lasiophyllum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 34: Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils

4.32 Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils

4.32.1 Flora

The flora recorded within this vegetation community was represented by a total of 16 Families, 23 Genera and 35 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.32.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils (Plate 35). The taxa in the upper storey included sterile Mallee Eucalypts, *Eucalyptus gongylocarpa* and *E. youngiana*. The mid-storey taxa included sterile *Acacia* spp., *Halgania cyanea* var. Allambi Stn (B.W. Strong 676), *Eremophila glabra* and *Hakea francisiana.* The understorey taxa included *Solanum plicatile*, *Velia hispidula, Disphyma kalpari, Swainsona colutoides, Brunonia australis, Ptilotus polystachyus,* and *Ptilotus nobilis.* Majority of the understorey species were annuals. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 35.

Table 35: Vegetation assemblage for Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	30-70%	*Eucalyptus* sp. (sterile)
Shrub 1-1.5m	10-30%	*Acacia* sp. (sterile)
Shrub <0.5m	30-70%	*Solanum plicatile* *Velleia hispida (A)*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 35: Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils

4.33 Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils

4.33.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 7 Genera and 11 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.33.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils (Plate 36). The taxa in the upper storey included *Eucalyptus gongylocarpa, E. leptopoda* subsp. *elevata* and *E. youngiana*. The mid-storey taxa included *Acacia caesaneura, A. kempeana, A. assimilis, Hakea francisiana, Grevillea* sp. (sterile), *Callitris preissii* and *Eremophila platythamnos* subsp. *platythamnos.* The understorey taxa included *Keraudrenia velutina* and *Leptosema chambersii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in
Table 36.

Table 36: Vegetation assemblage for Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	<10%	*Eucalyptus gongylocarpa*
Shrub 1.5-2m	30-70%	*Acacia caesaneura* *Acacia kempeana*
Shrub <0.5m	30-70%	*Keraudrenia velutina*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 36: Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils

CLOSED DEPRESSION: ACACIA SHRUBLANDS

4.34 Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia* sp. (Sterile) in clay drainage depression

4.34.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 13 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.34.2 Vegetation

The flora recorded in this vegetation community was representative of Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia sp.* (sterile) in clay drainage depression (Plate 37). The taxa in the upper storey included *Acacia rigens* and *Eremophila miniata*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima, Cratystylis subspinescens* and *Jacksonia arida.* The understorey taxa included *Frankenia setosa*, *Aristida holathera, Austrostipa elegantissima, Tecticornia sp.* (Sterile) and *Tecticornia disarticulata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 37.

Table 37: Vegetation assemblage for Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia* sp. (Sterile) in clay drainage depression within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	2-10%	*Acacia rigens*
Shrub 1.5-2m	2-10%	*Eremophila miniata*
Shrub 1-1.5m	2-10%	*Cratystylis subspinescens*
Shrub 0.5-1m	70-100%	*Frankenia setosa* *Tecticornia* sp. *(*Sterile)

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Shrublands vegetation group (DoE, 2014b).

Plate 37: Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia* sp. (Sterile) in clay drainage depression

4.35 Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia* sp. (Sterile) in clay drainage depression

4.35.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 14 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.35.2 Vegetation

The flora recorded in this vegetation community was representative of Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia* sp. (Sterile) in clay drainage depression (Plate 38). The taxa in the upper storey included *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila scoparia* and *Eremophila miniata*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima, Cratystylis subspinescens* and *Jacksonia arida.* The understorey taxa included *Frankenia setosa*, *Aristida holathera, Austrostipa elegantissima, Maireana amoena, Tecticornia sp.* (Sterile) and *Tecticornia disarticulata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 38.

Table 38: Vegetation assemblage for Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia* sp. (Sterile) in clay drainage depression within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	2-10%	*Acacia rigens* *Acacia ramulosa* var. *ramulosa*
Shrub 1.5-2m	2-10%	*Eremophila miniata* *Eremophila scoparia*
Shrub 1-1.5m	2-10%	*Cratystylis subspinescens*
Shrub 0.5-1m	70-100%	*Frankenia setosa* *Maireana amoena* *Tecticornia* sp. (Sterile)

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Shrublands vegetation group (DoE, 2014b).

Plate 38: Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia* sp. (Sterile) in clay drainage depression

4.36 Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression

4.36.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 15 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.36.2 Vegetation

The flora recorded in this vegetation community was representative of Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression (8). The taxa in the upper storey included *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima, Cratystylis subspinescens* and *Jacksonia arida.* The understorey taxa included *Frankenia setosa*, *Aristida holathera, Austrostipa elegantissima, Olearia subspicata, Triodia basedowii* and *Tecticornia disarticulata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 39.

Table 39: Vegetation assemblage for Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	2-10%	*Acacia rigens* *Acacia ramulosa* var. *ramulosa*
Shrub 1.5-2m	2-10%	*Eremophila miniata* *Eremophila scoparia*
Shrub 1-1.5m	2-10%	*Cratystylis subspinescens*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Shrublands vegetation group (DoE, 2014b).

Plate 39: Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression

CLOSED DEPRESSION: ACACIA FORESTS AND WOODLANDS

4.37 Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge

4.37.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 14 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa were identified within this vegetation community; *Melaleuca apostiba* (P3). No introduced taxa were recorded in this vegetation community.

4.37.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge (Plate 40). The taxa in the upper storey included *Acacia caesaneura* and *Eremophila miniata*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima, Cratystylis subspinescens, Acacia colletioides* and *Melaleuca apostiba* (P3). The understorey taxa included *Mirbelia rhagodioides, Aristida holathera and Austrostipa elegantissima.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 40.

Table 40: Vegetation assemblage for Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Acacia caesaneura*
Shrub >2m	30-70%	*Melaleuca apostiba* (P3)
Bunch Grass <0.5m	10-30%	*Aristida holathera (A)*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 40: Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge

CLOSED DEPRESSION: OTHER SHRUBLANDS

4.38 Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression

4.38.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 15 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa were identified within this vegetation community *Melaleuca apostiba* (P3). No introduced taxa were recorded in this vegetation community.

4.38.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression (Plate 41). The taxa in the upper storey comprised of *Dodonaea viscosa* subsp. *angustissima.* The mid-storey taxa comprised of *Cratystylis subspinescens*. The understorey taxa included *Atriplex vesicaria, Maireana platycarpa* ,*Disphyma crassifolium, Maireana glomerifolia* and *Frankenia setosa.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 41.

Table 41: Vegetation assemblage for Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub 1-1.5m	2-10%	*Dodonaea viscosa* subsp. *angustissima*
Shrub 0.5-1m	2-10%	*Cratystylis subspinescens*
Shrub <0.5m	30-70%	*Atriplex vesicaria* *Frankenia setosa* *Maireana platycarpa*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Other Shrublands vegetation group (DoE, 2014b).

Plate 41: Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression

DUNES: EUCALYPT WOODLANDS

4.39 Open Low Woodland of *E. gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune

4.39.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 10 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.39.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *E. gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune (Plate 42). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *Eucalyptus youngiana*. The mid-storey taxa included *Callitris columellaris, Grevillea juncifolia* and *Allocasuarina corniculata.* The understorey taxa included *Triodia basedowii, Lomandra leucocephala* subsp. *robusta*, *Lepidobolus deserti* and *Persoonia coriacea.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 42.

Table 42: Vegetation assemblage for Open Low Woodland of *E. gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Eucalyptus gongylocarpa*
Mallee Tree Form	2-10%	*Eucalyptus youngiana*
Shrub 1.5-2m	10-30%	*Allocasuarina corniculata* *Allocasuarina spinosissima* *Callitris columellaris*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the *Eucalypt* Woodlands vegetation group (DoE, 2014b).

Plate 42: Open Low Woodland of *E. gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune

4.40 Occasional *Eucalyptus gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/ Thryptomene seriata/ Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune

4.40.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 11 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.40.2 Vegetation

The flora recorded in this vegetation community was representative of Occasional *Eucalyptus gongylocarpa* over *Callitris columellaris/ Grevillea juncifolia* over *Acacia ligulata/ Thryptomene seriata/ Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune (Plate 43). The taxa in the upper storey included *Eucalyptus gongylocarpa, Callitris columellaris* and *Grevillea juncifolia*. The mid-storey taxa included *Acacia ligulata, Thryptomene seriata,* and *Anthotroche pannosa.* The understorey taxa included *Triodia basedowii and Triodia desertorum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 43.

Table 43: Vegetation assemblage for Occasional *Eucalyptus gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/ Thryptomene seriata/ Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Eucalyptus gongylocarpa*
Shrub >2m	10-30%	*Callitris columellaris* *Grevillea juncifolia*
Shrub 1.5-2m	10-30%	*Acacia ligulata*
Shrub 1-1.5m	10-30%	*Anthotroche pannosa* *Thryptomene seriata*
Hummock Grass	70-100%	*Triodia desertorum* *Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the *Eucalypt* Woodlands vegetation group (DoE, 2014b).

Plate 43: Occasional *Eucalyptus gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/ Thryptomene seriata/ Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune

DUNES: OTHER SHRUBLANDS

4.41 Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune

4.41.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 19 Genera and 26 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.41.2 Vegetation

The flora recorded in this vegetation community was representative of Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune (Plate **44:** Plate 44). The taxon in the upper storey was comprised of *Casuarina pauper*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima*, *Acacia incurvaneura, Acacia tetragonophylla, Scaevola spinescens* and *Acacia burkittii.* The understorey taxa included *Aristida holathera*, *Triodia basedowii, Podolepis capillaris and Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 44.

Table 44: Vegetation assemblage for Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	10-30%	*Casuarina pauper*
Shrub 1.5-2m	30-70%	*Dodonaea viscosa* subsp. *angustissima*
Bunch Grass <0.5m	30-70%	*Aristida holathera (A)*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Other Shrublands vegetation group (DoE, 2014b).

Plate 44: Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune

DUNES: MALLEE WOODLANDS AND SHRUBLANDS

4.42 Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune

4.42.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 10 Genera and 10 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.42.2 Vegetation

The flora recorded in this vegetation community was representative of Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune (Plate 45). The taxa in the upper storey comprised of *Eucalyptus youngiana* and *Callitris preissii*. The mid-storey taxa included *and Thryptomene biseriata, Daviesia grahamii* and *Grevillea juncifolia.* The understorey taxa included *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 45.

Table 45: Vegetation assemblage for Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Eucalyptus youngiana*
Tree <5m	2-10%	*Callitris preissii*
Shrub 1-1.5m	10-30%	*Thryptomene biseriata*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 45: Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune

ROCKY HILL SLOPE: ACACIA FORESTS AND WOODLANDS

4.43 Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma, Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope

4.43.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 28 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950,* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.43.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope (Plate 46). The taxa in the upper storey included *Acacia caesaneura, Acacia burkittii, Acacia ayersiana* and *Casuarina pauper*. The mid-storey taxa included *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Santalum lanceolatum* and *Scaevola spinescens.* The understorey taxa include *Ptilotus obovatus, Solanum lasiophyllum, Sclerolaena densiflora* and *Atriplex bunburyana.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 46.

Table 46: Vegetation assemblage for Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree < 5m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	30-70%	*Maireana sedifolia* *Senna artemisioides* subsp. x *artemisioides* *Senna cardiosperma*
Shrub <0.5m	30-70%	*Atriplex bunburyana* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 46: Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope

4.44 Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia*, *Senna artemisioides* subsp. x *artemisioides*, *Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope

4.44.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 10 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.44.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia*, *Senna artemisioides* subsp. x *artemisioides*, *Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope (Plate 47). The taxa in the upper storey included *Acacia caesaneura, Acacia burkittii, Acacia ayersiana* and *Casuarina pauper*. The mid-storey taxa included *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Santalum lanceolatum* and *Scaevola spinescens.* The understorey taxa include *Ptilotus obovatus, Solanum lasiophyllum, Sclerolaena densiflora* and *Atriplex bunburyana.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 47.

Table 47: Vegetation assemblage for Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia*, *Senna artemisioides* subsp. x *artemisioides*, *Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree < 5m	10-30%	*Acacia burkittii*
Shrub 1-1.5m	30-70%	*Maireana sedifolia* *Senna cardiosperma* *Senna artemisioides* subsp. x *artemisioides*
Shrub <0.5m	30-70%	*Atriplex bunburyana* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 47: Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia*, *Senna artemisioides* subsp. x *artemisioides*, *Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope

4.45 Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise

4.45.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 27 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.45.2 Vegetation

The flora recorded in this vegetation community was Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise (Plate 48). The taxa in the upper storey included *Acacia incurvaneura, Acacia ramulosa, Grevillea berryana* and *Santalum spicatum.* The mid-storey taxa included *Eremophila pantonii, Senna artemisioides* subsp. *filifolia, Eremophila alternifolia* and *Dodonaea lobulata.* The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Sida calyxhymenia, Sclerolaena diacantha, Rhagodia eremaea* and *Maireana georgei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 48.

Table 48: Vegetation Assemblage of Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia incurvaneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	10-30%	*Acacia tetragonophylla* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	70-100%	*Eremophila pantonii* *Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 48: Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise

4.46 Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise

4.46.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 15 Genera and 30 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.46.2 Vegetation

The flora recorded in this vegetation community was Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise (Plate 49). The taxa in the upper storey included *Acacia incurvaneura, Acacia ramulosa, Grevillea berryana* and *Santalum spicatum.* The mid-storey taxa included *Senna artemisioides* subsp. *filifolia, Eremophila alternifolia* and *Dodonaea lobulata.* The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Sida calyxhymenia, Sclerolaena diacantha, Rhagodia eremaea* and *Maireana georgei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 49.

Table 49: Vegetation assemblage of Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia incurvaneura* *Acacia ayersiana*
Shrub >2m	2-10%	*Acacia ramulosa* var. *ramulosa*
Shrub 1-1.5m	10-30%	*Acacia tetragonophylla* *Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	10-30%	*Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 49: Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise

4.47 Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise

4.47.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 14 Genera and 29 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.47.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise (Plate 50). The taxa in the upper storey included *Acacia incurvaneura, Acacia ayersiana, Acacia caesaneura, Eremophila oldfieldii* subsp*. angustifolia* and *Santalum spicatum*. The taxa in the mid-storey included *Scaevola spinescens, Senna artemisioides* subsp. x *artemisioides, Dodonaea lobulata* and *Eremophila clarkei.* The understorey taxa included *Ptilotus obovatus, Solanum lasiophyllum, Sclerolaena diacantha* and *Maireana triptera.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 50.

Table 50: Vegetation assemblage for Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	30-70%	*Acacia ayersiana* *Acacia caesaneura* *Acacia incurvaneura*
Shrub 1-1.5m	2-10%	*Acacia tetragonophylla* *Scaevola spinescens*
Shrub 0-0.5m	30-70%	*Ptilotus obovatus*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 50: Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise

4.48 Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise

4.48.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 19 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.48.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise (Plate 51). The upper storey comprised of *Acacia incurvaneura, Eucalyptus leptopoda subsp. elevata* and *Eucalyptus kingsmillii.* The mid-storey taxa included *Aluta maisonneuvei* subsp. *auriculata, Acacia cuthbertsonii, Eremophila latrobei* subsp*. glabra* and *Melaleuca hamata.* The understorey taxa included *Triodia basedowii, Ptilotus obovatus,* and *Olearia subspicata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 51.

Table 51: Vegetation assemblage for Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia incurvaneura*
Shrub 0.5-1m	10-30%	*Aluta maisonneuvei* subsp. *auriculata*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 51: Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise

4.49 Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles

4.49.1 Flora

The flora recorded within this vegetation community was represented by a total of 21 Families, 31 Genera and 57 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.49.2 Vegetation

The flora recorded in this vegetation community was representative of Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles (Plate 52). The upper storey comprised of *Acacia ayersiana, Acacia caesaneura, Acacia aptaneura* and *Acacia caesaneura.* The mid-storey taxa included *Eremophila margarethae, Acacia tetragonophylla, Dodonaea rigida, Eremophila granitica* and *Eremophila latrobei* subsp. *latrobei.* The understorey taxa included *Brachyscome ciliaris, Brachyscome ciliocarpa, Olearia pimelioides, Austrostipa elegantissima, Eragrostis eriopoda, Erodium cygnorum, Surreya diandra* and *Wahlenbergia gracilenta.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 52.

Table 52: Vegetation assemblage for Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia ayersiana* *Acacia caesaneura*
Shrub 1.5-2m	2-10%	*Acacia tetragonophylla* *Eremophila margarethae*
Herbaceous spp.	10-30%	*Brachyscome ciliaris (A)* *Brachyscome ciliocarpa (A)*
Bunch Grass <0.5m	10-30%	*Austrostipa elegantissima* *Eragrostis eriopoda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 52: Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over *Poaceae* and *Asteraceae* spp. in clay with quartz and ironstone pebbles

ROCKY HILLSOPE: CASUARINA FORESTS AND WOODLANDS

4.50 Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise

4.50.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 9 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.50.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise (Plate 53). The taxa in the upper storey included *Casuarina pauper, Acacia ayersiana, Acacia oswaldii* and *Acacia incurvaneura*. The mid-storey taxa included *Eremophila pantonii.* The understorey taxa included *Maireana sedifolia, Sclerolaena densiflora, Frankenia setosa, Ptilotus obovatus* and *Acacia burkittii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 53.

Table 53: Vegetation assemblage for Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Casuarina pauper*
Shrub 1-1.5m	2-10%	*Eremophila pantonii*
Shrub 0.5-1m	30-70%	*Maireana pyramidata* *Maireana sedifolia*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the *Casuarina* Forests and Woodlands vegetation group (DoE, 2014b).

Plate 53: Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise

INTERDUNE SWALES AND SANDPLAINS: ACACIA FORESTS AND WOODLANDS

4.51 Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils

4.51.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 11 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.51.2 Vegetation

The flora recorded in this vegetation community was representative of the Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Plate 54). The taxa in the upper storey included *Acacia caesaneura, Brachychiton gregorii, Eremophila oldfieldii* subsp. *angustifolia* and *Santalum spicatum.* The mid-storey taxa included *Acacia ramulosa, Allocasuarina helmsii, Alyxia buxifolia, Dodonaea lobulata* and *Eremophila latrobei* subsp. *latrobei.* The understorey taxa included *Triodia basedowii* and *Prostanthera althoferi.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 54.

Table 54: Vegetation assemblage for the Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	2-10%	*Acacia caesaneura*
Shrub 1.5-2m	30-70%	*Acacia ramulosa* var. *ramulosa* *Allocasuarina helmsii*
Shrub 1-1.5m	10-30%	*Prostanthera althoferi*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 54: Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils

4.52 Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida*, *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils

4.52.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 10 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.52.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida*, *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 55). The upper storey comprised of *Acacia caesaneura, Allocasuarina helmsii, Brachychiton gregorii, Eucalyptus concinna* and *Santalum spicatum*. The mid-story taxa included *Eremophila latrobei* subsp. *latrobei, Eremophila oldfieldii* subsp. *angustifolia, Dodonaea rigida, Acacia kempeana, Acacia oswaldii, Acacia ramulosa* var. *ramulosa, Prostanthera althoferi* and *Scaevola spinescens*. The understorey taxa comprised of *Triodia basedowii*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 55.

Table 55: Vegetation assemblage for Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida*, *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	30-70%	*Dodonaea rigida* *Eremophila latrobei* subsp. *latrobei* *Scaevola spinescens*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 55: Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida*, *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils

4.53 Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils

4.53.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 14 Genera and 19 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.53.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils (Plate 56). The taxa in the upper storey included *Acacia caesaneura, Acacia incurvaneura* and *Acacia aptaneura*. The mid-storey taxa included *Acacia burkittii*, *Eremophila margarethae*, *Eremophila longifolia* and *Acacia tetragonophylla.* The understorey taxa included *Triodia basedowii, Keraudrenia velutina* and *Spartothamnella teucriiflora.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 56.

Table 56: Vegetation assemblage for Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	30-70%	*Acacia burkittii* *Eremophila margarethae*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 56: Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils

4.54 Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils

4.54.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 8 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.54.2 Vegetation

The flora recorded in this vegetation community was representative of Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils (Plate 57). The taxa in the upper storey included *Acacia ayersiana*, *Acacia incurvaneura* and *Eucalyptus leptopoda* subsp. *elevata*. The mid-storey taxa included *Acacia grasbyi, Aluta maisonneuvei* subsp. *auriculata, Senna artemisioides* subsp. x *artemisioides* and *Eremophila latrobei* subsp. *glabra.* The understorey taxa included *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 57.

Table 57: Vegetation assemblage for Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	30-70%	*Acacia ayersiana* *Acacia incurvaneura*
Shrub 1.5-2m	30-70%	*Acacia grasbyi* *Aluta maisonneuvei* subsp. *auriculata*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 57: Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils

4.55 Open Low Woodland to Woodland of *Acacia caesaneura, Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum*, *Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils

4.55.1 Flora

The flora recorded within this vegetation community was represented by a total of 20 Families, 35 Genera and 67 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.55.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland to Woodland of *Acacia caesaneura, Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils (Plate 58). The upper storey comprised of *Acacia caesaneura, Acacia ayersiana* and *Acacia caesaneura.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila falcata, Eremophila granitica* and *Eremophila oldfieldii* subsp. *angustifolia.* The understorey taxa included *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus, Eragrostis eriopoda, Olearia pimelioides* and *Sclerolaena eriacantha*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 58.

Table 58: Vegetation assemblage for Open Low Woodland to Woodland of *Acacia caesaneura, Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Acacia ayersiana* *Acacia caesaneura* *Acacia caesaneura*
Shrub 1.5-2m	10-30%	*Acacia ramulosa* var. *ramulosa* *Acacia tetragonophylla*
Shrub 1-1.5m	10-30%	*Eremophila latrobei* subsp. *latrobei*
Shrub <0.5m	10-30%	*Maireana triptera* *Ptilotus obovatus* *Solanum lasiophyllum*
Bunch Grass <0.5m	10-30%	*Eragrostis eriopoda*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Acacia Forests and Woodlands vegetation group (DoE, 2014b).

Plate 58: Open Low Woodland to Woodland of *Acacia caesaneura, Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils

INTERDUNE SWALES AND SANDPLAINS: EUCALPYT WOODLANDS

4.56 Low Woodland of *Eucalyptus gongylocarpa* with occasional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils

4.56.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 16 Genera and 23 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. Two Priority Flora taxa were identified within this vegetation community: *Dicrastylis cundeeleensis* (P4) and *Labichea eremaea* (P3). No introduced taxa were recorded in this vegetation community.

4.56.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Eucalyptus gongylocarpa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils (Plate 59). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *Eucalyptus youngiana*. The mid-storey taxa included *Callitris columellaris, Hakea francisiana* and *Acacia desertorum* var. *desertorum.* The understorey taxa included *Triodia basedowii, Westringia cephalantha, Melaleuca leiocarpa, Eremophila platythamnos* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 59.

Table 59: Vegetation assemblage for Low Woodland of *Eucalyptus gongylocarpa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Shrub 1.5-2m	10-30%	*Callitris columellaris* *Hakea francisiana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalyptus Woodlands vegetation group (DoE, 2014b).

Plate 59: Low Woodland of *Eucalyptus gongylocarpa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils

4.57 Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils

4.57.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 17 Genera and 25 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.57.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils (Plate 60). The taxa in the upper storey included *Casuarina pauper, Acacia caesaneura* and *Acacia incurvaneura*. The mid-storey taxa included *Eremophila scoparia*, *Senna artemisioides* subsp. *filifolia, Scaevola spinescens*, *Ptilotus obovatus* and *Eremophila glabra.* The understorey taxa included *Triodia basedowii, Olearia muelleri, Ptilotus obovatus, Maireana sedifolia, Solanum orbiculatum* and *Atriplex stipitata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 60.

Table 60: Vegetation assemblage for Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus lesouefii*
Shrub 1-1.5m	10-30%	*Eremophila scoparia* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	10-30%	*Olearia muelleri*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalyptus Woodlands vegetation group (DoE, 2014b).

Plate 60: Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils

4.58 Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti*, *Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils

4.58.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 17 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.58.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti*, *Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils (Plate 61). The taxa in the upper storey included *Eucalyptus salicola*. The mid-storey taxa included *Eremophila deserti*, *Acacia colletioides*, *Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia.* The understorey taxa included *Triodia basedowii and Maireana georgei.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 61.

Table 61: Vegetation assemblage for Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti*, *Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus salicola*
Shrub >2m	10-30%	*Eremophila deserti*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalyptus Woodlands vegetation group (DoE, 2014b).

Plate 61: Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti*, *Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils

4.59 Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils

4.59.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 13 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.59.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils (Plate 62). The taxa in the upper storey included *Eucalyptus gongylocarpa, Eucalyptus concinna, Eucalyptus youngiana and Eucalyptus oleosa* subsp*. oleosa*. The mid-storey taxa included *Hakea francisiana, Scaevola spinescens, Pittosporum angustifolium* and *Acacia ligulata.* The understorey taxa included *Triodia Basedowii* and *Halgania cyanea.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 62.

Table 62: Vegetation assemblage for Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Eucalyptus gongylocarpa*
Shrub >2m	30-70%	*Hakea francisiana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalyptus Woodlands vegetation group (DoE, 2014b).

Plate 62: Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils

4.60 Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils

4.60.1 Flora

The flora recorded within this vegetation community was represented by a total of 14 Families, 19 Genera and 21 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.60.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 65). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *E. oleosa* subsp. *oleosa.* The mid-storey taxa included *Acacia desertorum var. desertorum, A.ligulata, Callitris columellaris* and *Pittosporum angustifolium.* The understorey taxa included *Dicrastylis brunnea, Goodenia xanthosperma, Lomandra leucocephala* subsp. *robusta, Triodia basedowii* and *Westringia rigida.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 65.

Table 63: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Shrub >2m	10-30%	*Callitris columellaris*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands vegetation group (DoE, 2014b).

Plate 63: Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils

4.61 Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils

4.61.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.61.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 64). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *Acacia caesaneura.* The mid-storey taxa included *Allocasuarina helmsii, Acacia abrupta, A. desertorum* var. *desertorum, A. tetragonophylla* and *Callitris columellaris.* The understorey taxa included *Scaevola spinescens, Sida calyxhymenia* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 64.

Table 64: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Shrub 1.5-2m	10-30%	*Acacia abrupta* *Callitris columellaris*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands vegetation group (DoE, 2014b).

Plate 64: Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils

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4.62 Low Woodland *of E. gongylocarpa* over moderately dense mallee *of E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils

4.62.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 15 Genera and 21 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxon was identified within this vegetation community; *Dicrastylis cundeeleensis* (P4). No introduced taxa were recorded in this vegetation community.

4.62.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland *of E. gongylocarpa* over moderately dense mallee *of E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils (Plate 65). The taxa in the upper storey included *Eucalyptus gongylocarpa, Eucalyptus concinna, Hakea francisiana and Eucalyptus youngiana.* The mid-storey taxa included *Acacia ligulata, Acacia desertorum* var. *desertorum, Callitris columellaris, Westringia cephalantha, Melaleuca hamata, Phebalium canaliculatum, Eremophila platythamnos and Senna artemisioides* subsp. x *artemisioides.* The understorey taxa included *Triodia basedowii* and *Solanum orbiculatum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 65.

Table 65: Vegetation assemblage for Low Woodland *of E. gongylocarpa* over moderately dense mallee *of E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Shrub Form	30-70%	*Eucalyptus concinna* *Eucalyptus youngiana*
Shrub 1-1.5m	30-70%	*Acacia desertorum* var. *desertorum* *Acacia ligulata*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 65: Low Woodland *of E. gongylocarpa* over moderately dense mallee *of E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var*. desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils

4.63 Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils

4.63.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 7 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.63.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils (Plate 66). The taxa in the upper storey included *Eucalyptus gongylocarpa*, *E. youngiana*, *E. concinna* and *E. trivalvis.* The mid-storey taxa included *Hakea francisiana, Acacia ligulata, A. colletioides, A. assimilis, A. tetragonophylla* and *Senna artemisioides subsp. filifolia*. The understorey taxa included *Solanum orbiculatum, Anthotroche pannosa, Solanum orbiculatum, Aluta maisonneuvei* subsp. *auriculata* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 66.

Table 66: Vegetation assemblage for Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Shrub Form	10-30%	*Eucalyptus youngiana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 66: Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils

4.64 Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii*, *A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam

4.64.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 13 Genera and 20 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.64.2 Vegetation

The flora recorded in this vegetation community was representative of Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii*, *A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam (Plate 67). The taxa in the upper storey included *Eucalyptus concinna*, *E. hypolaena, Acacia caesaneura, Grevillea nematophylla* and *Casuarina pauper*. The mid-storey taxa included *Acacia burkittii, Senna artemisioides* subsp. *filifolia, Dodonaea viscosa* subsp. *angustissima* and *Eremophila pantonii.* The understorey taxa included *Triodia basedowii, Scaevola spinescens, Maireana sedifolia and Olearia muelleri.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 67.

Table 67: Vegetation assemblage for Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii*, *A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus hypolaena*
Mallee Shrub Form	10-30%	*Eucalyptus concinna*
Shrub >2m	30-70%	*Acacia burkittii*
Shrub 1.5-2m	30-70%	*Acacia ligulata* *Senna artemisioides* subsp. *filifolia*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 67: Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii*, *A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam

4.65 Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils

4.65.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 9 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.65.2 Vegetation

The flora recorded in this vegetation community was representative Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils (Plate 68). The taxa in the upper storey included *Eucalyptus salicola*, *Eucalyptus hypolaena, Eucalyptus gongylocarpa* and *Acacia caesaneura*. The mid-storey taxa included *Daviesia benthamii, Beyeria brevifolia, Acacia colletioides, Acacia assimilis, Eremophila fallax* and *Eremophila scoparia.* The understorey taxa included *Triodia desertorum, Westringia cephalantha, and Scaevola spinescens.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 68.

Table 68: Vegetation assemblage for Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus salicola*
Shrub 1-1.5m	30-70%	*Daviesia benthamii* *Eremophila scoparia* *Beyeria brevifolia*
Hummock Grass	70-100%	*Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 68: Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils

4.66 Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils

4.66.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 13 Genera and 19 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxon was identified within this vegetation community; *Olearia arida* (P4). No introduced taxa were recorded in this vegetation community.

4.66.2 Vegetation

The flora recorded in this vegetation community was representative Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 69). The taxa in the upper storey comprised of *Eucalyptus gongylocarpa*. The mid-storey taxa included *E. concinna, Callitris pressii, Hakea fransciana, Acacia assimilis, Grevillea nematophylla* subsp. *nematophylla* and *Eremophila platythamnos* subsp. *platythamnos.* The understorey taxa included *Acacia helmsiana, A. ligulata, Westringia rigida* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 69.

Table 69: Vegetation assemblage for Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree <5m	10-30%	*Eucalyptus concinna*
Shrub 0.5-1m	30-70%	*Acacia helmsiana*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 69: Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils

4.67 Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils

4.67.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 14 Genera and 23 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.67.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils (Plate 70). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *E. commitae-vallis*. The mid-storey taxa included *Acacia desertorum* var. *desertorum, A. colletioides, Beyeria sulcata* var. *sulcata, Callitris columellaris* and *Scaevola spinescens.* The understorey taxa included *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Goodenia xanthosperma, Keraudrenia velutina, Aluta maisonneuvei* subsp*. auriculata* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 70.

Table 70: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree <5m	10-30%	*Eucalyptus commitae-vallis*
Shrub >2m	10-30%	*Callitris columellaris*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 70: Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils

4.68 Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils

4.68.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 8 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.68.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils (Plate 71). The taxa in the upper storey comprised of *Eucalyptus gonglyocarpa*. The mid-storey taxa included *Acacia desertorum* var. *desertorum, A. assimilis, E. concinna, E. horistes, Grevillea juncifolia* subsp. *juncifolia* and *Hakea fransciana.* The understorey taxa included *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Chrysitrix distigmatosa, Leptosema chambersii* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 71.

Table 71: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree <5m	10-30%	*Eucalyptus concinna* *Eucalyptus horistes*
Shrub <0.5m	30-70%	*Leptosema chambersii*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 71: Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils

4.69 Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp*. elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils

4.69.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 9 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.69.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp*. elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils (Plate 72). The taxa in the upper storey included *Eucalyptus gongylocarpa* and *Callitris preissii.* The mid-storey taxa included *E. leptopoda* subsp. *elevata, A. assimilis, A. helmsiana, Allocasuarina campestris, Grevillea juncifolia* subsp. *juncifolia* and *Hakea fransciana.* The understorey taxa included *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Leptosema chambersii* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 72.

Table 72: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp*. elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree <5m	10-30%	*Eucalyptus leptopoda* subsp. *elevata*
Shrub <0.5m	30-70%	*Leptosema chambersii*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 72: Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp. *elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils

4.70 Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils

4.70.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 9 Genera and 12 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.70.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils (Plate 73). The taxa in the upper storey comprised of *Eucalyptus gongylocarpa*. The mid-storey taxa included *Banksia elderiana, Callitris columellaris, E. concinna* and *E. youngiana.* The understorey taxa included *Aluta maisoneuvi* subsp. *auriculata, Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Keraudrenia velutina, Pityorida loricata* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 73.

Table 73: Vegetation assemblage for Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	10-30%	*Eucalyptus gongylocarpa*
Mallee Tree <5m	10-30%	*Eucalyptus concinna* *Eucalyptus youngiana*
Shrub 0.5-1m	30-70%	*Baeckea* sp. Great Victoria Desert (A.S. Weston 14813)
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Woodlands/Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 73: Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils

INTERDUNE SWALES AND SANDPLAINS: EUCALYPT OPEN WOODLANDS/MALLEE WOODLANDS AND SHRUBLANDS

4.71 Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var*. desertorum* over dense *Triodia basedowii* in sandy soils

4.71.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 16 Genera and 29 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.71.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var*. desertorum* over dense *Triodia basedowii* in sandy soils (Plate 74). The taxa in the upper storey included *Eucalyptus youngiana, Eucalyptus gongylocarpa, Eucalyptus concinna* and *Callitris columellaris.* The mid-storey taxa included *Acacia desertorum* var*. desertorum, Acacia assimilis, Acacia ligulata, Acacia hemiteles* and *Eremophila glabra.* The understorey taxa included *Triodia basedowii, Westringia rigida,* and *Westringia cephalantha.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 74.

Table 74: Vegetation assemblage for Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var*. desertorum* over dense *Triodia basedowii* in sandy soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Eucalyptus gongylocarpa*
Mallee Shrub Form	10-30%	*Eucalyptus youngiana*
Shrub 1.5-2m	30-70%	*Acacia assimilis* *Acacia desertorum* var*. desertorum*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Open Woodlands/ Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 74: Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var*. desertorum* over dense *Triodia basedowii* in sandy soils

4.72 Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils

4.72.1 Flora

The flora recorded within this vegetation community was represented by a total of 14 Families, 16 Genera and 28 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa were identified within this vegetation community; *Dicrastylis cundeeleensis* (P4). No introduced taxa were recorded in this vegetation community.

4.72.2 Vegetation

The flora recorded in this vegetation community was representative of Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils (Plate 75). The taxa in the upper storey included *Eucalyptus youngiana, Eucalyptus gongylocarpa, Eucalyptus concinna* and *Callitris preissii*. The mid-storey taxa included *Dodonaea viscosa* subsp. *angustissima, Grevillea juncifolia, Acacia jamesiana, Acacia prainii* and *Aluta maisonneuvei* subsp. *auriculata.* The understorey taxa included *Triodia basedowii* and *Triodia desertorum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 75.

Table 75: Vegetation assemblage for Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	2-10%	*Eucalyptus gongylocarpa*
Mallee Shrub Form	30-70%	*Eucalyptus concinna* *Eucalyptus youngiana*
Shrub 1-1.5m	10-30%	*Acacia jamesiana* *Acacia prainii* *Aluta maisonneuvei* subsp. *auriculata* *Dodonaea viscosa* subsp. *angustissima* *Grevillea juncifolia*
Hummock Grass	70-100%	*Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Eucalypt Open Woodlands/ Mallee Woodland and Shrublands vegetation group (DoE, 2014b).

Plate 75: Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils

INTERDUNE SWALES AND SANDPLAIN: HEATHLANDS

4.73 Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils

4.73.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 10 Genera and 11 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.73.2 Vegetation

The flora recorded in this vegetation community was representative of Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils (Plate 76). Occasional *Eucalyptus youngiana* was identified within the upper storey. The mid-storey taxa included *Acacia desertorum* var. *desertorum, Hakea francisiana, Grevillea juncifolia* subsp. *juncifolia, Melaleuca leiocarpa* and *Melaleuca hamata.* The understorey taxa included *Triodia basedowii, Leptosema chambersii,* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 76.

Table 76: Vegetation assemblage for Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub 1-1.5m	70-100%	*Acacia desertorum* var. *desertorum*
Shrub 0.5-1m	30-70%	*Melaleuca hamata* *Melaleuca leiocarpa*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Heathlands vegetation group (DoE, 2014b).

Plate 76: Dense Heath of *Acacia desertorum* var*. desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils

4.74 Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils

4.74.1 Flora

The flora recorded within this vegetation community was represented by a total of 4 Families, 6 Genera and 6 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.74.2 Vegetation

The flora recorded in this vegetation community was representative of Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils (Plate 77). The taxa in the upper storey included *Eucalyptus youngiana* and *Allocasuarina campestris*. The mid-storey taxa included *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813), *Aluta maisonneuvei* subsp. *auriculata* and *Chrysitrix distigmatosa*. The understorey taxa included *Triodia basedowii* and *Triodia desertorum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 77.

Table 77: Vegetation assemblage for Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Shrub >2m	30-70%	*Allocasuarina campestris*
Shrub 0.5-1m	10-30%	*Baeckea* sp. Great Victoria Desert (A.S. Weston 14813)
Hummock Grass	70-100%	*Triodia basedowii* *Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Heathlands vegetation group (DoE, 2014b).

Plate 77: Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils

INTERDUNE SWALES AND SANDPLAINS: REGROWTH, MODIFIED NATIVE VEGETATION

4.75 Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over dense *Triodia basedowii* in sandy-loam soils

4.75.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.75.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over dense *Triodia basedowii* in sandy-loam soils (Plate 78). The taxa in the upper storey included *Eucalyptus concinna, Eucalyptus oleosa* subsp. *oleosa, Eucalyptus youngiana* and *Allocasuarina helmsii.* The mid-storey taxa included *Scaevola spinescens, Dodonaea rigida* and *Acacia ramulosa* var. *ramulosa.* The understorey taxa included *Triodia basedowii, Solanum orbiculatum, Ptilotus obovatus, Keraudrenia velutina* and *Eremophila platythamnos.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 78.

Table 78: Vegetation assemblage for Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 78: Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over dense *Triodia basedowii* in sandy-loam soils

4.76 Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils

4.76.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.76.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils (Plate 79). The taxa in the upper storey included *Eucalyptus concinna, E. oleosa* subsp. *oleosa, E. trivalva* and *Grevillea nematophylla*. The mid-storey taxa included *Acacia hemiteles, Codonocarpus cotinifolius, Acacia murrayana, Callitris columellaris, Eremophila platythamnos* subsp. *platythamnos, Melaleuca hamata, Hakea francisiana and Westringia cephalantha.* The understorey taxa included *Solanum plicatile, Triodia basedowii,* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 79.

Table 79: Vegetation assemblage for Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	30-70%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa*
Shrub 0.5-1m	10-30%	*Acacia hemiteles* *Melaleuca hamata* *Westringia cephalantha*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 79: Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils

4.77 Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils

4.77.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.77.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 80). The taxa in the upper storey included *Eucalyptus glomerosa, E. leptopoda* subsp. *elevata* and *Callitris preissii*. The mid-storey taxa included *Acacia desertorum* var. *desertorum, Aluta maisonneuvei* subsp. *auriculata, Hakea francisiana* and *Melaleuca hamata.* The understorey taxa included *Persoonia coriacea, Keraudrenia velutina* subsp. *elliptica* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 80.

Table 80: Vegetation assemblage for Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus glomerosa*
Shrub 1-1.5m	30-70%	*Acacia desertorum* var. *desertorum* *Aluta maisonneuvei* subsp. *auriculata*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 80: Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils

4.78 Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils

4.78.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.78.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils (Plate 81). The upper storey consisted of *Eucalyptus trivalva, E. youngiana, Acacia caesaneura*, *Allocasuarina helmsii* and *Santalum spicatum*. The mid-storey taxa included *Acacia rigens*, *Scaevola spinescens*, *Acacia ramulosa* var. *ramulosa* and *Dodonaea rigida.* The understorey taxa included *Triodia basedowii*, *Sida calyxhymenia* and *Aluta maisonneuvei* subsp. *auriculata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 81.

Table 81: Vegetation assemblage for Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva* *Eucalyptus youngiana*
Shrub 1-1.5m	70-100%	*Acacia rigens* *Melaleuca leiocarpa*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 81: Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils

4.79 Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils

4.79.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 21 Genera and 24 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa were identified within this vegetation community; *Dicrastylis cundeeleensis* (P4). No introduced taxa were recorded in this vegetation community.

4.79.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils (Plate 82). The upper storey included *E. gongylocarpa, E. youngiana* and *Codonocarpos cotinifolius.* The mid-storey taxa included *Acacia desertorum* var. *desertorum, Grevilliea juncifolia* subsp. *juncifolia, Hakea fransciana* and *Xanthorrhoea thorntonii.* The understorey taxa included *Aristida holathera, Dicarstylis parvifolia, Kennedia prorepens, Leptosema chambersii, Newcastelia hexarrhena, Senna pleurocarpa* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 82.

Table 82: Vegetation assemblage for Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	10-30%	*Eucalyptus gongylocarpa*
Shrub <0.5m	30-70%	*Leptosema chambersii* *Newcastelia hexarrhena*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 82: Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils

4.80 Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils

4.80.1 Flora

The flora recorded within this vegetation community was represented by a total of 4 Families, 4 Genera and 5 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.80.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils (Plate 82). The upper storey comprised of *E. gongylocarpa.* The mid-storey taxa included *Eucalpytus glomerosa* and *Callitris columellaris.* The understorey taxa included *Lomandra leucocephala* subsp*. robusta* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 83.

Table 83: Vegetation assemblage for Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <5m	2-10%	*Eucalyptus gongylocarpa*
Mallee Shrub Form	10-30%	*Eucalpytus glomerosa*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 83: Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils

4.81 Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils

4.81.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 12 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.81.2 Vegetation

The flora recorded in this vegetation community was representative of Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils (Plate 82). The upper storey comprised of junveille *Eucalyptus* sp. sterile, *Allocasuarina campestris* and *Callitris columellaris.* The mid-storey taxa included *Acacia assimilis, A. colletioides, A. desertorum* var. *desertorum, Grevillea juncifolia* subsp. *juncifolia* and *Hakea fransciana.* The understorey taxa included *Keraudrenia velutina, Dubosia hopwoodii, Xanthorrhaea thorntonii* and *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 84.

Table 84: Vegetation assemblage for Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	2-10%	*Eucalyptus* sp. sterile
Shrub 1-1.5m	10-30%	*Acacia assimilis* *Hakea fransciana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Regrowth, modified native vegetation group (DoE, 2014b).

Plate 84: Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils

INTERDUNE SWALES AND SANDPLAIN: MALLEE WOODLANDS AND SHRUBLANDS

4.82 Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia,* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils

4.82.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 8 Genera and 14 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.82.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils (Plate 85). The taxa in the upper storey comprised of *Eucalyptus concinna.* The mid-storey included *Acacia caesaneura, Dodonaea lobulata, Maireana sedifolia, Scaevola spinescens* and *Senna artemisioides* subsp. *filifolia.* The understorey taxa included *Ptilotus obovatus, Maireana platycarpa, Sclerolaena densiflora* and *Maireana georgei*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 85.

Table 85: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus concinna*
Shrub 1-1.5m	30-70%	*Dodonaea lobulata* *Senna artemisioides* subsp. *filifolia*
Shrub <0.5m	2-10%	*Ptilotus obovatus* *Maireana platycarpa*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 85: Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils

4.83 Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils

4.83.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 13 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.83.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils (Plate 86). The taxa in the upper storey included *Eucalyptus concinna, E. oleosa* subsp. *oleosa, E. youngiana* and *Allocasuarina helmsii.* The mid-storey taxa included *Grevillea juncifolia* subsp. *juncifolia, Scaevola spinescens, Dodonaea rigida* and *Acacia ramulosa* var. *ramulosa.* The understorey taxa included *Triodia basedowii, Solanum orbiculatum, Ptilotus obovatus, Keraudrenia velutina* and *Eremophila platythamnos* subsp. *platythamnos.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 86.

Table 86: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Trees <5m	10-30%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa*
Shrub 1-1.5m	2-10%	*Grevillea juncifolia* subsp. *juncifolia*
Shrub 0.5-1m	10-30%	*Scaevola spinescens*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 86: Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp*. oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils

4.84 Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils

4.84.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 11 Genera and 22 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.84.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 87). The taxa in the upper storey included *Eucalyptus concinna, Eucalyptus oleosa* subsp. *oleosa, Eremophila oldfieldii* subsp. *angustifolia, Acacia caesaneura* and *Santalum spicatum.* The mid-storey taxa included *Dodonaea lobulata, Scaevola spinescens, Acacia kempeana, Eremophila glabra* and *Hakea francisiana.* The understorey taxa included *Triodia basedowii, Prostanthera althoferi* and *Westringia rigida*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 87.

Table 87: Vegetation assemblage Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	30-70%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa*
Shrub 1-1.5m	30-70%	*Dodonaea lobulata* *Dodonaea rigida* *Scaevola spinescens*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 87: Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils

4.85 Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils

4.85.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 11 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.85.2 Vegetation

The flora recorded in this vegetation community was representative of the Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Plate 88). The taxa in the upper storey included *Eucalyptus concinna, Brachychiton gregorii, Eremophila oldfieldii* subsp. *angustifolia* and *Santalum spicatum.* The mid-storey taxa included *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii, Alyxia buxifolia, Dodonaea lobulata* and *Eremophila latrobei* subsp. *latrobei.* The understorey taxa included *Triodia basedowii* and *Prostanthera althoferi.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 88.

Table 88: Vegetation assemblage for the Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	2-10%	*Eucalyptus concinna*
Shrub 1.5-2m	30-70%	*Acacia ramulosa* var. *ramulosa* *Allocasuarina helmsii*
Shrub 0.5-1m	30-70%	*Prostanthera althoferi*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 88: Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils

4.86 Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils

4.86.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 9 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.86.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils (Plate 89). The upper storey consisted of *Eucalyptus trivalva, Eucalyptus youngiana, Acacia caesaneura*, *Allocasuarina helmsii* and *Santalum spicatum*. The mid-storey taxa included *Acacia rigens*, *Scaevola spinescens*, *Acacia ramulosa, and Dodonaea rigida.* The understorey taxa included *Triodia basedowii* and *Sida calyxhymenia*. Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 89.

Table 89: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva* *Eucalyptus youngiana*
Tree <5m	10-30%	*Acacia caesaneura*
Shrub >2m	10-30%	*Acacia rigens*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 89: Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils

4.87 Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils

4.87.1 Flora

The flora recorded within this vegetation community was represented by a total of 10 Families, 14 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.87.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils (Plate 90). The taxa in the upper storey included *Eucalyptus concinna*, *E. oleosa* subsp. *oleosa* and *E. youngiana*. The mid-storey taxa included *Callitris columellaris, Hakea francisiana* and *Acacia desertorum* var. *desertorum.* The understorey taxa included *Triodia basedowii, Westringia cephalantha, Melaleuca leiocarpa, Eremophila platythamnos* subsp. *platythamnos* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 90.

Table 90: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa*
Shrub 1.5-2m	10-30%	*Callitris columellaris* *Hakea francisiana*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 90: Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils

4.88 Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles*, *Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils

4.88.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.88.2 Vegetation

The flora recorded in this vegetation community was representative of Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles*, *Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils (Plate 91). The taxa in the upper storey included *Eucalyptus concinna, Eucalyptus trivalva* and *Grevillea nematophylla*. The mid-storey taxa included *Acacia hemiteles, Callitris columellaris, Eremophila platythamnos* subsp. *platythamnos, Melaleuca hamata, Hakea francisiana and Westringia cephalantha.* The understorey taxa included *Triodia basedowii,* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 91.

Table 91: Vegetation assemblage for Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles*, *Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	30-70%	*Eucalyptus concinna* *E. oleosa* subsp. *oleosa*
Shrub 0.5-1m	30-70%	*Acacia hemiteles* *Melaleuca hamata* *Westringia cephalantha*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 91: Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles*, *Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils

4.89 Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils

4.89.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 22 Genera and 35 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxa *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3) was identified within this vegetation community which formed the dominant mid-storey. No introduced taxa were recorded in this vegetation community.

4.89.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils (Plate 92). The taxa in the upper storey included *Eucalyptus trivalva*, *Eucalyptus gongylocarpa* and *Eucalyptus youngiana*. The mid-storey taxa included *Callitris columellaris, Hakea francisiana, Grevillea acacioides, Acacia desertorum* var. *desertorum, Acacia eremophila* var. *eremophila, Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3)*, Acacia rigens Grevillea juncifolia* subsp. *juncifolia, Melaleuca leiocarpa* and *Allocasuarina campestris.* The understorey taxa included *Triodia basedowii, Triodia desertorum, Keraudrenia velutina, Leptosema chambersii* and *Lepidobolus deserti.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 92.

Table 92: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva* *Eucalyptus youngiana*
Shrub 1-1.5m	30-70%	*Hakea francisiana* *Acacia desertorum* var. *desertorum* *Acacia eremophila* var. *eremophila* *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3) *Acacia rigens*
Hummock Grass	70-100%	*Triodia basedowii* *Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 92: Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils

4.90 Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils

4.90.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 6 Genera and 11 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.90.2 Vegetation

The flora recorded in this vegetation community was representative of Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils (Plate 93). The taxa in the upper storey included *Eucalyptus horistes* and *Eucalyptus gongylocarpa.* The mid-storey taxa included *Eremophila deserti, Acacia rigens, Acacia hemiteles, Eremophila caperata* and *Acacia colletioides.* The understorey taxa included *Triodia basedowii* and *Westringia rigida.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 93.

Table 93: Vegetation assemblage for Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	10-30%	*Eucalyptus horistes*
Shrub 1-1.5m	30-70%	*Acacia rigens* *Eremophila deserti*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 93: Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils

4.91 Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura*, *Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils

4.91.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 8 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.91.2 Vegetation

The flora recorded in this vegetation community was representative of Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura*, *Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils (Plate 94). The taxa in the upper storey included *Eucalyptus concinna, E. oleosa* subsp. *oleosa, E. youngiana* and *Acacia aptaneura*. The mid-storey taxa included *Acacia caesaneura, Eremophila pantonii, Senna artemisioides* subsp. *filifolia, Scaevola spinescens* and *Acacia ligulata.* The understorey taxa included *Triodia basedowii* and *Keraudrenia velutina.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 94.

Table 94: Vegetation assemblage for Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura*, *Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	10-30%	*Eucalyptus concinna* *E. oleosa* subsp. *oleosa*
Shrub >2m	30-70%	*Acacia caesaneura*
Shrub 1-1.5m	30-70%	*Eremophila pantonii* *Senna artemisioides* subsp. *filifolia*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 94: Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura*, *Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils

4.92 Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils

4.92.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 14 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.92.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils (Plate 95). The taxa in the upper storey included *Eucalyptus youngiana, E. comitae-vallis* and *Callitris columellaris*. The mid-storey taxa included *Grevillea juncifolia* subsp. *juncifolia, Exocarpos sparteus, Grevillea eriostachya, Hakea francisiana* and *Acacia ligulata.* The understorey taxa included *Triodia Basedowii, Micromyrtus flaviflora* and *Jacksonia nematoclada.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 95.

Table 95: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus comitae-vallis* *Eucalyptus youngiana*
Shrub 1-1.5m	30-70%	*Grevillea juncifolia* subsp. *juncifolia*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 95: Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils

4.93 Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils

4.93.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 14 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.93.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils (Plate 96). The taxa in the upper storey included *Eucalyptus concinna, E. gongylocarpa, E. hypolaena* and *E. horistes*. The mid-storey taxa included *Daviesia benthamii, Callitris preissii, Westringia cephalantha, Acacia hemiteles and Grevillea oncogyne.* The understorey taxa included *Triodia basedowii* and *Westringia rigida.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 96.

Table 96: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus hypolaena*
Shrub 1.5-2m	10-30%	*Daviesia benthamii* *Callitris preissii*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 96: Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils

4.94 Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigidula* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils

4.94.1 Flora

The flora recorded within this vegetation community was represented by a total of 7 Families, 9 Genera and 16 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.94.2 Vegetation

The flora recorded in this vegetation community was representative of Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigidula* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils (Plate 97). The taxa in the upper storey included *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigida*. The mid-storey taxa included *Daviesia benthamii, Acacia assimilis, Grevillia juncifolia, Acacia colletioides* and *A. caesaneura.* The understorey taxa included *Triodia desertorum and.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 97.

Table 97: Vegetation assemblage for Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigidula* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree 5-15m	30-70%	*Eucalyptus concinna* *Eucalyptus oleosa* subsp. *oleosa* *Eucalyptus rigidula*
Shrub >2m	10-30%	*Acacia caesaneura*
Shrub 1-1.5m	10-30%	*Acacia assimilis* *Daviesia benthamii*
Hummock Grass	70-100%	*Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 97: Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigidula* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils

4.95 Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils

4.95.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 12 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.95.2 Vegetation

The flora recorded in this vegetation community was representative of Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils (Plate 98). The taxa in the upper storey included *Eucalyptus eremophila, Acacia caesaneura* and *A. incurvaneura*. The mid-storey taxa included *Eremophila scoparia, Acacia aptaneura*, *Senna artemisioides* subsp. *filifolia and Scaevola spinescens.* The understorey taxa included *Maireana pyramidata, Maireana georgei* and *Triodia desertorum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 98.

Table 98: Vegetation assemblage for Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Tree Form	30-70%	*Eucalyptus eremophila*
Tree <5m	30-70%	*Acacia caesaneura* *Acacia incurvaneura*
Shrub 1.5-2m	10-30%	*Acacia aptaneura*
Shrub 1-1.5m	10-30%	*Eremophila scoparia*
Hummock Grass	70-100%	*Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 98: Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils

4.96 Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils

4.96.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 9 Genera and 10 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.96.2 Vegetation

The flora recorded in this vegetation community was representative of Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils (Plate 99). The taxa in the upper storey included *Eucalyptus concinna* and *Callitris preissii*. The mid-storey taxa included *Halgania integerrima, westringia rigida, Dianella revoluta* and *Hakea francisiana.* The understorey taxa included *Triodia desertorum* and *Olearia incana.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 99.

Table 99: Vegetation assemblage for Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	30-70%	*Eucalyptus concinna*
Shrub 1-1.5m	30-70%	*Hakea francisiana*
Shrub 0.5-1m	30-70%	*Halgania integerrima*
Hummock Grass	70-100%	*Triodia desertorum*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 99: Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils

4.97 Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils

4.97.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 10 Genera and 13 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.97.2 Vegetation

The flora recorded in this vegetation community was representative of Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils (Plate 96). The taxa in the upper storey included *Eucalyptus leptopoda* subsp. *elevata, Callitris preissii* and *E. youngiana*. The mid-storey taxa included *Acacia desertorum* var. *desertorum, Acacia murrayana, Daviesia benthamii and Hakea francisiana.* The understorey taxa included *Triodia basedowii* and *Leptosema chambersii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 96.

Table 100: Vegetation assemblage for Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	2-10%	*Eucalyptus leptopoda* subsp. *elevata* *E. youngiana*
Shrub 1-1.5m	30-70%	*Acacia desertorum* var. *desertorum*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 100: Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils

4.98 Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var*. desertorum* and *Baeckea sp*. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils

4.98.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 10 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.98.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var*. desertorum* and *Baeckea sp*. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 101). The taxa in the upper storey included *Eucalyptus youngiana, E. gongylocarpa, E. concinna* and *E. rigidula*. The mid-storey taxa included *Acacia desertorum* var*. desertorum, Hakea francisiana, Alyxia buxifolia* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813). The understorey taxa included *Triodia basedowii* and *Westringia rigida.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 101.

Table 101: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var*. desertorum* and *Baeckea sp*. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	2-10%	*Eucalyptus youngiana* *Eucalyptus rigidula*
Shrub 1.5-2m	10-30%	*Acacia desertorum* var*. desertorum*
Shrub 1-1.5m	10-30%	*Baeckea* sp. Great Victoria Desert (A.S. Weston 14813)
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 101: Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var*. desertorum* and *Baeckea sp*. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils

4.99 Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils

4.99.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 13 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxon was identified within this vegetation community; *Dicrastylis cundeeleensis* (P4). No introduced taxa were recorded in this vegetation community.

4.99.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils (Plate 102). The taxa in the upper storey included *Eucalyptus youngiana, Callitris preissii* and *Eucalyptus trivalva*. The mid-storey taxa included *Aluta maisonneuvei* subsp. *auriculata, Thryptomene biseriata, Duboisia hopwoodii* and *Solanum plicatile.* The understorey taxa included *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 102.

Table 102: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	2-10%	*Eucalyptus youngiana*
Shrub >2m	2-10%	*Callitris preissii*
Shrub 1-1.5m	10-30%	*Aluta maisonneuvei* subsp. *auriculata* *Thryptomene biseriata* *Duboisia hopwoodii*
Shrub <0.5m	10-30%	*Solanum plicatile*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 102: Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils

4.100 Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils

4.100.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 27 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxa were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.100.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils (Plate 103). The taxa in the upper storey included *E. youngiana, E. trivalva, E. effusa, E. horistes and E. concinna*. The mid-storey taxa included *Acacia colletioides, Acacia burkittii, Eremophila alternifolia* and *Eremophila glabra.* The understorey taxa included *Triodia basedowii, Ptilotus obovatus, Scaevola spinescens* and *Solanum plicatile.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 103.

Table 103: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva*
Shrub 1.5-2m	10-30%	*Acacia burkittii* *Acacia colletioides* *Eremophila alternifolia*
Shrub 1-1.5m	10-30%	*Eremophila glabra*
Hummock Grass	10-30%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 103: Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils

4.101 Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils

4.101.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.101.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils (Plate 104**Plate 103**). The taxa in the upper storey included *E. trivalva* and *E. leptopoda* subsp. *elevata*. The mid-storey taxa included *Acacia sibirica, Acacia incurvaneura, Eremophila platythamnos* subsp. *platythamnos, Hakea francisiana* and *Callitris preissii.* The understorey taxa included *Triodia basedowii, Aluta maisonneuvei* subsp. *auriculata, Keraudrenia velutina, Westringia cephalantha* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813). Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 104.

Table 104: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva*
Shrub 1-1.5m	10-30%	*Acacia sibrica*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 104: Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils

4.102 Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils

4.102.1 Flora

The flora recorded within this vegetation community was represented by a total of 9 Families, 12 Genera and 20 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.102.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils (Plate 105). The taxa in the upper storey included *E. trivalva, E. gongylocarpa* and *Callitris preissii*. The mid-storey taxa included *Acacia desertorum* var. *desertorum* and *Beyeria sulcata* var. *sulcata.* The understorey taxa included *Triodia basedowii, Aluta maisonneuvei* subsp. *auriculata, Keraudrenia velutina, Westringia cephalantha* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813). Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 105.

Table 105: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus trivalva*
Shrub 1-1.5m	30-70%	*Acacia desertorum* var. *desertorum*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 105: Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils

4.103 Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils

4.103.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 8 Genera and 9 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.103.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils (Plate 106). The taxa in the upper storey included *E. youngiana, E. comitae-vallis* and *Callitris columellaris.* The mid-storey taxa included *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata.* The understorey taxa included *Triodia basedowii* and *Aluta maisonneuvei* subsp. *auriculata.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 106.

Table 106: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus commitae-vallis* *Eucalyptus youngiana*
Shrub >2m	10-30%	*Callitris columellaris*
Shrub 0.5-1m	10-30%	*Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) *Beyeria sulcata* var. *sulcata*
Hummock Grass	70-100%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 106: Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils

4.104 Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub

of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils

4.104.1 Flora

The flora recorded within this vegetation community was represented by a total of 6 Families, 12 Genera and 15 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. One Priority Flora taxon was identified within this vegetation community *Grevillea secunda* (P4). No introduced taxa were recorded in this vegetation community.

4.104.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils (Plate 107). The taxa in the upper storey included *E. youngiana* and *E. leptopoda subsp. elevata*. The mid-storey taxa included *Acacia desertorum* var. *desertorum, Allocasuarina acutivalvis*, *Leptospermum roei, Melaleuca hamata*, *Hakea francisiana* and *Scaevola collaris.* The understorey taxa included *Triodia basedowii, Aluta maisonneuvei* subsp. *auriculata, Keraudrenia velutina, Persoonia coriacea* and *Grevillea secunda* (P4). Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 107.

Table 107: Vegetation assemblage for Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalpytus youngiana*
Shrub 1.5-2m	30-70%	*Acacia desertorum* var. *desertorum* *Allocasuarina acutivalvis*
Shrub <0.5	30-70%	*Aluta maisonneuvei* subsp. *auriculata*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 107: Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils

4.105 Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils

4.105.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 13 Genera and 17 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.105.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus leptopoda* subsp*. elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 108)*.* The taxa in the upper storey included *E. leptopoda* subsp*. elevata, E. gongylocarpa, E. youngiana* and *Hakea francisiana*. The mid-storey taxa included *Callitris preissii, Aluta maisonneuvei* subsp. *auriculata*, *Phebalium filifolium, Acacia desertorum* var. *desertorum, Leptospermum roei, Grevillea juncifolia* subsp. *juncifolia* and *Scaevola restiacea.* The understorey taxa included *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 108.

Table 108: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus leptopoda* subsp*. elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus leptopoda* subsp*. elevata*
Shrub 1.5-2m	10-30%	*Callitris preisii*
Shrub 0.5-1m	30-70%	*Aluta maisonneuvei* subsp. *auriculata* *Phebalium filifolium*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 108: Open Shrub Mallee of *Eucalyptus leptopoda* subsp*. elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils

4.106 Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils

4.106.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 13 Genera and 18 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.106.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 109). The taxa in the upper storey included *E. leptopoda* subsp. *elevata, E. gongylocarpa, E. youngiana* and *Hakea francisiana*. The mid-storey taxa included *Callitris preissii, Aluta maisonneuvei* subsp. *auriculata*, *Phebalium filifolium, Acacia desertorum* var. *desertorum, Leptospermum roei, Grevillea juncifolia* subsp. *juncifolia* and *Scaevola restiacea.* The understorey taxa included *Triodia basedowii.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 109.

Table 109: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus leptopoda* subsp. *elevata*
Shrub 1.5-2m	10-30%	*Callitris preissii* *Acacia desertorum* var. *desertorum*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 109: Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils

4.107 Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils

4.107.1 Flora

The flora recorded within this vegetation community was represented by a total of 8 Families, 11 Genera and 13 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.107.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 110). The taxa in the upper storey included *E. leptopoda* subsp. *elevata, Causuriana pauper* and *Acacia caesaneura*. The mid-storey taxa included *Aluta maisonneuvei* subsp. *auriculata*, *Melaleuca interioris, Acacia tetragonophylla, Senna artemisioides* subsp. *filifolia, Senna cardiosperma* and *Eremophila alternifolia.* The understorey taxa included *Triodia basedowii, Ptilotus obovatus* and *Solanum lasiophyllum.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 110.

Table 110: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus leptopoda* subsp. *elevata*
Shrub 1.5-2m	30-70%	*Melaleuca interioris*
Shrub 1-1.5m	30-70%	*Aluta maisonneuvei* subsp. *auriculata*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 110: Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils

4.108 Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils

4.108.1 Flora

The flora recorded within this vegetation community was represented by a total of 5 Families, 6 Genera and 8 Taxa (Appendix 3).

No Threatened Flora taxa, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950),* the *EPBC Act 1999* and as listed by the DPaW (Jacob, 2013) were identified within this vegetation community. No Priority Flora taxon were identified within this vegetation community. No introduced taxa were recorded in this vegetation community.

4.108.2 Vegetation

The flora recorded in this vegetation community was representative of Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils (Plate 111). The taxa in the upper storey included *Eucalyptus horistes*. The mid-storey taxa included *Acacia assimilis*, *A. desertorum* var. *desertorum, Grevillea nematophylla* subsp. *nematophylla, Hakea francisiana* and *Hakea kippistiana.* The understorey taxa included *Triodia basedowii* and *Ptilotus obovatus.* Dominant taxa from the vegetation assemblage according to Muir (1977) are shown in Table 111.

Table 111: Vegetation assemblage for Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant taxa present
Mallee Shrub Form	10-30%	*Eucalyptus horistes*
Shrub 1-1.5m	30-70%	*Acacia assimilis* *Acacia desertorum* var. *desertorum*
Hummock Grass	30-70%	*Triodia basedowii*

No broad scale clearing for agricultural purposes has occurred within this vegetation community within the survey area. According to NVIS this vegetation community is best represented by the Mallee Woodlands and Shrublands vegetation group (DoE, 2014b).

Plate 111: Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils

4.109 Vegetation of Conservation Significance

No TEC pursuant to Commonwealth legislation and as listed by the DPaW were recorded within the survey area. No PEC, as listed by the DPaW, is recorded within the survey area. However the *Mount Linden Range banded ironstone ridge vegetation complex* Priority 3 Ecological Community and *Yellow Sandplain Communities of the Great Victoria Desert* Priority 3 Ecological Community are located approximately 26km south of the far west pipeline route (Sunrise Dam Gold Mine end) and 20km south of the far east pipeline route (Tropicana Gold Mine end) respectively. None of the vegetation communities identified within the survey area are representative of vegetation that characterizes the *Mount Linden Range banded ironstone ridge vegetation complex*.

The definition of the *Yellow Sandplain Communities of the Great Victoria Desert* PEC (as defined by Pearson, 1994) is as follows:

> *Undulating yellow sandplain with an open upper stratum of marble gum (Eucalyptus gongylocarpa*) *with or without a diverse mallee stratum (dominated by E. mannensis, E. undulans, E. youngiana, E. platycorys); a sparse though diverse shrub stratum (Acacia heteroneura, A. helmsiana, Allocasuarina acutivalvis, Bertya dinerostigma and Hakea francisiana); with an understorey of Triodia desertorum or T. scariosa. The soils are typically yellow-orange deep Quartenary aeolian sands or sandy-loams.*

One of the vegetation communities identified within the survey area; Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune however was representative of vegetation that characterizes the *Yellow Sandplain Communities of the Great Victoria Desert.*

The DPaW have also identified other communities under threat (described by Pringle, 1994) in the Murchison Region which are not formally protected as PEC or TEC which were represented within the survey area. These include:

- Plain mixed halophyte low shrublands of the north-east Goldfields;
- Mixed Chenopod shrublands with Mulga (*Acacia aneura*) overstorey of the north-east Goldfields; and
- Mulga (*Acacia aneura*) shrublands with scattered Chenopod low shrubs of the north-east Goldfields.

The survey area is not located in an ESA or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

4.110 Vegetation condition

Based on Keighery's (1994) vegetation health rating scale (Appendix 7), ten of the one-hundred and four vegetation communities and sub-communities within the survey area were rated as being in 'good' health while the remaining ninety-four vegetation communities and sub-communities were rated as being in 'very good' heath (Table 112). Figures 9a to 9c below provides maps of the health condition across the survey area. Approximately 1,889 ha of the survey area was rated as being in 'good health', 11,911 ha was rated as being in 'very good' heath and the remaining 260 ha comprised of salt lakes with no vegetation.

A 'good' health rating depicts that although the vegetation structure has been affected by multiple disturbances, in this instance as a result from pastoral land use, weed infestations, mining and exploration. However it retains its basic structure and has the ability to regenerate. A 'very good' health condition is defined as vegetation that has been altered due to obvious signs of disturbance, in this instance as a result of mining and exploration.

Ten of the one-hundred and four vegetation communities identified during the survey comprised of vegetation in various stages of regrowth. According to Landgate (2014) the survey area has been subject to a number of fires ranging between 1 to 18 years ago as shown in Figure 9 below.

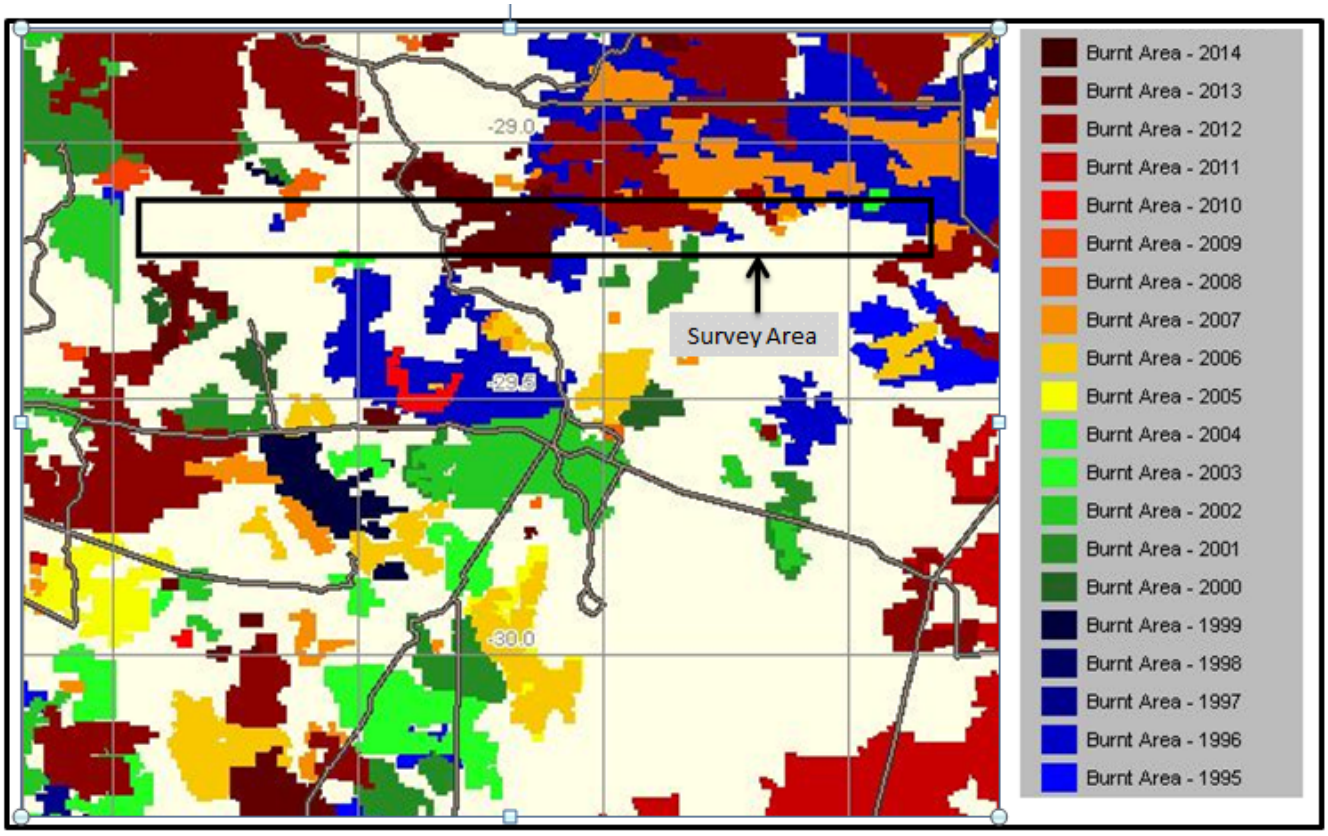

Figure 9: Map of recorded fires within the survey area and surrounding region (Landgate, 2014)

Table 112: Health condition rating of vegetation communities within the Sunrise Dam to Tropicana survey area (Keighery, 1994)

Vegetation Community	Health Rating (Keighery, 1994)
Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop	very good
Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* on breakaway outcrop	very good
Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	very good
Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. *x artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	very good
Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils	very good
Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils	very good
Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils	very good
Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	very good
Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils	good
Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils	very good
Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp. *angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils	very good
Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils	very good
Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils	very good
Low Woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei* subsp. *auriculata/Acacia ramulosa* var. *ramulosa* and *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii* in sandy-loam soils	very good
Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	very good
Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils	very good
Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma, Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils	very good
Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain	very good

Vegetation Community	Health Rating (Keighery, 1994)
Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* over sparse *Triodia basedowii* in clay-loam soils	very good
Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils	very good
Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils.	good
Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils	very good
Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils	very good
Very Open Shrub Mallee of *Eucalyptus youngiana* with occasional *E. gongylocarpa* over moderately dense scrub of *Acacia desertorum* var. *desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils	very good
Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	very good
Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	very good
Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	very good
Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils	good
Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils	good
Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge	very good
Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia sp.* (Sterile) in clay drainage depression	very good
Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia sp.* (Sterile) in clay drainage depression	very good
Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression	very good
Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression	very good
Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune	very good

Vegetation Community	Health Rating (Keighery, 1994)
Occasional *E. gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune	**very good**
Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune	**very good**
Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune	**very good**
Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils	**very good**
Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils.	**good**
Low Woodland of *Eucalyptus gongylocarpa* over moderately dense mallee of *E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils	**good**
Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii, A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	**good**
Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp. *elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils	**very good**

Vegetation Community	Health Rating (Keighery, 1994)
Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy soils	**very good**
Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils	**very good**
Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti, Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils	**very good**
Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils	**very good**
Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils	**good**
Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	**good**
Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils	**very good**

Vegetation Community	Health Rating (Keighery, 1994)
Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils	**very good**
Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura, Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils	**very good**
Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. *oleosa* and *E. rigida* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils	**very good**
Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	**very good**
Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils	**very good**
Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**

Vegetation Community	Health Rating (Keighery, 1994)
Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa subsp. oleosa* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils	**very good**
Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils	**very good**
Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope	**very good**
Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise	**very good**
Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma, Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope	**very good**
Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	**very good**
Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	**very good**
Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise	**very good**
Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles.	**good**
Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise	**very good**

4.111 Introduced Plant taxa

No introduced taxa were identified within the survey area.

Figure 10a: Maps of Health Condition across the Sunrise Dam to Tropicana survey area

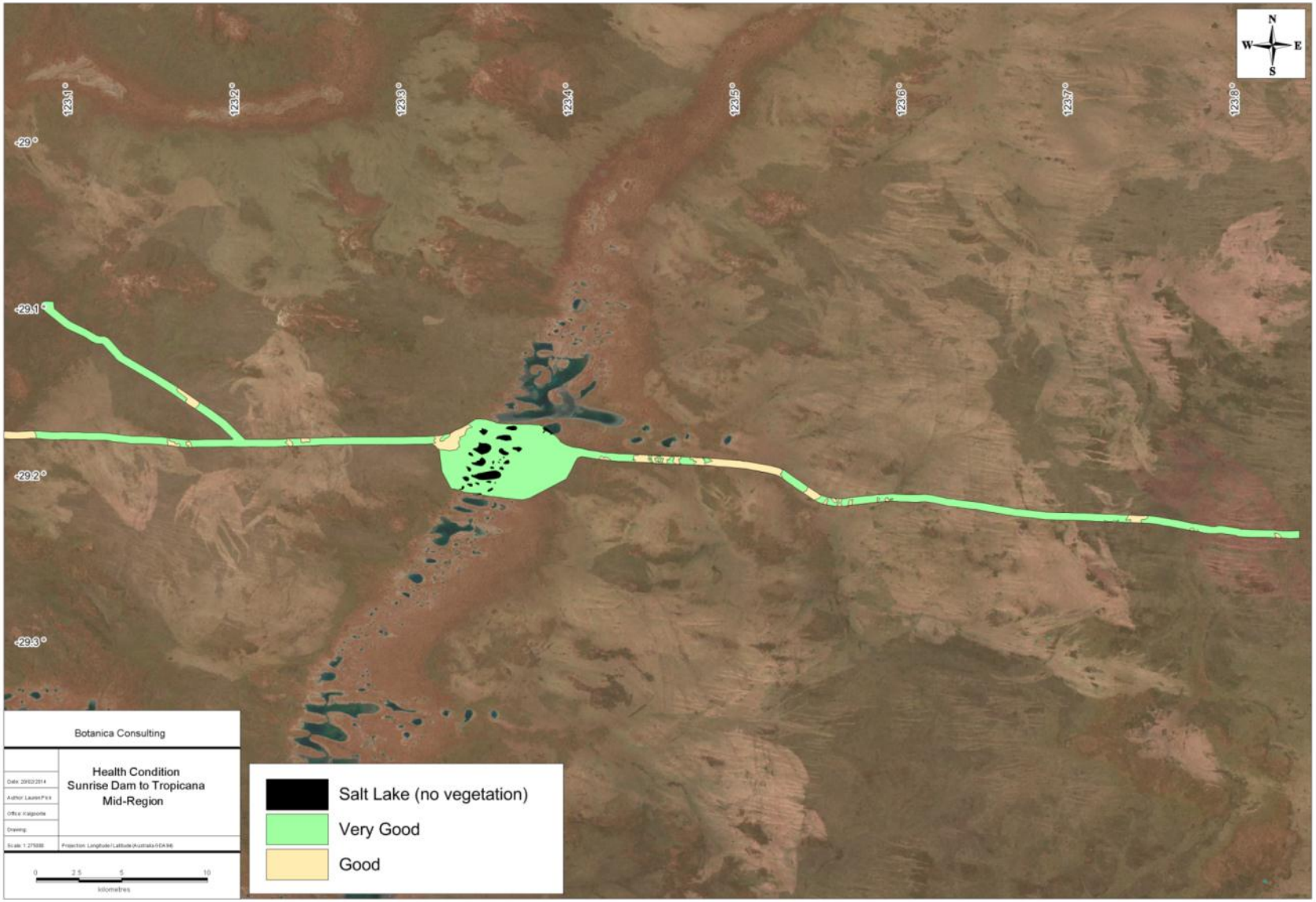

Figure 10b: Maps of Health Condition across the Sunrise Dam to Tropicana survey area

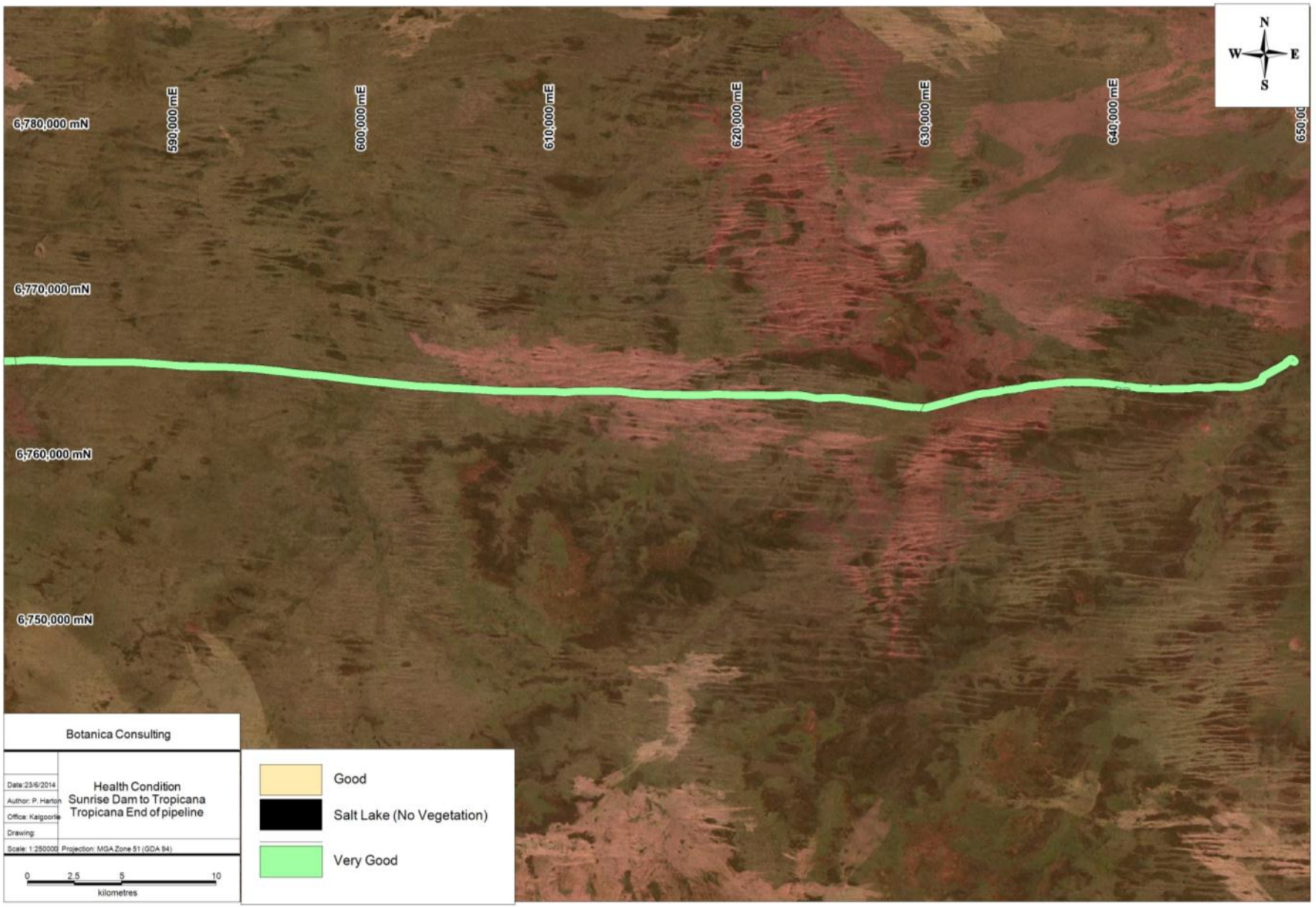

Figure 10c: Maps of Health Condition across the Sunrise Dam to Tropicana survey area

5 Relevant Legislation and Compliance with Recognised Standards

5.1 Commonwealth Legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The aim of this Act is to protect matters of national environmental significance and is used by the Commonwealth DoE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The survey area does not have national environmental significance in relation to vegetation or flora under the *EPBC Act 1999* as there are no TEC or Threatened Flora as listed under the *EPBC Act 1999* identified within the survey area.

5.2 State Legislation

5.2.1 *Environmental Protection Act 1986*

The *EP Act 1986* includes requirements relating to the protection of DRF and TEC, and to the assessment of applications for clearing permits. TEC and DRF are protected even where exemptions for a clearing permit may apply. The *EP Act 1986* enforces both financial and/or imprisonment penalties on those who unlawfully damage a TEC. Under Schedule 5 of the *EP Act 1986* there are ten principles for clearing of native vegetation.

The survey area does not contain any TEC or Threatened Flora as listed under the *EPBC Act 1999* or by the DPaW.

5.2.2 *Wildlife Conservation Act WA 1950*

The DPaW uses the provisions of this Act to list flora taxa as protected and the level of protection assigned to such flora. Flora taxa are classified as DRF when their populations are geographically restricted or are threatened by local processes. Under this Act, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties pursuant to the Act can be imposed if threatened plant taxa are collected without an appropriate licence.

5.2.3 DPaW Priority lists

The DPaW lists 'Priority' flora taxa which are under consideration for declaration as Threatened Flora. Taxa classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 taxa are considered to have been adequately surveyed but may become vulnerable or rare in future years. Priority 4 taxa are also taxa that have been removed from the threatened taxa list in the past 5 years. Priority 5 taxa are those taxa which are not currently threatened but are likely to become threatened within 5 years if not subject to a specific conservation program. The DPaW also lists PEC as a mechanism for identifying communities that may need monitoring before possible nomination for TEC status. These priority taxa and communities have no formal legal protection until they are endorsed by the Minister as being Threatened Flora and TEC respectively.

5.3 EPA Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia and the plans for the future to ensure protection and ecological sustainability of environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability and the protection of natural resources. . Two position statements are relevant to this flora and vegetation survey and are described below.

5.3.1 Position Statement No. 2

Environmental Protection of Native Vegetation in Western Australia (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include comparison of all proposal options; avoidance of taxa and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the "threshold level" of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

The survey area does not contain any Threatened Flora or TEC suggesting that clearing within the survey area will meet the EPA standards outlined in Position statement No. 2. According to DAFWA (2011), the survey area is located within Pre-European Beard vegetation associations Laverton 18 and Great Victoria Desert 18, 19, 84, 389 and 1239 which retain between 94-100% of the existing pre-European vegetation extent.

5.3.2 Position Statement No. 3

Terrestrial Biological Surveys as an Element of Biodiversity Protection establishes that the EPA has adopted the definition and principles of biological diversity as defined in the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia, 1996), and has stipulated the following requirements:

- The quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and
- The IBRA regionalisations should be used as the largest unit for environmental impact assessment (EIA) decision-making in relation to the conservation of biodiversity.

Pursuant to the IBRA regionalisations, 26 bioregions in WA, which are affected by a range of different threatening processes and have varying levels of sensitivity to impact, have been identified. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological functional values within the context of proposals and the results of surveys should be publicly available.

The survey of the study area was planned and implemented as far as practicable according to the EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also, the IBRA regionalisations have been used in preparing the report to identify the conservation status of the area and identify the main threats to the biodiversity of plant taxa in the region.

6 Conclusions

One hundred and four vegetation communities were identified within the survey area. These vegetation communities were represented by a total of 43 Families, 114 Genera and 281 Taxa (including sub-species and variants) (Appendix 3).

No DRF/Threatened Flora, pursuant to subsection (2) of section 23F of the *WC Act 1950,* the Commonwealth *EPBC Act 1999* and as listed by the DPaW were identified within the survey area. Seven Priority Flora taxa, as listed by the DPaW were identified within the survey area:

1. *Acacia eremophila* numerous-nerved variant (A.S. George 11924) (P3);
2. *Caesia talingka* (P2);
3. *Dicrastylis cundeeleensis* (P4);
4. *Grevillea secunda* (P4);
5. *Labichea eremaea* (P3);
6. *Melaleuca apostiba* (P3); and
7. *Olearia arida* (P4).

None of the vegetation communities identified during the survey have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or as listed by the DPaW were recorded within the survey area. No PEC as listed by the DPaW were recorded within the survey area. However the *Mount Linden Range banded ironstone ridge vegetation complex* Priority 3 Ecological Community and *Yellow Sandplain Communities of the Great Victoria Desert* Priority 3 Ecological Community are located approximately 26km south of the western end of the survey corridor (Sunrise Dam Gold Mine end) and 20km south of the eastern end of the survey corridor (Tropicana Gold Mine end) respectively. None of the vegetation communities identified within the survey area are representative of vegetation that characterises the *Mount Linden Range banded ironstone ridge vegetation complex*. One of the vegetation communities identified within the survey area; Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune however was representative of vegetation that characterizes the *Yellow Sandplain Communities of the Great Victoria Desert* as defined by Pearson (1994).

The survey area is not located in an ESA or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*. The survey area is not located within any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

According to Keighery's vegetation health rating scale (1994), ten of the one hundred and four vegetation communities and sub-communities surveyed by BC were rated as being in 'good' health.

The remaining ninetly-four vegetation communities were rated as being in 'very good' health. The majority of the survey area remains undisturbed with minimal access tracks, mining and exploration activities within the area. No introduced taxa were identified within the survey area.

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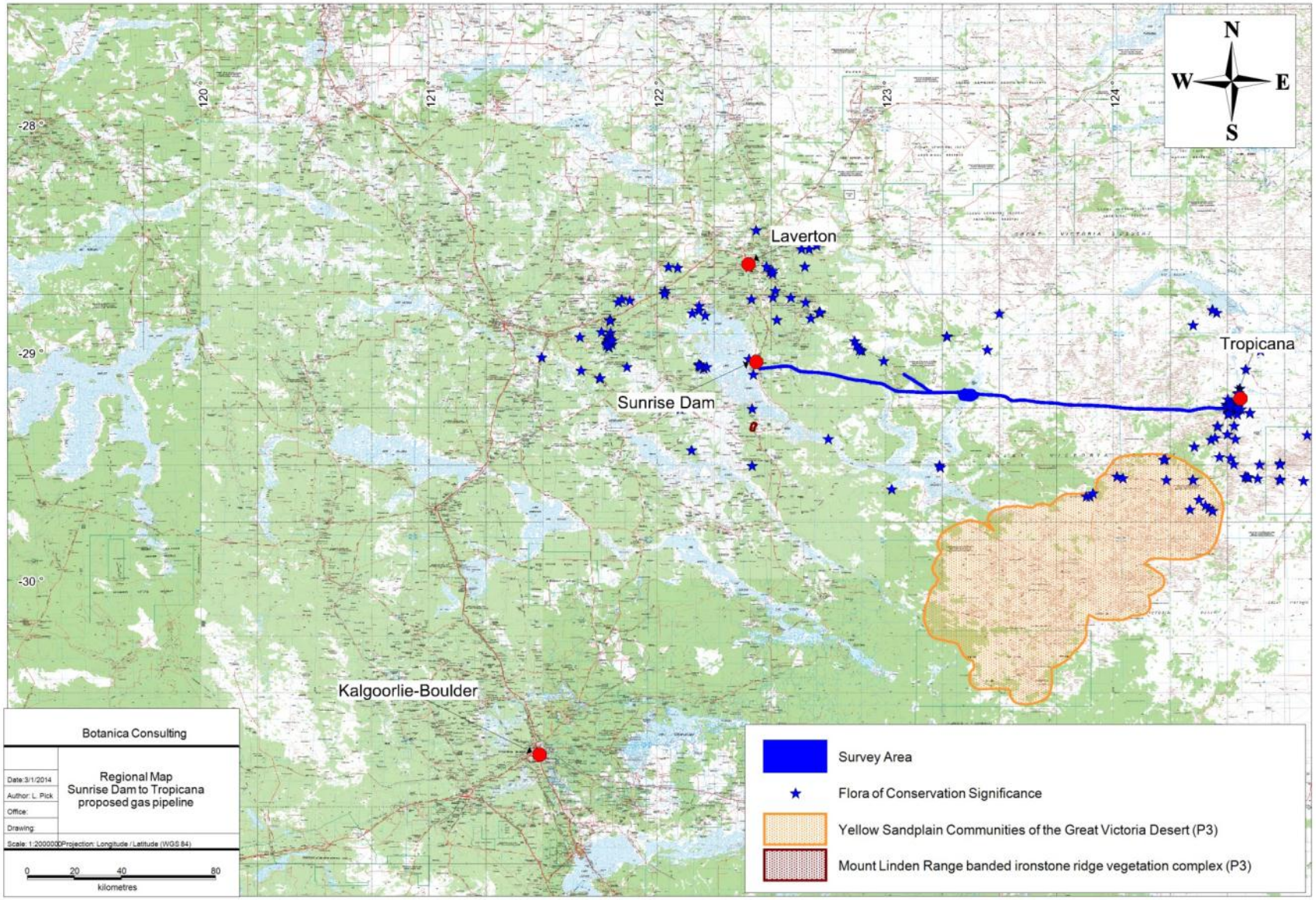
8 Appendices

Appendix 1: Regional map of the Sunrise Dam to Tropicana survey area including DEC locations of Flora of Conservation Significance and PEC's



Appendix 2: Vegetation maps of the Sunrise Dam to Tropicana survey area

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
Breakaway	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over sparse scrub of *Dodonaea lobulata, Bossiaea walkeri* and *Westringia rigida* on breakaway outcrop	B-CFW1
	Mallee Woodlands and Shrublands	Open Shrub Mallee of *Eucalyptus youngiana* over Low Woodland of *Acacia ayersiana* and *A. caesaneura* over moderately dense scrub of *Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* on breakaway outcrop	B-MWS1
Clay-loam Plains	Acacia Forests and Woodlands	Low Forest of *Acacia burkittii* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	CLP-AFW1
		Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over sparse scrub of *Senna artemisioides* subsp. *x artemisioides, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	CLP-AFW2
		Low Forest of *Acacia caesaneura* and *A. incurvaneura* over moderately dense soft grass of *Aristida contorta* in clay-loam soils	CLP-AFW3
		Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense soft annual grass of *Aristida holathera* in clay-loam soils	CLP-AFW4
		Low Forest of *Acacia caesaneura* over sparse scrub of *Eremophila miniata, Cratystylis subspinescens* and *Rhagodia eremaea* over moderately dense *Triodia basedowii* in clay-loam soils	CLP-AFW5
		Low Woodland of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia ligulata* and *Acacia kempeana* over *Dodonaea lobulata* and *Senna artemisioides* subsp. *filifolia* in clay-loam soils	CLP-AFW6
		Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Ptilotus obovatus* and *Sida* sp. Excedentifolia (J.L. Egan 1925) in clay-loam soils	CLP-AFW7
		Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* in clay-loam soils	CLP-AFW8
		Low Woodland of *Acacia caesaneura/Casuarina pauper* over moderately dense scrub of *Eremophila scoparia, Dodonaea viscosa* subsp. *angustissima, Eremophila miniata* and *Cratystylis subspinescens* in clay-loam soils	CLP-AFW9
		Low Woodland of *Acacia caesaneura* and *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Scaevola spinescens* and *Maireana triptera* in clay-loam soils	CLP-AFW10
		Low Woodland of *Acacia caesaneura* over isolated shrubs over scattered to open *Triodia basedowii* and soft grasses in clay-loam soils	CLP-AFW11
		Low Woodland of *Acacia caesaneura* over sparse to moderately dense *Aluta maisonneuvei* subsp. *auriculata/Acacia ramulosa* var. *ramulosa* and *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii* in sandy-loam soils	CLP-AFW12
	Acacia Open Woodlands	Open Low Woodland of *Acacia ayersiana* and *Casuarina pauper* over moderately dense scrub of *Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* in clay-loam soils	CLP-AOW1
		Open Low Woodland of *Acacia aptaneura* and *Acacia caesaneura* over sparse scrub of *Acacia tetragonophylla* and *Hakea preissii* and moderately dense dwarf scrub of mixed Chenopods in clay-loam soils	CLP-AOW2
		Open Low Woodland of *Acacia caesaneura* over sparse to moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma, Atriplex bunburyana* and *Ptilotus obovatus* in clay-loam soils	CLP-AOW3
	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and moderately dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* in clay-loam plain	CLP-CFW1
		Low Woodland of *Casuarina pauper* over moderately dense scrub of *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* over sparse *Triodia basedowii* in clay-loam soils	CLP-CFW2

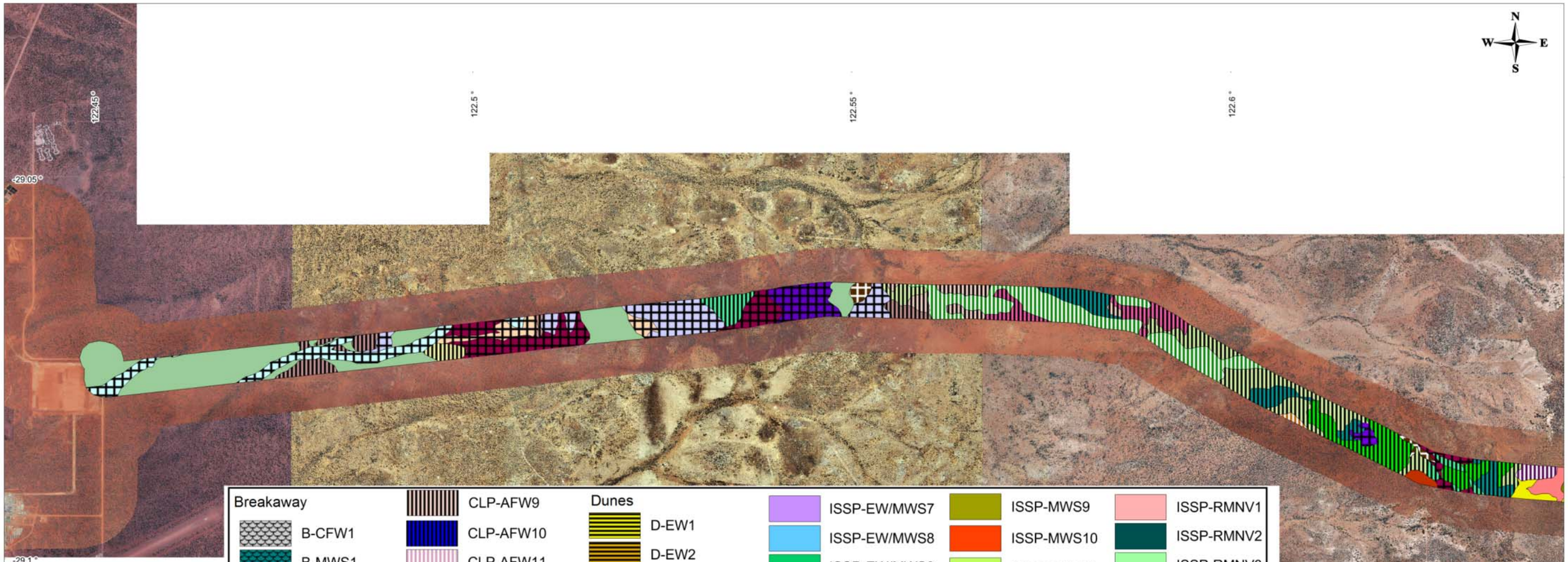
Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
		Low Woodland of *Casuarina pauper* over sparse to moderately dense scrub of *Eremophila scoparia, Olearia muelleri* and *Scaevola spinescens* in clay-loam soils	CLP-CFW3
	Chenopod shrublands, samphire shrublands and forblands	Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia caesaneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay-loam soils.	CLP-CSSSF1
	Eucalypt Woodlands	Low Woodland of *Eucalyptus salubris* over sparse scrub of *Acacia tetragonophylla, Eremophila scoparia, Atriplex vesicaria, Maireana triptera* and *Ptilotus obovatus* in clay-loam soils	CLP-EW1
	Mallee Woodlands and Shrublands	Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and sparse *Triodia basedowii* in clay-loam soils	CLP-MWS1
		Very Open Shrub Mallee of *Eucalyptus youngiana* with occasional *E. gongylocarpa* over moderately dense scrub of *Acacia desertorum* var. *desertorum, Callitris preissii, Leptospermum roei* and *Aluta maisonneuvei* subsp. *auriculata* in clay-loam soils	CLP-MWS2
		Open Shrub Mallee of *Eucalyptus concinna* and open low woodland of *Acacia caesaneura* over sparse scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	CLP-MWS3
		Open Tree Mallee of *Eucalyptus oleosa* subsp. *oleosa* over moderately dense scrub of *Eremophila scoparia* and *Scaevola spinescens* in clay-loam soils	CLP-MWS4
	Regrowth, modified native vegetation	Regrowth Low Forest of *Acacia aptaneura, Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Ptilotus obovatus* and *Solanum lasiophyllum* in clay-loam soils	CLP-RMNV1
		Regrowth Shrub Mallee of *Eucalyptus* spp. over sparse to moderately dense regrowth scrub of *Acacia* spp., *Solanum plicatile* and *Velleia hispida* in clay-loam soils	CLP-RMNV2
		Regrowth Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Acacia caesaneura, A. kempeana* and *Keraudrenia velutina* in clay-loam soils	CLP-RMNV3
Closed Depression	Acacia Forests and Woodlands	Open Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Melaleuca apostiba* (P3), *Eremophila miniata* and *Dodonaea viscosa* subsp. *angustissima* over sparse soft annual grass of *Aristida holathera* on drainage depression edge	CD-AFW1
	Acacia Shrublands	Open Scrub of *Acacia rigens* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa* and *Tecticornia sp.* (Sterile) in clay drainage depression	CD-AS1
		Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa, Eremophila miniata* and *Eremophila scoparia* over sparse low scrub of *Cratystylis subspinescens* and moderately dense to dense *Frankenia setosa, Maireana amoena* and *Tecticornia sp.* (Sterile) in clay drainage depression	CD-AS2
		Open Scrub of *Acacia rigens, A. ramulosa* var. *ramulosa* and *Eremophila miniata* over sparse low scrub of *Cratystylis subspinescens* and dense *Triodia basedowii* in clay drainage depression	CD-AS3
	Other Shrublands	Open Low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Cratystylis subspinescens* over dense *Atriplex vesicaria, Maireana platycarpa* and *Frankenia setosa* in clay-loam drainage depression	CD-OS1
Dunes	Eucalypt Woodlands	Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* over sparse scrub of *Callitris columellaris* and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii* on sand dune	D-EW1
		Occasional *E. gongylocarpa* over *Callitris columellaris/Grevillea juncifolia* over *Acacia ligulata/Thryptomene seriata/Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune	D-EW2
	Mallee Woodlands and Shrublands	Occasional Shrub Mallee of *Eucalyptus youngiana* over sparse scrub of *Callitris preissii* and *Thryptomene biseriata* over moderately dense *Triodia basedowii* on sand dune	D-MWS1
	Other Shrublands	Scrub of *Casuarina pauper* over moderately dense low scrub of *Dodonaea viscosa* subsp. *angustissima* and *Dodonaea lobulata* over sparse soft grasses and *Triodia basedowii* on sand dune	D-OS1

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
Interdune Swales and Sandplain	Acacia Forests and Woodlands	Low Woodland of *Acacia caesaneura* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW1
		Low Woodland of *Acacia caesaneura* over moderately dense *Dodonaea rigida, Eremophila latrobei* subsp. *latrobei* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW2
		Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over moderately dense scrub of *Acacia burkittii, Acacia tetragonophylla* and *Eremophila margarethae* over dense *Triodia desertorum* in sandy-loam soils	ISSP-AFW3
		Low Forest of *Acacia ayersiana* and *Acacia incurvaneura* over moderately dense scrub of *Acacia grasbyi* and *Aluta maisonneuvei* subsp. *auriculata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-AFW4
		Open Low Woodland to Woodland of *Acacia caesaneura* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp., *Maireana triptera, Solanum lasiophyllum, Ptilotus obovatus* and *Eragrostis eriopoda* in sandy-loam soils.	ISSP-AFW5
	Eucalypt Woodlands/Mallee Woodland and Shrublands	Low Woodland of *Eucalyptus gongylocarpa* over moderately dense mallee of *E. concinna* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Acacia ligulata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS1
		Low Woodland of *E. gongylocarpa* over sparse shrub mallee regrowth of *E. youngiana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS2
		Low Woodland of *Eucalyptus hypolaena* over sparse shrub mallee of *E. concinna* over moderately dense scrub of *Acacia burkittii, A. ligulata* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS3
		Low Woodland of *Eucalyptus salicola* over regrowth shrub mallee of *E. hypolaena* and moderately dense scrub of *Daviesia benthamii, Beyeria brevifolia* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	ISSP-EW/MWS4
		Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. concinna* and moderately dense scrub of *Acacia helmsiana* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS5
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. commitae-vallis* over sparse scrub of *Callitris columellaris* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS6
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. horistes* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS7
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. leptopoda* subsp. *elevata* over moderately dense dwarf scrub of *Leptosema chambersii* and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS8
		Low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *E. concinna* and *E. youngiana* over moderately dense dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Triodia basedowii* in sandy-loam soils	ISSP-EW/MWS9
	Eucalypt Open Woodlands/Mallee Woodland and Shrublands	Open Low Woodland of *Eucalyptus gongylocarpa* over sparse shrub mallee of *E. youngiana* and moderately dense scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy soils	ISSP-EOW/MWS1
		Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense shrub Mallee of *E. youngiana/E. concinna* over open mixed shrubland over dense *Triodia desertorum* in sandy-loam soils	ISSP-EOW/MWS2
	Eucalyptus Woodlands	Low Woodland of *Eucalyptus gongylocarpa* with occassional *E. youngiana* over sparse to moderately dense scrub of *Callitris columellaris* and *Hakea francisiana/ Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW1
		Low Woodland of *Eucalyptus lesouefii* over sparse scrub of *Eremophila scoparia, Senna artemisioides* subsp. *filifolia, Olearia muelleri* and *Ptilotus obovatus* over sparse *Triodia basedowii* in sandy-loam soils	ISSP-EW2
		Low Woodland of *Eucalyptus salicola* over sparse scrub of *Eremophila deserti, Dodonaea rigida* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-EW3

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
		Open Low Woodland of *Eucalyptus gongylocarpa* over moderately dense scrub of *Hakea francisiana* and dense *Triodia basedowii* in sandy-loam soils	ISSP-EW4
		Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW5
		Low woodland of *Eucalyptus gonglyocarpa* over sparse scrub of *Acacia abrupta* and *Callitris columellaris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-EW6
	Heathlands	Dense Heath of *Acacia desertorum* var. *desertorum* over moderately dense scrub of *Melaleuca hamata* and *Melaleuca leiocarpa* over dense *Triodia desertorum* and *T. basedowii* in sandy-loam soils	ISSP-H1
		Heath of *Allocasuarina campestris* over sparse scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over dense *Triodia basedowii* and *T. desertorum* in sandy soils	ISSP-H2
	Mallee Woodlands and Shrublands	Open Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and open dwarf scrub of *Maireana platycarpa* and *Ptilotus obovatus* in sandy-loam soils	ISSP-MWS1
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over open to sparse scrub of *Grevillea juncifolia* subsp. *juncifolia* and *Scaevola spinescens* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS2
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense *Dodonaea lobulata, Dodonaea rigida* and *Scaevola spinescens* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS3
		Very Open Shrub Mallee of *Eucalyptus concinna* over moderately dense *Acacia ramulosa* var. *ramulosa, Allocasuarina helmsii* and *Prostanthera althoferi* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS4
		Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over low woodland of *Acacia caesaneura* and sparse scrub of *Acacia rigens* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS5
		Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Callitris columellaris* and *Hakea francisiana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS6
		Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS7
		Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over moderately dense scrub of *Hakea francisiana* and mixed *Acacia* spp. over dense *Triodia basedowii/T. desertorum* in sandy-loam soils	ISSP-MWS8
		Open Tree Mallee of *Eucalyptus horistes* over moderately dense scrub of *Eremophila deserti* and *Acacia rigens* over moderately dense *Triodia desertorum* and *Triodia basedowii* in sandy-loam soils	ISSP-MWS9
		Open Tree Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over moderately dense scrub of *Acacia caesaneura, Eremophila pantonii* and *Senna artemisioides* subsp. *filifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS10
		Open Shrub Mallee of *Eucalyptus comitae-vallis* and *E. youngiana* over sparse to moderately dense scrub of *Grevillea juncifolia* subsp. *juncifolia* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS11
		Open Shrub Mallee of *Eucalyptus hypolaena* over moderately dense scrub of *Callitris preissii, Daviesia benthamii* and *Westringia cephalantha* over dense *Triodia basedowii* and *T. desertorum* in sandy-loam soils	ISSP-MWS12
		Shrub Mallee of *Eucalyptus concinna, E. oleosa* subsp. o*leosa* and *E. rigida* over sparse scrub of *Daviesia benthamii, Acacia assimilis* and *A. caesaneura* over dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS13
		Tree Mallee of *Eucalyptus eremophila* over moderately dense low woodland of *Acacia caesaneura* and *A. incurvaneura* and sparse scrub of *A. aptaneura* and *Eremophila scoparia* over dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS14
		Shrub Mallee of *Eucalyptus concinna* over moderately dense scrub of *Halgania integerrima* and *Hakea francisiana* over moderately dense *Triodia desertorum* in sandy-loam soils	ISSP-MWS15

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
		Very Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* and *E. youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS16
		Open Shrub Mallee of *Eucalyptus youngiana* and *E. rigidula* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS17
		Open Shrub Mallee of *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS18
		Open Shrub Mallee of *Eucalyptus trivalva* over *Acacia* and *Eremophila* dominated shrubland over sparse to open *Triodia basedowii* in sandy-loam soils	ISSP-MWS19
		Open Shrub Mallee of *Eucalyptus trivalva* over sparse scrub of *Acacia sibirica* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS20
		Open Shrub Mallee of *Eucalyptus trivalva* over moderately dense scrub of *Acacia desertorum* var. *desertorum* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS21
		Open Shrub Mallee of *Eucalyptus commitae-vallis* and *E. youngiana* over sparse scrub of *Callitris columellaris* and dwarf scrub of *Baeckea* sp. Great Victoria Desert (A.S. Weston 14813) and *Beyeria sulcata* var. *sulcata* over dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS22
		Open Shrub Mallee of *Eucalpytus youngiana* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Allocasuarina acutivalvis* over moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS23
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Callitris preisii* and moderately dense dwarf scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Phebalium filifolium* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS24
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over sparse scrub of *Acacia desertorum* var. *desertorum* and *Callitris preisii* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS25
		Open Shrub Mallee of *Eucalyptus leptopoda* subsp. *elevata* over moderately dense low scrub of *Aluta maisonneuvei* subsp. *auriculata* and *Melaleuca interioris* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS26
		Open Shrub Mallee of *Eucalyptus horistes* over moderately dense low scrub of *Acacia assimilis* and *A. desertorum* var. *desertorum* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-MWS27
	Regrowth, modified native vegetation	Regrowth Open Shrub Mallee of *Eucalyptus concinna* and *E. oleosa subsp. oleosa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV1
		Regrowth Shrub Mallee of *Eucalyptus concinna* and *E. oleosa* subsp. *oleosa* over sparse scrub of *Acacia hemiteles, Melaleuca hamata* and *Westringia cephalantha* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV2
		Regrowth Open Shrub Mallee of *Eucalyptus glomerosa* over moderately dense scrub of *Acacia desertorum* var. *desertorum* and *Aluta maisonneuvei* subsp. *auriculata* over moderately dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV3
		Regrowth Open Shrub Mallee of *Eucalyptus trivalva* and *E. youngiana* over dense scrub of *Acacia rigens* and *Melaleuca leiocarpa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV4
		Regrowth open low woodland of *Eucalyptus gonglyocarpa* over moderately dense *Leptosema chambersii* and *Newcastelia hexarrhena* in sandy-loam soils	ISSP-RMNV5
		Regrowth open low woodland of *Eucalyptus gonglyocarpa* over sparse shrub mallee of *Eucalyptus glomerosa* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV6
		Regrowth Very Open Shrub Mallee of *Eucalyptus* sp. sterile over sparse low scrub of *Acacia assimilis* and *Hakea fransciana* over dense *Triodia basedowii* in sandy-loam soils	ISSP-RMNV7
Rocky Hillslope	Acacia Forests and Woodlands	Low Woodland of *Acacia burkittii* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma*, *Atriplex bunburyana* and *Ptilotus obovatus* on quartz low slope	RH-AFW1

Landform	NVIS Vegetation Group	Vegetation Community	Vegetation Code
		Low Forest of *Acacia ayersiana, Acacia caesaneura* and *Acacia incurvaneura* over open to sparse scrub of *Acacia tetragonophylla, Scaevola spinescens* and moderately dense low scrub of *Ptilotus obovatus* on rocky rise	RH-AFW2
		Low Woodland of *Acacia caesaneura* over moderately dense scrub of *Maireana sedifolia, Senna artemisioides* subsp. x *artemisioides, Senna cardiosperma,* A*triplex bunburyana* and *Ptilotus obovatus* on quartz low slope	RH-AFW3
		Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Eremophila pantonii, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	RH-AFW4
		Low Woodland of *Acacia ayersiana, Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* over sparse scrub of *Acacia tetragonophylla, Dodonaea lobulata, Senna artemisioides* subsp. *filifolia* and *Ptilotus obovatus* on rocky rise	RH-AFW5
		Low Woodland of *Acacia incurvaneura* over moderately dense scrub of *Aluta maisonneuvei* subsp. *auriculata* over sparse *Triodia basedowii* on rocky rise	RH-AFW6
		Forest to Woodland of *Acacia ayersiana* and *Acacia caesaneura* over *Eremophila margarethae* and *Acacia tetragonophylla* over Poaceae and Asteraceae spp. in clay with quartz and ironstone pebbles.	RH-AFW7
	Casuarina Forests and Woodlands	Low Forest of *Casuarina pauper* over open to sparse scrub of *Eremophila pantonii* and mid-dense low scrub of *Maireana pyramidata* and *Maireana sedifolia* on rocky rise	RH-CFW1
		salt lake	N/A

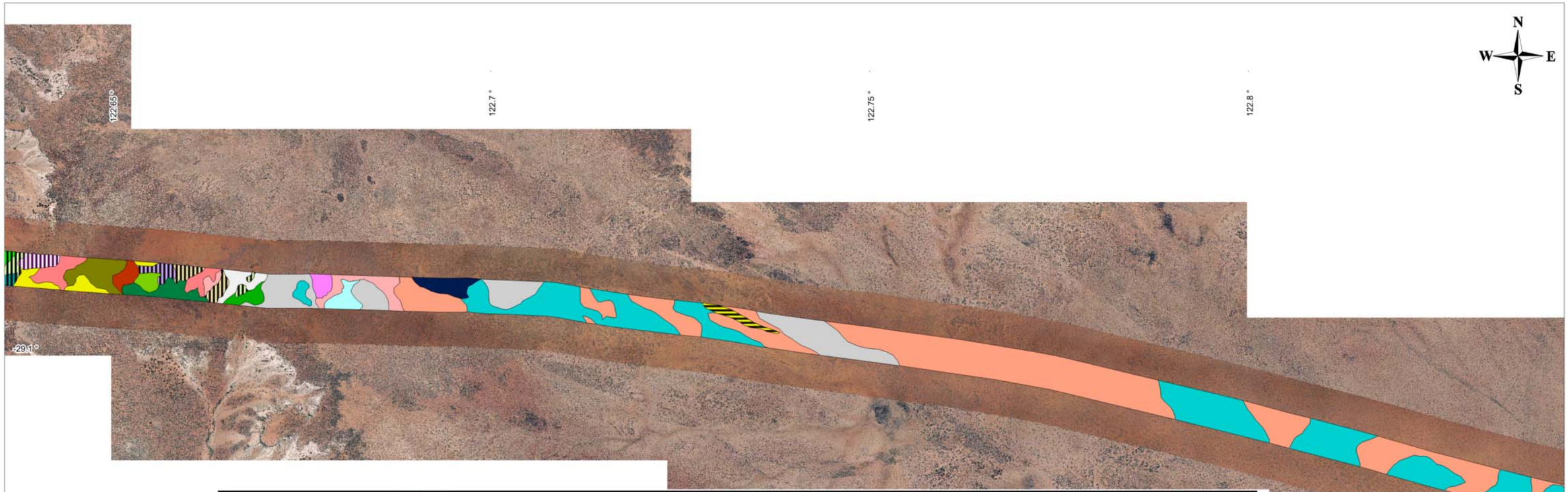


Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 1

Date: 20/02/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)

0 0.5 1 2
kilometres



Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
- ISSP-MWS7
- ISSP-MWS8
- ISSP-MWS9
- ISSP-MWS10
- ISSP-MWS11
- ISSP-MWS12
- ISSP-MWS13
- ISSP-MWS14
- ISSP-MWS15
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- ISSP-MWS19
- ISSP-MWS20
- ISSP-MWS21
- ISSP-MWS22
- ISSP-MWS23
- ISSP-MWS24
- ISSP-MWS25
- ISSP-MWS26
- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 2

Date: 20/03/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)

0 0.5 1 2
kilometres

-29.1 °

122.65 °

122.9 °

122.95 °

123 °

-29.15 °

-29.2 °

N

W

E

S

Breakaway

- B-CFW1
- B-MWS1

Closed Depression

- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain

- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes

- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains

- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
- ISSP-MWS7
- ISSP-MWS8
- ISSP-MWS9
- ISSP-MWS10
- ISSP-MWS11
- ISSP-MWS12
- ISSP-MWS13
- ISSP-MWS14
- ISSP-MWS15
- ISSP-MWS16
- ISSP-MWS17
- ISSP-MWS18
- ISSP-MWS19
- ISSP-MWS20
- ISSP-MWS21
- ISSP-MWS22
- ISSP-MWS23
- ISSP-MWS24
- ISSP-MWS25
- ISSP-MWS26
- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope

- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 3

Date: 20/02/2014
Author: Lauren Fick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)

0 0.5 1 2
kilometres

N
W E
S

-29 °
-29.05 °
-29.1 °
-29.15°
123.05 °
123.1 °

Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
- ISSP-MWS7
- ISSP-MWS8
- ISSP-MWS9
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- ISSP-MWS21
- ISSP-MWS22
- ISSP-MWS23
- ISSP-MWS24
- ISSP-MWS25
- ISSP-MWS26
- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 4

Date: 28/03/2014
Author: Lauren Fick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude/Latitude (WGS 84)

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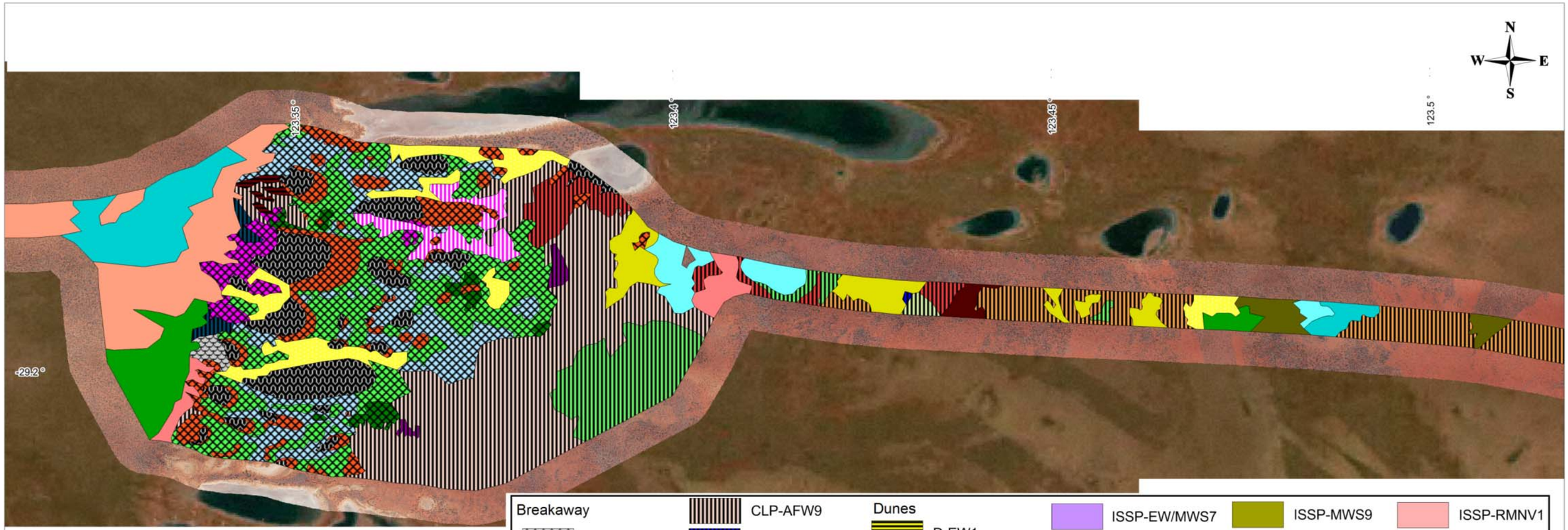
kilometres



Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
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- ISSP-MWS2
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- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 5

Date: 26/08/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)

0 0.5 1 2
kilometres

Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
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- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 6

Date: 20/02/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)

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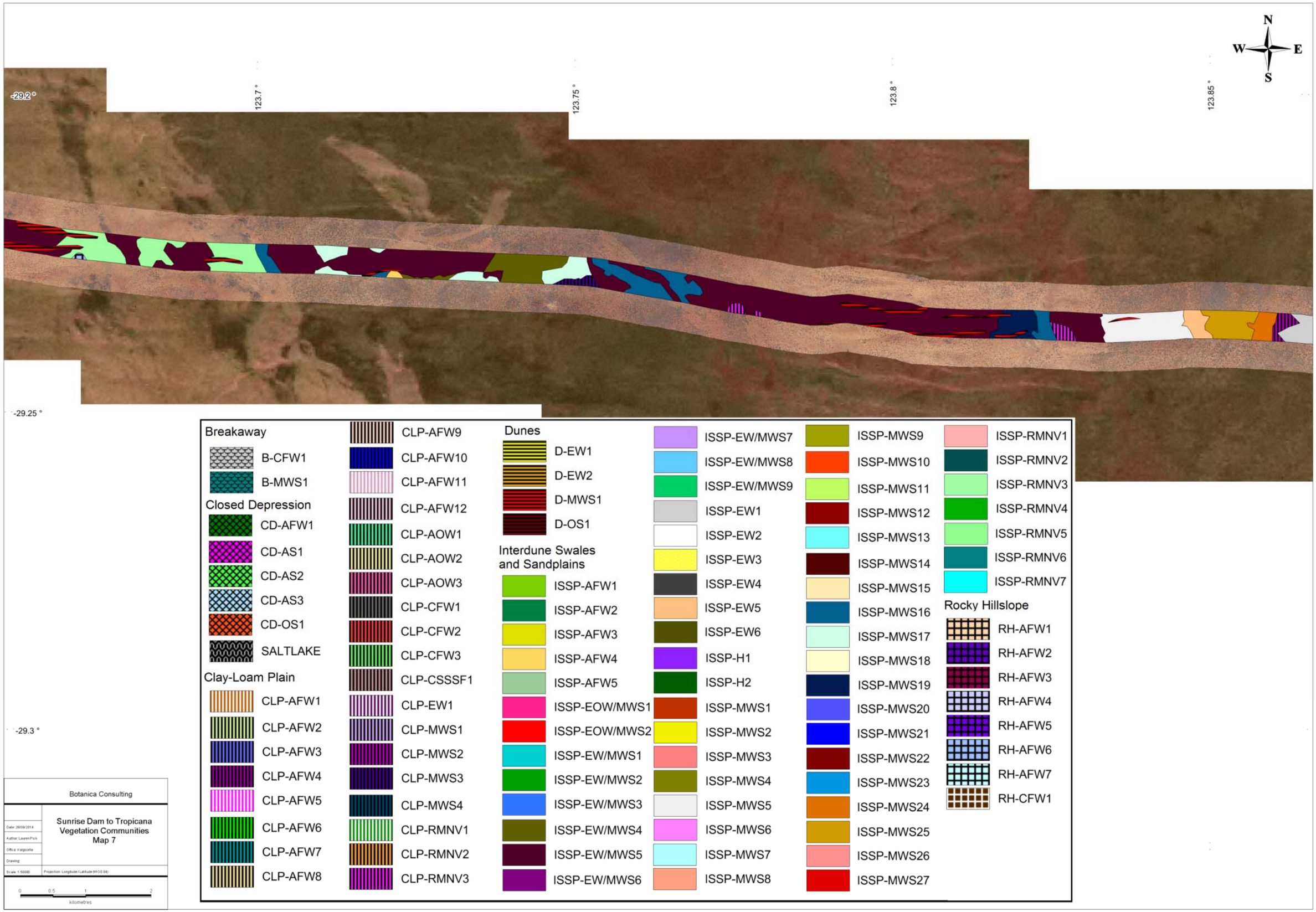
kilometres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W
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S
-29.2 °
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-29.3 °
Breakaway
B-CFW1
B-MWS1
Closed Depression
CD-AFW1
CD-AS1
CD-AS2
CD-AS3
CD-OS1
SALTLAKE
Clay-Loam Plain
CLP-AFW1
CLP-AFW2
CLP-AFW3
CLP-AFW4
CLP-AFW5
CLP-AFW6
CLP-AFW7
CLP-AFW8
CLP-AFW9
CLP-AFW10
CLP-AFW11
CLP-AFW12
CLP-AOW1
CLP-AOW2
CLP-AOW3
CLP-CFW1
CLP-CFW2
CLP-CFW3
CLP-CSSSF1
CLP-EW1
CLP-MWS1
CLP-MWS2
CLP-MWS3
CLP-MWS4
CLP-RMNV1
CLP-RMNV2
CLP-RMNV3
Dunes
D-EW1
D-EW2
D-MWS1
D-OS1
Interdune Swales and Sandplains
ISSP-AFW1
ISSP-AFW2
ISSP-AFW3
ISSP-AFW4
ISSP-AFW5
ISSP-EOW/MWS1
ISSP-EOW/MWS2
ISSP-EW/MWS1
ISSP-EW/MWS2
ISSP-EW/MWS3
ISSP-EW/MWS4
ISSP-EW/MWS5
ISSP-EW/MWS6
ISSP-EW/MWS7
ISSP-EW/MWS8
ISSP-EW/MWS9
ISSP-EW1
ISSP-EW2
ISSP-EW3
ISSP-EW4
ISSP-EW5
ISSP-EW6
ISSP-H1
ISSP-H2
ISSP-MWS1
ISSP-MWS2
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ISSP-MWS24
ISSP-MWS25
ISSP-MWS26
ISSP-MWS27
ISSP-RMNV1
ISSP-RMNV2
ISSP-RMNV3
ISSP-RMNV4
ISSP-RMNV5
ISSP-RMNV6
ISSP-RMNV7
Rocky Hillslope
RH-AFW1
RH-AFW2
RH-AFW3
RH-AFW4
RH-AFW5
RH-AFW6
RH-AFW7
RH-CFW1
Botanica Consulting
Sunrise Dam to Tropicana
Vegetation Communities
Map 7
Date: 28/08/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)
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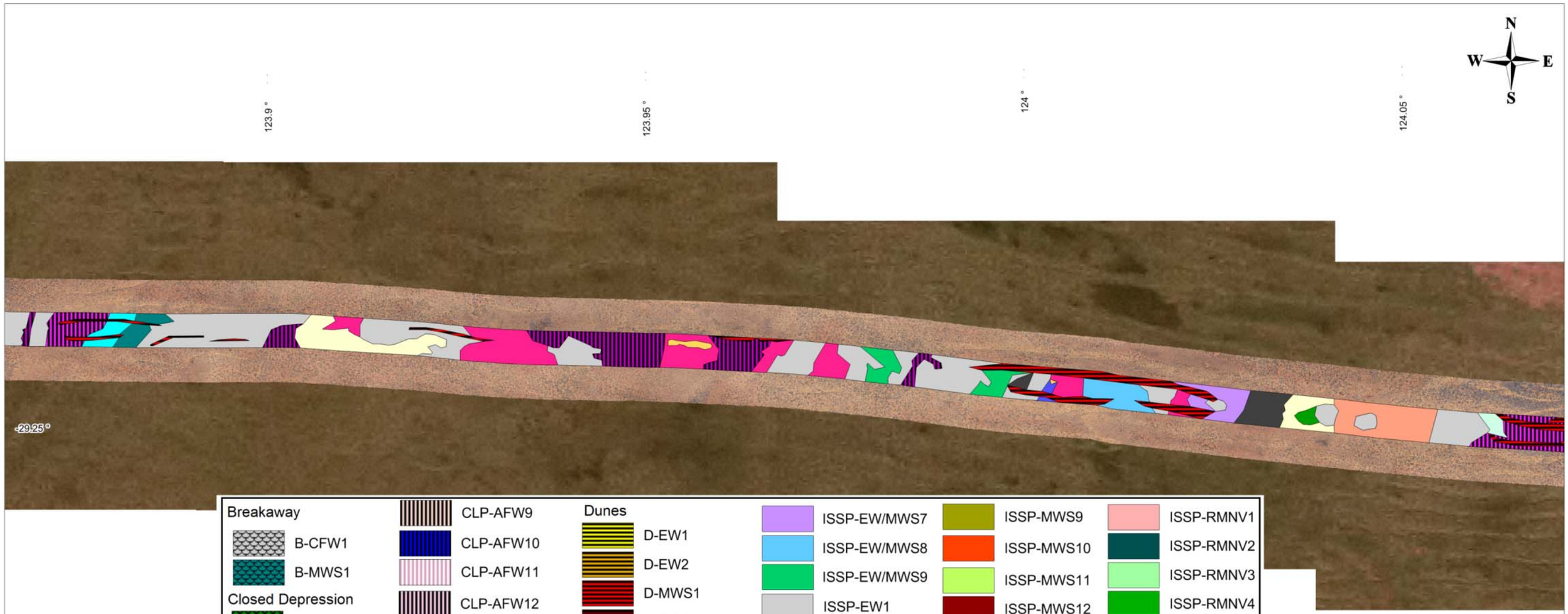
kilometres



Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
- ISSP-MWS7
- ISSP-MWS8
- ISSP-MWS9
- ISSP-MWS10
- ISSP-MWS11
- ISSP-MWS12
- ISSP-MWS13
- ISSP-MWS14
- ISSP-MWS15
- ISSP-MWS16
- ISSP-MWS17
- ISSP-MWS18
- ISSP-MWS19
- ISSP-MWS20
- ISSP-MWS21
- ISSP-MWS22
- ISSP-MWS23
- ISSP-MWS24
- ISSP-MWS25
- ISSP-MWS26
- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 8

Date: 26/08/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude/Latitude (WGS 84)

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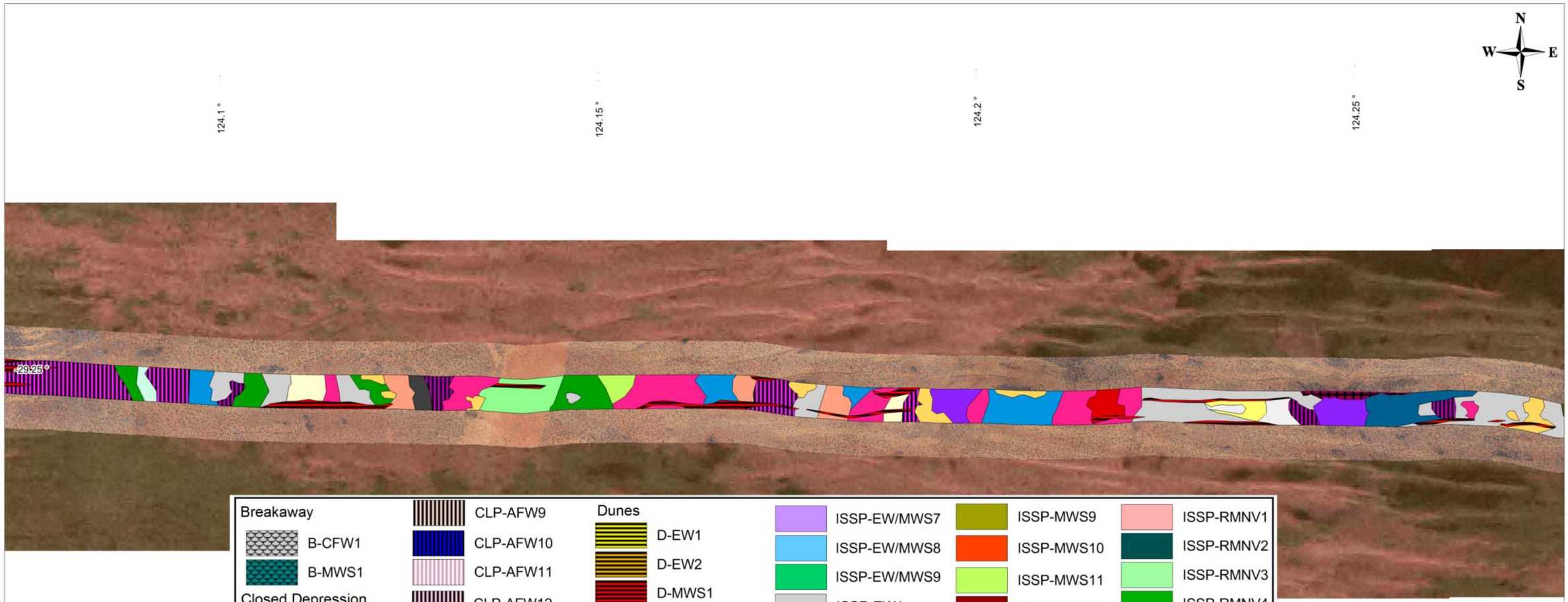
kilometres



Breakaway
- B-CFW1
- B-MWS1

Closed Depression
- CD-AFW1
- CD-AS1
- CD-AS2
- CD-AS3
- CD-OS1
- SALTLAKE

Clay-Loam Plain
- CLP-AFW1
- CLP-AFW2
- CLP-AFW3
- CLP-AFW4
- CLP-AFW5
- CLP-AFW6
- CLP-AFW7
- CLP-AFW8
- CLP-AFW9
- CLP-AFW10
- CLP-AFW11
- CLP-AFW12
- CLP-AOW1
- CLP-AOW2
- CLP-AOW3
- CLP-CFW1
- CLP-CFW2
- CLP-CFW3
- CLP-CSSSF1
- CLP-EW1
- CLP-MWS1
- CLP-MWS2
- CLP-MWS3
- CLP-MWS4
- CLP-RMNV1
- CLP-RMNV2
- CLP-RMNV3

Dunes
- D-EW1
- D-EW2
- D-MWS1
- D-OS1

Interdune Swales and Sandplains
- ISSP-AFW1
- ISSP-AFW2
- ISSP-AFW3
- ISSP-AFW4
- ISSP-AFW5
- ISSP-EOW/MWS1
- ISSP-EOW/MWS2
- ISSP-EW/MWS1
- ISSP-EW/MWS2
- ISSP-EW/MWS3
- ISSP-EW/MWS4
- ISSP-EW/MWS5
- ISSP-EW/MWS6
- ISSP-EW/MWS7
- ISSP-EW/MWS8
- ISSP-EW/MWS9
- ISSP-EW1
- ISSP-EW2
- ISSP-EW3
- ISSP-EW4
- ISSP-EW5
- ISSP-EW6
- ISSP-H1
- ISSP-H2
- ISSP-MWS1
- ISSP-MWS2
- ISSP-MWS3
- ISSP-MWS4
- ISSP-MWS5
- ISSP-MWS6
- ISSP-MWS7
- ISSP-MWS8
- ISSP-MWS9
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- ISSP-MWS21
- ISSP-MWS22
- ISSP-MWS23
- ISSP-MWS24
- ISSP-MWS25
- ISSP-MWS26
- ISSP-MWS27
- ISSP-RMNV1
- ISSP-RMNV2
- ISSP-RMNV3
- ISSP-RMNV4
- ISSP-RMNV5
- ISSP-RMNV6
- ISSP-RMNV7

Rocky Hillslope
- RH-AFW1
- RH-AFW2
- RH-AFW3
- RH-AFW4
- RH-AFW5
- RH-AFW6
- RH-AFW7
- RH-CFW1

Botanica Consulting

Sunrise Dam to Tropicana
Vegetation Communities
Map 9

Date: 26/08/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude/Latitude (WGS 84)

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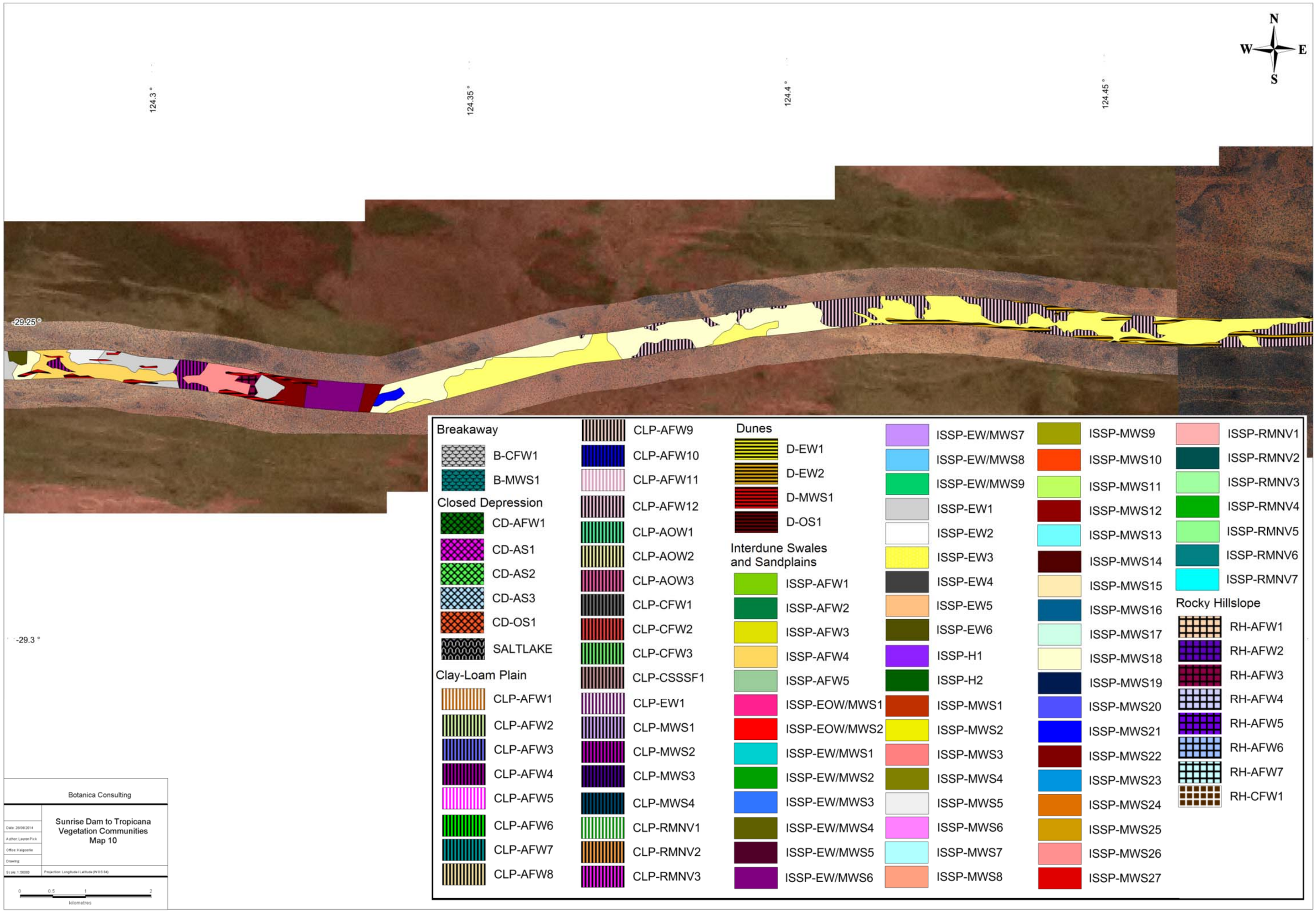
kilometres


N
W
E
S
124.3 °
124.35 °
124.4 °
124.45 °
-29.25 °
-29.3 °
Breakaway
B-CFW1
B-MWS1
Closed Depression
CD-AFW1
CD-AS1
CD-AS2
CD-AS3
CD-OS1
SALTLAKE
Clay-Loam Plain
CLP-AFW1
CLP-AFW2
CLP-AFW3
CLP-AFW4
CLP-AFW5
CLP-AFW6
CLP-AFW7
CLP-AFW8
CLP-AFW9
CLP-AFW10
CLP-AFW11
CLP-AFW12
CLP-AOW1
CLP-AOW2
CLP-AOW3
CLP-CFW1
CLP-CFW2
CLP-CFW3
CLP-CSSSF1
CLP-EW1
CLP-MWS1
CLP-MWS2
CLP-MWS3
CLP-MWS4
CLP-RMNV1
CLP-RMNV2
CLP-RMNV3
Dunes
D-EW1
D-EW2
D-MWS1
D-OS1
Interdune Swales and Sandplains
ISSP-AFW1
ISSP-AFW2
ISSP-AFW3
ISSP-AFW4
ISSP-AFW5
ISSP-EOW/MWS1
ISSP-EOW/MWS2
ISSP-EW/MWS1
ISSP-EW/MWS2
ISSP-EW/MWS3
ISSP-EW/MWS4
ISSP-EW/MWS5
ISSP-EW/MWS6
ISSP-EW/MWS7
ISSP-EW/MWS8
ISSP-EW/MWS9
ISSP-EW1
ISSP-EW2
ISSP-EW3
ISSP-EW4
ISSP-EW5
ISSP-EW6
ISSP-H1
ISSP-H2
ISSP-MWS1
ISSP-MWS2
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ISSP-RMNV1
ISSP-RMNV2
ISSP-RMNV3
ISSP-RMNV4
ISSP-RMNV5
ISSP-RMNV6
ISSP-RMNV7
Rocky Hillslope
RH-AFW1
RH-AFW2
RH-AFW3
RH-AFW4
RH-AFW5
RH-AFW6
RH-AFW7
RH-CFW1
Botanica Consulting
Sunrise Dam to Tropicana
Vegetation Communities
Map 10
Date: 26/08/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude/Latitude (WGS 84)
0
0.5
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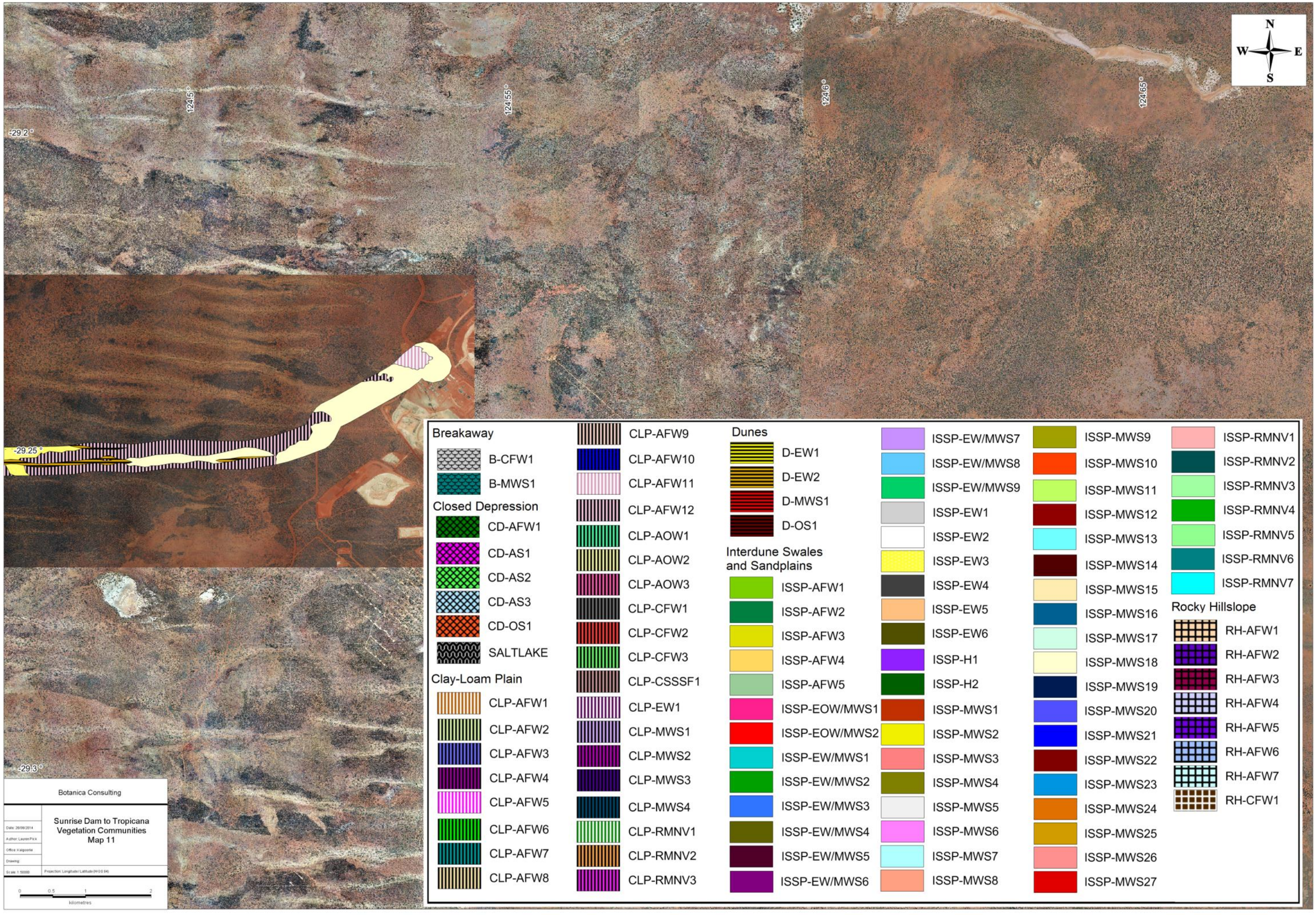
kilometres


N
W
E
S
124.5°
124.55°
124.6°
124.65°
-29.2°
-29.25°
-29.3°
Breakaway
B-CFW1
B-MWS1
Closed Depression
CD-AFW1
CD-AS1
CD-AS2
CD-AS3
CD-OS1
SALTLAKE
Clay-Loam Plain
CLP-AFW1
CLP-AFW2
CLP-AFW3
CLP-AFW4
CLP-AFW5
CLP-AFW6
CLP-AFW7
CLP-AFW8
CLP-AFW9
CLP-AFW10
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CLP-AFW12
CLP-AOW1
CLP-AOW2
CLP-AOW3
CLP-CFW1
CLP-CFW2
CLP-CFW3
CLP-CSSSF1
CLP-EW1
CLP-MWS1
CLP-MWS2
CLP-MWS3
CLP-MWS4
CLP-RMNV1
CLP-RMNV2
CLP-RMNV3
Dunes
D-EW1
D-EW2
D-MWS1
D-OS1
Interdune Swales and Sandplains
ISSP-AFW1
ISSP-AFW2
ISSP-AFW3
ISSP-AFW4
ISSP-AFW5
ISSP-EOW/MWS1
ISSP-EOW/MWS2
ISSP-EW/MWS1
ISSP-EW/MWS2
ISSP-EW/MWS3
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ISSP-RMNV3
ISSP-RMNV4
ISSP-RMNV5
ISSP-RMNV6
ISSP-RMNV7
Rocky Hillslope
RH-AFW1
RH-AFW2
RH-AFW3
RH-AFW4
RH-AFW5
RH-AFW6
RH-AFW7
RH-CFW1
Botanica Consulting
Sunrise Dam to Tropicana
Vegetation Communities
Map 11
Date: 26/09/2014
Author: Lauren Pick
Office: Kalgoorlie
Drawing:
Scale: 1:50000
Projection: Longitude / Latitude (WGS 84)
0
0.5
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kilometres

Appendix 3: List of taxa identified within each vegetation community

(A) Denotes Annual taxa; (P) Denotes Priority taxa as listed on Florabase (WAHERB, 2014). **Breakaway, Clay-Loam Plain, Closed Depression Dunes & Rocky Hillslope vegetation communities**

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Aizoaceae	*Disphyma*	*crassifolium*																																	*												
Aizoaceae	*Gunniopsis*	*quadrifida*											*																		*	*	*	*												
Amaranthaceae	*Ptilotus*	*gaudichaudii (A)*																								*																					
Amaranthaceae	*Ptilotus*	*nobilis (A)*																								*																					
Amaranthaceae	*Ptilotus*	*obovatus*			*	*	*	*	*	*	*		*	*			*	*	*	*	*	*	*		*			*		*	*				*				*		*	*	*	*	*		*	*
Amaranthaceae	*Ptilotus*	*polystachyus (A)*																								*																					*	
Amaranthaceae	*Ptilotus*	*schwartzii*																																													*	
Amaranthaceae	*Ptilotus*	*sessilifolius*																								*																					
Apocynaceae	*Alyxia*	*buxifolia*	*																									*			*															*	
Apocynaceae	*Marsdenia*	*australis*				*					*														*																						
Asparagaceae	*Lomandra*	*effusa*																																														
Asparagaceae	*Lomandra*	*leucocephala* subsp. *robusta*																																		*			*								
Asteraceae	*Angianthus*	*tomentosus (A)*																						*																						
Asteraceae	*Asteraceae*	sp. (sterile)																																	*												
Asteraceae	*Brachyscome*	*ciliaris (A)*																																												*	
Asteraceae	*Brachyscome*	*ciliocarpa (A)*																																												*	
Asteraceae	*Olearia*	*subspicata*						*	*					*							*													*												*
Asteraceae	*Chrysocephalum*	*apiculatum*																																													
Asteraceae	*Cratystylis*	*subspinescens*						*	*				*					*			*	*		*								*	*	*	*	*			*							
Asteraceae	*Leucochrysum*	*stipitatum (A)*																								*																					
Asteraceae	*Olearia*	*arida (P4)*																																		*											
Asteraceae	*Olearia*	*incana*																																													
Asteraceae	*Olearia*	*muelleri*	*										*	*						*	*	*						*		*	*															
Asteraceae	*Olearia*	*pimelioides*																																												*	
Asteraceae	*Olearia*	*subspicata*							*																																			*		
Asteraceae	*Podolepis*	*capillaris (A)*			*					*	*																														*						
Boraginaceae	*Halgania*	*integerrima*																																													
Boraginaceae	*Halgania*	*cyanea* var. Allambi Stn (B.W. Strong 676)																								*																					
Campanulaceae	*Wahlenbergia*	*tumidifructa (A)*																								*																					
Casuarinaceae	*Allocasuarina*	*acutivalvis*																																														
Casuarinaceae	*Allocasuarina*	*campestris*																										*																				
Casuarinaceae	*Allocasuarina*	*corniculata*																																														
Casuarinaceae	*Allocasuarina*	*helmsii*										*																																			
Casuarinaceae	*Allocasuarina*	sp. (sterile)																																													
Casuarinaceae	*Allocasuarina*	*spinosissima*																																													
Casuarinaceae	*Casuarina*	*pauper*	*											*			*		*	*			*								*								*		*					*
Chenopodiaceae	*Atriplex*	*bunburyana*															*	*	*	*				*																*		*	*	*		*	*
Chenopodiaceae	*Atriplex*	*codonocarpa (A)*																																											*	*			
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*																																														
Chenopodiaceae	*Atriplex*	*stipitata*					*	*	*					*							*	*																	*							
Chenopodiaceae	*Atriplex*	*vesicaria*	*															*			*		*	*								*	*	*		*			*							
Chenopodiaceae	*Dysphania*	*kalpari (A)*																								*																					
Chenopodiaceae	*Enchylaena*	*lanata*																				*																									
Chenopodiaceae	*Enchylaena*	*tomentosa*												*																																	
Chenopodiaceae	*Maireana*	*amoena*																																														
Chenopodiaceae	*Maireana*	*aphylla*																																														
Chenopodiaceae	*Maireana*	*brevifolia*																																												*	*			
Chenopodiaceae	*Maireana*	*carnosa*			*								*									*																								
Chenopodiaceae	*Maireana*	*convexa*												*																																		
Chenopodiaceae	*Maireana*	*georgei*			*	*	*	*	*		*			*			*	*			*		*		*																*		*	*		*		
Chenopodiaceae	*Maireana*	*glomerifolia*																		*	*															*						*		*				*
Chenopodiaceae	*Maireana*	*pentatropis*															*																														
Chenopodiaceae	*Maireana*	*platycarpa*																				*																									

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Chenopodiaceae	*Maireana*	*platycarpa*																																	*											
Chenopodiaceae	*Maireana*	*pyramidata*									*		*				*	*	*	*																				*		*				*	*
Chenopodiaceae	*Maireana*	*sedifolia*								*	*		*				*		*	*																				*		*	*	*		*	*
Chenopodiaceae	*Maireana*	*thesioides*																																												
Chenopodiaceae	*Maireana*	*tomentosa*																																												
Chenopodiaceae	*Maireana*	*trichoptera*															*			*																							*	*			*
Chenopodiaceae	*Maireana*	*triptera*			*	*	*				*			*					*		*	*	*		*															*	*	*	*	*		*	
Chenopodiaceae	*Rhagodia*	*eremaea*						*	*		*			*							*	*														*	*			*				*	*			
Chenopodiaceae	*Rhagodia*	*spinescens*																																												*		
Chenopodiaceae	*Sclerolaena*	*cuneata*								*								*	*																*						*		*	*	*			
Chenopodiaceae	*Sclerolaena*	*densiflora*												*				*	*	*		*																			*		*	*	*			*
Chenopodiaceae	*Sclerolaena*	*diacantha*									*						*	*	*	*			*																		*	*	*	*	*		*	*
Chenopodiaceae	*Sclerolaena*	*drummondii*																																	*											
Chenopodiaceae	*Sclerolaena*	*fusiformis*			*															*																							*	*			*
Chenopodiaceae	*Sclerolaena*	*parvifolia*																																												
Chenopodiaceae	*Sclerolaena*	*uniflora*																																												
Chenopodiaceae	*Tecticornia*	*calyptrata*																						*																						
Chenopodiaceae	*Tecticornia*	*disarticulata*																*						*																						
Chenopodiaceae	*Tecticornia*	*halocnemoides*																						*																						
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*																						*																						
Chenopodiaceae	*Tecticornia*	*indica* subsp. *leiostachya*																						*																						
Chenopodiaceae	*Tecticornia*	*pergranulata*																						*																						
Chenopodiaceae	*Tecticornia*	*pruinosa*																						*																						
Chenopodiaceae	*Tecticornia*	sp. (sterile)																														*	*	*												
Convolvulaceae	*Duperreya*	*sericea*																																												*	
Cupressaceae	*Callitris*	*columellaris*																																		*	*									
Cupressaceae	*Callitris*	*preissii*																									*		*								*		*							
Cyperaceae	*Chrysitrix*	*distigmatosa*																																												
Euphorbiaceae	*Bertya*	*dimerostigma*														*																														
Euphorbiaceae	*Beyeria*	*brevifolia*																																												
Euphorbiaceae	*Beyeria*	*sulcata* var. *sulcata*																																												
Euphorbiaceae	*Euphorbia*	*drummondii* subsp. *drummondii*																																												
Euphorbiaceae	*Euphorbia*	*tannensis (A)*																																												
Fabaceae	*Acacia*	*abrupta*																																												
Fabaceae	*Acacia*	*acanthoclada*																																												
Fabaceae	*Acacia*	*aneura* (sterile)													*	*										*																			*	
Fabaceae	*Acacia*	*aptaneura*				*												*	*						*						*										*	*	*			*	
Fabaceae	*Acacia*	*assimilis*																									*																			
Fabaceae	*Acacia*	*ayersiana*		*													*		*	*																					*	*	*	*	*	*	*	*
Fabaceae	*Acacia*	*burkittii*			*		*			*	*		*	*					*												*								*		*	*	*			*	
Fabaceae	*Acacia*	*caesaneura*		*	*	*	*	*	*	*	*	*	*	*	*		*		*		*	*			*		*			*				*				*			*	*	*			*	
Fabaceae	*Acacia*	*colletioides*	*										*	*								*								*				*				*								
Fabaceae	*Acacia*	*craspedocarpa*																																												*	
Fabaceae	*Acacia*	*cuthbertsonii*																																											*		
Fabaceae	*Acacia*	*desertorum* subsp. *desertorum*																								*			*																
Fabaceae	*Acacia*	*eremophila* numerous-nerved variant (A.S. George 11924) (P3)																																												
Fabaceae	*Acacia*	*eremophila* subsp. *eremophila*																																											
Fabaceae	*Acacia*	*erinacea*			*																																								
Fabaceae	*Acacia*	*fragilis*																																												
Fabaceae	*Acacia*	*grasbyi*																																										*	*			
Fabaceae	*Acacia*	*helmsiana*																																												
Fabaceae	*Acacia*	*hemiteles*																								*						*														
Fabaceae	*Acacia*	*incurvaneura*			*	*	*			*	*					*			*	*	*				*				*	*								*		*	*	*	*	*	*	*	*
Fabaceae	*Acacia*	*jamesiana*																																												
Fabaceae	*Acacia*	*jennerae*									*																																			
Fabaceae	*Acacia*	*kalgoorliensis*																																												*	
Fabaceae	*Acacia*	*kempeana*																														*														

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Fabaceae	*Acacia*	*kempeana*										*				*	*						*				*				*															
Fabaceae	*Acacia*	*ligulata*		*	*					*	*					*												*									*									
Fabaceae	*Acacia*	*macraneura*																																												*	
Fabaceae	*Acacia*	*mulganeura*																																												*	
Fabaceae	*Acacia*	*murrayana*																																												
Fabaceae	*Acacia*	*oswaldii*										*					*	*	*	*																						*		*	*	*			*
Fabaceae	*Acacia*	*pachyacra*		*																								*																		
Fabaceae	*Acacia*	*prainii*																																													
Fabaceae	*Acacia*	*ramulosa* var. *ramulosa*		*	*	*	*					*			*	*									*								*	*									*	*	*	*	
Fabaceae	*Acacia*	*rigens*																														*	*	*													
Fabaceae	*Acacia*	*sibirica*																																													
Fabaceae	*Acacia*	sp. (sterile)																								*																					
Fabaceae	*Acacia*	*tetragonophylla*	*	*	*	*	*			*				*				*	*		*		*		*						*								*			*	*	*	*	*		*	
Fabaceae	*Bossiaea*	*walkeri*	*																												*																
Fabaceae	*Cullen*	*discolor*																								*																					
Fabaceae	*Daviesia*	*benthamii*												*																																	
Fabaceae	*Daviesia*	*grahamii*																																													
Fabaceae	*Daviesia*	*purpurascens*																																								*					
Fabaceae	*Daviesia*	*ulicifolia* subsp. *aridicola*																																												
Fabaceae	*Jacksonia*	*arida*																						*								*	*	*					*							
Fabaceae	*Jacksonia*	*nematoclada*																																												
Fabaceae	*Kennedia*	*prorepens*																																												
Fabaceae	*Labichea*	*eremaea (P3)*																																												
Fabaceae	*Leptosema*	*chambersii*																									*		*																		
Fabaceae	*Mirbelia*	*rhagodioides*																														*	*	*	*												
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*	*		*	*				*	*		*				*		*		*	*	*					*		*									*			*	*	*	*	*		*	
Fabaceae	*Senna*	*artemisioides* subsp. x *artemisioides*				*	*			*									*																							*	*	*				*	
Fabaceae	*Senna*	*cardiosperma*																	*																							*		*				*	
Fabaceae	*Senna*	*pleurocarpa*																								*																					
Fabaceae	*Swainsona*	*canescens*																																													
Fabaceae	*Swainsona*	*colutoides (A)*																								*																					
Fabaceae	*Swainsona*	*kingii (A)*																								*																					
Fabaceae	*Templetonia*	*aculeata*												*							*																										
Frankeniaceae	*Frankenia*	*cinerea*																						*																							
Frankeniaceae	*Frankenia*	*setosa*											*					*		*	*	*										*	*	*		*										*
Geraniaceae	*Erodium*	*cygnorum (A)*																																												*	
Goodeniaceae	*Brunonia*	*australis (A)*																								*																				*	
Goodeniaceae	*Goodenia*	*havilandii (A)*																																												*	
Goodeniaceae	*Goodenia*	*mimuloides*																																													
Goodeniaceae	*Goodenia*	*xanthosperma*																																													
Goodeniaceae	*Scaevola*	*basedowii*																																													
Goodeniaceae	*Scaevola*	*collaris*																																													
Goodeniaceae	*Scaevola*	*restiacea*																																													
Goodeniaceae	*Scaevola*	*spinescens*	*	*	*	*	*	*	*	*	*	*	*	*			*		*			*	*		*			*		*	*	*	*	*					*		*	*	*				*	
Goodeniaceae	*Velleia*	*hispida (A)*																								*																					
Goodeniaceae	*Velleia*	*rosea (A)*																								*																				*	
Goodeniaceae	*Velleia*	*connata (A)*																								*																					
Gyrostemonaceae	*Codonocarpus*	*cotinifolius*																																													
Haloragaceae	*Glischrocaryon*	*angustifolium*																								*																					
Haloragaceae	*Glischrocaryon*	*aureum*																																													
Hemerocallidaceae	*Dianella*	*revoluta*																																													
Lamiaceae	*Dicrastylis*	*brunnea*																								*																					
Lamiaceae	*Dicrastylis*	*cundeeleensis (P4)*																																												
Lamiaceae	*Dicrastylis*	*parvifolia*																																													
Lamiaceae	*Microcorys*	*macredieana*																													*																
Lamiaceae	*Newcatselia*	*hexarrhena*																																													
Lamiaceae	*Pityrodia*	*loricata*																																				*									
Lamiaceae	*Prostanthera*	*althoferi*		*								*																																			

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Lamiaceae	*Prostanthera*	*sericea*														*																														
Lamiaceae	*Spartothamnella*	*teucriiflora*		*		*		*	*										*						*															*		*			*	
Lamiaceae	*Westringia*	*cephalantha*																																													
Lamiaceae	*Westringia*	*rigida*	*																									*			*																
Loranthaceae	*Amyema*	*miquelii*																																													*	
Loranthaceae	*Lysiana*	*murrayi*																																													*	
Malvaceae	*Abutilon*	*oxycarpum* subsp. Prostrate (AA. Mitchell PRP 1266)																																													*	
Malvaceae	*Alyogyne*	*pinoniana*																								*																					
Malvaceae	*Androcalva*	*loxophylla*																								*																					
Malvaceae	*Brachychiton*	*gregorii*				*						*													*																					
Malvaceae	*Hannafordia*	*bissillii* subsp. *bissillii*														*																														
Malvaceae	*Keraudrenia*	*velutina*																									*														*						
Malvaceae	*Keraudrenia*	*velutina* subsp. *elliptica*																																													
Malvaceae	*Lawrencia*	*glomerata*																													*	*	*		*												
Malvaceae	*Sida*	*calyxhymenia*								*								*																										*	*			
Malvaceae	*Sida*	sp. Excedentifolia (J.L. Egan 1925)					*				*																																			*	
Myrtaceae	*Aluta*	*maisonneuvei* subsp. *auriculata*													*	*													*																*		
Myrtaceae	*Baeckea*	sp. Great Victoria Desert (A.S. Weston 14813)																																													
Myrtaceae	*Calothamnus*	*gilesii*																																												
Myrtaceae	*Eucalyptus*	*comitae-vallis*																																												
Myrtaceae	*Eucalyptus*	*concinna*										*														*																				
Myrtaceae	*Eucalyptus*	*effusa*																																												
Myrtaceae	*Eucalyptus*	*eremicola*												*																																
Myrtaceae	*Eucalyptus*	*glomerosa*																																												*	
Myrtaceae	*Eucalyptus*	*gongylocarpa*																									*		*																	
Myrtaceae	*Eucalyptus*	*gracilis*																												*																
Myrtaceae	*Eucalyptus*	*horistes*																																												
Myrtaceae	*Eucalyptus*	*hypolaena*																																												
Myrtaceae	*Eucalyptus*	*kingsmillii*																																												*	
Myrtaceae	*Eucalyptus*	*leptopoda* subsp. *elevata*																									*		*																	*	
Myrtaceae	*Eucalyptus*	*lesouefii*											*																																		
Myrtaceae	*Eucalyptus*	*lucasii*																																													
Myrtaceae	*Eucalyptus*	*oleosa*												*														*																		
Myrtaceae	*Eucalyptus*	*oleosa* subsp. *oleosa*																												*																
Myrtaceae	*Eucalyptus*	*rigidula*																																												
Myrtaceae	*Eucalyptus*	*salicola*																			*																									
Myrtaceae	*Eucalyptus*	*salubris*																					*																						
Myrtaceae	*Eucalyptus*	sp. (sterile)																								*																				
Myrtaceae	*Eucalyptus*	*trivalva*																																												
Myrtaceae	*Eucalyptus*	*youngiana*		*																						*	*		*																
Myrtaceae	*Leptospermum*	*roei*																											*																
Myrtaceae	*Melaleuca*	*apostiba (P3)*																																*											
Myrtaceae	*Melaleuca*	*hamata*																																											*	
Myrtaceae	*Melaleuca*	*interioris*																																												
Myrtaceae	*Melaleuca*	*leiocarpa*																																												
Myrtaceae	*Micromyrtus*	*flaviflora*																																												
Myrtaceae	*Thryptomene*	*biseriata*																																												
Oleaceae	*Jasminum*	*calcareum*																																												
Pittosporaceae	*Pittosporum*	*angustifolium*																																												
Pittosporaceae	*Pittosporum*	*angustifolium*																																												
Poaceae	*Aristida*	*contorta (A)*			*		*								*											*		*																		
Poaceae	*Aristida*	*holathera (A)*						*	*																										*											
Poaceae	*Austrostipa*	*elegantissima*	*																									*						*											*	
Poaceae	*Enneapogon*	*caerulescens*			*						*																																			
Poaceae	*Enteropogon*	*ramosus*						*	*																																				
Poaceae	*Eragrostis*	*eriopoda*													*																					*				*						*	

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Poaceae	*Eriachne*	*pulchella (A)*		*																																									
Poaceae	*Monachather*	*paradoxus*													*																														
Poaceae	*Paspalidium*	*constrictum*																								*																				
Poaceae	*Poaceae*	sp. (sterile)																																	*											
Poaceae	*Triodia*	*basedowii*	*				*	*	*					*	*						*		*					*						*	*	*	*								
Poaceae	*Triodia*	*desertorum*																				*				*			*		*							*								
Polygonaceae	*Muehlenbeckia*	*florulenta*																*														*	*	*	*										
Portulaceae	*Calandrinia*	*eremaeum (A)*																																												
Proteaceae	*Banksia*	*elderiana*																																											
Proteaceae	*Grevillea*	*berryana*			*	*																			*																		*	*		
Proteaceae	*Grevillea*	*deflexa*																																*					*							
Proteaceae	*Grevillea*	*didymobotrya* subsp. *didymobotrya*																																											
Proteaceae	*Grevillea*	*eriostachya*																																											
Proteaceae	*Grevillea*	*juncifolia* subsp. *juncifolia*																											*							*	*		*						
Proteaceae	*Grevillea*	*nematophylla* subsp. *nematophylla*																																											
Proteaceae	*Grevillea*	*sarissa* subsp. *sarissa*						*	*												*	*																						
Proteaceae	*Grevillea*	*secunda* (P4)																												*																
Proteaceae	*Hakea*	*francisiana*																								*	*		*																
Proteaceae	*Hakea*	*kippistiana*			*						*																																		
Proteaceae	*Hakea*	*lorea*			*																																								
Proteaceae	*Hakea*	*preissii*																*																												
Proteaceae	*Persoonia*	*coriacea*																											*							*										
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*																																											*	
Restionaceae	*Lepidobolus*	*deserti*																																			*	*								
Rubiaceae	*Psydrax*	*latifolia*																																										*		
Rubiaceae	*Psydrax*	*rigidula*																																											*	
Rubiaceae	*Psydrax*	*suaveolens*																																												
Rutaceae	*Phebalium*	*canaliculatum*																																												
Rutaceae	*Phebalium*	*filifolium*																																												
Rutaceae	*Philotheca*	*tomentella*																																												
Santalaceae	*Anthobolus*	*leptomerioides*																																												
Santalaceae	*Choretrum*	*chrysanthum*																																										*	*		
Santalaceae	*Exocarpos*	*aphyllus*	*					*	*												*	*							*		*							*							
Santalaceae	*Exocarpos*	*sparteus*											*																																	
Santalaceae	*Santalum*	*acuminatum*																																									*			
Santalaceae	*Santalum*	*lanceolatum*																	*																									*		*		
Santalaceae	*Santalum*	*spicatum*						*	*			*		*							*	*																			*		*		*	*		*	
Sapindaceae	*Alectryon*	*oleifolius*												*						*		*																								
Sapindaceae	*Dodonaea*	*adenophora*																																												
Sapindaceae	*Dodonaea*	*lobulata*	*		*	*	*			*	*	*		*			*								*			*			*							*			*		*	*			
Sapindaceae	*Dodonaea*	*rigida*					*					*																																		*	
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*						*	*				*								*	*										*	*	*	*	*			*							
Scrophulariaceae	*Eremophila*	*alternifolia*								*									*																								*		*	*	*			
Scrophulariaceae	*Eremophila*	*caperata*																																														
Scrophulariaceae	*Eremophila*	*clarkei*																																														
Scrophulariaceae	*Eremophila*	*decipiens*						*	*				*																													*						
Scrophulariaceae	*Eremophila*	*fallax*																													*																
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*														*																															
Scrophulariaceae	*Eremophila*	*georgei*																																												*	
Scrophulariaceae	*Eremophila*	*glabra*																									*																		*	
Scrophulariaceae	*Eremophila*	*glutinosa*																	*																									*		*		
Scrophulariaceae	*Eremophila*	*granitica*																																												*	
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *glabra*						*	*					*																															*		
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*		*								*			*																														*	
Scrophulariaceae	*Eremophila*	*longifolia*				*	*																		*																				*	
Scrophulariaceae	*Eremophila*	*maculata*											*																																	*	
Scrophulariaceae	*Eremophila*	*margarethae*																																													
Scrophulariaceae	*Eremophila*	*metallicorum*																																												*	

			Breakaway		Clay-Loam Plain																										Closed Depression					Dunes				Rocky Hillslope							
Family	**Genus**	**Taxon**	**B-CFW1**	**B-MWS1**	**CLP-AFW1**	**CLP-AFW2**	**CLP-AFW3**	**CLP-AFW4**	**CLP-AFW5**	**CLP-AFW6**	**CLP-AFW7**	**CLP-AFW8**	**CLP-AFW9**	**CLP-AFW10**	**CLP-AFW11**	**CLP-AFW12**	**CLP-AOW1**	**CLP-AOW2**	**CLP-AOW3**	**CLP-CFW1**	**CLP-CFW2**	**CLP-CFW3**	**CLP-EW1**	**CLP-CSSSF1**	**CLP-RMNV1**	**CLP-RMNV2**	**CLP-RMNV3**	**CLP-MWS1**	**CLP-MWS2**	**CLP-MWS3**	**CLP-MWS4**	**CD-AS1**	**CD-AS2**	**CD-AS3**	**CD-AFW1**	**CD-OS1**	**D-EW1**	**D-EW2**	**D-OS1**	**D-MWS1**	**RH-AFW1**	**RH-AFW2**	**RH-AFW3**	**RH-AFW4**	**RH-AFW5**	**RH-AFW6**	**RH-AFW7**	**RH-CFW1**
Scrophulariaceae	*Eremophila*	*miniata*						*	*				*								*											*	*	*	*	*			*							*	
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*								*		*																														*						
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *oldfieldii*	*																												*																	
Scrophulariaceae	*Eremophila*	*paisleyi* subsp. *paisleyi*																																														
Scrophulariaceae	*Eremophila*	*pantonii*															*			*																									*				*
Scrophulariaceae	*Eremophila*	*platycalyx* subsp. *platycalyx*													*																																		
Scrophulariaceae	*Eremophila*	*platythamnos* subsp. *platythamnos*												*													*												*									
Scrophulariaceae	*Eremophila*	*scoparia*	*					*	*					*							*	*	*							*	*							*									
Scrophulariaceae	*Eremophila*	*serrulata*																	*																							*		*					
Scrophulariaceae	*Eremophila*	*youngii*																																														
Solanaceae	*Anthotroche*	*pannosa*																																				*		*								
Solanaceae	*Duboisia*	*hopwoodii*																																														
Solanaceae	*Nicotiana*	*rosulata* subsp. *rosulata* (A)																								*																						
Solanaceae	*Solanum*	*lasiophyllum*			*	*	*			*	*				*		*	*	*						*										*					*	*	*	*	*		*	
Solanaceae	*Solanum*	*nummularium*																																														
Solanaceae	*Solanum*	*orbiculatum*						*	*																	*										*											
Solanaceae	*Solanum*	*plicatile*													*											*																						
Thymelaeaceae	*Pimelea*	*microcephala*									*																																					
Xanthorrhoeaceae	*Xanthorrhoea*	*thorntonii*																											*																			

(A) Denotes Annual taxa; (P) Denotes Priority taxa as listed on Florabase (WAHERB, 2014). **Interdune Swales and Sandplain vegetation communities**

Interdune swales and sandplain

Family	Genus	Taxon	ISSP-AFW1	ISSP-AFW2	ISSP-AFW3	ISSP-AFW4	ISSP-AFW5	ISSP-EW1	ISSP-EW2	ISSP-EW3	ISSP-EW4	ISSP-EW5	ISSP-EW6	ISSP-EW/MWS1	ISSP-EW/MWS2	ISSP-EW/MWS3	ISSP-EW/MWS4	ISSP-EW/MWS5	ISSP-EW/MWS6	ISSP-EW/MWS7	ISSP-EW/MWS8	ISSP-EW/MWS9	ISSP-EOW/MWS1	ISSP-EOW/MWS2	ISSP-H1	ISSP-H2	ISSP-RMNV1	ISSP-RMNV2	ISSP-RMNV3	ISSP-RMNV4	ISSP-RMNV5	ISSP-RMNV6	ISSP-RMNV7
Aizoaceae	*Disphyma*	*crassifolium*																															
Aizoaceae	*Gunniopsis*	*quadrifida*																															
Amaranthaceae	*Ptilotus*	*gaudichaudii (A)*																															
Amaranthaceae	*Ptilotus*	*nobilis (A)*																													*		
Amaranthaceae	*Ptilotus*	*obovatus*			*		*		*																		*						
Amaranthaceae	*Ptilotus*	*polystachyus (A)*								*																							
Amaranthaceae	*Ptilotus*	*schwartzii*																															
Amaranthaceae	*Ptilotus*	*sessilifolius*																															
Apocynaceae	*Alyxia*	*buxifolia*	*																					*									
Apocynaceae	*Marsdenia*	*australis*																															
Asparagaceae	*Lomandra*	*effusa*																															
Asparagaceae	*Lomandra*	*leucocephala* subsp. *robusta*						*				*																				*	
Asteraceae	*Angianthus*	*tomentosus (A)*																															
Asteraceae	*Asteraceae*	sp. (sterile)																															
Asteraceae	*Brachyscome*	*ciliaris (A)*																															
Asteraceae	*Brachyscome*	*ciliocarpa (A)*																															
Asteraceae	*Olearia*	*subspicata*								*																							
Asteraceae	*Chrysocephalum*	*apiculatum*																															
Asteraceae	*Cratystylis*	*subspinescens*							*																								
Asteraceae	*Leucochrysum*	*stipitatum (A)*																															
Asteraceae	*Olearia*	*arida (P4)*						*							*			*					*										
Asteraceae	*Olearia*	*incana*																*															
Asteraceae	*Olearia*	*muelleri*							*							*																	
Asteraceae	*Olearia*	*pimelioides*					*																										
Asteraceae	*Olearia*	*subspicata*								*																							
Asteraceae	*Podolepis*	*capillaris (A)*					*																										
Boraginaceae	*Halgania*	*integerrima*																*							*								
Boraginaceae	*Halgania*	*cyanea* var. Allambi Stn (B.W. Strong 676)									*																						
Campanulaceae	*Wahlenbergia*	*tumidifructa (A)*																															
Casuarinaceae	*Allocasuarina*	*acutivalvis*																															
Casuarinaceae	*Allocasuarina*	*campestris*																*			*		*			*			*				*
Casuarinaceae	*Allocasuarina*	*corniculata*																															
Casuarinaceae	*Allocasuarina*	*helmsii*	*	*									*														*			*			
Casuarinaceae	*Allocasuarina*	sp. (sterile)									*																						
Casuarinaceae	*Allocasuarina*	*spinosissima*																															
Casuarinaceae	*Casuarina*	*pauper*							*							*																	
Chenopodiaceae	*Atriplex*	*bunburyana*					*									*																	
Chenopodiaceae	*Atriplex*	*codonocarpa (A)*																															
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*					*																										
Chenopodiaceae	*Atriplex*	*stipitata*							*	*																							
Chenopodiaceae	*Atriplex*	*vesicaria*					*			*																							
Chenopodiaceae	*Dysphania*	*kalpari (A)*																															
Chenopodiaceae	*Enchylaena*	*lanata*					*			*																							

Family	Genus	Taxon	ISSP-MWS1	ISSP-MWS2	ISSP-MWS3	ISSP-MWS4	ISSP-MWS5	ISSP-MWS6	ISSP-MWS7	ISSP-MWS8	ISSP-MWS9	ISSP-MWS10	ISSP-MWS11	ISSP-MWS12	ISSP-MWS13	ISSP-MWS14	ISSP-MWS15	ISSP-MWS16	ISSP-MWS17	ISSP-MWS18	ISSP-MWS19	ISSP-MWS20	ISSP-MWS21	ISSP-MWS22	ISSP-MWS23	ISSP-MWS24	ISSP-MWS25	ISSP-MWS26	ISSP-MWS27
Aizoaceae	*Disphyma*	*crassifolium*																											
Aizoaceae	*Gunniopsis*	*quadrifida*																											
Amaranthaceae	*Ptilotus*	*gaudichaudii (A)*																											
Amaranthaceae	*Ptilotus*	*nobilis (A)*																											
Amaranthaceae	*Ptilotus*	*obovatus*	*	*												*					*							*	*
Amaranthaceae	*Ptilotus*	*polystachyus (A)*																											
Amaranthaceae	*Ptilotus*	*schwartzii*																											
Amaranthaceae	*Ptilotus*	*sessilifolius*																											
Apocynaceae	*Alyxia*	*buxifolia*				*													*										
Apocynaceae	*Marsdenia*	*australis*																											
Asparagaceae	*Lomandra*	*effusa*												*															
Asparagaceae	*Lomandra*	*leucocephala* subsp. *robusta*						*																					
Asteraceae	*Angianthus*	*tomentosus (A)*																											
Asteraceae	*Asteraceae*	sp. (sterile)																											
Asteraceae	*Brachyscome*	*ciliaris (A)*																											
Asteraceae	*Brachyscome*	*ciliocarpa (A)*																											
Asteraceae	*Olearia*	*subspicata*																											
Asteraceae	*Chrysocephalum*	*apiculatum*								*																			
Asteraceae	*Cratystylis*	*subspinescens*																											
Asteraceae	*Leucochrysum*	*stipitatum (A)*																											
Asteraceae	*Olearia*	*arida (P4)*					*											*	*	*									
Asteraceae	*Olearia*	*incana*															*												
Asteraceae	*Olearia*	*muelleri*																											
Asteraceae	*Olearia*	*pimelioides*																											
Asteraceae	*Olearia*	*subspicata*																											
Asteraceae	*Podolepis*	*capillaris (A)*																											
Boraginaceae	*Halgania*	*integerrima*								*							*												
Boraginaceae	*Halgania*	*cyanea* var. Allambi Stn (B.W. Strong 676)																											
Campanulaceae	*Wahlenbergia*	*tumidifructa (A)*																											
Casuarinaceae	*Allocasuarina*	*acutivalvis*																							*				
Casuarinaceae	*Allocasuarina*	*campestris*								*																			
Casuarinaceae	*Allocasuarina*	*corniculata*																											
Casuarinaceae	*Allocasuarina*	*helmsii*		*	*	*	*			*																			
Casuarinaceae	*Allocasuarina*	sp. (sterile)																											
Casuarinaceae	*Allocasuarina*	*spinosissima*																											
Casuarinaceae	*Casuarina*	*pauper*																										*	
Chenopodiaceae	*Atriplex*	*bunburyana*																											
Chenopodiaceae	*Atriplex*	*codonocarpa (A)*																											
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*																											
Chenopodiaceae	*Atriplex*	*stipitata*																											
Chenopodiaceae	*Atriplex*	*vesicaria*																											
Chenopodiaceae	*Dysphania*	*kalpari (A)*																											
Chenopodiaceae	*Enchylaena*	*lanata*														*													

			Interdune swales and sandplain																																																							
Family	Genus	Taxon	ISSP-AFW1	ISSP-AFW2	ISSP-AFW3	ISSP-AFW4	ISSP-AFW5	ISSP-EW1	ISSP-EW2	ISSP-EW3	ISSP-EW4	ISSP-EW5	ISSP-EW6	ISSP-EW/MWS1	ISSP-EW/MWS2	ISSP-EW/MWS3	ISSP-EW/MWS4	ISSP-EW/MWS5	ISSP-EW/MWS6	ISSP-EW/MWS7	ISSP-EW/MWS8	ISSP-EW/MWS9	ISSP-EOW/MWS1	ISSP-EOW/MWS2	ISSP-H1	ISSP-H2	ISSP-RMNV1	ISSP-RMNV2	ISSP-RMNV3	ISSP-RMNV4	ISSP-RMNV5	ISSP-RMNV6	ISSP-RMNV7	ISSP-MWS1	ISSP-MWS2	ISSP-MWS3	ISSP-MWS4	ISSP-MWS5	ISSP-MWS6	ISSP-MWS7	ISSP-MWS8	ISSP-MWS9	ISSP-MWS10	ISSP-MWS11	ISSP-MWS12	ISSP-MWS13	ISSP-MWS14	ISSP-MWS15	ISSP-MWS16	ISSP-MWS17	ISSP-MWS18	ISSP-MWS19	ISSP-MWS20	ISSP-MWS21	ISSP-MWS22	ISSP-MWS23	ISSP-MWS24	ISSP-MWS25	ISSP-MWS26	ISSP-MWS27
Chenopodiaceae	*Enchylaena*	*tomentosa*					*																																																			
Chenopodiaceae	*Maireana*	*amoena*																																																								
Chenopodiaceae	*Maireana*	*aphylla*					*																																																			
Chenopodiaceae	*Maireana*	*brevifolia*																																																								
Chenopodiaceae	*Maireana*	*carnosa*																																																								
Chenopodiaceae	*Maireana*	*convexa*																																																								
Chenopodiaceae	*Maireana*	*georgei*					*		*	*																								*													*													
Chenopodiaceae	*Maireana*	*glomerifolia*					*																																																			
Chenopodiaceae	*Maireana*	*pentatropis*																																*																										
Chenopodiaceae	*Maireana*	*platycarpa*					*																											*																										
Chenopodiaceae	*Maireana*	*platycarpa*																																																								
Chenopodiaceae	*Maireana*	*pyramidata*					*																																																			
Chenopodiaceae	*Maireana*	*sedifolia*					*		*							*																		*																										
Chenopodiaceae	*Maireana*	*thesioides*					*																																																			
Chenopodiaceae	*Maireana*	*tomentosa*					*																																																			
Chenopodiaceae	*Maireana*	*trichoptera*							*																																																	
Chenopodiaceae	*Maireana*	*triptera*					*																											*													*													
Chenopodiaceae	*Rhagodia*	*eremaea*					*			*																																																
Chenopodiaceae	*Rhagodia*	*spinescens*					*																																																			
Chenopodiaceae	*Sclerolaena*	*cuneata*																																																								
Chenopodiaceae	*Sclerolaena*	*densiflora*																																																								
Chenopodiaceae	*Sclerolaena*	*diacantha*							*																									*																										
Chenopodiaceae	*Sclerolaena*	*drummondii*																																																								
Chenopodiaceae	*Sclerolaena*	*fusiformis*																																																								
Chenopodiaceae	*Sclerolaena*	*parvifolia*																																																*								
Chenopodiaceae	*Sclerolaena*	*uniflora*																																																								
Chenopodiaceae	*Tecticornia*	*calyptrata*																																																								
Chenopodiaceae	*Tecticornia*	*disarticulata*																																																								
Chenopodiaceae	*Tecticornia*	*halocnemoides*																																																								
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*																																																								
Chenopodiaceae	*Tecticornia*	*indica* subsp. *leiostachya*																																																								
Chenopodiaceae	*Tecticornia*	*pergranulata*																																																								
Chenopodiaceae	*Tecticornia*	*pruinosa*																																																								
Chenopodiaceae	*Tecticornia*	sp. (sterile)																																																								
Convolvulaceae	*Duperreya*	*sericea*																																																								
Cupressaceae	*Callitris*	*columellaris*				*		*				*	*	*					*			*	*					*				*	*						*	*	*			*									*	*				*		
Cupressaceae	*Callitris*	*preissii*																*	*		*			*					*															*			*	*	*	*		*	*	*		*	*		
Cyperaceae	*Chrysitrix*	*distigmatosa*									*									*			*			*							*							*			*																
Euphorbiaceae	*Bertya*	*dimerostigma*																																																								
Euphorbiaceae	*Beyeria*	*brevifolia*															*																																									
Euphorbiaceae	*Beyeria*	*sulcata* var. *sulcata*																	*																																		*	*		*	*		
Euphorbiaceae	*Euphorbia*	*drummondii* subsp. *drummondii*					*																																																			

			Interdune swales and sandplain																																																								
Family	**Genus**	**Taxon**	**ISSP-AFW1**	**ISSP-AFW2**	**ISSP-AFW3**	**ISSP-AFW4**	**ISSP-AFW5**	**ISSP-EW1**	**ISSP-EW2**	**ISSP-EW3**	**ISSP-EW4**	**ISSP-EW5**	**ISSP-EW6**	**ISSP-EW/MWS1**	**ISSP-EW/MWS2**	**ISSP-EW/MWS3**	**ISSP-EW/MWS4**	**ISSP-EW/MWS5**	**ISSP-EW/MWS6**	**ISSP-EW/MWS7**	**ISSP-EW/MWS8**	**ISSP-EW/MWS9**	**ISSP-EOW/MWS1**	**ISSP-EOW/MWS2**	**ISSP-H1**	**ISSP-H2**	**ISSP-RMNV1**	**ISSP-RMNV2**	**ISSP-RMNV3**	**ISSP-RMNV4**	**ISSP-RMNV5**	**ISSP-RMNV6**	**ISSP-RMNV7**	**ISSP-MWS1**	**ISSP-MWS2**	**ISSP-MWS3**	**ISSP-MWS4**	**ISSP-MWS5**	**ISSP-MWS6**	**ISSP-MWS7**	**ISSP-MWS8**	**ISSP-MWS9**	**ISSP-MWS10**	**ISSP-MWS11**	**ISSP-MWS12**	**ISSP-MWS13**	**ISSP-MWS14**	**ISSP-MWS15**	**ISSP-MWS16**	**ISSP-MWS17**	**ISSP-MWS18**	**ISSP-MWS19**	**ISSP-MWS20**	**ISSP-MWS21**	**ISSP-MWS22**	**ISSP-MWS23**	**ISSP-MWS24**	**ISSP-MWS25**	**ISSP-MWS26**	**ISSP-MWS27**
Euphorbiaceae	*Euphorbia*	*tannensis (A)*																											*																													
Fabaceae	*Acacia*	*abrupta*						*					*																																													
Fabaceae	*Acacia*	*acanthoclada*																						*																			*																
Fabaceae	*Acacia*	*aneura* (sterile)				*	*																																								*													
Fabaceae	*Acacia*	*aptaneura*			*	*	*		*							*												*												*			*									*								
Fabaceae	*Acacia*	*assimilis*													*		*	*		*	*		*										*													*														*
Fabaceae	*Acacia*	*ayersiana*				*	*																						*																															
Fabaceae	*Acacia*	*burkittii*			*											*																																				*								
Fabaceae	*Acacia*	*caesaneura*	*	*	*		*		*		*		*			*	*												*	*				*		*	*	*					*			*	*					*							*	
Fabaceae	*Acacia*	*colletioides*							*	*					*	*	*		*				*					*					*							*		*			*	*				*		*	*	*			*	*		
Fabaceae	*Acacia*	*craspedocarpa*																																																									
Fabaceae	*Acacia*	*cuthbertsonii*																																																									
Fabaceae	*Acacia*	*desertorum* subsp. *desertorum*						*				*	*	*					*	*	*		*		*				*		*		*						*		*		*						*					*	*	*	*	*		*
Fabaceae	*Acacia*	*eremophila* numerous-nerved variant (A.S. George 11924) (P3)																																						*																			
Fabaceae	*Acacia*	*eremophila* subsp. *eremophila*																		*																*					*																			
Fabaceae	*Acacia*	*erinacea*																																																								
Fabaceae	*Acacia*	*fragilis*																																						*																			
Fabaceae	*Acacia*	*grasbyi*				*																																																					
Fabaceae	*Acacia*	*helmsiana*												*				*			*																												*										
Fabaceae	*Acacia*	*hemiteles*							*														*				*	*							*	*				*	*	*	*		*					*										
Fabaceae	*Acacia*	*incurvaneura*			*	*	*		*										*																												*						*	*						
Fabaceae	*Acacia*	*jamesiana*																						*																																		
Fabaceae	*Acacia*	*jennerae*							*														*																																			
Fabaceae	*Acacia*	*kalgoorliensis*																																																								
Fabaceae	*Acacia*	*kempeana*											*																	*						*		*																						
Fabaceae	*Acacia*	*kempeana*	*	*																																*	*								*														
Fabaceae	*Acacia*	*ligulata*						*			*	*		*	*	*		*					*	*			*						*		*				*				*	*	*							*								
Fabaceae	*Acacia*	*macraneura*																																																								
Fabaceae	*Acacia*	*mulganeura*				*	*																																																				
Fabaceae	*Acacia*	*murrayana*																										*																				*			*								
Fabaceae	*Acacia*	*oswaldii*	*	*																														*			*																						
Fabaceae	*Acacia*	*pachyacra*																																																								
Fabaceae	*Acacia*	*prainii*																					*	*									*																										
Fabaceae	*Acacia*	*ramulosa* var. *ramulosa*	*	*			*						*						*								*			*					*		*	*														*	*	*						
Fabaceae	*Acacia*	*rigens*						*					*							*										*								*			*	*																		
Fabaceae	*Acacia*	*sibirica*																	*																								*										*	*						
Fabaceae	*Acacia*	sp. (sterile)																																																								
Fabaceae	*Acacia*	*tetragonophylla*			*		*						*		*															*				*				*								*													*	
Fabaceae	*Bossiaea*	*walkeri*																																																								
Fabaceae	*Cullen*	*discolor*																																																								
Fabaceae	*Daviesia*	*benthamii*															*																												*	*	*		*						*					
Fabaceae	*Daviesia*	*grahamii*																																						*																			
Fabaceae	*Daviesia*	*purpurascens*												*																																												
Fabaceae	*Daviesia*	*ulicifolia* subsp. *aridicola*																													*																						*				*	*		
Fabaceae	*Jacksonia*	*arida*																																																								
Fabaceae	*Jacksonia*	*nematoclada*											*																											*			*																
Fabaceae	*Kennedia*	*prorepens*																													*																													
Fabaceae	*Labichea*	*eremaea (P3)*						*																																																		
Fabaceae	*Leptosema*	*chambersii*																		*	*				*						*										*			*					*			*								
Fabaceae	*Mirbelia*	*rhagodioides*																																						*			*																
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*					*		*	*					*	*																		*									*																*	

			Interdune swales and sandplain																																																							
Family	**Genus**	**Taxon**	**ISSP-AFW1**	**ISSP-AFW2**	**ISSP-AFW3**	**ISSP-AFW4**	**ISSP-AFW5**	**ISSP-EW1**	**ISSP-EW2**	**ISSP-EW3**	**ISSP-EW4**	**ISSP-EW5**	**ISSP-EW6**	**ISSP-EW/MWS1**	**ISSP-EW/MWS2**	**ISSP-EW/MWS3**	**ISSP-EW/MWS4**	**ISSP-EW/MWS5**	**ISSP-EW/MWS6**	**ISSP-EW/MWS7**	**ISSP-EW/MWS8**	**ISSP-EW/MWS9**	**ISSP-EOW/MWS1**	**ISSP-EOW/MWS2**	**ISSP-H1**	**ISSP-H2**	**ISSP-RMNV1**	**ISSP-RMNV2**	**ISSP-RMNV3**	**ISSP-RMNV4**	**ISSP-RMNV5**	**ISSP-RMNV6**	**ISSP-RMNV7**	**ISSP-MWS1**	**ISSP-MWS2**	**ISSP-MWS3**	**ISSP-MWS4**	**ISSP-MWS5**	**ISSP-MWS6**	**ISSP-MWS7**	**ISSP-MWS8**	**ISSP-MWS9**	**ISSP-MWS10**	**ISSP-MWS11**	**ISSP-MWS12**	**ISSP-MWS13**	**ISSP-MWS14**	**ISSP-MWS15**	**ISSP-MWS16**	**ISSP-MWS17**	**ISSP-MWS18**	**ISSP-MWS19**	**ISSP-MWS20**	**ISSP-MWS21**	**ISSP-MWS22**	**ISSP-MWS23**	**ISSP-MWS24**	**ISSP-MWS25**	**ISSP-MWS26**	**ISSP-MWS27**
Fabaceae	*Senna*	*artemisioides* subsp. x *artemisioides*				*					*			*		*							*																									*													
Fabaceae	*Senna*	*cardiosperma*																																																									*	
Fabaceae	*Senna*	*pleurocarpa*																					*								*																														
Fabaceae	*Swainsona*	*canescens*			*																																																								
Fabaceae	*Swainsona*	*colutoides (A)*																																																											
Fabaceae	*Swainsona*	*kingii (A)*																																																											
Fabaceae	*Templetonia*	*aculeata*																																															*													
Frankeniaceae	*Frankenia*	*cinerea*																																																											
Frankeniaceae	*Frankenia*	*setosa*																																																											
Geraniaceae	*Erodium*	*cygnorum (A)*					*																																																				
Goodeniaceae	*Brunonia*	*australis (A)*																																																											
Goodeniaceae	*Goodenia*	*havilandii (A)*					*																																																				
Goodeniaceae	*Goodenia*	*mimuloides*																													*																														
Goodeniaceae	*Goodenia*	*xanthosperma*										*							*																																								
Goodeniaceae	*Scaevola*	*basedowii*																						*																												*								
Goodeniaceae	*Scaevola*	*collaris*																																																					*				
Goodeniaceae	*Scaevola*	*restiacea*																																																						*	*		
Goodeniaceae	*Scaevola*	*spinescens*	*	*	*		*		*	*	*		*			*	*		*								*			*				*	*	*	*	*					*			*	*					*								
Goodeniaceae	*Velleia*	*hispida (A)*																																																											
Goodeniaceae	*Velleia*	*rosea (A)*					*																																																				
Goodeniaceae	*Velleia*	*connata (A)*																																																											
Gyrostemonaceae	*Codonocarpus*	*cotinifolius*																										*			*																				*									
Haloragaceae	*Glischrocaryon*	*angustifolium*			*																																																								
Haloragaceae	*Glischrocaryon*	*aureum*																													*																														
Hemerocallidaceae	*Dianella*	*revoluta*					*											*																										*				*												
Lamiaceae	*Dicrastylis*	*brunnea*						*				*																											*																					
Lamiaceae	*Dicrastylis*	*cundeeleensis (P4)*						*						*										*							*																				*									
Lamiaceae	*Dicrastylis*	*parvifolia*																													*																														
Lamiaceae	*Microcorys*	*macredieana*							*							*																																			*									
Lamiaceae	*Newcatselia*	*hexarrhena*																													*																														
Lamiaceae	*Pityrodia*	*loricata*						*				*										*		*															*																					
Lamiaceae	*Prostanthera*	*althoferi*	*	*									*						*																	*	*														*		*	*						
Lamiaceae	*Prostanthera*	*sericea*																																																											
Lamiaceae	*Spartothamnella*	*teucriiflora*			*		*																																																						
Lamiaceae	*Westringia*	*cephalantha*												*			*	*	*				*					*												*					*			*		*			*	*						
Lamiaceae	*Westringia*	*rigida*						*				*						*	*				*													*			*			*			*	*		*		*				*						
Loranthaceae	*Amyema*	*miquelii*																																																											
Loranthaceae	*Lysiana*	*murrayi*																																																											
Malvaceae	*Abutilon*	*oxycarpum* subsp. Prostrate (AA. Mitchell PRP 1266)																																																											
Malvaceae	*Alyogyne*	*pinoniana*																																																											
Malvaceae	*Androcalva*	*loxophylla*																																																											
Malvaceae	*Brachychiton*	*gregorii*	*	*			*						*																	*							*	*																							
Malvaceae	*Hannafordia*	*bissillii* subsp. *bissillii*																						*																												*									
Malvaceae	*Keraudrenia*	*velutina*			*			*			*	*							*			*	*		*		*	*			*		*		*				*	*	*		*						*				*	*		*				
Malvaceae	*Keraudrenia*	*velutina* subsp. *elliptica*																											*																														

Family	Genus	Taxon	ISSP-AFW1	ISSP-AFW2	ISSP-AFW3	ISSP-AFW4	ISSP-AFW5	ISSP-EW1	ISSP-EW2	ISSP-EW3	ISSP-EW4	ISSP-EW5	ISSP-EW6	ISSP-EW/MWS1	ISSP-EW/MWS2	ISSP-EW/MWS3	ISSP-EW/MWS4	ISSP-EW/MWS5	ISSP-EW/MWS6	ISSP-EW/MWS7	ISSP-EW/MWS8	ISSP-EW/MWS9	ISSP-EOW/MWS1	ISSP-EOW/MWS2	ISSP-H1	ISSP-H2	ISSP-RMNV1	ISSP-RMNV2	ISSP-RMNV3	ISSP-RMNV4	ISSP-RMNV5	ISSP-RMNV6	ISSP-RMNV7	ISSP-MWS1	ISSP-MWS2	ISSP-MWS3	ISSP-MWS4	ISSP-MWS5	ISSP-MWS6	ISSP-MWS7	ISSP-MWS8	ISSP-MWS9	ISSP-MWS10	ISSP-MWS11	ISSP-MWS12	ISSP-MWS13	ISSP-MWS14	ISSP-MWS15	ISSP-MWS16	ISSP-MWS17	ISSP-MWS18	ISSP-MWS19	ISSP-MWS20	ISSP-MWS21	ISSP-MWS22	ISSP-MWS23	ISSP-MWS24	ISSP-MWS25	ISSP-MWS26	ISSP-MWS27
			Interdune swales and sandplain																																																								
Malvaceae	*Lawrencia*	*glomerata*																																																								
Malvaceae	*Sida*	*calyxhymenia*					*						*																	*									*																						
Malvaceae	*Sida*	sp. Excedentifolia (J.L. Egan 1925)			*																																																							
Myrtaceae	*Aluta*	*maisonneuvei* subsp. *auriculata*				*		*				*		*	*		*		*			*	*	*	*	*	*	*	*	*			*		*				*	*	*			*	*				*	*	*		*	*	*	*	*	*	*	
Myrtaceae	*Baeckea*	sp. Great Victoria Desert (A.S. Weston 14813)																	*	*	*	*				*																											*	*	*		*	*		
Myrtaceae	*Calothamnus*	*gilesii*																																							*														*				
Myrtaceae	*Eucalyptus*	*comitae-vallis*																	*	*																								*											*					
Myrtaceae	*Eucalyptus*	*concinna*	*	*							*			*	*	*		*		*		*	*	*			*	*						*	*	*	*			*			*		*	*		*		*		*								
Myrtaceae	*Eucalyptus*	*effusa*																						*																												*								
Myrtaceae	*Eucalyptus*	*eremicola*																																												*	*													
Myrtaceae	*Eucalyptus*	*glomerosa*				*																							*			*									*																			
Myrtaceae	*Eucalyptus*	*gongylocarpa*						*			*	*	*	*	*		*	*	*	*	*	*	*	*							*	*							*		*	*		*	*					*	*			*			*	*		
Myrtaceae	*Eucalyptus*	*gracilis*																																																								
Myrtaceae	*Eucalyptus*	*horistes*						*					*							*																		*				*			*							*								*
Myrtaceae	*Eucalyptus*	*hypolaena*														*	*																										*		*															
Myrtaceae	*Eucalyptus*	*kingsmillii*																																																								
Myrtaceae	*Eucalyptus*	*leptopoda* subsp. *elevata*				*							*						*		*								*	*								*						*					*				*	*		*	*	*	*	
Myrtaceae	*Eucalyptus*	*lesouefii*							*																																																			
Myrtaceae	*Eucalyptus*	*lucasii*																																									*																	
Myrtaceae	*Eucalyptus*	*oleosa*																																																								
Myrtaceae	*Eucalyptus*	*oleosa* subsp. *oleosa*						*			*	*											*				*	*							*	*			*	*			*		*	*														
Myrtaceae	*Eucalyptus*	*rigidula*																																												*				*										
Myrtaceae	*Eucalyptus*	*salicola*								*							*																									*																		
Myrtaceae	*Eucalyptus*	*salubris*																																																								
Myrtaceae	*Eucalyptus*	sp. (sterile)																														*																											
Myrtaceae	*Eucalyptus*	*trivalva*											*	*	*				*									*		*								*		*	*										*	*	*	*						
Myrtaceae	*Eucalyptus*	*youngiana*						*			*		*	*	*							*	*	*	*	*	*			*	*				*	*		*	*		*		*	*					*	*	*	*			*	*	*	*		
Myrtaceae	*Leptospermum*	*roei*																																							*														*	*	*		
Myrtaceae	*Melaleuca*	*apostiba (P3)*																																																								
Myrtaceae	*Melaleuca*	*hamata*												*											*			*	*											*																*				
Myrtaceae	*Melaleuca*	*interioris*																																																						*	*	*	
Myrtaceae	*Melaleuca*	*leiocarpa*						*				*													*					*									*		*					*														
Myrtaceae	*Micromyrtus*	*flaviflora*																																										*																
Myrtaceae	*Thryptomene*	*biseriata*																																															*		*									
Oleaceae	*Jasminum*	*calcareum*																						*																																				
Pittosporaceae	*Pittosporum*	*angustifolium*					*			*	*	*																																																
Pittosporaceae	*Pittosporum*	*angustifolium*							*																																																			
Poaceae	*Aristida*	*contorta (A)*			*		*																				*								*																									
Poaceae	*Aristida*	*holathera (A)*																													*																				*									
Poaceae	*Austrostipa*	*elegantissima*					*																																																					
Poaceae	*Enneapogon*	*caerulescens*																																																								
Poaceae	*Enteropogon*	*ramosus*																																																								
Poaceae	*Eragrostis*	*eriopoda*					*																								*																													
Poaceae	*Eriachne*	*pulchella (A)*																																																								
Poaceae	*Monachather*	*paradoxus*																																																								
Poaceae	*Paspalidium*	*constrictum*																																																								
Poaceae	*Poaceae*	sp. (sterile)																																																								
Poaceae	*Triodia*	*basedowii*	*	*		*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*				*	*	*	*	*	*	*		*	*	*	*
Poaceae	*Triodia*	*desertorum*			*												*							*																						*	*	*												
Polygonaceae	*Muehlenbec*	*florulenta*								*																																																	

Family	Genus	Taxon	Interdune swales and sandplain																			
			ISSP-AFW1	ISSP-AFW2	ISSP-AFW3	ISSP-AFW4	ISSP-AFW5	ISSP-EW1	ISSP-EW2	ISSP-EW3	ISSP-EW4	ISSP-EW5	ISSP-EW6	ISSP-EW/MWS1	ISSP-EW/MWS2	ISSP-EW/MWS3	ISSP-EW/MWS4	ISSP-EW/MWS5	ISSP-EW/MWS6	ISSP-EW/MWS7	ISSP-EW/MWS8	ISSP-EW/MWS9
	kia																					
Portulaceae	*Calandrinia*	*eremaeum* (A)					*															
Proteaceae	*Banksia*	*elderiana*																				*
Proteaceae	*Grevillea*	*acacioides*																				
Proteaceae	*Grevillea*	*berryana*																				
Proteaceae	*Grevillea*	*deflexa*																				
Proteaceae	*Grevillea*	*didymobotrya* subsp. *didymobotrya*																				
Proteaceae	*Grevillea*	*eriostachya*																*				
Proteaceae	*Grevillea*	*juncifolia* subsp. *juncifolia*																*		*	*	
Proteaceae	*Grevillea*	*nematophylla* subsp. *nematophylla*					*									*		*				
Proteaceae	*Grevillea*	*sarissa* subsp. *sarissa*					*															
Proteaceae	*Grevillea*	*secunda* (P4)																				
Proteaceae	*Hakea*	*francisiana*						*			*	*		*	*			*	*	*	*	
Proteaceae	*Hakea*	*kippistiana*																				
Proteaceae	*Hakea*	*lorea*																				
Proteaceae	*Hakea*	*preissii*					*															
Proteaceae	*Persoonia*	*coriacea*																				
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*					*															
Restionaceae	*Lepidobolus*	*deserti*																				
Rubiaceae	*Psydrax*	*latifolia*																				
Rubiaceae	*Psydrax*	*rigidula*					*															
Rubiaceae	*Psydrax*	*suaveolens*					*															
Rutaceae	*Phebalium*	*canaliculatum*				*								*								
Rutaceae	*Phebalium*	*filifolium*																				
Rutaceae	*Philotheca*	*tomentella*						*				*										
Santalaceae	*Anthobolus*	*leptomerioides*					*															
Santalaceae	*Choretrum*	*chrysanthum*																				
Santalaceae	*Exocarpos*	*aphyllus*					*			*	*	*		*								
Santalaceae	*Exocarpos*	*sparteus*																				
Santalaceae	*Santalum*	*acuminatum*																				
Santalaceae	*Santalum*	*lanceolatum*					*															
Santalaceae	*Santalum*	*spicatum*	*	*			*						*									
Sapindaceae	*Alectryon*	*oleifolius*			*		*			*												
Sapindaceae	*Dodonaea*	*adenophora*																				
Sapindaceae	*Dodonaea*	*lobulata*	*	*			*															
Sapindaceae	*Dodonaea*	*rigida*	*	*			*			*			*									
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*							*	*						*						
Scrophulariaceae	*Eremophila*	*alternifolia*																				
Scrophulariaceae	*Eremophila*	*caperata*																				
Scrophulariaceae	*Eremophila*	*clarkei*																				
Scrophulariaceae	*Eremophila*	*decipiens*														*						
Scrophulariaceae	*Eremophila*	*fallax*								*	*	*					*					
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*					*															
Scrophulariaceae	*Eremophila*	*georgei*																				
Scrophulariaceae	*Eremophila*	*glabra*							*													
Scrophulariaceae	*Eremophila*	*glutinosa*																				
Scrophulariaceae	*Eremophila*	*granitica*					*															
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *glabra*				*	*															

Family	Genus	Taxon	Interdune swales and sandplain																			
			ISSP-EOW/MWS1	ISSP-EOW/MWS2	ISSP-H1	ISSP-H2	ISSP-RMNV1	ISSP-RMNV2	ISSP-RMNV3	ISSP-RMNV4	ISSP-RMNV5	ISSP-RMNV6	ISSP-RMNV7	ISSP-MWS1	ISSP-MWS2	ISSP-MWS3	ISSP-MWS4	ISSP-MWS5	ISSP-MWS6	ISSP-MWS7	ISSP-MWS8	ISSP-MWS9
	kia																					
Portulaceae	*Calandrinia*	*eremaeum* (A)																				
Proteaceae	*Banksia*	*elderiana*																				
Proteaceae	*Grevillea*	*acacioides*																			*	
Proteaceae	*Grevillea*	*berryana*																				
Proteaceae	*Grevillea*	*deflexa*																				
Proteaceae	*Grevillea*	*didymobotrya* subsp. *didymobotrya*																			*	
Proteaceae	*Grevillea*	*eriostachya*																				
Proteaceae	*Grevillea*	*juncifolia* subsp. *juncifolia*	*	*	*						*		*		*						*	
Proteaceae	*Grevillea*	*nematophylla* subsp. *nematophylla*						*												*		*
Proteaceae	*Grevillea*	*sarissa* subsp. *sarissa*																				
Proteaceae	*Grevillea*	*secunda* (P4)		*																	*	
Proteaceae	*Hakea*	*francisiana*	*	*	*			*	*		*		*			*			*	*	*	
Proteaceae	*Hakea*	*kippistiana*																				
Proteaceae	*Hakea*	*lorea*																				
Proteaceae	*Hakea*	*preissii*																				
Proteaceae	*Persoonia*	*coriacea*							*													
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*																				
Restionaceae	*Lepidobolus*	*deserti*																			*	
Rubiaceae	*Psydrax*	*latifolia*							*													
Rubiaceae	*Psydrax*	*rigidula*																				
Rubiaceae	*Psydrax*	*suaveolens*																				
Rutaceae	*Phebalium*	*canaliculatum*																				
Rutaceae	*Phebalium*	*filifolium*																				
Rutaceae	*Philotheca*	*tomentella*																*				
Santalaceae	*Anthobolus*	*leptomerioides*																				
Santalaceae	*Choretrum*	*chrysanthum*																				
Santalaceae	*Exocarpos*	*aphyllus*																				
Santalaceae	*Exocarpos*	*sparteus*																			*	
Santalaceae	*Santalum*	*acuminatum*																				
Santalaceae	*Santalum*	*lanceolatum*																				
Santalaceae	*Santalum*	*spicatum*								*						*	*	*				
Sapindaceae	*Alectryon*	*oleifolius*																				
Sapindaceae	*Dodonaea*	*adenophora*	*																			
Sapindaceae	*Dodonaea*	*lobulata*					*							*	*	*	*					
Sapindaceae	*Dodonaea*	*rigida*								*						*	*	*				
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*		*																		
Scrophulariaceae	*Eremophila*	*alternifolia*																				
Scrophulariaceae	*Eremophila*	*caperata*																				*
Scrophulariaceae	*Eremophila*	*clarkei*														*						
Scrophulariaceae	*Eremophila*	*decipiens*		*																		
Scrophulariaceae	*Eremophila*	*fallax*																				*
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*																			*	
Scrophulariaceae	*Eremophila*	*georgei*																				
Scrophulariaceae	*Eremophila*	*glabra*	*													*						
Scrophulariaceae	*Eremophila*	*glutinosa*																				
Scrophulariaceae	*Eremophila*	*granitica*																				
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *glabra*														*						

Family	Genus	Taxon	Interdune swales and sandplain																	
			ISSP-MWS10	ISSP-MWS11	ISSP-MWS12	ISSP-MWS13	ISSP-MWS14	ISSP-MWS15	ISSP-MWS16	ISSP-MWS17	ISSP-MWS18	ISSP-MWS19	ISSP-MWS20	ISSP-MWS21	ISSP-MWS22	ISSP-MWS23	ISSP-MWS24	ISSP-MWS25	ISSP-MWS26	ISSP-MWS27
	kia																			
Portulaceae	*Calandrinia*	*eremaeum* (A)																		
Proteaceae	*Banksia*	*elderiana*																		
Proteaceae	*Grevillea*	*acacioides*																		
Proteaceae	*Grevillea*	*berryana*																		
Proteaceae	*Grevillea*	*deflexa*																		
Proteaceae	*Grevillea*	*didymobotrya* subsp. *didymobotrya*														*				
Proteaceae	*Grevillea*	*eriostachya*		*																
Proteaceae	*Grevillea*	*juncifolia* subsp. *juncifolia*		*		*				*						*	*	*		
Proteaceae	*Grevillea*	*nematophylla* subsp. *nematophylla*										*								*
Proteaceae	*Grevillea*	*sarissa* subsp. *sarissa*			*															
Proteaceae	*Grevillea*	*secunda* (P4)														*				
Proteaceae	*Hakea*	*francisiana*		*				*	*	*		*	*	*		*	*	*		*
Proteaceae	*Hakea*	*kippistiana*																		*
Proteaceae	*Hakea*	*lorea*	*																	
Proteaceae	*Hakea*	*preissii*																		
Proteaceae	*Persoonia*	*coriacea*														*				
Pteridaceae	*Cheilanthes*	*sieberi* subsp. *sieberi*																		
Restionaceae	*Lepidobolus*	*deserti*																		
Rubiaceae	*Psydrax*	*latifolia*																		
Rubiaceae	*Psydrax*	*rigidula*																		
Rubiaceae	*Psydrax*	*suaveolens*																		
Rutaceae	*Phebalium*	*canaliculatum*								*										
Rutaceae	*Phebalium*	*filifolium*															*	*		
Rutaceae	*Philotheca*	*tomentella*																		
Santalaceae	*Anthobolus*	*leptomerioides*																		
Santalaceae	*Choretrum*	*chrysanthum*																		
Santalaceae	*Exocarpos*	*aphyllus*		*																
Santalaceae	*Exocarpos*	*sparteus*																		
Santalaceae	*Santalum*	*acuminatum*			*															
Santalaceae	*Santalum*	*lanceolatum*																	*	
Santalaceae	*Santalum*	*spicatum*																		
Sapindaceae	*Alectryon*	*oleifolius*					*													
Sapindaceae	*Dodonaea*	*adenophora*																		
Sapindaceae	*Dodonaea*	*lobulata*																		
Sapindaceae	*Dodonaea*	*rigida*																		
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*																		
Scrophulariaceae	*Eremophila*	*alternifolia*										*							*	
Scrophulariaceae	*Eremophila*	*caperata*																		
Scrophulariaceae	*Eremophila*	*clarkei*																		
Scrophulariaceae	*Eremophila*	*decipiens*										*								
Scrophulariaceae	*Eremophila*	*fallax*			*	*														
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*																		
Scrophulariaceae	*Eremophila*	*georgei*																		
Scrophulariaceae	*Eremophila*	*glabra*										*								
Scrophulariaceae	*Eremophila*	*glutinosa*																		
Scrophulariaceae	*Eremophila*	*granitica*																		
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *glabra*																		

Interdune swales and sandplain

Family	Genus	Taxon	ISSP-AFW1	ISSP-AFW2	ISSP-AFW3	ISSP-AFW4	ISSP-AFW5	ISSP-EW1	ISSP-EW2	ISSP-EW3	ISSP-EW4	ISSP-EW5	ISSP-EW6	ISSP-EW/MWS1	ISSP-EW/MWS2	ISSP-EW/MWS3	ISSP-EW/MWS4	ISSP-EW/MWS5	ISSP-EW/MWS6	ISSP-EW/MWS7	ISSP-EW/MWS8	ISSP-EW/MWS9
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*	*	*			*															
Scrophulariaceae	*Eremophila*	*longifolia*			*		*															
Scrophulariaceae	*Eremophila*	*maculata*																				
Scrophulariaceae	*Eremophila*	*margarethae*			*		*															
Scrophulariaceae	*Eremophila*	*metallicorum*					*															
Scrophulariaceae	*Eremophila*	*miniata*								*												
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*	*	*			*															
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *oldfieldii*																				
Scrophulariaceae	*Eremophila*	*paisleyi* subsp. *paisleyi*																				
Scrophulariaceae	*Eremophila*	*pantonii*														*						
Scrophulariaceae	*Eremophila*	*platycalyx* subsp. *platycalyx*																				
Scrophulariaceae	*Eremophila*	*platythamnos* subsp. *platythamnos*						*				*		*			*	*	*			
Scrophulariaceae	*Eremophila*	*scoparia*							*	*							*					
Scrophulariaceae	*Eremophila*	*serrulata*																				
Scrophulariaceae	*Eremophila*	*youngii*					*															
Solanaceae	*Anthotroche*	*pannosa*												*								
Solanaceae	*Duboisia*	*hopwoodii*																				
Solanaceae	*Nicotiana*	*rosulata* subsp. *rosulata* (A)																				
Solanaceae	*Solanum*	*lasiophyllum*			*		*															
Solanaceae	*Solanum*	*nummularium*					*															
Solanaceae	*Solanum*	*orbiculatum*			*				*					*	*							
Solanaceae	*Solanum*	*plicatile*																				
Thymelaeaceae	*Pimelea*	*microcephala*																				
Xanthorrhoeaceae	*Xanthorrhoea*	*thorntonii*						*				*										

Family	Genus	Taxon	ISSP-EOW/MWS1	ISSP-EOW/MWS2	ISSP-H1	ISSP-H2	ISSP-RMNV1	ISSP-RMNV2	ISSP-RMNV3	ISSP-RMNV4	ISSP-RMNV5	ISSP-RMNV6	ISSP-RMNV7	ISSP-MWS1	ISSP-MWS2	ISSP-MWS3	ISSP-MWS4	ISSP-MWS5	ISSP-MWS6	ISSP-MWS7	ISSP-MWS8
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*		*													*				
Scrophulariaceae	*Eremophila*	*longifolia*	*																		
Scrophulariaceae	*Eremophila*	*maculata*																			
Scrophulariaceae	*Eremophila*	*margarethae*																			
Scrophulariaceae	*Eremophila*	*metallicorum*																			
Scrophulariaceae	*Eremophila*	*miniata*																			
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*														*	*				
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *oldfieldii*														*					
Scrophulariaceae	*Eremophila*	*paisleyi* subsp. *paisleyi*																			
Scrophulariaceae	*Eremophila*	*pantonii*																			
Scrophulariaceae	*Eremophila*	*platycalyx* subsp. *platycalyx*		*																	
Scrophulariaceae	*Eremophila*	*platythamnos* subsp. *platythamnos*	*				*	*							*				*	*	
Scrophulariaceae	*Eremophila*	*scoparia*		*																	
Scrophulariaceae	*Eremophila*	*serrulata*																			
Scrophulariaceae	*Eremophila*	*youngii*																			
Solanaceae	*Anthotroche*	*pannosa*		*																	*
Solanaceae	*Duboisia*	*hopwoodii*	*										*								
Solanaceae	*Nicotiana*	*rosulata* subsp. *rosulata* (A)									*										
Solanaceae	*Solanum*	*lasiophyllum*					*								*						
Solanaceae	*Solanum*	*nummularium*																			
Solanaceae	*Solanum*	*orbiculatum*					*				*				*						
Solanaceae	*Solanum*	*plicatile*						*													
Thymelaeaceae	*Pimelea*	*microcephala*		*																	
Xanthorrhoeaceae	*Xanthorrhoea*	*thorntonii*	*								*		*								

Family	Genus	Taxon	ISSP-MWS9	ISSP-MWS10	ISSP-MWS11	ISSP-MWS12	ISSP-MWS13	ISSP-MWS14	ISSP-MWS15	ISSP-MWS16	ISSP-MWS17	ISSP-MWS18	ISSP-MWS19	ISSP-MWS20	ISSP-MWS21	ISSP-MWS22	ISSP-MWS23	ISSP-MWS24	ISSP-MWS25	ISSP-MWS26	ISSP-MWS27
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*																			
Scrophulariaceae	*Eremophila*	*longifolia*																			
Scrophulariaceae	*Eremophila*	*maculata*																			
Scrophulariaceae	*Eremophila*	*margarethae*																			
Scrophulariaceae	*Eremophila*	*metallicorum*																			
Scrophulariaceae	*Eremophila*	*miniata*																			
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*																			
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *oldfieldii*																			
Scrophulariaceae	*Eremophila*	*paisleyi* subsp. *paisleyi*											*								
Scrophulariaceae	*Eremophila*	*pantonii*		*																	
Scrophulariaceae	*Eremophila*	*platycalyx* subsp. *platycalyx*																			
Scrophulariaceae	*Eremophila*	*platythamnos* subsp. *platythamnos*							*			*	*	*	*						
Scrophulariaceae	*Eremophila*	*scoparia*					*	*													
Scrophulariaceae	*Eremophila*	*serrulata*																			
Scrophulariaceae	*Eremophila*	*youngii*																			
Solanaceae	*Anthotroche*	*pannosa*																			
Solanaceae	*Duboisia*	*hopwoodii*										*	*								
Solanaceae	*Nicotiana*	*rosulata* subsp. *rosulata* (A)																			
Solanaceae	*Solanum*	*lasiophyllum*																		*	
Solanaceae	*Solanum*	*nummularium*																			
Solanaceae	*Solanum*	*orbiculatum*																			
Solanaceae	*Solanum*	*plicatile*										*	*								
Thymelaeaceae	*Pimelea*	*microcephala*																			
Xanthorrhoeaceae	*Xanthorrhoea*	*thorntonii*																			

Appendix 4: DPaW Threatened Flora Database search results within 50km of Sunrise Dam to Tropicana survey area (DPaW 2013a)

taxa	Conservation Code	Description (WAHERB, 2013)
Acacia eremophila numerous-nerved variant (A.S. George 11924)	3	Dense, spreading shrub, 1-2 m high. Fl. yellow, Sep. Sandy soils. Flats.
Acacia eremophila var. *variabilis*	3	Shrub, 1-1.6 m high. Fl. yellow, Sep. Sandy or sandy-loam.
Baeckea sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963)	3	Upright shrub, ca 1 m high. Fl. white, Oct. Orange sand. Flats.
Caesia rigidifolia	1	Rhizomatous, tufted perennial, herb, to 0.45 m high. Fl. green-white, Oct.
Caesia talingka	2	No information available
Comesperma viscidulum	4	Shrub, to ca 0.7 m high.
Conospermum toddii	4	Spreading shrub, 1.2-2 m high. Fl. white/white-yellow, Jul to Oct. Yellow sand. Sand dunes.
Dampiera eriantha	1	Erect perennial, herb, to 0.6 m high.
Dicrastylis cundeeleensis	4	Woolly shrub, 0.2-0.5 m high. Yellow sand, red or reddish-yellow sand. Sandplains.
Eremophila arachnoides subsp. *tenera*	1	Broom-like shrub, to 3 m high, branches with tubercules often elongated & coalescing. Fl. white/blue-purple.
Eremophila aureivisca	1	Dense much-branched shrub, ca 1 m high. Fl. blue-purple, Sep. Stony, skeletal red clay. Between breakways & claypans.
Eucalyptus nigrifunda	4	Tree, 5-7 m high, bark rough & black on trunk. Sandy clay. Breakaways of decomposing granite.
Eucalyptus pimpiniana	3	Straggly shrubby mallee, 0.7-2 m high, bark smooth. Fl. white, May to Oct. Red sand. Sand dunes & plains.
Grevillea secunda	4	Low spreading shrub, 0.3-0.8 m high. Fl. red, Sep to Oct. Yellow or red sand. Sand dunes, sandplains.
Malleostemon sp. Officer Basin (D. Pearson 350)	2	Shrub, 1-3 m high. Fl. white, Dec. Yellow sand. Dune slopes. No image available
Melaleuca apostiba	3	Spreading shrub, to 2 m high, with grey fissured bark and dull green leaves. Fl. red, Jun.
Olearia arida	4	Erect shrub, to 0.4 m high. Fl. white, Jul to Sep. Red or yellow sand. Undulating low rises.
Physopsis chrysotricha	2	Erect shrub, 1-5 m high. Fl. yellow/yellow-orange, Sep to Dec or Jan. Red or yellow sandy soils. Sandplains.
Thryptomene nealensis	3	Shrub, ca 0.3 m high. Fl. pink, Oct. Lateritic breakaways.

Appendix 5: Locations of Priority Flora taxa (GDA94) identified within the Sunrise Dam to Tropicana survey area

Taxa	Zone	Easting	Northing	Estimated No. plants
Acacia eremophila numerous-nerved variant (A.S. George 11924) (P3)	51 J	475793	6780962	>100 (dominant mid-storey)
	51 J	493061	6777285	>100 (dominant mid-storey)
	51 J	515636	6772046	>100 (dominant mid-storey)
Estimated Population Size				**>200**
Caesia talingka (P2)	51 J	644379	6763188	25
				25
Dicrastylis cundeeleensis (P4)	51 J	637966	6763718	12
	51 J	635741	6763484	5
	51 J	517101	6774537	20
	51 J	518473	6773493	5
	51 J	611199	6763375	1000
Estimated Population Size				**1042**
Grevillea secunda (P4)	51 J	617646	6763125	1
	51 J	617400	6763114	1
	51 J	617245	6763099	30
	51 J	617106	6763113	20
	51 J	617121	6763123	20
	51 J	617101	6763102	5
	51 J	617104	6763106	5
	51 J	617027	6763132	5
	51 J	616808	6763132	5
	51 J	616791	6763140	2
	51 J	615295	6763222	5
	51 J	615121	6763225	10
	51 J	615055	6763228	5
	51 J	614999	6763191	2
	51 J	613873	6763406	1
	51 J	613834	6763384	5
	51 J	613803	6763378	>100
	51 J	613735	6763373	>100
	51 J	613676	6763348	>50
	51 J	613645	6763351	>50
	51 J	613629	6763359	>50
	51 J	613612	6763369	>50
	51 J	613315	6763402	5
	51 J	613228	6763396	5
	51 J	613205	6763397	5
	51 J	612806	6763441	20
	51 J	612793	6763437	5
	51 J	612770	6763430	20
	51 J	612755	6763421	20
	51 J	612743	6763416	20
Estimated Population Size				**>620**
Labichea eremaea (P3)	51 J	517758	6774056	1

Taxa	Zone	Easting	Northing	Estimated No. plants
Estimated Population Size				**1**
Melaleuca apostiba (P3)	51 J	533935	6772077	>50 dominant mid-storey
	51 J	534390	6771924	>50 dominant mid-storey
	51 J	537241	6770333	>100 dominant mid-storey
	51 J	536423	6770865	>50 dominant mid-storey
	51 J	536193	6771055	>100 dominant mid-storey
	51 J	534771	6768982	>100 dominant mid-storey
	51 J	535028	6768947	>50 dominant mid-storey
Estimated Population Size				**>500**
Olearia arida (P4)	51 J	559248	6767971	10
	51 J	575892	6765670	>20
	51 J	576144	6765639	5
	51 J	623051	6763032	12
	51 J	620596	6763119	5
	51 J	615656	6763192	100
	51 J	606971	6763479	2
	51 J	606963	6763481	5
	51 J	606937	6763485	10
	51 J	606867	6763477	10
	51 J	600759	6764085	1
	51 J	600613	6764108	3
	51 J	599682	6764211	2
	51 J	597765	6764460	1
	51 J	587112	6765356	4
	51 J	574804	6766143	5
	51 J	573040	6766662	2
Estimated Population Size				**>197**

Appendix 6: Muir Life Form/Height Class (Muir, 1977).

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% -100%	**MID DENSE 30% -70%**	**SPARSE 10% -30%**	**VERY SPARSE 2% -10%**
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch Grass <0.5m >0.5m Bunch Grass <0.5m < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Grass Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 7: Keighery Health rating scale (1994).

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual taxa
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected multiple disturbances. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native taxa

Sunrise Dam - Tropicana Infrastructure Corridor Preliminary Fauna Management Measures

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CONTENTS

INTRODUCTION

Background

AngloGold Ashanti Australia (AngloGold) is proposing to develop a 210 km infrastructure corridor to connect the Sunrise Dam and Tropicana Gold mines. As part of the Environmental Impact Assessment for the project, AngloGold commissioned Kingfisher Environmental Consulting (Kingfisher) to undertake a fauna assessment of the infrastructure corridor route (KEC, 2014).

A desktop review identified 323 fauna species potentially occurring within the proposed corridor of which 157 fauna species were recorded during field surveys. Eleven fauna species of conservation significance were recorded from the project area (see Appendix 1).

This document presents an initial impact assessment and lists preliminary management measures to minimise the impacts of the proposed development on local fauna, particularly those of conservation significance. Additional supplementary information is presented in Appendices 1 and 2.

SUMMARY OF FAUNA VALUES AND IMPACTS

The vertebrate fauna assemblage occurring along the proposed infrastructure corridor is potentially rich (see summary below and also KEC, 2014), because the routes traverse a large and remote area and a variety of habitats. The majority of species recorded or expected are widespread however a number of significant species are present and include several listed under the EPBC Act. The project area does have some notable values:

- Significant fauna habitats including relictual Mulga Woodland, yellow sandplain habitats with elements of a PEC, sand dunes, mature spinifex grasslands suitable for the Sandhill Dunnart, Samphire Shrublands, long-unburnt low dense proteaceous heath and isolated rocky outcrops;
- Conservation significant fauna species present including the EPBC listed Southern Marsupial Mole, Sandhill Dunnart and Malleefowl, several DPaW priority species including the Brush-tailed Mulgara, Striated Grasswren, Australian Bustard and the locally significant and relictual Southern Scrub-robin;
- A resident population of EPBC listed Slender-billed Thornbill is considered likely to occur in adjacent areas;
- The potential for a resident population of the Great Desert Skink; and
- Remote and intact fauna assemblage with refugia.

Overall, impacts of the development and operation of the pipeline upon the local fauna assemblage are anticipated be low, as the development area is long and narrow, passes through many widespread landscapes and effects are mostly temporary because the pipeline can be buried and to some extent rehabilitated. The main impacts upon the fauna assemblage associated with the development include:

- Loss of significant fauna habitats;
- Fauna mortality (including during construction due to clearing and entrapment in trenches, but also during the creation of a new road/track and the potential introduction of traffic);
- Disruption of fauna movement (crossings of linear habitats such as drainage lines, but also potentially if the pipeline forms a barrier to movement of small fauna);
- Fragmentation of refugia;
- Novel biota and their impact on biodiversity – including weeds and feral fauna; and
- Greater fire risk associated with access to intact and significant habitat;

Impacts to conservation significant fauna (such as the EPBC listed Malleefowl, Slender-billed Thornbill, Princess Parrot and Southern Marsupial Mole) are expected to be low assuming management practises are carried out. This includes the avoidance of important habitat, fire management and appropriate trench management during construction. By design, the proposed pipeline avoids much of the significant habitat supporting significant taxa (remnant Mulga Woodland, Samphire Shrubland and sand dunes) and disturbances to important Marble Gum trees may be avoided. Impacts and potential management measures are summarised in Table 1. Recommended management measures are then listed under “Management Recommendations”.

TABLE 1. Impacts upon the fauna of the survey area and suggested management.

Species Name	Nature and significance of likely impact		Management
	Nature of impact	Significance	
Malleefowl	Roadkill possible. Some loss of habitat. Potential for habitat removal / degradation due to increased fire incidence, fragmentation of habitat. Disturbances associated with increased access to people and feral predators.	Low to moderate (most habitat will not be affected but individuals at risk of collision with vehicles and some habitat loss anticipated. Species occurs at low densities).	Develop appropriate measures to minimise impacts on Malleefowl. This includes: • Avoid disturbance to Mulga Woodland where possible. • Avoid disturbance to Malleefowl mounds. • Disturbance free buffer zones implemented around active and recently active mounds. This should include traffic / personnel restrictions near active mounds. • Address fire management challenges for the protection and preservation of important habitat areas. • Refer project to the national Department of the Environment.
Sandhill Dunnart	Loss of habitat, Roadkill possible. Entrapment in trenches.	Moderate (species recorded and optimal habitat occurs patchily along corridor).	Develop appropriate measures to minimise impacts on the Sandhill Dunnart. This includes: • Disturbances to optimal Sandhill Dunnart habitat are recommended to be avoided where possible. Disturbances to sand dunes should also be avoided. Where trench work intersects sand dunes, appropriate measures should be undertaken to minimise impacts to Sandhill Dunnarts. • Trench work to minimise impacts to Sandhill Dunnart populations by following DPaW guidelines. Limit the length of trench open at any given time so that it can be inspected and fauna managed. Daily trench inspections to be conducted by fauna specialists to ensure the correct identification, handling and translocation of conservation significant fauna. • Address fire management challenges for the protection and preservation of important habitat areas. • Refer project to the national Department of the Environment.
Southern Marsupial Mole	Loss of habitat, Roadkill possible.	Low (most sand dune habitat to be avoided, species is mostly subterranean)	Develop appropriate measures to minimise impacts on the Southern Marsupial Mole. This includes: • Avoid disturbance to yellow sand dunes. Where trench work intersects sand dunes, appropriate measures should be undertaken

Species Name	Nature and significance of likely impact		Management
	Nature of impact	Significance	
			to minimise impacts to Southern Marsupial Moles. • Minimise disturbance footprint. • Refer project to the national Department of the Environment.
Slender-billed Thornbill	Loss of habitat.	Low (most Samphire Shrubland lies outside the proposed corridor route)	Avoid clearance of samphire shrubland especially in the vicinity of Sunrise Dam and Hope Campbell Lake. Such habitat occurs mostly outside disturbance footprint.
Princess Parrot	Potential for the loss of breeding trees	Low (species likely to be a rare visitor to area)	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Great Desert Skink	Potential for loss of habitat, disturbances from fire and introduced predators	Low – moderate (species not detected within survey corridor, however may occur in small areas)	• Avoid disturbance to areas containing active burrows where possible. Where pipeline intersects optimal habitat final alignment to be walked to ensure no active burrows are disturbed • Daily trench inspections to be conducted by fauna specialists to ensure the correct identification, handling and translocation of conservation significant fauna.
Brush-tailed Mulgara	Some loss of habitat and disturbance. Potential for impacts from introduced predators. Roadkill possible.	Low to moderate (some habitat will be disturbed, however species is widespread in local area).	• Avoid important areas containing active Mulgara burrows where possible. Where pipeline intersects optimal habitat final alignment to be walked to ensure no active burrows are disturbed. • Daily trench inspections to be conducted by fauna specialists to ensure the correct identification, handling and translocation of conservation significant fauna.
Long-tailed Dunnart	Some loss of habitat.	Low (minimal habitat will be disturbed).	• Avoid disturbance to BIF ridges where possible. • Daily trench inspections to be conducted by fauna specialists to ensure the correct identification, handling and translocation of conservation significant fauna. Manage trench mortality.
Striated Grasswren	Some loss of habitat, disturbances from fire and introduced predators	Low to moderate (some habitat will be disturbed).	• Avoid areas of important habitat where possible. • Address fire management challenges for the protection and preservation of important habitat areas.
Southern Scrub-robin	Some loss of habitat. Potential for habitat removal / degradation due to increased fire incidence, fragmentation of habitat. Disturbances associated with	Low to moderate (most habitat will not be affected, species occurs at low densities)	• Avoid areas of important habitat where possible. • Address fire management challenges for the protection and preservation of important habitat areas. • Further survey work to determine taxonomic status and extent of occurrence in Tropicana area.

Species Name	Nature and significance of likely impact		Management
	Nature of impact	Significance	
	increased access to people and feral predators.		
Woma or Ramsay's Python	Some loss of habitat through clearing. Roadkill possible.	Low (suitable habitat widespread but individuals at risk of collision with vehicles).	Minimise disturbance footprint. Manage trench mortality.
Peregrine Falcon	Loss of habitat - possible loss of nesting trees	Low (most habitat should not be affected).	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Grey Falcon	Loss of habitat - possible loss of nesting trees	Low (most habitat should not be affected).	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Major Mitchell's Cockatoo	Loss of habitat - possible loss of nesting trees	Low (most habitat should not be affected).	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Australian Bustard	Some loss of habitat through clearing.	Low (most habitat should not be affected).	Minimise disturbance footprint.
Bush Stone-curlew	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	Minimise disturbance footprint.
Central Long-eared Bat	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Carpet Python	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	• Avoid disturbances to potential breeding habitat where possible – large hollow-bearing Marble Gums. • Minimise disturbance footprint.
Lerista puncticauda	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	Minimise disturbance footprint
EPBC Migratory Species	Loss or disturbance of roosting habitat	Low (most habitat should not be affected).	• Avoid disturbances to wetlands. • Minimise hydrological impacts.
Locally Significant Fauna	Some loss of habitat and disturbance.	Low (most habitat should not be affected).	• Avoid areas of important habitat where possible. • Address fire management challenges for the protection and preservation of important habitat areas. • Minimise disturbance footprint.

MANAGEMENT RECOMMENDATIONS

To minimise potential impacts on fauna and fauna habitats, the loss of habitat from vegetation clearing should be minimised where possible and disturbances to significant habitat should be avoided.

Several areas of important habitat are listed. Some occur outside the exact pipeline alignment (eg. Samphire shrublands and sand dunes are generally avoided and most Mulga remnants occur approximately 50m away from proposed pipeline location). However some important areas of Sandhill Dunnart habitat are likely to be traversed.

In the vicinity of Tropicana several areas of significant habitat are mapped (eg. mature hummock grasslands) however are also traversed by an existing access track. The proposed pipeline route and associated disturbance footprint should be limited to existing access tracks where possible, to minimise the disturbance to important fauna habitat.

Management recommendations are summarised below:

1. Refer project to the Department of the Environment – due to the presence / perceived presence of significant populations of EPBC listed fauna, this is considered necessary under DOTE guidelines (see Appendix 1);
2. Limit loss of habitat by minimising the clearing footprint - retain as much habitat as possible, in the best condition possible. This will help retain the fauna values already present along the pipeline route and facilitate rehabilitation. Where possible the proposed pipeline route should be restricted to existing tracks and previously disturbed areas;
3. Minimise disturbances to significant fauna habitats. Even small areas of such habitat provide breeding, sheltering and foraging habitat for EPBC listed species:
    a. Mulga Woodland: intact and long-unburnt Mulga Woodland provides important habitat to conservation significant fauna and refugia. Most areas already lie outside the proposed alignment;
    b. Mature yellow sandplain habitats: a potential PEC and supports the Sandhill Dunnart;
    c. Sand dunes: habitat for specialist fauna including Southern Marsupial Mole and Sandhill Dunnart. Most elevated dunes lie outside the proposed alignment;
    d. Isolated rocky outcrops;
    e. Samphire Shrubland: avoid clearance of samphire shrubland in the vicinity of Sunrise Dam and Hope Campbell Lake. Mostly occurs outside the proposed alignment;
    f. Where possible avoid the clearing of mature, hollow-bearing Marble Gums as these provide breeding habitat for many important species;
    g. Where possible avoid areas of active Mulgara and Great Desert Skink burrows. This may include a final inspection of alignment prior to clearing;

4. Minimise disturbances to optimal Sandhill Dunnart Habitat – this includes the mature spinifex grassland habitats at:
    a. The four locations where the Sandhill Dunnart was recorded; and
    b. Other areas of habitat considered "Optimal" (refer to habitat mapping).
5. Develop appropriate measures to minimise impacts on Malleefowl such as avoiding known Malleefowl mounds, and implement disturbance free buffer zones around active and recently active mounds. This should include traffic / personnel restrictions near active mounds;
6. Avoid disturbance to wetland habitats - DPaW policy recommends a minimum buffer of 50m around wetlands, which includes salt lakes. However salt lake areas appear to lie outside the proposed pipeline alignment;
7. Ensure fauna specialists (suitable experienced and qualified personnel) conduct regular trench inspections during trenching operations. Fauna specialists should be present at trench digging for the appropriate identification, handling and translocation of all fauna, particularly significant species (Sandhill Dunnart, *Lerista puncticauda*, Brush-tailed Mulgara, other locally important species). DPaW has guidelines for the management of fauna under these circumstances (such as daily trench inspections). Where trench work intersects sand dunes, appropriate measures should be taken to minimise impacts to Southern Marsupial Moles and the Sandhill Dunnart. The length of trench open at any given time should be limited to that which can be inspected and fauna managed accordingly. All fauna trapped within the trench should be recorded;
8. Develop appropriate measures to minimise the introduction and/or spread of environmental weeds;
9. Address fire management challenges for the protection and preservation of Mulga Woodland and mature yellow sandplain habitat;
10. Limit access along the infrastructure corridor to minimise the potential for roadkill and fire events;
11. Conduct appropriate revegetation of disturbed areas; and
12. Conduct an assessment of the local Southern Scrub-robin population.

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Appendix 1. Conservation Significant Fauna Recorded from the Project Area

Eleven fauna species of conservation significance were recorded from the project area. This included four species listed under the EPBC Act, three Priority taxa listed by DPaW and four locally significant fauna (KEC, 2014). These species include:

- Sandhill Dunnart (Sminthopsis psammophila) – EPBC Endangered, recorded from four locations;
- Southern Marsupial Mole (*Notoryctes typhlops*) – EPBC Endangered, recorded at five locations;
- Malleefowl (*Leipoa ocellata*) – EPBC Vulnerable, 19 mounds recorded;
- Brush-tailed Mulgara (*Dasycercus blythi*) – DPaW Priority 4, two individuals trapped, numerous active burrows recorded;
- Rainbow Bee-eater (*Merops ornatus*) – EPBC Migratory, several observed;
- Striated Grasswren (*Amytornis striatus*) – DPaW Priority 4, three separate groups recorded;
- Australian Bustard (*Ardeotis australis*) – DPaW Priority 4, four records;
- Scarlet-chested Parrot (*Neophema splendida*) – locally significant, pair seen;
- Rufous Tree-creeper (*Climacteris rufus*) – locally significant, four observed;
- Southern Scrub-robin (*Drymodes brunneopygia*) – locally significant, ten records; and
- Chestnut Quail-Thrush (*Cinclosoma castanotum*) – locally significant.

EPBC Listed Fauna.

When developments propose to undertake an action that has, will have or is likely to have a significant impact on a species listed under the EPBC Act (such as the Sandhill Dunnart, Malleefowl, Great Desert Skink, Slender-billed Thornbill or Southern Marsupial Mole) the proposed development is required to be referred to the Australian Government Department of the Environment. The Federal Environment Minister will then decide, whether assessment is required under the EPBC Act (DOTE 2013). Guidelines for a referral involving EPBC listed species have been prepared: Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DOTE, 2013).

The Department of Environment lists a significant impact as:

“an impact which is important, notable, or of consequence, having regard to its context or intensity” (DOTE, 2013).

Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (DOTE, 2013). A significant impact is “likely” if the impact on the environment is a real (or not remote) chance or possibility. An action will require federal approval if the action

has, will have, or is likely to have a significant impact on a species listed under the EPBC Act.

Critically Endangered and Endangered Species

An action is likely to have a significant impact on a Critically Endangered or Endangered species (such as the Sandhill Dunnart or Southern Marsupial Mole) if there is a real chance or possibility that it will:

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

Further, specific referral guidelines have been developed for the Endangered Northern Quoll (SEWPaC, 2011). While absent from the region, similar assessment thresholds are expected for the Sandhill Dunnart and Southern Marsupial Mole and are applied here. A referral for Endangered fauna is recommended where:

- Actions remove known habitat critical to the survival of the species. In this case habitat supporting a known population of Sandhill Dunnart or Southern Marsupial Mole;
- Actions which remove >10 ha of potential habitat critical to the survival of the species. In this case habitat supporting optimal Sandhill Dunnart habitat (yellow sand plains with mature spinifex hummock grasslands with unburnt, mature spinifex - life stage 2 - 3.5) and Southern Marsupial Mole habitat (sand dunes);
- Actions which remove >200 ha of potential foraging and dispersal habitat. In this case the removal of greater than 200 ha of potential Sandhill Dunnart Habitat (with Spinifex life stage 2 -5) or yellow sand dunes.

Actions that fulfil the above criteria are also considered to fulfil the significant impact criteria listed under the EPBC act. As the Sandhill Dunnart and Southern Marsupial Mole were recorded along the survey corridor it is likely that greater than 10 ha of optimal habitat (or >200 ha of potential habitat) will be disturbed. As a result a referral is likely to be needed (to DOTE) for the assessment of the Sandhill Dunnart. Furthermore, while the proposed pipeline route does avoid most sand dune habitat, it does intersect elevated sandplain habitat between dunes and thus, likely dispersal habitat for the Southern Marsupial Mole. As a result a referral is likely to be needed (to DOTE) for the assessment of the Southern Marsupial Mole. The details of Endangered listed fauna are listed in Table 4.

Vulnerable Species

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

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

Four species occurring or expected in the survey area are listed as Vulnerable under the EPBC Act. These are the Malleefowl, Slender-billed Thornbill, Great Desert Skink and Princess Parrot. The Malleefowl population occurring in the Tropicana area would be considered important as it is near the limit of the species range and a key source population in a fragmented landscape. Likewise, if present, a Slender-billed Thornbill or Great Desert Skink population would be considered important as the species is locally rare and a population in the area would provide a key source for dispersal and genetic linkage. A resident Princess Parrot population is unlikely so an important population is not expected. The details of Vulnerable listed fauna are listed in Table 4.

The proposed pipeline route has been designed to avoid most Mulga remnants and therefore disturbances to critical Malleefowl habitat are expected to be minimal. However there is the potential for roadkill and also for an increased incidence of fire. Disturbances to Malleefowl habitat will require a referral to the federal Department of the Environment.

While the Princess Parrot is not considered to have a significant population in the survey area, the significant impact criteria lists disturbances to habitat critical to the survival of a species (breeding habitat) and the disruption of the breeding cycle as significant impacts. While it may not occur in the survey area for many years, there is the potential for the species to breed in the survey area during favourable conditions. Therefore to avoid significant impacts to the Princess Parrot, disturbances to breeding habitat (mature, hollow bearing Marble Gum trees) should be avoided where possible.

Migratory Species

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

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

- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat within an area where the species is declining.

The region is not considered to contain ecologically significant numbers of Migratory waterbirds however some species may occur at Lake Carey which lies outside the project area. The proposed pipeline route avoids ephemeral wetlands such as salt lakes which may provide temporary habitat for some species. Some salt lake habitat does occur within the buffer zone which may provide occasional habitat during periodic flood events. Suitable habitat within the survey area is considered marginal and may support small numbers or vagrants for a limited period. As a result the habitat within the survey area is not considered to be "important" under the EPBC criteria.

EPBC Summary

Actions considered to be at "low risk" of significant impact include those which avoid habitat removal, adopt and implement best practice mitigation and have a management plan in place to monitor significant populations (DOTE, 2013). Overall, the project is recommended to be referred to the Federal Environment Minister (DOTE) as there is the potential for significant impacts to EPBC listed fauna. This includes disturbances to the optimal and potential foraging and dispersal habitat of the Sandhill Dunnart and Southern Marsupial Mole. Additionally, a referral is also recommended when increased traffic volumes increase the risk of mortality and population fragmentation. This may be relevant to local populations of Malleefowl where traffic in the vicinity to active mounds pose a risk of roadkill.

To minimise impacts on the EPBC listed fauna, disturbances to significant fauna habitats, including long unburnt yellow sandplain, sand dunes, long unburnt Mulga Woodland, Samphire shrubland and mature Marble Gum trees should be minimised and avoided where possible. The disturbances to potential foraging habitat or dispersal habitat should also be minimised. Several management practises are recommended to minimise impacts on EPBC listed fauna (see Recommendations).

Table 4. EPBC listed fauna expected in the survey area and criteria for significant impact.

Species	Status	Important Population Expected	Habitat		Significant Disturbance Anticipated			Referral
			Optimal Habitat	Foraging/Dispersal Habitat	Optimal Habitat	Foraging/Dispersal Habitat	Significant Impact Criteria Relevant	
Sandhill Dunnart	Endangered	Yes	Triodia (Stage 2-3.5) yellow sand dunes.	Triodia (Stage 2-5) yellow sandplains	Likely to disturb >10 ha	Likely to disturb >200 ha	Potential for habitat loss and fragmentation	Referral
Southern Marsupial Mole	Endangered	Yes	Sand dunes	Interdune plains	Likely to disturb >10 ha	May disturb >200 ha	Potential for fragmentation, habitat loss	Referral
Malleefowl	Vulnerable	Yes	Dense, long unburnt Mulga	Regenerating Mulga, adjacent sandplains	Likely to disturb >10 ha	May disturb >200 ha	Roadkill potential. Unlikely to result in population decline, significant impact unlikely provided management measure employed	Referral
Slender-billed Thornbill	Vulnerable	Yes	Samphire shrubland	Adjacent chenopod shrubland	Unlikely to disturb >10 ha	May disturb >200 ha	Unlikely to result in population decline, significant impact unlikely provided management measure employed	Referral
Great Desert Skink	Vulnerable	Unknown	Spinifex Sandplains	Spinifex Sandplains	Potential for disturbance	Potential for disturbance	Unknown – precautionary principle applied and so potential for habitat loss	Referral
Princess Parrot	Vulnerable	No	Mature Marble Gum Woodland	Sandplains	Unlikely to disturb >10 ha	Not Applicable	Not significant providing disturbances to breeding habitat avoided	No
Migratory Waterbirds	Migratory	No	Salt Lakes, ephemeral wetlands	Temporary wetlands	Unlikely to disturb >10 ha	Unlikely to disturb >200 ha	None	No

Appendix 2: Ecological Processes

Many of the potential impacts of the proposed development upon fauna can be related to ecological processes. Chapin *et al*. (2002) defined an ecosystem (ecological) process as the transfer of matter or energy between components (either biotic or abiotic) of an ecosystem. These include processes such as inter- or intra-specific interactions (e.g. predation, competition) and physical or biophysical interactions (e.g. photosynthesis, hydrological fluxes, erosion). Amundson and Jenny (1997) suggest that ecosystem processes (and, hence, ecosystem 'function') are driven or influenced by at least five main factors: climate, parent material, topography, biota and time. Human activity may directly or indirectly affect these factors and may therefore, also impact upon ecosystem processes and ecosystems.

Soule *et al*. (2004), in a review of the ecological function of landscape connectivity in conservation, identified seven ecological processes that are most relevant to the conservation of biodiversity in Australia. Several of these may be relevant to impacts of the proposed project:

- Interactions between species (including introduced and invasive species);
- Long distance biological movement (landscape permeability allowing movement of populations across the landscape);
- Short distance biological movement (gene flow and changes to gene flow);
- Disturbance and loss of habitat at local and regional scales that exceed natural rates of such disturbance;
- Global climate change (leading to the decline, disappearance or geographic shift of microhabitats);
- Hydroecology (interactions between the biota and the hydrology of a site); and/or
- Increases in nutrients and chemicals (e.g. pesticides, heavy metals) and the impediment of natural water movements and sediment transportation by man-made diversions.

In addition, under the EPBC Act (1999), a key threatening process is defined as an ecological interaction that threatens or may threaten the survival, abundance or evolutionary development of a threatened species or ecological community (DOTE, 2013). There are currently 20 key threatening processes listed by the federal Department of the Environment (DOTE, 2013, see Appendix 6). Several of these processes may be applicable to the survey area:

- Land clearance;
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases;
- Predation by Feral Cats;
- Predation by the European Red Fox;
- Competition and land degradation by Feral Rabbits;

- Novel biota and their impact on biodiversity – includes the grazing and habitat degradation of unmanaged stock (particularly Cattle and Sheep), Feral Camels and the introduction of invasive species such as environmental weeds; and
- Competition and land degradation by unmanaged Goats.

There are common themes through the ecological processes outlined by Soule *et al*. (2004), the key threatening processes listed by DOTE, 2013, and some of the impacts discussed with respect to threatened species. The simplified categories of processes relevant to the project are discussed below.

Increased mortality

Direct mortality can result from clearing and the associated loss of habitat and during trenching operations (such as during pipeline construction) whereby animals become trapped and die in excavated trench lines. Controlling the length of trench open at any one time and regular trench inspections (to remove trapped animals on a daily basis) are procedures to minimise potential impacts.

Where trench lines are constructed through significant fauna habitat, particularly Sandhill Dunnart habitat, a management plan should be developed to minimise any impacts on a potential local population and fauna translocation strategies developed in consultation with DPaW. Furthermore, an open trenchline provides the opportunity to collect wide scale information on fauna. Fauna specialists should be involved during the construction process and with the identification and removal of fauna trapped in trench lines to ensure significant species are appropriately identified, removed and translocated to areas of optimal habitat (eg. Sandhill Dunnart, *Lerista puncticauda*).

Direct mortality is expected mainly during construction due to clearing and the associated habitat loss and the entrapment in trenches, but some ongoing mortality may arise due to roadkill. This may be relevant to local populations of Malleefowl where traffic in the vicinity to active mounds pose a risk of roadkill.

Loss of habitat affecting population survival

Clearing for a development can lead to habitat loss which may lead to a consequent decline in population size for local fauna species. Loss of habitat can occur directly by vegetation clearing or can also occur through the degradation of vegetation (such as through fire events and weed invasion). The loss or degradation of vegetation can be minimised through controls during clearing and management during operation (eg. weed hygiene measures). Immediate rehabilitation of disturbed areas will assist in reducing impacts.

Loss of habitat can reduce population size that for some species may be critical. This may include the loss of breeding or nesting sites. The pipeline footprint is small and much of the disturbance will be temporary, and therefore loss of habitat for most species is anticipated to be low.

Impacts to the local population of the Sandhill Dunnart or Malleefowl may arise where habitat "critical to the survival" of the species is disturbed. To minimise impacts on the local populations areas of optimal breeding habitat should be avoided where possible. This includes areas of Mulga Woodland, long unburnt spinifex shrubland and mature hollow-bearing Eucalypt trees. Several areas of potential Sandhill Dunnart habitat occur along the proposed route. Disturbances to optimal Sandhill Dunnart habitat are recommended to be avoided where possible. Disturbance free buffer zones should be implemented around active Malleefowl mounds. Additionally pipeline construction within significant habitats should be managed to ensure impacts are minimised.

Where significant habitats are isolated and occupy small areas (eg. isolated rocky outcrops, Malleefowl mounds) within the survey corridor, it is recommended the pipeline and associated roads and infrastructure should be positioned to avoid such habitats.

Loss of habitat affecting population movements and gene flow

Loss of habitat can affect population movements by limiting movement of individuals throughout the landscape as a result of habitat fragmentation. Obstructions associated with the development, such as roads, pipes and drainage channels, may affect movement of small, terrestrial species. Pipeline construction and installation will leave a bare strip of ground and minor access tracks that may present a barrier for the movement of small fauna. Natural regeneration may occur but this may need to be monitored and where necessary facilitated.

Areas of disturbance within the pipeline routes are likely to be temporary if the pipeline is rehabilitated directly after construction. Burying the pipeline underground will reduce the level of surface impediment.

Species interactions, including introduced vertebrates and weeds

Introduced species may have adverse impacts upon native species. The Feral Cat, Rabbit, European Red Fox, Goat, Cattle and Camel were recorded along the survey corridor. All are associated with Key Threatening Processes listed under the EPBC Act.

In particular, the Department of the Environment lists the Rabbit as significant threat to the Slender-billed Thornbill, Malleefowl, Princess Parrot and Night Parrot. Rabbits are widespread through the region and were recorded from a range of habitat types including salt lakes, chenopod shrubland and *Casuarina pauper* Woodland. At a national level the impact of rabbits on the Australian environment has been disastrous and they have significantly altered the botanical composition of extensive areas of natural habitat (DOTE, 2013). Rabbits graze heavily on native plant species, killing some and preventing germination and seeding establishment of others, cause soil erosion due to the loss of vegetation, reduce the amount of protective vegetation for native species, take over burrows and compete for food (DOTE, 2013).

The presence of rabbits also attracts predatory species, such as cats and foxes that also prey on native animal species (Norris *et al*., 2005).

Other novel fauna such as cats and foxes and prey on native species, are vectors for disease and compete for food and shelter (DOTE, 2013). Some native species expected in the area are sensitive to predation by Feral Cats and Foxes (such as the Sandhill Dunnart and Malleefowl, DOTE, 2013). Both the Feral Cat and Fox can increase in abundance with human activities and may also forage in the open trenches during pipe-laying.

Escaped or released domestic animals such as camels, cattle and horses damage the environment by grazing and trampling native vegetation, fouling water sources, severely damaging the aquatic ecosystems and riparian zones of waterways, causing soil erosion on river banks by destroying vegetation, out-competing native species for food and shelter and acting as vectors for disease (DOTE, 2013). Samphire and chenopod shrublands in the region have been significantly degraded by cattle which has contributed to the decline of the Slender-billed Thornbill (Johnstone and Storr, 2004).

Additionally, weed invasion poses a threat to the fauna and flora values of the survey area. Invasive weed species can replace native species and degrade fauna habitats and also impact fire regimes. Weeds can be spread by vehicles, earthworks and road construction. Weed outbreaks tend to occur on recently disturbed ground such as road sides and drainage channels. A weed prevention and control strategy should be in implemented to prevent the spread of weeds in the survey area.

Hydroecology

Hydrological changes can have far-reaching consequences on surrounding ecosystems. Habitats associated with seasonal wetlands are locally significant for a range of fauna, in particular populations of amphibians which often rely on seasonal flooding to breed. Wetland habitats are dependent on the maintenance of natural hydrological processes and may be sensitive to changes in surface and sub-surface hydrology. Changes in hydrology including groundwater levels may affect any groundwater dependent ecosystems, which may consequently impact on fauna utilising such areas.

Natural hydrological flows should be maintained and disturbances to any groundwater dependent habitats avoided. DPaW policy recommends a minimum buffer of 50m around wetlands, which includes permanently, seasonally or intermittently waterlogged or inundated wetlands with water that may be fresh, saline (salty), flowing or static (DPaW, 2013). The proposed pipeline alignment avoids Lake Carey and the series of small salt lakes associated with the Hope Campbell Lake drainage system.

Changes in Fire Regime

Fire is a natural feature of the environment in the region, but frequent, extensive fires may adversely impact some fauna, particularly threatened species such as the Sandhill Dunnart, Malleefowl and Striated Grasswren. Trenching and other construction activities may lead to fires, but conversely the development could result in the control of some fires.

Fire Impacts on the Mulga / Spinifex Communities

Mulga (*Acacia aneura*) and spinifex (*Triodia* spp.) are common throughout arid Australia, often dominating the landscape as discrete, abruptly alternating dominants of vegetation. The parapatric nature of mulga and spinifex communities is thought to be an outcome of pre-settlement Aboriginal burning practices (Latz 1995, Nicholas 2007). Traditional burning regimes are thought to have largely avoided extensive, severe and frequent hot wild fires, allowing for the development of fire sensitive Mulga Woodlands across the landscape (Nicholas, 2007).

Spinifex grasses are highly flammable and have been described as fire encouraged, fire tolerant or fire dependant, as they are able to withstand high intensity fires by regenerating quickly from seed and rootstock following a fire event (Latz 1995). Mulga Woodland however is highly sensitive to fire and can be permanently removed by high intensity fires. Mature Mulga trees and seedlings readily succumb to moderately intense fire and generally do not resprout. High intensity fires, repeat fire events or the lack of rainfall following a fire can deplete Mulga seed supply and cause long-term damage (Bradstock, 2012). Where intense fire events are regular, fire-sensitive Mulga Woodland is replaced with fire tolerant Spinifex communities.

Changes to the balance of Mulga – Spinifex Communities have been recorded across Western Australia. In the absence of traditional burning regimes adopted by indigenous Australians across the central deserts, large areas of Mulga Woodland (including the associated animals and plants) are being replaced by spinifex dominated communities (Bradstock *et. al.*, 2012). Over time repeated fires result in the gradual contraction of the Mulga, where (spinifex supported) high intensity fires are able to penetrate and remove Mulga woodland margins and allow for the subsequent invasion of (fire encouraged) spinifex.

Within the survey area, the perimeter of many Mulga Woodlands were observed to have undergone some “erosion” by fire. Most Mulga stands recorded along the survey corridor showed evidence of fire degradation and are smaller, fragmented relics from a previous more widespread community. Dead (burnt) Mulga trees were often observed over 100m away from the current Mulga Woodland boundary into Spinifex grassland (see Plate 58).

A review of satellite imagery reveals long-unburnt (dense, dark) Mulga Woodland is rare, fragmented and sparsely scattered through the region. Most Mulga remnants are small, typically less than 1 km wide and situated on the interdune plains (with tall sand ridges providing some protection from fire). Across the region Mulga Woodland occurs as small “island” fragments in a “sea” of Spinifex Hummock Grasslands. As a

result of fire degradation and the fragmentation of habitat, Mulga Woodland is considered a significant fauna habitat in the region.

Yellow Sandplain Habitat

A similar threatening process appears to be impacting the yellow sandplain communities of the Great Victoria Desert where large areas of mature habitat are removed by high intensity fires. Much of the vegetation along the survey corridor had been recently burnt (within the last 10 years) and as a result much of the vegetation comprised low spinifex grasslands with smaller relics of taller unburnt shrubland habitat. On the yellow sandplains this included shrublands of *Acacia* spp., *Allocasuarina acutivalvis*, *Grevillia* sp., *Melaleuca* sp., and *Hakea francisiana*. Long unburnt mature spinifex shrubland favouring the Sandhill Dunnart or Striated Grasswren appeared scattered and fragmented with younger recently burnt sandplain a dominating feature of the landscape.

Fire Impacts on Local Fauna

The cessation of traditional land management practices has created a new fire regime where vast areas of land are burnt by very hot, extensive fires leaving very few patches of unburnt habitat within it. As small patches of unburnt habitat (fire refuges) are rare, over time such a fire regime is likely to eliminate many fire sensitive fauna populations until only a few fragmented, small populations persist (eg. Striated Grasswren, Southern Scrub-robin, DOTE, 2013). Fire is a significant threat to the ongoing survival of several significant fauna species that rely on long unburnt and intact habitat. This includes the Malleefowl and Southern Scrub-robin (in Mulga Woodland); and Sandhill Dunnart, Great Desert Skink and Striated Grasswren (in mature Spinifex Sandplains).

Fire is considered to be an ongoing threat to biodiversity in the Tropicana area. Further high intensity fires are likely to exacerbate the contraction of fire sensitive habitat (eg. Mulga). The establishment of the infrastructure corridor may increase the potential for fires in the region as it will allow for a greater number of people to access a previously remote area. However the development may also form a barrier to some fire events, may provide the opportunity to have greater control of some fires and allow for the preservation of some Mulga relics.

Dust, Light and Noise and Disturbance

Impacts of light and noise upon fauna are difficult to predict. As such, it is best to take a precautionary approach. The death of very large numbers of insects has been reported around some remote minesites and this attracts other fauna (including introduced predators), as well as presumably reducing the populations of insects in surrounding habitats. Impacts associated with light, noise and disturbance can be expected to be slight with respect to pipeline construction and operation.

Refugia

In evolutionary terms refugia are areas where organisms are able to persist during a period in which their wider geographic range becomes uninhabitable, generally due to changes in climatic and environmental conditions (Byrne, et. al, 2011). Australia

has undergone major periods of historical climate change resulting in major changes to vegetation at a landscape level and the fragmentation of formerly widespread species to relictual populations.

Since the Eocene, Australia has become increasingly drier resulting in expansion of the arid zone to cover approximately 70% of the continent, and contraction of mesic (temperate) environments to the southern extremes (eg. the south-west of Western Australia, Bryne *et. al.*, 2011). This process has resulted in the separation of the formerly widespread mesic biome, with the modern day temperate fauna species of the south-west and south-east of Australia separated by the arid central deserts and Nullarbor Plain (Byrne *et. al.*, 2011). The contraction of mesic biota in response to acidification resulted in fragmentation of many vegetation communities and the separation of fauna populations. Many bird species occurring in the south-west of Western Australia have disjunct populations in southern South Australia broadly separated by the arid extremes of the Nullarbor Plain (eg. Southern Scrub Robin, Scarlet Robin, White-eared Honeyeater, Regent Parrot, Purple-crowned Lorikeet).

Examples of refugia in arid Western Australia include rocky ranges and the fringes of deserts. Desert ranges with complex topography provide a diverse range of thermal, hydric and edaphic conditions where mesic habitat may survive during changing environmental and climate conditions (Byrne *et. al.*, 2011). The peripheral areas of semi-arid habitat may also have provided refugial areas for arid taxa during peak arid conditions as the greatest intensity of aridification in Australia occurred within the central arid zone (Byrne *et. al.*, 2011). The fringe of the Great Victoria Desert may be such a periphery area where the yellow sandplain communities provide habitat for several temperate species as well as fauna more typical of the arid zone.

Some species occurring in the Tropicana area occur there in isolated and fragmented populations. They appear to be relics from a historically widespread population, condensed and fragmented by changes in climate. It is suggested that the Southern Scrub-robin at Tropicana is relictual – a remnant population from a formerly widespread species. The Tropicana population is probably further fragmented by fire and genetic isolation.

The relic Mulga Woodlands in the Tropicana area are an example of a more recent refugia where repeated fire events have eroded a formerly widespread habitat to small and fragmented remnants. The Mulga Woodlands support restricted fauna assemblage including relictual species such as Southern Scrub-robin and Malleefowl. Both species have a restricted occurrence due to their reliance on dense, mature shrubland. The on-going replacement of fire-sensitive Mulga with fire-tolerant Spinifex communities has been recorded across Western Australia and is evident in the Tropicana area. Mulga Woodlands are considered a highly significant fauna habitat in the area due to their restricted and declining occurrence (by fire) and the provision for relictual fauna.

The yellow sandplain habitats also include elements of refugia and are likely to have been historically widespread and contracted to the southern desert fringes with a changing climate. The Yellow Sandplain PEC occurs on the southern periphery of the

Great Victoria Desert and supports several species with restricted ranges that have disjunct populations in southern South Australia (Sandhill Dunnart, Southern Scrub-robin, Gilbert's Whistler, *Diporiphora regina, Diporiphora linga, Diplodactylus wiru, Delma petersoni*). The yellow sandplain PEC is also regionally significant in supporting several "cross-over" species where more temperate species occur with taxa more typical of the arid zone.

Refugia in the region therefore support significant relictual populations. This includes populations restricted to isolated remnants (eg Southern Scrub-robin, Malleefowl, *Lerista puncticauda*). While others have a more continuous distribution which may provide some linkage across the Great Victoria Desert (Rufous Tree-creeper, Purple-crowned Lorikeet).

Sunrise Dam - Tropicana Infrastructure Corridor Fauna Survey

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EXECUTIVE SUMMARY

AngloGold Ashanti Australia (AngloGold) and the APA Group are proposing a 210 km infrastructure corridor to connect the Sunrise Dam and Tropicana Gold mines. As part of the Environmental Impact Assessment for the project, Kingfisher Environmental Consulting was commissioned by AngloGold to undertake a Level 1 Fauna Assessment of the proposed infrastructure corridor route.

The fauna assessment comprised a desktop review, targeted fauna survey and assessment of significant habitats. The desktop review identified 323 fauna species potentially occurring within the proposed corridor comprising eight frog, 115 reptile, 155 bird, 35 native mammal and 10 introduced mammal species. The potential fauna assemblage included 33 species of conservation significance.

A total of 157 fauna species were recorded during the field surveys, comprising one frog, 50 reptile, 78 bird, 19 native mammal and nine introduced mammal species. Eleven fauna species of conservation significance were recorded from the project:

- Sandhill Dunnart (*Sminthopsis psammophila*) – EPBC Endangered, recorded from four locations;
- Southern Marsupial Mole (*Notoryctes typhlops*) – EPBC Endangered, recorded at five locations;
- Malleefowl (*Leipoa ocellata*) – EPBC Vulnerable, 19 mounds recorded;
- Brush-tailed Mulgara (*Dasycercus blythi*) – DPaW Priority 4, two individuals trapped, numerous active burrows recorded;
- Rainbow Bee-eater (*Merops ornatus*) – EPBC Migratory, several observed;
- Striated Grasswren (*Amytornis striatus*) – DPaW Priority 4, three separate groups recorded;
- Australian Bustard (*Ardeotis australis*) – DPaW Priority 4, four records;
- Scarlet-chested Parrot (*Neophema splendida*) – locally significant, pair seen;
- Rufous Tree-creeper (*Climacteris rufus*) – locally significant, four observed;
- Southern Scrub-robin (*Drymodes brunneopygia*) – locally significant, ten records; and
- Chestnut Quail-Thrush (*Cinclosoma castanotum*) – locally significant;

Additional conservation significant fauna species are considered likely to occur within the survey area. Several significant fauna habitats were recorded from the survey area. These included:

- Dense Mulga Woodland (Malleefowl habitat);
- Yellow sandplain habitats with elements of a Priority Ecological Community;
- Sand dunes;
- Mature Spinifex Hummock Grasslands (optimal habitat for the Sandhill Dunnart);
- Samphire Shrublands (Slender-billed Thornbill habitat);
- Long-unburnt low proteaceous heath (Striated Grasswren habitat); and
- Isolated rocky outcrops (refugia).

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3	J. Turpin	B. Bastow	E. Bamforth	21/07/2014

CONTENTS

1. INTRODUCTION

1.1 Project Background

AngloGold Ashanti Australia (AngloGold) manages two operational gold mines in Western Australia: Sunrise Dam Gold Mine, located 55 km south of Laverton and the Tropicana Gold Mine, located 330 km north-east of Kalgoorlie. AngloGold with APA Group plan to establish an infrastructure corridor (a gas pipeline (STP-PLA-0025) with associated infrastructure and an access track) connecting the two mines (Figure 1). The proposed infrastructure corridor extends over 210 km from Sunrise Dam Gold Mine (SDGM) to Tropicana Gold Mine (Tropicana).

As part of the Environmental Impact Assessment for the project, Kingfisher Environmental Consulting (KEC) was commissioned by AngloGold to undertake a fauna assessment of the proposed infrastructure corridor route. A fauna assessment is required to identify the fauna values of a site so that impacts upon these from any proposed development can be assessed and, where possible, minimised.

1.2 Fauna Assessment Objectives

Where a project is likely to affect biodiversity, the information gathered for Environmental Impact Assessment (EIA) via desktop studies and fauna surveys should enable the impacts of the proposal and their environmental significance to be determined to an acceptable level. Fauna assessments should provide a sufficient level of detail so that proposals that receive environmental approval by government agencies, meet state, national and international legislative requirements (EPA, 2002). The requirements of fauna surveys and desktop studies associated with the Environmental Impact Assessment are documented in EPA's Guidance Statement 56 (EPA, 2004), Position Statement No. 3 (EPA, 2002), and Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2010). The key objectives of fauna studies are to:

1. Conduct a review of background information (a search of all sources for literature, data and map-based information);
2. Compile an inventory of vertebrate fauna expected to occur in light of fauna habitats present;
3. Identify significant fauna species occurring or likely to utilise habitat within the project area;
4. Document the characteristics of the fauna assemblage including significance at an international, national, state, regional and local level;
5. Delineate key fauna values present in the area and potential sensitivity to impacts;
6. Identify significant or fragile fauna habitats within the study area;
7. Identify any ecological processes in the study area upon which fauna may depend; and

8. Identify general patterns of biodiversity within or adjacent to the project area.

The Sunrise Dam to Tropicana Level 1 Fauna Survey therefore comprises a Desktop Survey, Field Survey (Two Survey Phases) and Fauna Assessment Report (this report). After consultation with AngloGold the specific scope of works for the fauna assessment also included the following objectives:

1. Identify and sample all major vegetation and substrate associations (fauna habitats) present within the survey corridor with a focus on the identification of significant or fragile habitats;
2. Conduct targeted searches for species of conservation significance;
3. Prepare an inventory of species recorded or expected to occur within the survey corridor, based on a data, literature reviews and habitats types present;
4. Map the occurrence and expected extent of conservation significant fauna and their associated habitats;
5. Assess the regional and local significance of the fauna assemblage;
6. Assess the potential impact of construction and operation of the corridor on vertebrate fauna; and
7. Develop strategies for the environmental management of significant species and their habitats.

1.3 Survey Corridor

The survey corridor for the fauna assessment (the "survey area") follows the proposed infrastructure corridor route and links Sunrise Dam Gold Mine to the Tropicana Gold Mine. The corridor is approximately 210 km in length and is predominantly 500m wide (250m either side of the proposed pipeline). However it extends up to 5 km wide in the vicinity of Hope Campbell Lake to allow for several alternative route options. A small 15 km spur connecting the corridor with an existing haul road near the Irwin Hills (90 km south-east of Laverton) is also included. The corridor is situated mostly on unallocated crown land (outside of pastoral and mining areas) and therefore traverses mostly undisturbed vegetation and traverses some remote and therefore highly intact fauna habitats.

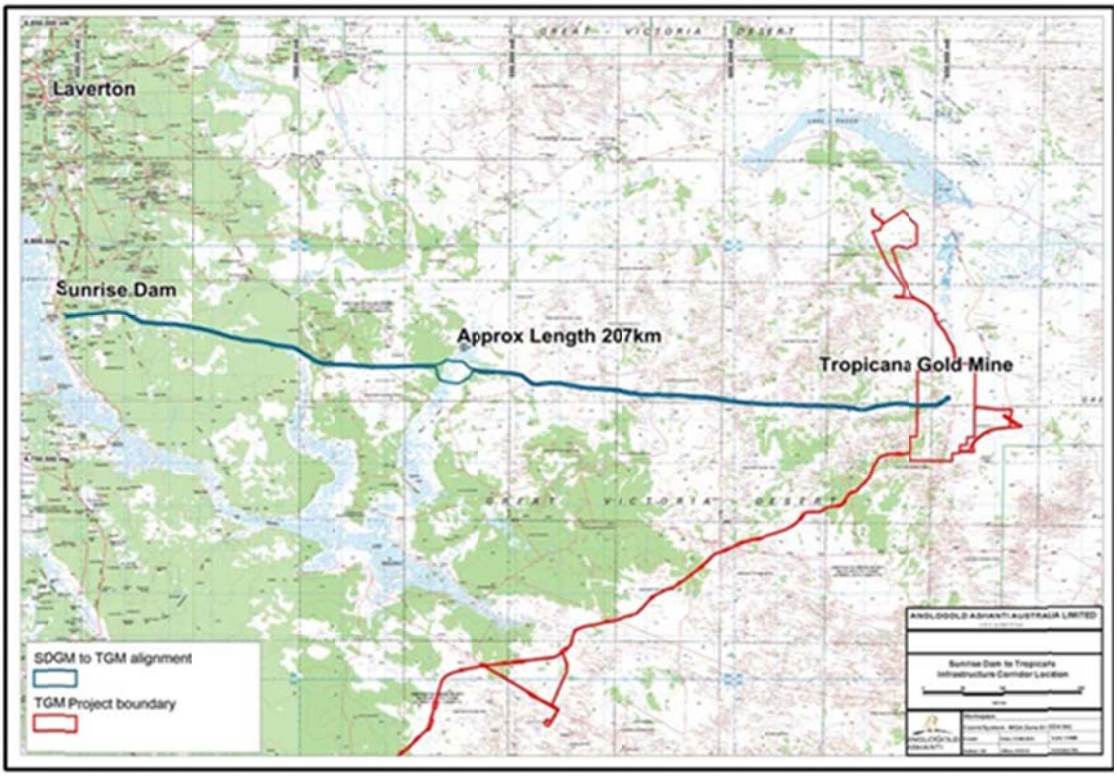
1.4 Scoping Requirements

This document has been developed in consideration of the following:

1. EPA Position Statement No 3, Terrestrial Biological Surveys as an element of Biodiversity Protection (EPA, 2002);
2. EPA Guidance Statement No 56, Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004); and

3. EPA Technical guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2010).

Figure 1: Project Location – Sunrise Dam to Tropicana Gold Mine.



2. BACKGROUND

2.1 Regional Description

The Interim Biogeographic Regionalisation of Australia (IBRA) has identified 26 bioregions in Western Australia (Figure 2). Bioregions are classified on the basis of climate, geology, landforms, vegetation and fauna (Thackway and Cresswell, 1995). IBRA Bioregions are affected by a range of different threatening processes and have varying levels of sensitivity to impact (EPA, 2004). The survey corridor traverses two major biogeographic zones and therefore two bioregions – the Murchison and Great Victoria Desert Bioregions.

Murchison Bioregion

The western third of the corridor lies within the Murchison Bioregion. The Murchison Bioregion falls within the Bioregion Group 2 classification of EPA (2004). Bioregions within Group 2 have "native vegetation that is largely contiguous but is used for commercial grazing" (EPA, 2004). The Murchison Bioregion contains low hills and mesas separated by flat colluvium and alluvial plains with vegetation dominated by low Mulga (*Acacia aneura*) woodlands. Other vegetation types include saltbush shrubland on calcareous soils, saline areas with samphire, and hummock grassland on red sandplain (Bastin *et. al*., 2008).

Great Victoria Desert Bioregion

The survey corridor extends from the eastern margins of the Murchison Bioregion and into the Great Victoria Desert Bioregion approximately 20 km east of Sunrise Dam. The Great Victoria Desert bioregion is characterised by dunefields with playa lakes and lunettes. Vegetation is predominantly Marble Gum (*Eucalyptus gongylocarpa*), Mulga (*Acacia aneura*) and Yarldarlba (*Eucalyptus youngiana*) over Spinifex (*Triodia* spp.) hummock grassland. Most of the bioregion is unallocated crown land, conservation reserves and Aboriginal land. The Great Victoria Desert Bioregion is classified by the EPA as Group 4 – "bioregions of the Eremaean Botanical Province, native vegetation is largely contiguous but is generally not used for commercial grazing"(EPA, 2004).

In the vicinity of the bioregional boundaries (near the Irwin Hills, approximately 60 km east of Sunrise Dam), the vegetation is highly transitional with elements of both bioregions. To the west, vegetation is dominated by Mulga (*Acacia aneura*) and chenopod shrublands. To the east vegetation is dominated by extensive areas of Spinifex hummock grasslands on red or yellow sandplains with Marble Gum, Mulga, Yarldarlba and Sheoak (*Casuarina pauper*).

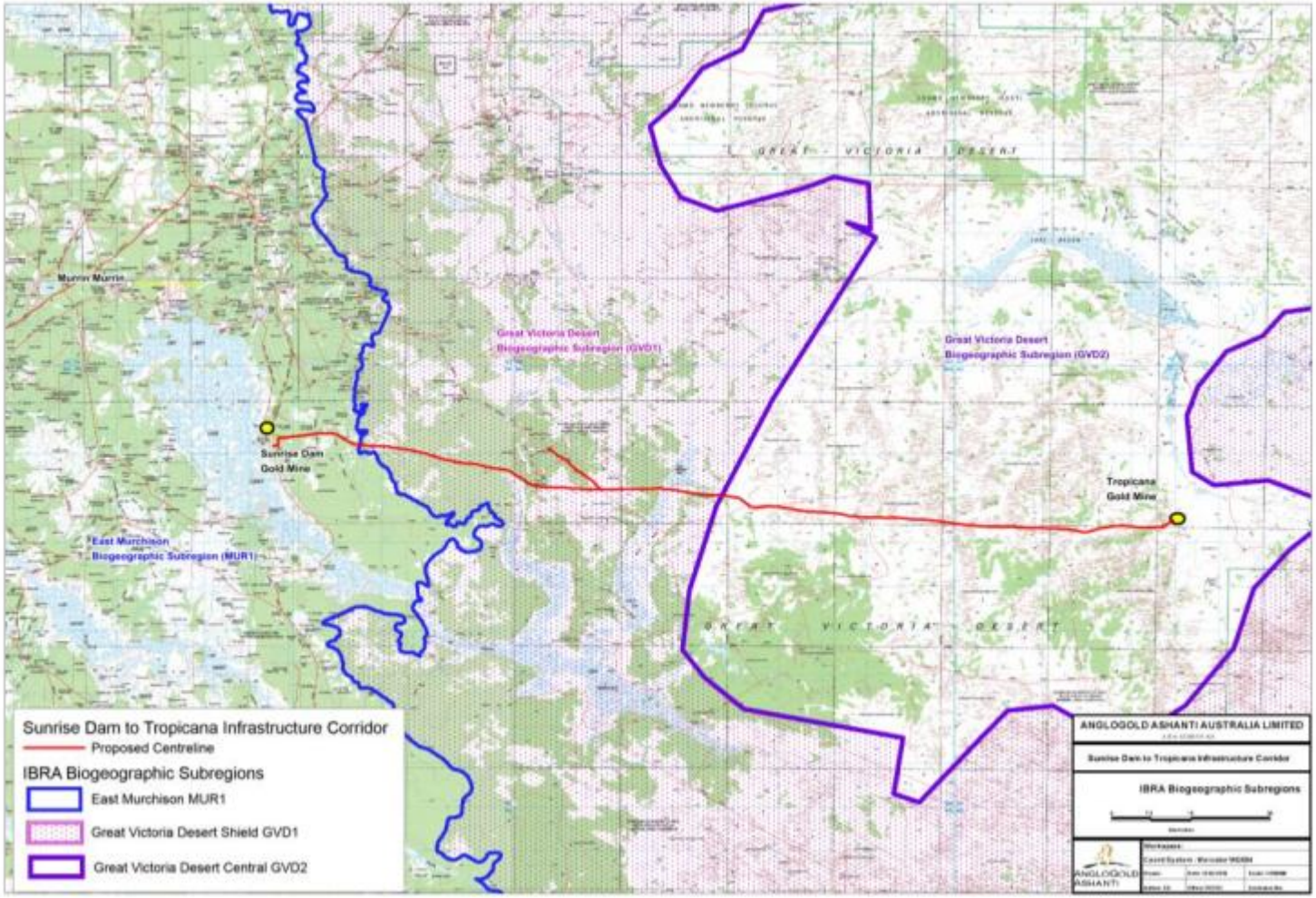
Both the Murchison and the Great Victoria Desert Bioregions are further split into subregions of which three are traversed by the survey corridor (see Figure 2). These are described by McKenzie *et al.* (2003) and are listed below:

1. The Eastern Murchison Subregion - is characterised by its internal drainage, broad plains of red-brown soils (hardpan plains) and elevated red desert sandplains with minimal dune development. Other landforms include salt lake systems and breakaway complexes. Vegetation is dominated by Mulga woodlands often rich in ephemerals, hummock grasslands, saltbush and halophytic shrublands;
2. Great Victoria Desert Shield Subregion - is the western margin of the Great Victoria Desert and contains a higher proportion of sandplain communities. Landforms consist of sandplains, sand dune fields, salt lakes, major valley floors and minor areas of out-cropping (silcrete-capped mesas and breakaways). Sandplain vegetation is dominated by Spinifex (*Triodia basedowii*) hummock grassland and mallee (*Eucalyptus kingsmillii*, *E. youngiana*). Marble Gum (*E. gongylocarpa*) and Native Pine (*Callitris*) woodlands occur on the deeper sands. Mulga and mixed acacia woodlands occur mainly on the colluvial and residual soils. Halophytes such as Saltbush (*Atriplex*), Bluebush (*Maireana*), and Samphire (*Tecticornia*) occur on the margins of salt lakes and in saline drainage areas. Yellow sandplain communities are distinctive vegetation communities occurring within the subregion;
3. Great Victoria Desert Central Subregion – is an arid active sand-ridge desert with extensive dune fields. The region is characterised by east-west orientated sand dune fields, sandplains, salt lakes, major valley floors, occasional outcropping (breakaways) and quartzite hills. Vegetation is dominated by Marble Gum (*Eucalyptus gongylocarpa*), Mulga and Mallee (*E. youngiana*) over hummock grassland dominated by *Triodia basedowii*. Acacia dominates colluvial soils with *Eremophila* and *Santalum* species. Halophytes are confined to edges of salt lakes and saline drainage systems.

McKenzie *et al.* (2003) identifies at least 14 conservation significant vertebrate fauna species occurring from the Eastern Murchison, Great Victoria Desert Shield and Great Victoria Desert Central Subregions. These include:

- Sandhill Dunnart (*Sminthopsis psammophila*);
- Malleefowl (*Leipoa ocellata*);
- Princess Parrot (*Polytelis alexandrae*);
- Great Desert Skink (*Egernia kintorei*);
- Southern Marsupial Mole (*Notoryctes typhlops*);
- Slender-billed Thornbill (*Acanthiza iredalei iredalei*);
- Brush-tailed Mulgara (*Dasycercus cristicauda*);
- Australian Bustard (*Ardeotis australis*);
- Bush Stone-curlew (*Burhinus grallarius*);
- Grey Falcon (*Falco hypoleucos*);
- Peregrine Falcon (*Falco peregrinus*);
- Major Mitchell Cockatoo (*Cacatua leadbeateri*);
- Woma python (*Aspidites ramsayi*); and
- Dotty-tailed Robust Slider (*Lerista puncticauda*).

Figure 2: IBRA Subregions. Note the survey area lies within the Eastern Murchison, Great Victoria Desert Shield and Central Subregions.



2.2 Landforms

Pringle *et al.* (1994) classified and mapped the landforms of the north-eastern Goldfields region. This includes the area traversed by the western third of the corridor (Figure 3). Landforms are grouped into "Land Types", which are classified according to similarities in landform, soil, vegetation, geology and geomorphology. Seven Land Types have been mapped across the western third of the corridor (see Table 1). However as landform mapping was restricted to pastoral areas it is absent from much of the corridor which lies predominantly outside the pastoral region.

Table 1. Major Land Types traversed by the proposed pipeline.

Land Type	Description
5	Mesas, breakaways and stony plains with acacia or eucalypt woodlands and halophytic shrublands
9	Low hills with eucalypt or acacia woodlands with halophytic undershrubs
17	Stony plains with acacia shrublands and halophytic shrublands
28	Sandplains and occasional dunes with shrubby spinifex grasslands or Acacia woodlands
29	Sandy plains with acacia shrublands and wanderrie grasses
31	Wash plains on hardpan with mulga shrublands
43	Salt lakes and fringing alluvial plains with halophytic shrublands

Land Types are further divided into Land Systems based on similarities of vegetation, landform and soil. The Land Systems present in the survey area, and traversed by the survey corridor are listed below (Table 2). Land Systems provide an indication of the fauna habitats present within the survey area.

Table 2. Land Systems traversed by the proposed infrastructure corridor.

Code	Land System	Landform
RAI	Rainbow	Hardpan plains supporting mulga shrublands.
VIO	Violet	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and patchy halophytic shrublands.
LEO	Leonora	Low greenstone hills and stony plains supporting mixed stony chenopod shrublands.
GUN	Gundockerta	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.
YOW	Yowie	Sandy plains supporting shrublands of mulga and bowgada with patchy wanderrie grasses.
CRE	Crete	Breakaways and lower plains based on weathered granites, with halophytic shrublands.
BLM	Bullimore	Extensive sand plains supporting spinifex hummock grasslands.
CAR	Carnegie	Salt lakes with extensively fringing saline plains and dunes supporting low halophytic shrublands and scattered tall acacia shrublands

Figure 3: Land Systems of the Project Area.

2.3 Vegetation

At a broad scale, Beard (1974) mapped the vegetation of the region including the survey corridor. Five major vegetation communities mapped by Beard (1974) are traversed by the survey corridor (see Figure 4). These are:

1. Salt Lake communities (Sl) with fringing samphire shrublands;
2. Open Mulga (*Acacia aneura*) woodland with Bluebush (*Maireana*) low shrublands (a1LrK2Ci);
3. Open Mulga (*Acacia aneura*) woodland with Saltbush (*Atriplex*) low shrublands (a1LrK1Ci);
4. Mulga (*Acacia aneura*) Low Woodland (a1Li); and
5. Marble Gum (*E. gongylocarpa*) and Mallee (*E. youngiana*) shrub steppe between sand hills with hummock grassland (*Triodia basedowii*) (e19Mr e20Srt2Hi).

The Tropicana area lies within the Great Victoria Desert Region of the Helms Botanical District (Beard, 1974). This region is dominated by sandplains and sand hills covered by tree and shrub steppe with Marble Gum (*Eucalyptus gongylocarpa*), Mallee (*Eucalyptus youngiana*) and Spinifex (*Triodia basedowii*) being predominant species. Ecologia (2009) identified and mapped seven broad vegetation communities from the Tropicana area. These are:

1. Interdune swales and sand plains: Mixed Eucalypt Woodlands / Mallee over mixed shrubs and spinifex;
2. Interdune swales and sand plains: Marble Gum (*Eucalyptus gongylocarpa*) Woodland over spinifex;
3. Longitudinal sand dunes: Open to moderately dense shrublands over sparse hummock grasslands and sedge-like perennials. Dominant species include Marble Gum, *Thryptomene biseriata* and Callitris;
4. Saline lakes and associated drainage systems: Dwarf scrub dominated by halophytic genera such as *Halosarcia*, *Maireana* spp. and *Atriplex* spp.;
5. Rocky ridges, slopes and calcareous soils: Open to moderately dense *Casuarina pauper* woodland over open shrubs and sparse soft grasses;
6. Rocky gullies: Tall *Acacia quadrimarginea* shrubland over a sparse cover of soft grasses; and
7. Broad plains on clay loams: Mulga woodlands over soft grasses and Spinifex.

Yellow Sand Plain Communities of the Great Victoria Desert

One Priority Ecological Community (PEC) occurs in the Tropicana Operational Area. The "Yellow Sand Plain Communities of the Great Victoria Desert Priority Ecological Community (No. 57)" is listed as Priority 3. It contains a very diverse mammalian and reptile fauna assemblage and distinctive plant communities.

The PEC is listed as Priority 3(ii) which is defined by as:

"A poorly known ecological community known from a few widespread occurrence which are either large or within significant remaining areas of habitat is which other occurrence may occur, much of it not under imminent threat".

The Tropicana Conservation and Environmental Management Plan (AngloGold 2010) lists the PEC as:

"An undulating yellow sandplain with an open upper stratum of Marble Gum (*Eucalyptus gongylocarpa*) with or without a diverse mallee stratum on *Eucalyptus mannensis*, *Eucalyptus undulans*, *Eucalyptus youngiana* and *Eucalyptus platycorys*. A sparse though diverse shrub stratum consisting of *Acacia heteroneura*, *Acacia helmsiana*, *Allocasuarina acutivalvis*, *Bertya dimerostigma* and *Hakea francisiana*, with an understorey of *Triodia dersertorum* or *Triodia scariosa*. The soils are typically yellow-orange deep Quaternary Aeolian sands or sandy loams."

"The defining feature is the yellow sandplain and it is hypothesised that *Triodia desertorum* is linked to these sands, while the other associated vegetation is diverse. This PEC was listed due to the extremely high small vertebrate diversity with more species of small terrestrial reptile and mammal per hectare of anywhere in Western Australia, unusual combinations of species, high numbers of threatened species and a hot spot for Mallee Eucalypt species as well as other rare or poorly known plant species."

The Yellow Sandplain Communities of the Great Victoria Desert are unique in containing a "cross-over" fauna assemblage. As the PEC lies in a transition zone between the temperate south-west of Western Australia and the arid desert interior, the yellow sandplain communities contain a fauna assemblage which includes elements from both regions. It supports a diverse mammal assemblage (for example Southern Marsupial Moles, Sandhill Dunnarts and Brush-tailed Mulgara occur in the same habitats as Western Pygmy Possums and *Sminthopsis dolichura*) and bird assemblage (Major Mitchell's Cockatoo, Regent Parrot, Princess Parrot, Scarlet-chested Parrot, Australian Ringneck and Purple-crowned Lorikeet (D. Pearson, pers. comm). Additionally the skink *Lerista puncticauda* is only known from the PEC (DPaW, 2013).

The Southern boundary for the PEC lies within the Queen Victoria Spring Nature Reserve (AngloGold, 2010) however its northern, eastern and western extent are currently unknown. Several conservation significant fauna species have been recorded within the yellow sandplain communities (AngloGold, 2010; DPaW, 2013; J. Turpin, pers. obs.). These include:

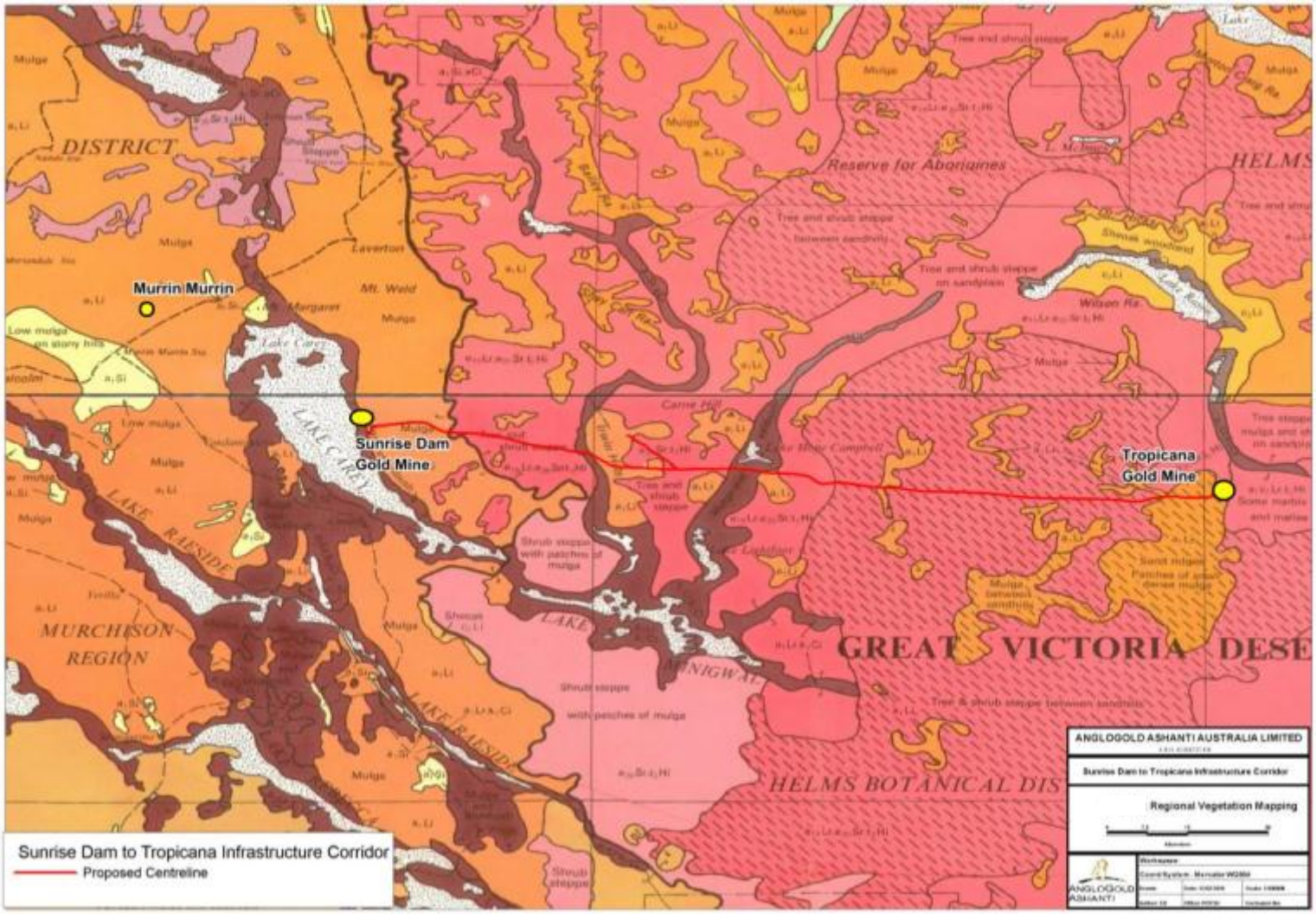
- Southern Marsupial Mole, *Notoryctes typhlops* (Endangered);
- Sandhill Dunnart, *Sminthopsis psammophila* (Endangered);
- Malleefowl, *Leipoa ocellata* (Vulnerable);
- Brush-tailed Mulgara, *Dasycercus blythi* (P4);
- Princess Parrot, *Polytelis alexandrae* (P4);
- Carpet Python, *Morelia spilota imbricata* (Schedule 4);

- Woma, *Aspidites ramsayi* (Schedule 4);
- Major Mitchell's Cockatoo, *Lophochroa leadbeateri* (Schedule 4); and
- Scarlet-chested Parrot, *Neophema splendida* (locally significant).

Other fauna species recorded from the PEC near Tropicana include (ecologia, 2009; J. Turpin, pers. obs.):

- Mammals: *Ningaui yvonnae, Sminthopsis dolichura, Pseudomys hermannsburgensis, Notomys alexis*;
- Dragons: C*tenophorus cristatus, Ctenophorus fordi, Ctenophorus isolepis, Diporiphora reginae, Moloch horridus, Pogona minor*;
- Geckos: *Lucasium dameum, Nephrurus laevissimis, Strophurus elderi, Diplodactylus wiru, Lucasium bungabinna*;
- Pygopods: *Delma butleri, Delma petersoni, Lialis burtonis*;
- Skinks: *Ctenotus brooksi, C. dux, C. grandis, C. helenae, C. quatturodecimlineatus, Liopholis inornata, Lerista bipes, Lerista taeniata, Proablepharus reginae*.

Figure 4. Beard regional vegetation mapping.



2.4 Previous Survey Work

Several fauna surveys have previously been conducted in the region, as the proposed infrastructure corridor traverses areas close to existing and operational mines. Fauna surveys associated with environmental impact assessment have previously been conducted in the vicinity of the Tropicana Gold Mine, Sunrise Dam Gold Mine, Granny Smith Gold Mine (20 km south of Laverton) and the Murrin Murrin Nickel Mine. Fauna surveys have also been conducted at Queen Victoria Spring Nature Reserve (approximately 100 km south-east of the survey corridor) and Plumridge Lakes Nature Reserve (25 km south-east of Tropicana, DPaW, 2013).

Several targeted surveys have also been conducted in the greater Tropicana region aimed at collecting information on conservation significant fauna. These include targeted surveys for Malleefowl (URS, 2009; Ninox, 2009), Southern Marsupial Mole (ecologia, 2009), Mulgara (URS, 2009) and the Sandhill Dunnart (Gaikhorst and Lambert, 2008; GHD 2010).

Additionally, AngloGold has previously supported fauna surveys for infrastructure corridors from Pinjin to Tropicana (Turpin, 2008; Ninox, 2009), and Carosue Dam to Pinjin (Biologic, 2010). Kingfisher staff were involved in both the Pinjin Infrastructure Corridor surveys (and the Tropicana Fauna Surveys), which provide useful background information relevant to the Sunrise Dam - Tropicana area. The local distribution of conservation significant fauna and their associated habitat types are of particular relevance.

Consequently regional information on fauna is available and relevant for some areas along the proposed corridor. The results of the above fauna surveys are included in the desktop assessment and are detailed in Appendix 3.

2.5 Conservation Significance

Biodiversity in Western Australia is protected, managed and assessed under international, national and state agreements, legislation and policy. For Environmental Impact Assessment, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Wildlife Conservation Act 1950* (WC Act) are of particular relevance to Western Australian fauna.

EPBC Act

At the national level, fauna are protected under the EPBC Act. Schedule 1 of the Commonwealth EPBC Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent. These categories are described in Appendix 1. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for

the Conservation of Nature and Natural Resources (IUCN) and reviewed by Mace and Stuart (1994).

Under the provisions of the Commonwealth EPBC Act proposed actions which have the potential to have a significant impact on a matter of national environmental significance must be referred to the Commonwealth Minister for the Environment for a decision as to whether an assessment is required under the provisions of that Act (EPA, 2004).

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals).

Wildlife Conservation Act

At the state level, significant fauna are listed under the *Western Australian Wildlife Conservation Act 1950: Wildlife Conservation (Specially Protected Fauna) Notice 2007.* Threatened species are listed under four schedules:

1) Schedule 1 - Species that are rare and likely to become extinct;
2) Schedule 2 - Species that area presumed extinct;
3) Schedule 3 - Migratory species listed under international treaties; and
4) Schedule 4 - Other specially protected fauna.

The WC Act uses a set of schedules but also classifies species using some of the IUCN categories. These categories and Schedules are described in Appendix 1.

Biodiversity Publications

In addition, the Department of the Environment (DOTE, formerly SEWPaC) has supported the publication of reports on the conservation status of most vertebrate fauna species e.g. fish (Wager and Jackson (1993), reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al*. 1996), rodents (Lee, 1995) and bats (Duncan *et al.* 1999). These publications also use the IUCN categories, although those used by Cogger *et al*. (1993) and Wager and Jackson (1993) differ in some respects as these reports pre-date Mace and Stuart's review (1994).

Priority Fauna

In Western Australia, the Department of Parks and Wildlife (DPaW) has produced a supplementary list of Priority Fauna for species that do not meet the criteria for listing as threatened under Schedule 1 (of the *WC Act*). These species however are often poorly known and/or of conservation dependence. Some Priority species, however, are also assigned to the IUCN 'Conservation Dependent' category. Levels of

Priority are described in Appendix 1.

Conservation Significant Fauna

Fauna species included under conservation acts and/or agreements are formally recognised as of conservation significance under state or federal legislation. Species listed only as Priority by DPaW, or that are included in publications such as Garnett and Crowley (2000) and Cogger *et al.* (1993) but not in state or commonwealth acts, are also of recognised conservation significance. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information.

Locally significant fauna are species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution. This level may have links to preserving biodiversity at the genetic level (EPA, 2002). For example, if a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as locally significant.

3. SURVEY METHODS

3.1 Approach

This fauna assessment was conducted with reference to guidance and position statements published by the WA Environmental Protection Authority (EPA) on fauna surveys and environmental protection, and commonwealth biodiversity legislation (e.g. EPA; 2002; 2004; EPA and DEC, 2010). The level of fauna assessment required by the EPA is determined by the size and location of the proposed disturbance and the sensitivity of the surrounding environment in which the disturbance is planned. Due to the size and location of the proposed project, AngloGold requested an extended Level 1 Fauna Survey with some additional targeted sampling.

A Level 1 Fauna Survey consists of a desktop study and basic ground truthing through a reconnaissance survey. The EPA (2004) describes a Level 1 survey as:

"Background research or 'desktop' study with the purpose to gather background information on the target area (usually at the locality scale). This involves a search of all sources for literature, data and map-based information".

The purpose of a Reconnaissance Survey is to verify the accuracy of the background study to further delineate and characterise the fauna and faunal assemblages present in the target area and to identify potential impacts.

This involves:

"a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area" (EPA, 2004).

3.2 Survey Area

The survey area for this assessment corresponded to the proposed Infrastructure Corridor between Sunrise Dam and Tropicana, which included the specific pipeline route with a buffer of 250 m, see Figure 1. The proposed pipeline corridor was visually inspected along its entire length. All major fauna habitats within the corridor were assessed as well as some significant fauna habitats occurring immediately adjacent to the corridor route.

3.3 Personnel and Survey Timing

The Sunrise Dam to Tropicana Fauna Assessment was undertaken over three field surveys. An initial reconnaissance survey phase (Phase 1) was conducted from the 7th - 14th October 2013. The second survey phase (Phase 2) was conducted from the 4th -

17th November 2013. A third survey phase, assessing species of high conservation significance (those listed under the EPBC Act, and their associated habitats) was completed from 22nd May till 1st June 2014. The fauna assessment was conducted by the following personnel:

- Jeff Turpin (Supervising Zoologist, B.Sc. Zoology, Phase 1, 2, 3);
- Ray Lloyd (Senior Zoologist, BSc. Hons Zoology, Phase 1, 2, 3);
- Glen Gaikhorst (Senior Zoologist, Phase 3); and
- Joanna Riley (Zoologist, BSc. Hons Zoology / Biochemistry, Phase 3).

This report was prepared by Jeff Turpin and Ray Lloyd.

3.4 Licences and Permits

The field surveys were conducted under DPaW Regulation 17 (Licence to take Fauna for Scientific Purposes), licensed to J.M. Turpin, licence number SF009500, valid from 07/10/2013 to 07/10/2014.

3.5 Nomenclature and taxonomy

As per the recommendations of EPA and DEC (2010), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum's *Checklist of the Vertebrates of Western Australia*. The authorities used for each vertebrate group are: amphibians and reptiles (Aplin and Smith, 2001), birds (Christidis and Boles, 2008) and mammals (How *et al.* 2001).

Field identification of vertebrate species was based on the following field guides:

Mammals	. . . .	Menkhorst and Knight (2010);
Birds	. . . .	Simpson and Day (2010);
Reptiles	. . . .	Wilson and Swan (2013); and
Amphibians	. . . .	Tyler and Doughty (2009).

3.6 Desktop Survey

Information for this fauna assessment was drawn primarily from the DPaW database "NatureMap" (DPaW, 2013), the BirdLife Australia Atlas Database (BirdLife Australia, 2013), EPBC Protected Matters Search Tool (DOTE, 2013) and the results of fauna surveys conducted in the region (Turpin 2008; Biologic 2010; ecologia 2009; Ninox 2009; GHD 2010; URS 2009). All databases were interrogated in October 2013 (see below, Table 3). This information was supplemented with species expected in the area based on general patterns of distribution. Sources of information used for these general patterns included the above field guides.

Table 3. Sources of information used for the Desktop Survey.

Title	Comments	Area searched / Year
NatureMap	Records of specimens held in the WA Museum and DPaW database records. Includes historical data.	Survey Corridor with a 40 km Buffer.
Birds Australia Atlas Database	Records of bird observations in Australia, 1998-2013.	Species list for the 1 degree grid cells containing the survey corridor.
EPBC Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and conservation estate.	Survey corridor (plus~100 km buffer)
Sunrise Dam Level 2 Fauna Survey	Vertebrate Fauna Assessment of the Sunrise Dam Project Area (Ninox, 1995).	1995
Pinjin Haul Road Fauna Assessment	Opportunistic fauna survey conducted by Jeff Turpin for AngloGold along the proposed Pinjin Infrastructure Corridor (Turpin, 2008).	2008
Pinjin Level 1 Fauna Survey	Level 1 survey for the AngloGold Pinjin Infrastructure Corridor (Ninox, 2009).	2007, 2008
Carosue Dam – Pinjin Level 1 Fauna Survey	Survey for a proposed pipeline from Carosue Dam to Pinjin, conducted by Jeff Turpin (Biologic 2010).	2010
Targeted Sandhill Dunnart Survey	Trapping Survey for the Tropicana Operational Area and Infrastructure Corridor. Contains supplementary mammal, reptile and bird observations (GHD 2010).	2009
Tropicana Vertebrate Fauna Assessment	Level 2 fauna assessment of the Tropicana Operational Area. Survey conducted by Jeff Turpin (ecologia, 2009).	2006, 2007, 2008
URS Malleefowl and Mulgara Survey	Targeted Survey of the Tropicana Gold Project, conducted by URS (URS, 2009a)	2009
URS Marsupial Mole Survey	Targeted Survey of the Tropicana Gold Project, conducted by URS (URS, 2009b)	2009

3.7 Field Survey

Three field surveys were undertaken (during October and November 2013 and May 2014) to assess the proposed infrastructure corridor. During the surveys, the entire pipeline route was visually inspected by vehicle and selected areas traversed on foot.

All major fauna habitats occurring along the proposed infrastructure corridor were sampled and assessed for the likelihood of supporting conservation significant fauna. Habitats deemed suitable to support significant fauna were subject to more intensive targeted surveying. While surveying focused on locating evidence of conservation significant fauna, all fauna species observed were recorded.

Surveying included:

- Identification of vegetation and substrate associations (fauna habitats);
- Targeted searching for species of conservation significance;
- Some systematic fauna trapping – targeting Mulgara, the Yellow Sandplain PEC and the Sandhill Dunnart;
- Bird Census;
- Targeted herpetofauna searches (raking, hand searching, head-torching, linear transects focussing along the centreline of the corridor;);
- Motion Camera Sites;
- Acoustic bat surveys;
- Marsupial Mole Trenches – for the detection of the Southern Marsupial Mole;
- Spotlighting;
- Opportunistic Surveying;
- Fauna habitat assessment – the suitability of vegetation communities (fauna habitats) to support species of conservation significance.

3.7.1 Vegetation and Substrate associations

Vegetation and substrate associations (VSAs) combine broad vegetation types, soils or other substrates with which they are associated, and the landform type. In the context of a fauna assessment, VSAs are the environments that provide habitats for fauna.

VSAs throughout the survey area were assessed during the desktop review and as part of the field investigations. All major VSAs were identified and surveyed to sample the major fauna habitat types present and to assess the likelihood of conservation significant species being present.

3.7.2 Targeted searching for conservation significant fauna

The current survey builds on methodologies previously employed to successfully detect conservation significant fauna in the region (see Turpin, 2008; Biologic 2010). As several significant fauna species have been recorded from within the region (see

Section 2.1) the field surveys employed a combination of survey techniques to maximise the potential for their detection. These are listed in Table 4.

The presence of many conservation significant fauna species can be confirmed by searching for evidence of their activities (e.g. scats, tracks, diggings, burrows, see Table 4). The Malleefowl, Southern Marsupial Mole, Sandhill Dunnart, Mulgara spp. and Great Desert Skink were of particular interest and specifically targeted during the survey as all are species of high conservation significance known from the region. Surveying focused on searching for:

- Malleefowl – distinctive tracks, mounds, feathers and scats;
- Southern Marsupial Mole – distinctive surface tracks and subsurface tunnels;
- Mulgara spp. - distinctive scats, tracks, foraging signs and burrows;
- Great Desert Skink - distinctive scats (latrine sites) and burrows;
- Australian Bustard – distinctive tracks;
- Bush Stone-Curlew – distinctive tracks.

Searching for evidence of significant fauna was therefore undertaken by walking through habitat considered suitable for such species.

Table 4. Survey methods used to detect conservation significant fauna.

Species	Status	Habitat	Target Search Focus	Other Survey Techniques
Malleefowl	Vulnerable	Dense Acacia, Mallee	Mounds, tracks, feathers, scats	Motion cameras
Sandhill Dunnart	Endangered	Yellow sand dunes with mature spinifex	Habitat Assessment	Motion cameras, Elliot Traps, Deep Pitfall Traps
Crest-tailed Mulgara	Vulnerable	Sand dunes and sandplains	Tracks, burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Brush-tailed Mulgara	Priority 4	Spinifex sandplains	Tracks, burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Southern Marsupial Mole	Endangered	Sand Dune fields	Tracks	Standardised Mole Trenches
Great Desert Skink	Vulnerable	Spinifex sandplains	Burrows, scats	Motion cameras, Elliot Traps, Pitfall Traps, Funnel Traps
Princess Parrot	Vulnerable	Marble Gum Woodland	Direct Observation	Bird Census
Major Mitchell's Cockatoo	Schedule 4	Woodlands, Shrublands	Direct Observation	Bird Census
Central Long-eared Bat	Priority 4	Woodlands, Shrublands	Acoustic Recording	Bat Detectors
Lerista puncticauda	Priority 2	Marble Gum leaf litter	Raking	Pitfall Traps, Funnel Traps
Australian Bustard	Priority 4	Spinifex sandplains	Tracks	Bird Census
Bush Stone-Curlew	Priority 4	Mulga, sandplains	Tracks	Bird Census
Locally significant fauna	Local	Yellow Sandplains	Raking, active searching	Pitfall Traps, Funnel Traps

3.7.3 Systematic Fauna Trapping

Some limited fauna trapping was conducted along the survey corridor to capture Mulgara (to determine the taxon identification, Table 5), to sample Yellow Sandplain communities (to determine the likely occurrence of the listed Priority Ecological Community) and to survey for the Sandhill Dunnart (see Tables 6, 7 and 8).

Systematic fauna trapping was conducted during 2013 and 2014 across a total of 20 sites with most sampling conducted over a consecutive, four night period. Trapping included the use of:

- Pitfall Traps - including 20 L buckets, 65 - 70 cm deep pits (aiming to capture Mulgara and the Sandhill Dunnart). All pitfall traps were assisted with drift fence;
- Funnel Traps – established at regular intervals along the drift fence;
- Elliot traps – Medium Elliot Traps (Dimensions: 33cm long, 9 cm wide and 9cm high) were established in linear transects at each survey site (spaced at least 20 m apart) and were also placed opportunistically near the entrance to active Mulgara burrows. Each Elliot Trap was baited with “universal bait” – a mixture of sardines, peanut butter and rolled oats;
- Motion sensitive cameras were also placed at each trapping site to supplement capture data. Each motion camera was also baited with “universal bait”.

Sampling was conducted over a total of 1664 trap nights during 2013 and 2989 trap nights in 2014 with survey effort summarised in Tables 6 and 7.

Mulgara Assessment

Woolley (2005) recognised two distinct species of mulgara, the Crest-tailed Mulgara (*Dasycercus cristicauda*) and the Brush-tailed Mulgara (*D. blythi*). Prior to this, only the Crest-tailed Mulgara was recognised which has led to some confusion in museum records and under legislation between these species.

Both the Crest-tailed Mulgara (*Dasycercus cristicauda*) and the Brush-tailed Mulgara (*Dasycercus blythi*) are conservation significant and have the potential to occur within the survey area. Database searches conducted prior to the commencement of the field survey revealed several records of Mulgara in the region (eg. Queen Victoria Spring, Neale Junction) however some of these records predate the Mulgara taxonomic revision.

During the initial survey phase several Mulgara burrows were recorded along the proposed corridor. Some of these were re-visited during the second survey phase with the aim to trap several individuals to determine the taxon present. While similar in appearance, Table 5 lists the characteristics used to identify the two species of Mulgara in the field (from DOTE, 2013).

Table 5. Characters used to identify the Crest-tailed and Brush-tailed Mulgara.

Character	Crest-tailed Mulgara	Brush-tailed Mulgara
Coat	Tan to ginger and described as "more brightly coloured"	Light sandy brown above, greyish white below
Tail	Dorsal fin-like crest of black hairs	Reddish on base of tail, black on distal two-thirds
Nipples	8	6
Hindfoot	long hair folding over a third of the sole from lateral side	long hair folds over 75% of the sole from both sides of the foot
Habitat	Sand dunes with sparse cover of Sandhill Canegrass or areas around salt lakes with Nitre Bush	Generally Spinifex (Triodia spp.) grassland with medium to dense cover
Burrow sites	On dunes, mostly at the base of large Sandhill Canegrass	On swales or the lower slopes of dunes where Spinifex dominates.
Conservation Status	EPBC listed Vulnerable	DPaW Priority 4

Five survey sites were established to trap for Mulgara over four nights. The survey sites were established within sandplain habitat dominated by Spinifex hummock grassland, with four of the survey sites containing active Mulgara burrows. Surveying included the use of Pitfall Traps (two sites each containing five 20L Buckets and five 60 – 70 cm deep PVC pipes), Elliot Traps (all five sites), Funnel Traps (two sites) and motion sensitive cameras (all five sites). The locations and descriptions of the Mulgara survey sites are summarised in Table 7 with survey effort summarised in Table 6. A total of 20 Pitfall Traps, 110 Elliot Traps, 40 Funnel Traps and 10 Motion Sensitive Cameras were used to survey for the Mulgara over 720 survey nights (see Table 6; Figure 5; Appendix 2).

To obtain further information on the distribution of Mulgara along the survey corridor, burrow searches were undertaken within areas of suitable habitat. Low-lying red sandplain supporting Spinifex (*Triodia* spp.) hummock grassland with a sparse overstorey of low Acacia shrubs and scattered Mallee was specifically targeted. Burrow searches were conducted at 13 locations (see opportunistic sites, Figure 5).

Yellow Sandplain PEC Assessment

The Yellow Sandplain PEC (listed as Priority 3, see Section 2) has the potential to occur within the survey corridor. It contains a very diverse fauna assemblage, including the conservation significant Sandhill Dunnart. While the PEC occurs to the south of the survey corridor (at Queen Victoria Spring), its northern extent is not defined (AngloGold, 2010).

As the survey corridor traverses yellow sandplain communities, including those containing the indicator species present in the listed PEC (eg. *Xanthorrhoea thorntonii, Eucalyptus gongylocarpa, Eucalyptus youngiana, Allocasuarina acutivalvis, Hakea francisiana*), systematic fauna trapping was conducted to collect information on the fauna assemblage present. Four survey sites were established within yellow sandplain areas potentially containing the PEC. Each survey site comprised ten Pitfall Traps (five 20L buckets and five deep PVC pipes), 20 Elliot Traps

(one site contained 40), 20 Funnel Traps and at least two motion sensitive cameras. The locations and descriptions of each survey site are listed in Table 7 with survey effort summarised in Table 6. All survey sites were sampled over four consecutive nights.

Table 6. Survey Effort at Trapping Sites.

	Mulgara Sites					Potential PEC Sites				Other		Total
Site	1	2	3	4	5	6	7	8	9	10	11	ALL
Nights sampled	4	4	4	4	4	4	4	4	4	1	1	
Pit Traps	10	10				10	10	10	10	0	6	246
Elliot Traps	25	10	60	10	5	20	20	40	20	0	0	840
Funnel Traps	20	20				20	20	20	20	4	10	494
Motion Cameras	3	1	5		1	2	2	3	2		2	21
Total Trap Nights	232	164	260	40	24	208	208	292	208	4	24	1664

Sandhill Dunnart Assessment

Surveying for the Sandhill Dunnart included a trapping programme, supplemented with the use of motion sensitive cameras, spotlighting and habitat assessment. Sampling was conducted in May 2014, using a standardised method previously employed to detect the species (GHD, 2010). Sampling included the use of:

- Pitfall Traps (65 cm deep): Seven pitfalls spaced at even intervals along a 50m drift fence-line. With 2 lines (14 pits) per survey site;
- Elliot Traps: 15 traps, spaced at 20 m intervals along a linear transect. Two transects (30 Elliot Traps) per site, spaced 100m apart and parallel to the pitfall lines. Baited with universal bait (a mixture of peanut butter, sardines and oats);
- Funnel Traps: spaced at even intervals along the drift fence line;
- Motion sensitive cameras: one per site and an additional 11 placed elsewhere.

Trapping was conducted across nine sites and motion cameras were placed at an additional 11 sites (see Table 7 and Appendix 2). Survey sites were selected based on habitat suitability with spinifex age and cover, substrate and proximity to yellow sand dunes determining factors. Trapping was conducted mostly at sites considered optimal for the species, determined by a habitat assessment process (see Appendix 7).

Each survey site was sampled over a minimum of four survey nights, however most sites were sampled over six or seven nights. In total sampling was conducted over 2989 trap nights (see Table 7) and also included 315 camera nights.

Table 7. Survey Effort at 2014 Sandhill Dunnart Trapping Sites.

Site	Easting	Northing	Traps			Camera	Nights Sampled	Trap Nights	Trap Nights		
			Pits	Elliots	Funnels				Pits	Elliots	Funnels
1	646049	6763200	14	30	14	1	7.64	443	105	240	98
2	645198	6763280	14	30	14	1	7	406	98	210	98
3	628047	6762304	14	30	14	1	6.76	392	91	210	91
4	623482	6762885	14	30	14	1	6	348	84	180	84
5	622992	6763018	14	30	14	1	6.24	362	91	180	91
6	615615	6763153	14	30	14	1	6	348	84	180	84
7	612883	6763382	14	30	7	1	6	306	84	180	42
8	608905	6763463		45		1	4	180		180	
9	606958	6763485	14	30	7	1	4	204	56	120	28
Total			112	285	98	9		2989	693	1680	616

3.7.4 Marsupial Mole Assessment

To survey for the presence of the Southern Marsupial Mole, standardised trenches (Benshemesh, 2005) were dug to detect the subsurface burrows of the species at ten sites along the survey corridor (see Appendix 2).

3.7.5 Opportunistic Survey Sites

To sample all major fauna habitats occurring along the survey corridor, opportunistic surveying was conducted at numerous sites. At each opportunistic survey site, surveying consisted of bird census and targeted herpetofauna searches (see Appendix 2, Figure 5)

3.7.6 Bird Census

Bird surveys consisted of 20 minute meandering transects within each habitat type. These were conducted at each opportunistic survey site however focused mainly on locating species of conservation significance. As a result, bird surveys were biased towards samphire (targeting the Slender-billed Thornbill), Marble Gum Woodland (targeting the Princess Parrot and Major Mitchell's Cockatoo) and Mulga (targeting Malleefowl and the Bush Stone-Curlew) habitats.

3.7.7 Targeted Herpetofauna Searches

Foraging for herpetofauna (raking through leaf litter, turning over rocks, active searching) was undertaken at each fauna trapping site, opportunistic site, marsupial mole site and areas potentially supporting significant fauna. This included raking and hand foraging (turning over rocks) in rocky areas targeting *Aprasia picturata*.

3.7.8 Motion Cameras

Motion sensitive cameras (Bushnell Trophy Cam) were placed at 35 locations along the survey corridor. Motion sensitive cameras were placed at each trapping site (aiming to detect mammals such as Mulgara and the Sandhill Dunnart) and additionally on ironstone ridges to survey for the Long-tailed Dunnart. While most cameras sampled over four nights, six motion cameras remained deployed between the two survey phases (over the three week interval). The camera locations, site

descriptions and survey effort are listed in Appendix 2. All cameras were baited with universal bait.

3.7.9 Acoustic Bat surveys

Bats were sampled using both an ANABAT detector (SD1, Titley Electronics) and Song Meter Detector (SM2, Wildlife Acoustics). Detectors were placed at eight sites within a variety of habitats types including those potentially supporting significant fauna. The locations of bat survey sites are listed in Appendix 2 and shown in Figure 5.

3.7.10 Spotlighting

Nocturnal surveying was conducted both on foot and by vehicle along access tracks in the vicinity of the survey corridor.

3.7.11 Opportunistic Observations

At all times, observations of fauna were noted when they contributed to the accumulation of information on the local fauna assemblage. These included such casual observations as birds or reptiles seen while travelling through the site.

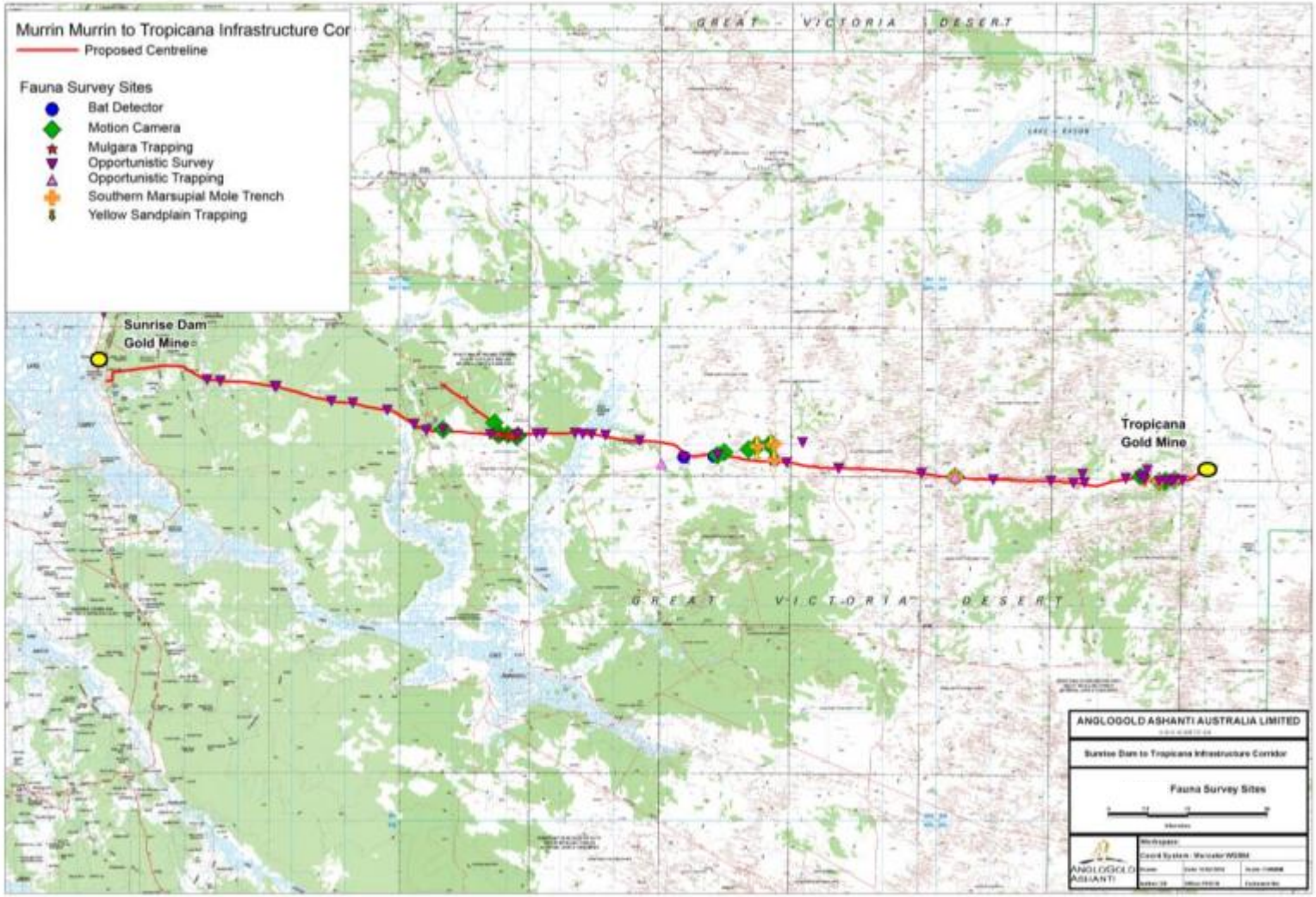
3.7.12 Habitat Assessment

All fauna habitats present along the survey corridor were inspected and assessed for the suitability of supporting conservation significant fauna, particularly the Sandhill Dunnart, Malleefowl, Brush-tailed Mulgara and Great Desert Skink (see Appendix 7 for the detailed Sandhill Dunnart Assessment).

Table 8. Fauna Survey Trapping Sites. (Note UTM Zone 51).

Site	Easting	Northing	Vegetation	Landform	Comments
Mulgara Sites					
1	518827	6771918	*E. gongylocarpa, Acacia* sp. and *Hakea francisiana*.	Yellow Sandplain	Mulgara burrows
2	520121	6771847	*E. gongylocarpa, Callitris columellaris, Triodia sp.,* sedges	Yellow Sandplain	Long unburnt
3	522076	6771628	Scattered Mallee (*Eucalyptus youngiana*) and *Brachychiton gregoryi over* low *Acacia* sp. and Spinifex (*Triodia basedowii*)	Low lying red / granitic sandplain	Mulgara burrows present
4	520909	6771542	Scattered Mallee (*Eucalyptus youngiana*) and *Brachychiton gregoryi* over low *Acacia* sp. and Spinifex (*Triodia basedowii*)	Low lying red / granitic sandplain	Mulgara burrows present
5	518411	6771839	*E. gongylocarpa, Hakea francisiana, Triodia* sp., sedges	Yellow Sandplain	Mulgara burrows
Yellow Sandplain Sites					
6	566657	6769651	*E. gongylocarpa, Eucalyptus sp.* (Mallee), *Callitris columellaris, Triodia spp., Xanthorrhoea thorntonii*	Yellow Sand Dune	Potential PEC
7	569203	6769832	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Allocasuarina acutivalvis, Xanthorrhoea thorntonii, Triodia* spp.	Yellow Sandplain	Potential PEC
8	569848	6767087	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, *Triodia* spp.	Yellow Sand Dune	Potential PEC
9	566614	6766862	*E. gongylocarpa, Callitris columellaris, Allocasuarina acutivalvis, Xanthorrhoea thorntonii, Triodia* spp.	Yellow Sandplain	Potential PEC
Sandhill Dunnart Sites					
1	646049	6763200	*E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.*	Yellow Sand Dune	Optimal Habitat
2	645198	6763280	*E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.*	Yellow Sand Dune	Optimal Habitat
3	628047	6762304	*E. gongylocarpa, Callitris columellaris,* mixed *Acacia* shrubs *over Triodia spp.*	Orange / Yellow Sand Plain and Dune	Potential Habitat
4	623482	6762885	*E. gongylocarpa, Callitris columellaris, mixed Acacia* shrubs*, Thryptomene biseriata, Anthotroche pannosa, over Triodia spp.*	Yellow Sand Dune	Optimal Habitat
5	622992	6763018	*E. gongylocarpa, E. youngiana, Callitris columellaris,* mixed Acacia, *Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa over Triodia spp.*	Yellow Sandplain	Optimal Habitat
6	615615	6763153	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, mixed Acacia, *Grevillea juncifolia, Hakea francisiana, Xanthorrhoea thorntonii Triodia* spp.	Yellow Sand Dune	Likely Habitat
7	612883	6763382	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, *Xanthorrhoea thorntonii Triodia* spp.	Yellow Sand Dune	Likely Habitat
8	608905	6763463	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Xanthorrhoea thorntonii, Triodia* spp.	Yellow Sand Dune	Optimal Habitat
9	606958	6763485	*E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.*	Yellow Sandplain	Optimal Habitat

Figure 5. Fauna Survey Sites.



3.8 Limitations

The EPA Guidance Statement 56 (EPA 2004) outlines a number of limitations that may arise during surveying. These survey limitations are addressed below in Table 9.

Table 9. Survey Limitations.

Limitation	Comment
Level of survey.	Level 1 (desktop study, reconnaissance survey with some targeted surveying for conservation significant fauna).
Competency/experience of the consultant(s) carrying out the survey.	The field personnel/authors have had extensive experience in conducting desktop reviews and fauna surveys. This includes several Level 1 and Level 2 surveys conducted across the region (eg. Turpin 2008; ecologia 2009; Biologic 2010).
Scope (What faunal groups were sampled and were some sampling methods not able to be employed because of constraints?).	Birds were extensively sampled due to the nature of the survey, and some trapping / foraging was conducted to sample for reptiles, amphibians and mammals. Additional mammal species occurring in the area were detected using the motion sensitive cameras and bat detectors.
Proportion of fauna identified, recorded and/or collected.	All fauna observed were identified. Two tissue / hair samples from Brush-tailed Mulgara tail tips collected and submitted to the Western Australian Museum for DNA Analysis (TM893 and TM894). Additionally, tissue / hair samples were collected from one Sandhill Dunnart - forwarded to Murdoch University.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	Sources include previous reports on the fauna of the region (Ninox 1995; Turpin 2008; Ninox 2009; ecologia 2009; Biologic 2010; GHD 2010; URS 2009); databases (BirdLife Australia, DPaW, EPBC).
The proportion of the task achieved and further work which might be needed.	Survey Complete. Additional genetic sampling of the locally significant Southern Scrub-robin population is also proposed, in conjunction with the Western Australian Museum.
Timing/weather/season/cycle.	Field surveys conducted October and November 2013 and May 2014. Weather conditions were mild during October, warm with afternoon storms and minor rainfall during November and mild during May (2014) which was conducted immediately after a high rainfall event.
Disturbances (e.g. fire, flood,	No disturbances affected the survey results.

Limitation	Comment
accidental human intervention etc.) which affected results of survey.	Due to the remote survey location, the survey design was influenced by safety restrictions. Additionally some survey time was lost due to numerous flat tyres.
Intensity. (In retrospect, was the intensity adequate?)	Survey intensity was moderate (desktop study, reconnaissance survey with some targeted surveying for conservation significant fauna) and was adequate to satisfy EPA guidelines.
Completeness (e.g. was relevant area fully surveyed).	Desktop study covered infrastructure corridor area and adjacent habitats. The entire infrastructure corridor route was driven and visually inspected and all major fauna habitats sampled. Habitats likely to support conservation significant fauna were subject to further intensive sampling.
Resources (e.g. degree of expertise available in animal identification to taxon level).	All species identified to taxon level.
Remoteness and/or access problems.	Due to the remote survey location, the survey design was influenced by safety restrictions. Additionally some survey time was lost due to numerous flat tyres.
Availability of contextual (e.g. biogeographic) information on the region.	Regional information was available and was consulted. Dr Patricia Woolley (La Trobe University) was consulted for information on the Mulgara occurring within the Great Victoria Desert and David Pearson (DPaW) was consulted for information on the Yellow Sandplain PEC. Surveying for the Sandhill Dunnart was conducted in consultation with Glen Gaikhorst and Sue Churchill, who have significant experience trapping the species across the Great Victoria Desert. Glen Gaikhorst also participated in the third survey phase.

4. RESULTS

4.1 Fauna Habitats

Twenty five (25) fauna habitats (or VSAs) were recognised along the survey corridor. These can be grouped into eight major landform types, extending from low lying salt lake systems to elevated rocky ridges. Major fauna habitats occurring along the survey corridor are:

1. Broad Stony / Hardpan Plains:
   a. Stony plains supporting low Bluebush (*Maireana* spp.) and Saltbush (*Atriplex* spp.) shrublands with areas of open Mulga (*Acacia aneura*) shrubland;
   b. Hardpan plains supporting Mulga (*Acacia aneura*) woodland over mixed shrubs (*Acacia* and *Eremophila* spp.) and soft grasses (including *Aristida contorta*);
   c. Broad drainage tracts supporting dense Mulga (*Acacia aneura*) and mixed Acacia shrublands.
2. Low Gravelly Rises:
   a. Gently undulating gravelly plains and low stony rises supporting mixed Acacia (*Acacia aneura* and *Acacia ramulosa*) shrublands with areas of *Casuarina pauper* and patchy halophytic shrublands;
   b. Low gravelly rises and plateaus supporting dense Acacia (particularly *Acacia aneura*, *Acacia ayersiana* and *Acacia ramulosa*) and *Allocasuarina campestris* thickets;
3. Loam Plains:
   a. Loam plains supporting Goldfields Black Butt (*Eucalyptus lesouefii*) Woodland with Gimlet (*Eucalyptus salubris*) and scattered mixed shrubs particularly *Eremophila scoparia*;
4. Great Victoria Desert Sandplains
   a. Low lying sandplains supporting Spinifex (*Triodia basedowii*) Hummock Grassland with scattered low Acacia shrubs;
   b. Sandplain supporting Mallee (*Eucalyptus youngiana*) over Spinifex (*Triodia basedowii*) Hummock Grasslands;
   c. Elevated sandplain supporting Marble Gum (*E. gongylocarpa*) Woodland over Spinifex (*Triodia basedowii*) Hummock Grassland;
   d. Elevated Sandplain supporting mixed Woodland, particularly of *Callitris columellaris, E. gongylocarpa, Eucalyptus youngiana* over Spinifex (*Triodia basedowii*) Hummock Grassland;
   e. Yellow Sandplain Communities supporting Marble Gum (*Eucalyptus gongylocarpa*), Mallee (*Eucalyptus mannensis, Eucalyptus undulans, Eucalyptus youngiana* and *Eucalyptus platycorys*), *Acacia heteroneura, Acacia helmsiana,*

Allocasuarina acutivalvis, Bertya dimerostigma, Hakea francisiana, Triodia desertorum or *Triodia scariosa* and *Xanthorrhoea thorntonii;*

f. Sandy clay plains supporting Mulga (*Acacia aneura*) over Spinifex (*Triodia basedowii*) Hummock Grassland;
g. Dense Mallee (including *Eucalyptus concinna and E. oleosa*) over Spinifex (*Triodia* spp.) Hummock Grasslands;
h. Pale Yellow sandplain supporting low Proteaceous heath (*Melaleuca* spp., *Banksia* sp. and *Grevillea juncifolia*), scattered Mallee (*Eucalyptus* spp.) and Spinifex (*Triodia* spp.) Hummock Grasslands;
i. Orange Sandplain Communities supporting mixed Eucalypt Woodland / Mallee (*Eucalyptus gongylocarpa, Eucalyptus youngiana*) with Spinifex (*Triodia basedowii*) Hummock Grassland.

5. Sand Dune Systems:
   a. Sand dunes supporting Marble Gum (*E. gongylocarpa*), *Callitris columellaris*, mixed shrublands (including *Acacia* spp. and *Thryptomene biseriata*) over sparse *Triodia* spp. hummock grasslands and sedge like perennials;
   b. Sandy rises supporting dense Acacia shrublands (*Acacia aneura*, *Acacia ramulosa*) and *Thryptomene biseriata*;
   c. Long-unburnt (relictual) patches of Mulga (*Acacia aneura*) with *Eremophila forrestii, Aluta maisonneuvei* and *Thryptomene biseriata* understorey, on interdunal flats between sand ridges;
6. Calcareous Plains:
   a. Calcareous plains supporting *Casuarina pauper* woodland over *Eremophila scoparia*;
7. Salt Lake Systems:
   a. Salt lakes and saline drainage systems with fringing saline plains supporting halophytic shrublands (*Tecticornia* spp.) and scattered Acacia shrubs;
   b. Sandy rises and low sand dunes fringing salt lakes supporting mixed Acacia shrublands with *Dodenia viscosa*;
   c. Saline plains supporting low Saltbush (*Atriplex* spp.) and Bluebush (*Maireana* spp.) chenopod shrublands;
   d. Gypsiferous rises fringing salt lakes supporting mixed Acacia shrubs, *Casuarina pauper* and *Lawrenceia helmsii*;
8. Low Hills and Outcrops:
   a. Low silcrete / granitic rocky hills and outcrops supporting mixed Acacia shrublands (including *Acacia aneura*, *Acacia ayersiana*);
   b. Gravelly breakaways fringing saline depressions supporting Mallee (*Eucalyptus* spp.);
   c. Ironstone hills and stony rises supporting *Acacia aneura* Woodland;

These habitats are depicted below (see Plates 1 – 27).

Plate 1. Stony plains supporting low Bluebush (*Maireana* spp.) and Saltbush (*Atriplex* spp.) shrublands with areas of open Mulga (*Acacia aneura*) Shrubland.

Plate 2. Hardpan plains supporting Mulga (*Acacia aneura*) Woodland over mixed shrubs (*Acacia* and *Eremophila* spp.) and soft grasses (including *Aristida contorta)*.

Plate 3. Broad drainage tracts supporting dense Mulga (*Acacia aneura*) and mixed Acacia shrublands.

Plate 4. Gently undulating gravelly plains and low stony hills supporting mixed Acacia shrublands with areas of *Casuarina pauper* and patchy halophytic shrublands.

Plate 5. Low gravelly rises and supporting dense Acacia (particularly *Acacia aneura*, *Acacia ayersiana* and *Acacia ramulosa*) and *Allocasuarina campestris* thickets.

Plate 6. Loam plains supporting Goldfields Black Butt (*Eucalyptus lesouefii*) Woodland with Gimlet (*Eucalyptus salubris*) and *Eremophila scoparia*.

Plate 7. Low lying sandplains supporting Spinifex (*Triodia basedowii*) Hummock Grassland with scattered low Acacia shrubs.

Plate 8. Sandplain supporting Mallee (*Eucalyptus youngiana*) over Spinifex (*Triodia basedowii*) Hummock Grasslands.

Plate 9. Elevated sandplain supporting Marble Gum (*E. gongylocarpa*) Woodland over Spinifex (*Triodia basedowii*) Hummock Grassland.

Plate 10. Elevated Sandplain supporting mixed Woodland, particularly of *Callitris columellaris*, *E. gongylocarpa, E. youngiana* over Spinifex (*Triodia basedowii*).

Plate 11. Yellow Sandplain Communities supporting Marble Gum, Mallee, mixed Acacia, *Allocasuarina acutivalvis, Bertya dimerostigma, Hakea francisiana, Triodia dersertorum* or *Triodia scariosa* and *Xanthorrhoea thorntonii*.

Plate 12. Yellow Sandplain Communities (picture 2).

Plate 13. Sandy clay plains supporting Mulga (*Acacia aneura*) over Spinifex (*Triodia basedowii*) Hummock Grassland.

Plate 14. Dense Mallee (including *Eucalyptus concinna* and *E. oleosa*) over Spinifex (*Triodia* spp.) Hummock Grasslands.

Plate 15. Pale Yellow sands supporting low Proteaceous heath (*Melaleuca* spp., *Banksia sp. and Grevillea juncifolia*), Mallee (*Eucalyptus* spp.) and Spinifex (*Triodia* spp.) Hummock Grasslands.

Plate 16. Orange Sandplain Communities supporting mixed Eucalypt Woodland / Mallee (*Eucalyptus gongylocarpa, Eucalyptus youngiana*) with Spinifex (*Triodia basedowii*).

Plate 17. Sand dune systems supporting Marble Gum (*E. gongylocarpa*), *Callitris columellaris*, mixed shrublands (including *Acacia* spp.) over *Triodia* spp. hummock grasslands and sedge-like perennials.

Plate 18. Long-unburnt sandy rises supporting dense Acacia shrublands (*Acacia aneura, Acacia ramulosa*) and *Thryptomene biseriata*.

Plate 19. Sandy clay and gravelly plains supporting long-unburnt (relictual) patches of Mulga (*Acacia aneura*) with *Eremophila forrestii, Aluta maisonneuvei* and *Thryptomene biseriata* understorey, often plains between sand ridges.

Plate 20. Calcareous plains supporting *Casuarina pauper* woodland over *Eremophila scoparia*.

Plate 21. Salt lakes and saline drainage systems with fringing saline plains supporting halophytic shrublands (*Tecticornia* spp.) and scattered Acacia shrubs.

Plate 22. Saline plains supporting low Saltbush (*Atriplex* spp.) and Bluebush (*Maireana* spp.) chenopod shrublands.

Plate 23. Sandy rises and low sand dunes fringing salt lakes supporting mixed Acacia shrublands with *Dodenia viscosa*.

Plate 24. Gypsiferous rises fringing salt lakes supporting mixed Acacia shrubs, *Casuarina pauper* and *Lawrenceia helmsii*.

Plate 25. Low silcrete / granitic rocky hills and outcrops supporting mixed Acacia shrublands (including *Acacia aneura*, *Acacia ayersiana*).

Plate 26. Gravelly breakaways fringing saline depressions supporting Mallee (*Eucalyptus* spp.);

Plate 27. Ironstone hills and stony rises supporting Acacia aneura Woodland.

4.2 Vertebrate Fauna

The desktop survey identified 323 fauna species potentially occurring in the survey area (listed in Appendix 3). Based on the results of the database searches and literature reviews, eight frog, 115 reptile, 155 bird, 35 native mammal and 10 introduced mammal species may potentially occur. This fauna list includes 33 species of conservation significance. These expected fauna lists are based largely upon known distributions and available habitats. The vertebrate fauna expected to occur within the survey area has the following composition (see Table 10, Appendix 3).

Table 10. Vertebrate Fauna Assemblage Expected in the Survey Area.

Taxon	Species Expected	Species Recorded (field survey)	Significant Fauna Expected			Significant Fauna Recorded		
			EPBC WCA	DPaW	Local	EPBC WCA	DPaW	Local
Frogs	8	1	0	0	0	0	0	0
Reptiles	115	50	3	2	1	0	0	0
Birds	155	78	10	3	7	2	2	4
Native Mammals	35	19	2	3	2	2	1	0
Introduced Mammals	10	9	-	-	-	-	-	-
Total	**323**	**157**	**15**	**8**	**10**	**4**	**3**	**4**

A total of 157 fauna species were recorded during the field surveys, comprising one frog, 50 reptile, 78 bird, 19 native mammal and nine introduced mammal species (see Appendix 3, 4 and 5). Eleven fauna species of conservation significance were recorded:

- Sandhill Dunnart (*Sminthopsis psammophila*) – EPBC Endangered, recorded from four locations;
- Southern Marsupial Mole (*Notoryctes typhlops*) – EPBC Endangered, burrows recorded at five locations;
- Malleefowl (*Leipoa ocellata*) – EPBC Vulnerable, 10 mounds recorded;
- Brush-tailed Mulgara (Dasycercus blythi) – Priority 4, two individuals trapped, numerous active burrows recorded;
- Rainbow Bee-eater (*Merops ornatus*) – EPBC Migratory, several observed;
- Striated Grasswren (*Amytornis striatus*) – Priority 4, two groups recorded;
- Australian Bustard (*Ardeotis australis*) – Priority 4, several observed;
- Scarlet-chested Parrot (*Neophema splendida*) – locally significant, pair seen;
- Rufous Tree-creeper (*Climacteris rufus*) – locally significant, four observed;
- Southern Scrub-robin (*Drymodes brunneopygia*) – locally significant, five records; and
- Chestnut Quail-Thrush (*Cinclosoma castanotum*) – locally significant.

4.2.2 Amphibians

Eight frog species are expected to occur in the survey area (see Appendix 3). One frog species, the Shoemaker Frog (*Neobatrachus sutor*) was recorded during the field surveys. Several *Neobatrachus sutor* were recorded from a low sand dune perched above a low gravelly rise, where the sandy substrate retained some moisture after seasonal rains. No frog species expected to occur within the survey area are of conservation significance.

4.2.3 Reptiles

A total of 115 reptile species may occur in the survey area (see Appendix 3). Fifty (50) species were recorded during the field surveys. This comprised eight Dragons (Agamidae), 10 Geckos (Gekkonidae), three Legless Lizard (Pygopodidae), 20 Skinks (Scincidae), four Goannas (Varanidae) and five Elapid Snake species (Elapidae). These species are listed in Appendix 3.

Several species recorded were specific to particular habitat types, such as sand dunes (*Ctenophorus cristatus, Ctenophorus fordi, Nephrurus laevissimus, Diporiphora reginae, Ctenotus brooksi* and *Eremiascincus richardsonii*). *Egernia depressa* was recorded from *Casuarina pauper* Woodland, with scats from several colonies recorded at the base of hollow logs and trees.

Most reptile species recorded are widespread across the Great Victoria Desert or Murchison however due to the location of the survey area (on the fringe of two biogeographic regions) several species recorded occur in the area near the extremes of their range (eg. *Egernia depressa*). The Dragon *Ctenophorus sp. aff. femoralis* is listed in this report as an undescribed fauna species. This species is referred to as *Ctenophorus fordi* in some previous fauna survey reports, however is referred to here as a separate species due to distinctions in morphology and habitat preference.

No reptile species of conservation significance were recorded however six species are expected to occur within the survey area (see Section 5).

4.2.4 Birds

A total of 155 bird species are expected to occur in the survey area (see Appendix 3). Seventy eight (78) bird species were recorded during the field surveys (see Appendix 4). The high number of birds recorded reflects the high number of habitat types traversed by the proposed infrastructure corridor (and the inclusion of two biogeographic regions).

Most avian species recorded are widespread across the Great Victoria Desert or Murchison regions however due to the location of the survey area (on the fringe of two biogeographic regions) several species recorded occur in the area near the extremes of their range (eg. Western Bowerbird).

Seven conservation significant fauna species were recorded (see Section 5) including the Malleefowl, Striated Grasswren, Australian Bustard, and Rainbow Bee-eater. Of particular interest was the presence of several pairs of the Southern Scrub-robin, recorded from relictual (long-unburnt) patches of Mulga Woodland with a dense shrubby understory (including *Eremophila* spp. and *Thryptomene biseriata*). These records represent a significant range extension for the species, with the nearest known population (itself an outlier from the main species range) occurring over 300 km to the south – west, near Menzies (DPaW, 2013). As it has not been recorded in the region (despite numerous surveys) the Southern Scrub-robin is likely to be relatively rare, sparsely distributed and locally significant. The Southern Scrub-robin is discussed further under "Species of Conservation Significance" (Section 5).

Other species of note included several which had not been recorded on previous fauna surveys in the area - Striated Grasswren, Rufous Tree-creeper, Chestnut Quail-Thrush and Brown Songlark. All species were recorded from few locations, indicating a relatively sparse occurrence in the region due to a particular preference for a specific and locally rare habitat type. The Striated Grasswren was recorded from long-burnt heath from two distinct locations. The Rufous Tree-creeper was recorded from one location, with a group of four recorded from mature Marble Gum Woodland containing several tree hollows. The Chestnut Quail-Thrush was recorded from dense and long-unburnt Acacia shrubland and the Brown Songlark was recorded from regenerating sandplain. These species are discussed further, along with additional conservation significant fauna in Section 5.

4.2.5 Mammals

Thirty five (35) native mammal species and ten introduced mammal species are expected to occur within the survey area (see Appendix 3). Nineteen native mammal species and nine introduced species were recorded during the field surveys. Ten species were trapped at the fauna survey sites – the Brush-tailed Mulgara, Mallee Ningaui, Sandhill Dunnart, Hairy-footed Dunnart, Little Long-tailed Dunnart, Ooldea Dunnart, Spinifex Hopping Mouse, Sandy Inland Mouse, Desert Mouse and House Mouse. The Brush-tailed Mulgara was also recorded from several locations along the survey corridor, with numerous active burrows (some with fresh scats) recorded from spinifex sandplain. Additionally, four bat species were recorded using the bat detectors.

The Southern Marsupial Mole was recorded at several locations along the survey corridor, with old burrow systems recorded at several of the trench sites on the crests and slopes of sand dunes. Echidna tracks were also numerous in sand dune areas and the species was recorded from motion cameras.

Woolley's Pseudantechinus (*Pseudantechinus woolleyae*) was also recorded from north of Sunrise Dam (outside the survey corridor) with several scats recorded from a rock crevice on the crest of a banded ironstone ridge. This species is considered likely to occur within the survey area in areas of rocky outcropping.

Three Macropod species (the Red Kangaroo, Western Grey Kangaroo and Euro) were also recorded. The Red Kangaroo was recorded from the sandplains fringing the salt lake systems, Euros from rocky areas and the Western Grey Kangaroo was observed to be numerous on the sandplains with many individuals and pairs recorded.

Old, abandoned burrow systems of the Boodie (*Bettongia lesueur*) were recorded from a gravelly rise supporting Mulga Woodland east of Sunrise Dam. The Boodie is considered regionally extinct and listed as such under the EPBC Act. It formerly occurred across arid Australia, with declines associated with the widespread establishment of the fox, feral cat and rabbit (DOTE, 2013).

Nine introduced mammals, the Feral Cat (*Felis catus*), Fox (*Vulpes vulpes*), Horse (*Equus caballus*), Dog (*Canis lupis*), Camel (*Camelus dromedaries*), Cattle (*Bos taurus*), Goat (*Capra hircus*), House Mouse (*Mus musculus*), and Rabbit (*Oryctolagus cuniculus*) were recorded from the study area. Tracks of three species (Feral Cat, Fox and Rabbit) were observed to be widespread along the corridor. However evidence of Cattle, Goat and Horse were recorded only near Sunrise Dam and Camels were recorded extensively on the desert sandplains.

Three species of conservation significance, the Sandhill Dunnart, Brush-tailed Mulgara and Southern Marsupial Mole were recorded from the survey area (see Appendix 3). Conservation significant mammals are discussed in Section 5.

4.2.5 Trapping Results

The results of the systematic fauna sampling are summarized in Tables 11 and 12. Reptiles were trapped in higher numbers during 2013 (during hot, humid conditions) while mammals were trapped in abundance during 2014 (during cooler conditions). During 2013 the *Lerista bipes* was recorded across most habitat types, however was only trapped once in 2014. Only one species of Dunnart was trapped during 2013, however four were trapped in 2014. Species of note include several indicative of the Yellow Sandplain PEC – Sandhill Dunnart, *Diporiphora reginae, Delma petersoni, Proablepharus reginae*. Several other sand dune specialists were trapped (*Nephrurus laevissimus*, *Ctenophorus cristatus*, *Ctenotus brooksi, Eremiascincus richardsonii* and *Brachyurophis fasciolatus*). The Brush-tailed Mulgara was trapped from red granitic sandplain habitat (two individuals) however was also recorded from yellow sandplain areas. *Strophurus assimilis* was only recorded from yellow sandplain habitat in the western parts of the survey area.

Table 11. Fauna species recorded from the 2013 trapping sites.

Species	1	2	3	4	5	6	7	8	9	10	11	Opp	Total
Reptiles													
Ctenophorus cristatus						1		3				3	7
Ctenophorus sp. aff. femoralis						5		4				13	22
Ctenophorus isolepis	1		2				1					5	9
Ctenophorus scutulatus												6	6
Moloch horridus	1		1									3	5
Pogona minor												5	5

Species	1	2	3	4	5	6	7	8	9	10	11	Opp	Total
Diplodactylus conspicillatus												2	2
Gehyra purpurascens						3	1		1			3	8
Gehyra variegata							1		3			6	10
Heteronotia binoei												1	1
Lucasium damaeum						3		2				8	13
Nephrurus laevissimus								6				6	12
Nephrurus levis												1	1
Rhynchoedura ornata	1											10	11
Strophurus assimilis								1				1	2
Strophurus elderi	1	1				2		1			1	2	8
Pygopus nigriceps								2					2
Ctenotus brooksi						4		1				1	6
Ctenotus calurus	3												3
Ctenotus dux						1	1	2	1				5
Ctenotus greeri										1	1		2
Ctenotus helenae	1	3	2				1						7
Ctenotus leonhardi												2	2
Ctenotus pantherinus	2		1										3
Ctenotus quattuordecimlineatus	1						1					3	5
Ctenotus schomburgkii	2	1										2	5
Egernia depressa												4	4
Eremiascincus richardsonii						2							2
Lerista bipes	25	3				10	14	6	4		1		63
Lerista desertorum	1					1	1	2	1				6
Lerista timida		1						1	3				5
Liopholis inornata							1					2	3
Mentia greyii	1												1
Morethia butleri	1	1				1			2			1	6
Tiliqua occipitalis	1					1							2
Brachyurophis fasciolatus								1					1
Brachyurophis semifasciatus	1											3	4
Demansia psammophis	1												1
Simoselaps bertholdi	1					3		1					5
Varanus giganteus												1	1
Varanus gouldii			2			1		1				1	5
Varanus panoptes												2	2
Varanus tristis							1	1				1	3
Mammals													
Tachyglossus aculeatus						T						T	T
Dasycercus blythi			2									B	2
Ningaui yvonnae		1											1
Sminthopsis ooldea								1					1
Macropus fuliginosus						T	T	T	T			12	12
Notomys alexis												1	1
Felis catus						T	T	T				T	T
Mus musculus												1	1
TOTAL	**45**	**11**	**10**	**0**	**0**	**38**	**23**	**36**	**15**	**1**	**3**	**112**	**294**

Note: Opp = Opportunistic records, B = burrows, T = Tracks.

Table 12. Fauna species recorded from the 2014 trapping sites.

Site	1	2	3	4	5	6	7	8	9	Total
FROGS										
Neobatrachus sutor	5									5
REPTILES										
Ctenophorus isolepis						1	1			2
Ctenotus brooksi				4		3				7
Ctenotus dux		2	3	1						6
Ctenotus pantherinus	1			1						2
Ctenotus quattuordecimlineatus	1		1				1			3
Ctenotus schomburgkii		1	1		1	2	1		2	8
Delma nasuta			1							1
Delma petersoni				1						1
Diporiphora reginae	2	1					1			4
Lerista bipes	1									1
Moloch horridus	1	3								4
Nephrurus laevissimus	1			1						2
Parasuta monachus	1									1
Pogona minor		1			1			2		4
Proablepharus reginae		1	1							2
MAMMALS										
Ningaui yvonnae / ridei	7	10	4	4	5	7	2		1	40
Sminthopsis dolichura	1				1	2			1	5
Sminthopsis hirtipes	3		2		1	2			1	9
Sminthopsis ooldea			1							1
Sminthopsis psammophila		1								1
Notomys alexis		8	3	1		3	2	2	1	20
Pseudomys desertor	2		1			1				4
Pseudomys hermansbergensis	1				1	1			1	4
Mus musculus	1		1		1					3
Total	28	28	19	15	11	22	9	4	7	145

4.3 Invertebrate Fauna

Invertebrates in general are beyond the scope of environmental impact assessment because there are so many species and their taxonomy is poorly understood, but it is possible to focus on a small range of taxa including those that are of listed conservation significance, and those that qualify as short-range endemics (SREs). Harvey (2002) notes that the majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and

slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish).

The Arid Bronze Azure Butterfly is listed as Critically Endangered under the Wildlife Conservation Act and is currently being assessed for listing under the EPBC Act (T. Gamblin, pers. comm.). It is only known from Barbalin Nature Reserve (in the Wheatbelt region of Western Australia), however was formerly known from the Lake Douglas area near Kalgoorlie. There are no records of this species near the survey area.

The fairy shrimp *Branchinella simplex*, is listed as Priority 1 by DPaW and Vulnerable under the IUCN. Several records come from Lake Carey (DPaW, 2013) and as a result this species may occur near the survey area in salt lake habitat. The fairy shrimp *Branchinella apophysata*, is also listed as Priority 1. It known only from Lake Carey near Mount Margaret.

While the majority of habitats traversed by the infrastructure corridor are widespread there are some habitats traversed that have the potential to support SRE invertebrate fauna. These include rare and/or discontinuous habitats such as:

- Isolated rocky ridges such as the banded ironstone formation ridges, and greenstone ridges. Banded ironstone formation ridges are a recognised SRE habitat in the Midwest and Goldfields (DEC, 2007) and support SRE fauna such as mygalomorph spiders (eg. *Idiosoma nigrum*) and millipedes (eg. *Atelomastix bamfordi*);
- Salt lake communities support restricted invertebrate fauna such as *Branchinella spp*; and
- Relictual and long-unburnt mature Mulga patches - likely to support restricted fauna assemblages including SRE invertebrates. Mature Mulga communities often provide substantial shade and produce thick leaf litter, providing habitat supporting SRE invertebrates including mygalomorph spiders and scorpions.

5. CONSERVATION SIGNIFICANT FAUNA

5.1 Conservation Significant Fauna in the Region

Conservation significance includes fauna species listed under federal or state legislation, species listed as Priority Fauna by DPaW, species listed as declining in biodiversity publications and locally significant fauna due to restricted distributions. Thirty three (33) species of conservation significance have the potential to occur within the survey corridor (recorded from regional database searches and during previous surveys). These species are listed below in Table 13 along with their conservation status and expected occurrence in the survey area. This list includes six reptile, 20 bird and seven mammal species. Of the species listed, 11 were recorded during the field surveys.

The conservation significant reptiles known from the region and expected to occur within the survey corridor include three species listed under state or federal legislation (Great Desert Skink, Carpet Python and Woma), two DPaW Priority species (*Lerista puncticauda* and *Ramphotyphlops margaretae*) and the locally significant *Aprasia picturata*.

Conservation significant mammals expected include two species listed under state or federal legislation (Southern Marsupial Mole, Sandhill Dunnart), three DPaW priority fauna (Brush-tailed Mulgara, Long-tailed Dunnart, Central Long-eared Bat) and two locally significant mammal species due to their restricted ranges (Woolley's Pseudantechinus and Kultarr). Of these, the Sandhill Dunnart, Southern Marsupial Mole, Brush-tailed Mulgara and Woolley's Pseudantechinus were recorded during the field surveys.

Conservation significant birds expected include federally listed (EPBC) species (Malleefowl, Princess Parrot, Slender-billed Thornbill, Rainbow Bee-eater and Fork-tailed Swift), state listed (WCA) species (Peregrine Falcon, Major Mitchell's Cockatoo, Grey Falcon), DPaW Priority species (Striated Grasswren, Australian Bustard and Bush Stone-Curlew) and seven locally significant fauna species due to their limited patterns of distribution (Square-tailed Kite, Scarlet-chested Parrot, Regent Parrot, Purple-crowned Lorikeet, Rufous Tree-creeper, Chestnut Quail-thrush and Southern Scrub-robin). Additionally, several species listed as Migratory under the EPBC are expected to occur in the survey corridor only as rare visitors, associated with seasonal flooding of the salt lake habitats. These include the Common Sandpiper, Wood Sandpiper, Common Greenshank, Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper.

Table 13 also lists the likelihood of significant fauna occurring within the survey area. Fauna species are classified as Recorded (recorded during the current survey), Likely Resident (recorded nearby, suitable habitat present), Seasonal Visitor (expected to occur within the survey area at least on a seasonal basis), Rare Visitor (vagrant), Potential Resident (recorded in region, suitable habitat present), or Unlikely (suitable habitat absent).

Table 13. Conservation status of significant fauna species expected to occur in the survey area.

Common Name	Species Name	Conservation Status			Local Records	Preferred Habitat Type	Habitat Present in Survey Area	Expected Status in Survey Area	Recorded in Survey Area
REPTILES		**CS1**	**CS2**	**CS3**					
Great Desert Skink	*Liopholis kintorei*	Vul	Vul		40 km east of Laverton	Red spinifex sandplains and sand ridges, paleodrainage lines.	Yes	Potential Resident	
Carpet Python	*Morelia spilota imbricate*	S4	P4		Tropicana	Eucalypt Woodland	Yes	Resident	Previously Recorded
Woma	*Aspidites ramsayi*	S4	P1		Neale Junction, Kitchener	Sandplains	Yes	Resident	
Dotty-tailed Robust Slider	*Lerista puncticauda*		P2		Queen Victoria Spring	Marble Gum Woodland	Yes	Potential Resident	
Buff-snouted Blind Snake	*Ramphotyphlops margaretae*		P2		Neale Junction	Sandplain fringing salt lake systems		Potential Resident	
Black-headed Worm-lizard	*Aprasia picturata*			L	Murrin Murrin	Rocky hills including greenstone with Acacia shrublands	Yes	Potential Resident	
BIRDS									
Malleefowl	*Leipoa ocellata*	Vul	Vul		Laverton, Tropicana	Acacia shrublands, dense woodlands.	Yes	Resident	Recorded
Princess Parrot	*Polytelis alexandrae*	Vul	P4		Queen Victoria Spring	Marble Gum or Casuarina Woodland	Yes	Potential Resident / Visitor	
Slender-billed Thornbill	*Acanthiza iredalei*	Vul			Sunrise Dam, Lake Rason	Samphire, Chenopods	Yes	Potential Resident / Visitor	
Peregrine Falcon	*Falco peregrinus*	S4			Tropicana	Rocky ridges, major drainage lines, woodland	Yes	Potential Resident / Visitor	Previously Recorded
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	S4			Queen Victoria Spring	Eucalypt Woodland	Yes	Potential Visitor / Resident	
Night Parrot	*Pezoporus occidentalis*	CrE	CrE		None	Spinifex Grasslands, Chenopod shrublands	Yes	Unlikely Resident	
Rainbow Bee-eater	*Merops ornatus*	Mig	S3		Tropicana	Watercourses, woodland	Yes	Regular Migrant	Recorded
Fork-tailed Swift	*Apus pacificus*	Mig	S3		Menangina	Aerial	Yes	Irregular Visitor	
Striated Grasswren	*Amytornis striatus striatus*		P4		Queen Victoria Spring	Long-unburnt Spinifex sandplain with a dense shrub layer	Yes	Resident	Recorded
Australian Bustard	*Ardeotis australis*		P4		Tropicana	Plains	Yes	Resident / Visitor	Recorded
Bush Stone-curlew	*Burhinus grallarius*		P4		Leonora	Acacia shrublands, Woodlands	Yes	Likely Resident	
Grey Falcon	*Falco hypoleucos*		Vul		Plumridge Lakes	Open grasslands, Watercourses	Yes	Potential Visitor	

Square-tailed Kite	*Lophoictinia isura*			L	Menzies	Woodland and Heath	Yes	Potential Visitor	
Scarlet-chested Parrot	*Neophema splendida*			L	Tropicana	Arid Woodland	Yes	Visitor / Resident	Recorded
Regent Parrot	*Polytelis anthopeplus*			L	Tropicana	Eucalypt Forest, Woodland	Yes	Resident / Visitor	Previously Recorded
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*			L	Tropicana	Woodland, Mallee	Yes	Likely Resident / Visitor	Previously Recorded
Rufous Tree-creeper	*Climacteris rufus*			L	Neale Junction	Mature Woodland with tree hollows	Yes	Resident	Recorded
Chestnut Quail-thrush	*Cinclosoma castanotus*			L	Leonora	Woodland, Mallee, rocky ridges	Yes	Resident	Recorded
Southern Scrub-robin	*Drymodes brunneopygia*			L	Tropicana	Dense mallee dense shrublands	Yes	Resident	Recorded
EPBC Migratory Waterbirds	*Eg. Ardea modesta, Tringa nebularia*	Mig	S3		Leonora	Wetlands	Yes	Vagrant	
Mammals									
Southern Marsupial Mole	*Notoryctes typhlops*	End	End		Tropicana	Extensive sand dune fields	Yes	Resident	Recorded
Sandhill Dunnart	*Sminthopsis psammophila*	End	End		Plumridge Lakes Access Track 33 km south of corridor	Long unburnt spinifex sandplain between yellow sand dunes. (*Triodia basedowii* life stage 2 - 3.5).	Yes	Resident	Recorded
Crest-tailed Mulgara	*Dasycercus cristicauda*	Vul			Rawlinna	Sandhill Canegrass Sand dunes or salt lakes with Nitre Bush	No	Unlikely to occur	
Brush-tailed Mulgara	*Dasycercus blythi*		P4		Queen Victoria Spring	Red Spinifex sandplains	Yes	Resident	Recorded
Long-tailed Dunnart	*Sminthopsis longicaudata*		P4		Granny Smith – 3 km east of corridor	Banded Ironstone Ridges	Yes	Likely Resident	
Central Long-eared Bat	*Nyctophilus timoriensis*		P4		Tropicana	Woodlands, shrublands	Yes	Resident	Previously Recorded
Kultarr	*Antechinomys laniger*			L	Granny Smith – 3 km east of corridor	Stony plains	Yes	Likely Resident / Visitor	
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*			L	Tropicana, Laverton	Rocky Ridges	Yes	Resident	Recorded

Codes:

- EPBC Act listed species: End = Endangered, Vul = Vulnerable, Mig = Migratory, CrE = Critically Endangered;
- WC Act listed species: S1 = Schedule 1, S3 = Schedule 3, S4 = Schedule 4, DPaW Priority Species: P1 = Priority 1, P4 = Priority 4;
- Locally Significant species: L = Locally Significant.

5.2 Conservation Significant Fauna Recorded during the Field Survey

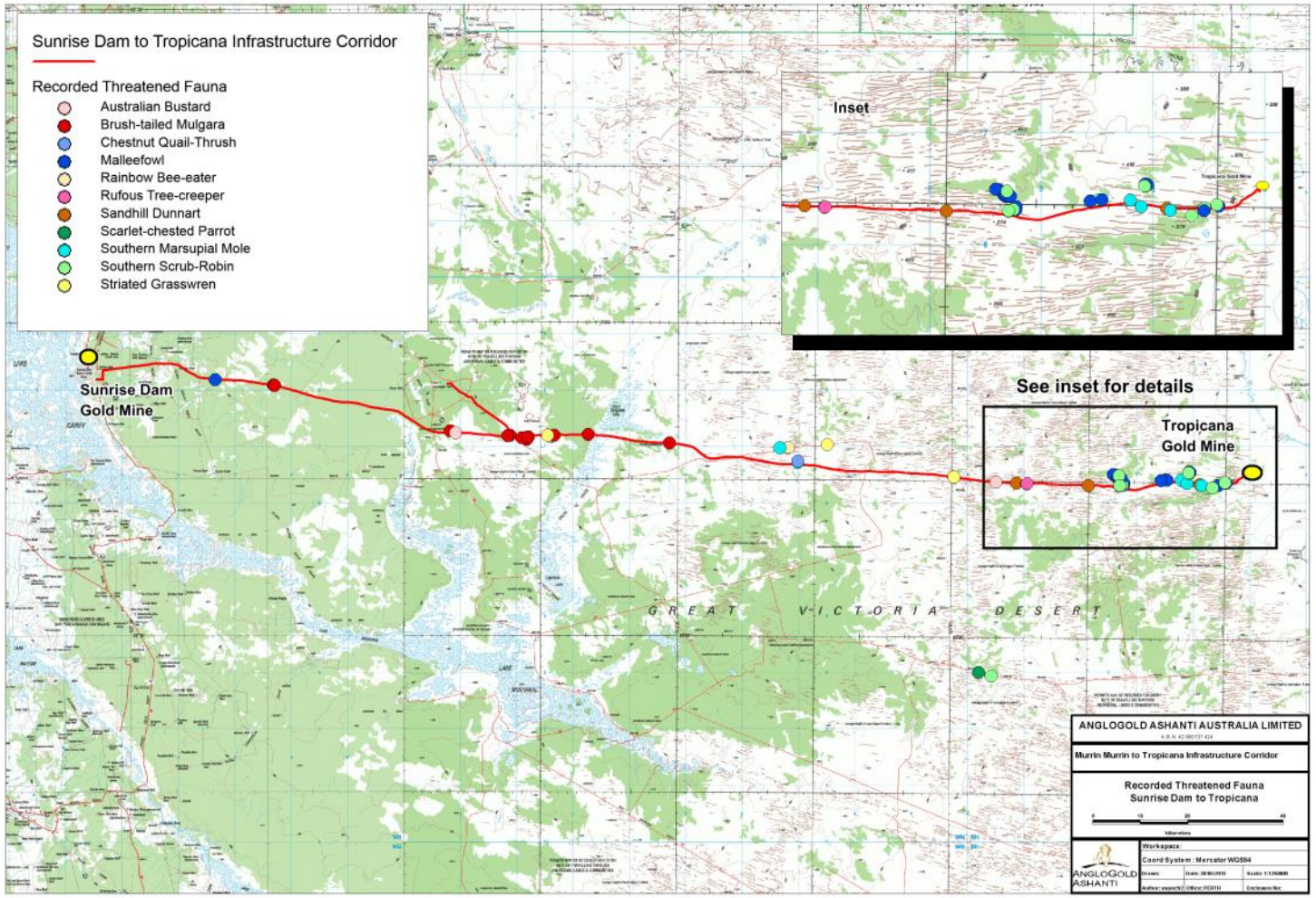
Eleven (11) conservation significant fauna species were recorded within the survey corridor during the field surveys - four species listed under the EPBC Act (Sandhill Dunnart, Southern Marsupial Mole, Malleefowl, Rainbow Bee-eater), three species listed as Priority Fauna by DPaW (Brush-tailed Mulgara, Striated Grasswren, Australian Bustard) and four locally significant species (see Figure 6, Table 14, note UTM Zone 51).

Table 14. Conservation Significant Fauna recorded during the fauna survey.

Common Name	Status	Easting	Northing	Comments
Sandhill Dunnart	Endangered	641230	6763198	Individual trapped
Sandhill Dunnart	Endangered	621441	6763009	Observed Spotlighting
Sandhill Dunnart	Endangered	641205	6763221	Recorded on Motion Camera
Sandhill Dunnart	Endangered	608727	6763471	Recorded on Motion Camera
Malleefowl	Vulnerable	466511	6781782	Inactive Mound
Malleefowl	Vulnerable	627675	6763117	Inactive Mound
Malleefowl	Vulnerable	627467	6763152	Inactive Mound
Malleefowl	Vulnerable	635382	6764010	Inactive Mound
Malleefowl	Vulnerable	634358	6763891	Inactive Mound
Malleefowl	Vulnerable	626155	6764918	Inactive Mound
Malleefowl	Vulnerable	625850	6764970	Inactive Mound
Malleefowl	Vulnerable	626612	6764408	Inactive Mound
Malleefowl	Vulnerable	626795	6764304	Inactive Mound
Malleefowl	Vulnerable	626798	6764406	Inactive Mound
Malleefowl	Vulnerable	645881	6763450	Inactive Mound
Malleefowl	Vulnerable	644540	6763032	Inactive Mound
Malleefowl	Vulnerable	627019	6763007	Inactive Mound
Malleefowl	Vulnerable	627198	6764322	Inactive Mound
Malleefowl	Vulnerable	627103	6764287	Inactive Mound
Malleefowl	Vulnerable	627199	6764322	Inactive Mound
Malleefowl	Vulnerable	639286	6765432	Recently active mound
Malleefowl	Vulnerable	639497	6765341	Inactive Mound
Malleefowl	Vulnerable	643434	6762611	Inactive Mound
Malleefowl	Vulnerable	627714	6763397	Fresh scats/ feathers
Brush-tailed Mulgara	Priority 4	522076	6771625	Female Trapped, TM893
Brush-tailed Mulgara	Priority 4	521782	6771245	Female Trapped, TM894
Brush-tailed Mulgara	Priority 4	476813	6780833	Active burrow
Brush-tailed Mulgara	Priority 4	476829	6780816	Active burrow
Brush-tailed Mulgara	Priority 4	477056	6780745	Active burrow
Brush-tailed Mulgara	Priority 4	547124	6770587	Burrow
Brush-tailed Mulgara	Priority 4	532701	6772108	Active burrow, many scats
Brush-tailed Mulgara	Priority 4	520910	6771543	Burrow
Brush-tailed Mulgara	Priority 4	526701	6771971	Burrow
Brush-tailed Mulgara	Priority 4	521987	6771657	Burrow
Brush-tailed Mulgara	Priority 4	518827	6771917	Burrow
Brush-tailed Mulgara	Priority 4	522076	6771628	Active burrow
Brush-tailed Mulgara	Priority 4	508182	6772764	Active burrow
Brush-tailed Mulgara	Priority 4	518827	6771918	Active burrow, many scats
Brush-tailed Mulgara	Priority 4	518411	6771839	Active burrow, many
Brush-tailed Mulgara	Priority 4	521988	6771657	Active burrow
Striated Grasswren	Priority 4	525527	6771973	Small group
Striated Grasswren	Priority 4	575092	6770322	Small group observed
Striated Grasswren	Priority 4	597564	6764519	Small group observed

Common Name	Status	Easting	Northing	Comments
Australian Bustard	Priority 4	568062	6769753	Observed
Australian Bustard	Priority 4	509116	6772362	Tracks
Australian Bustard	Priority 4	605082	6763631	Tracks
Australian Bustard	Priority 4	610511	6763328	Tracks
Rainbow Bee-eater	Migratory	568215	6769775	Two individuals observed
Southern Marsupial Mole	Endangered	566706	6769685	Mole tunnel
Southern Marsupial Mole	Endangered	569867	6767162	Mole tunnel
Southern Marsupial Mole	Endangered	637938	6763972	Mole tunnel
Southern Marsupial Mole	Endangered	638899	6763408	Mole tunnel
Southern Marsupial Mole	Endangered	641522	6763060	Mole tunnel
Scarlet-chested Parrot	Local	601977	6729964	2 individuals observed
Rufous Tree-creeper	Local	610579	6763368	4 individuals observed
Southern Scrub-Robin	Local	639291	6765222	2 individuals observed
Southern Scrub-Robin	Local	627467	6763152	Heard calling
Southern Scrub-Robin	Local	645694	6763579	2 individuals observed
Southern Scrub-Robin	Local	635122	6764021	2 individuals observed
Southern Scrub-Robin	Local	626860	6764785	Heard calling
Southern Scrub-Robin	Local	643434	6762611	Single bird observed
Southern Scrub-Robin	Local	639194	6765247	Pair observed
Southern Scrub-Robin	Local	644576	6763298	Single bird observed
Southern Scrub-Robin	Local	627026	6763044	Single bird observed
Southern Scrub-Robin	Local	604177	6729311	Pair observed
Chestnut Quail-Thrush	Local	569843	6767348	Individual observed

Figure 6: Locations of Significant Fauna Species.



5.2.1 Malleefowl (*Leipoa ocellata*)

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

The Malleefowl Mound
Malleefowl have developed a highly sophisticated method of temperature control for egg incubation. They construct distinctive nests that comprise a large mound covering a central core of leaf litter. The mound is constructed out of sand, loam, pebbles or small rocks, depending on the substrate available. Mounds have a large central depression which is filled with leaf litter and covered with soil. Eggs are laid within the mound, buried and left to incubate by the heat generated from decomposing leaf litter (Malleefowl Preservation Group, 2013). An adult pair maintain the mound temperature of 32 – 34 degrees by adjusting soil cover to either retain or expel heat from the egg chamber (Malleefowl Preservation Group, 2013).

Malleefowl are monogamous with pair bonds maintained for life (Priddel and Wheeler, 2003). The mound is constructed and maintained by an adult pair over 9 - 11 months of the year. Nest preparation occurs in autumn and the male will tend the nest through summer until temperatures begin to fall (Malleefowl Preservation Group, 2013).

Malleefowl mounds range in size and diameter, depending on age and activity, however mounds commonly span more than five metres and up to one metre high. A pair of Malleefowl will often use the same nest over subsequent seasons however nest fidelity is highly variable. Some Malleefowl pairs have been recorded using the same mound for up to nine years while others relocate seasonally between a cluster of two, three or four mounds (Priddel and Wheeler, 2003). Where Malleefowl mounds are used over many generations, mounds can attain a size of over 20 metres (Malleefowl Preservation Group, 2013).

Mound construction and breeding rely heavily on rainfall. Malleefowl have been recorded abandoning mound construction or failing to use a mound during seasons of low rainfall (Priddel and Wheeler, 2003). Priddel and Wheeler (2003) studied the nesting activity of Malleefowl within an isolated remnant of mallee in central New South Wales. The maximum longevity recorded for breeding adults was 12 years with an average of 7.5 years. Over a twenty year period the population declined, with large population decreases coincident with years of low rainfall and unsuccessful breeding.

Breeding Malleefowl tend to be sedentary, as they nest and roost in the same area year after year. Breeding males do not stray far from the active nest however birds may range over several kilometres outside the breeding season (DEC, 2012). Malleefowl also require large amounts of leaf litter for egg incubation and so are generally restricted to areas of dense vegetation that have not been burnt for many years. In the Great Victoria Desert, Malleefowl are often restricted to areas of long-unburnt and dense Mulga (J. Turpin, pers. obs.).

Established pairs generally breed annually with eggs laid from September to January. The average clutch size is 16 (but may range from five to 30) and the incubation period lasts for between 62 and 64 days (DEC, 2012). Malleefowl chicks receive no parental care and as a result chick mortality is high due to predation and exposure (DEC, 2012).

Mound Profile

The profile of a Malleefowl Mound changes with breeding activity and age (erosion and vegetation growth). A number of profile stages are classified according to age (Benshemesh *et. al.*, 2000) and include:

1. Profile 1: Typical crater with raised rims. This is the typical shape of an inactive nest. However the nest may also be active and open;
2. Profile 2: Nest fully dugout. The characteristic of this profile is that the crater slopes down steeply and at the base the sides drop vertically to form a box-like structure with side usually 20 to 30 cm deep. Often, litter will have been raked into windrows, and may have started to enter the nest;
3. Profile 3: Nest with litter. This is the next stage after profile 2. Litter will have been raked into the nest by Malleefowl, and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage.
4. Profile 4: Nest mounded up (no crater). This is the typical profile of an active but unopened Malleefowl nest. The active mound is closed and dome shaped.
5. Profile 5: Nest a sandy crater with peak in centre. This is a typical profile of an active nest which is in the process of being closed by Malleefowl.
6. Profile 6: Nest low and flat without peak or crater. This mound has not been used for some time and weathering and erosion have ‘flattened” the original mound.

Survey Results

Searches for Malleefowl mounds were undertaken on foot by two personnel traversing through area of suitable habitat. Search areas were selected using aerial imagery, with long-unburnt patches of Mulga targeted (often the darkest areas of vegetation on imagery). Searches concentrated on areas of dense, mature and tall

Mulga with a dense shrubby understorey and containing areas of dense leaf litter, on either gravelly or sandy substrate. While substrate varied, searching within Mulga Woodland was particularly concentrated where gravelly soils occurred. Due to the nature of the substrate, mounds constructed out of gravel are more resistant to erosion (than mounds made from sand or loam) and decay at a slower rate, often resulting in an elevated density of intact (detectable) mounds (compared to other substrates such as sand or loam where mounds may readily decay to an undetectable level). Therefore searching concentrated on gravelly soils with the aim of detecting as many mounds as possible within the limited survey time period.

Nineteen Malleefowl mounds were recorded from the survey area (see Table 15, Plates 28 – 37)). When Malleefowl mounds were detected, the location, vegetation type and physical characteristics (mound width, height, depth, shape / profile and substrate) were recorded. The approximate age of each mound was classified according to the criteria listed below:

- Active: Fresh scratching, loose soil and mound dug out in preparation for the breeding season or mounded for breeding. Mounds containing abundant but weathered plant material and shell fragments have been used regularly over at least the previous few years.
- Recently used (1-5 years): No signs of very recent activity, such as scratching however mound may still contain large amounts of leaf litter if not excavated. Soil surface compacted however, mound slopes still steep and no plants growing in mound. Well defined central depression.
- Moderately old (5-20 years): No recent activity, soil compacted and no plant material. Surface of mound showing some weathering, such as loose soil and debris accumulating in defined central depression, and some plant colonisation possibly present.
- Old (20-100 years): Mound moderately to very weathered, often with a veneer of gravel on the slopes because of removal of fine materials from the surface. Some bushes growing on mound.
- Very old (100+ years): Mound very weathered, with profile low and central depression poorly defined. Bushes and even small trees growing on mound.

One Malleefowl mound was recorded from the dense Acacia shrublands (*A. aneura* and *A. ramulosa*) on the gravelly rises approximately 20 km east of Sunrise Dam. This area is likely to support several breeding pairs of Malleefowl as habitat extends north / south along a low ironstone rise and plateau. While Malleefowl habitat was observed to be extensive at Irwin Hills (approximately 60 km east of Sunrise Dam), no Malleefowl mounds were recorded within the Mulga Shrublands occurring on the gravelly lower slopes. The remaining Malleefowl mounds recorded (18) were in the eastern parts of the corridor and in the vicinity of Tropicana. In this area several large and long-unburnt stands of Mulga occur. The 18 mounds were recorded from

four large patches of Mulga, all within a 20 km radius (see Table 15, Figure 6). Mounds were recorded mostly within the dense areas of Mulga shrubland with a gravelly substrate. Two recently active mounds were recorded and the presence of eggshell (at one mound) indicated a recent breeding event. Further, fresh Malleefowl scats and feathers were recorded approximately 12 km west of a recently active mound, indicating an additional active site. As Malleefowl have recently bred in the area, and fresh evidence (eggshell, scats and feathers) and a high number of inactive mounds has been recorded across a broad area, the persistence of a small population appears evident in the vicinity of the survey area. Most mounds recorded varied in age from moderately old (raised mound with a well-defined central depression) to very old (eroded, flattened mound colonised by several shrubs, see Table 15).

Additional mounds are highly likely to occur in the Mulga patches in the vicinity of the survey area. This survey aimed to detect the presence of Malleefowl and was not a comprehensive population study. As the survey sampled limited sections of habitat, additional mounds are expected near the areas surveyed.

An active Malleefowl mound is situated 1.5 km north of the proposed pipeline route. The pair maintaining this mound are likely to forage into the survey corridor and utilise the surrounding Mulga remnants, some of which are situated adjacent to the proposed pipeline route.

Importantly, no Malleefowl mounds were recorded along the exact pipeline route as it has been designed to avoid most Mulga remnants. Most mounds recorded were outside the 100 m buffer. While the proposed route does pass through some areas of Malleefowl habitat, the majority of breeding habitat is avoided (see Figure 10).

The presence of several Malleefowl mounds in varying stages of activity, over several discrete Mulga patches (spread over approximately 10 km), suggests the ongoing persistence of a small breeding population near Tropicana. The local population is likely to be a smaller relict from a previously more widespread population reduced and threatened by climate change, fire and predation. The lack of recently active mounds, coupled with a widespread occurrence of very old and inactive mounds may also indicate a declining or contracting population.

In the Tropicana area, Malleefowl habitat is fragmented and removed by fire and the subsequent colonisation by spinifex. Mulga has a low tolerance to fire. Mature trees and seedlings readily succumb to moderately intense fire and generally do not resprout. High intensity fires, repeated fire events or the lack of rainfall following a fire can deplete Mulga seed supply and cause long-term damage (Bradstock *et. al*.,

2012). Where intense fire events are regular, fire-sensitive Mulga Woodland is replaced with fire tolerant spinifex communities. Many areas of Mulga along the survey corridor have shown evidence of fire degradation and further habitat removal / fragmentation as a result of high intensity fires is likely.

Table 15. Malleefowl Mounds recorded during the fauna survey (UTM Zone 51).

Mound	Easting	Northing	Substrate	Habitat	Width (m)	Height (cm)	Depth (cm)	Age	Profile
1	466511	6781782	Gravel	Mulga	8	30	10	Old	1
2	627675	6763117	Gravel	Mulga	6	10	0	very old	6
3	627467	6763152	Gravel	Mulga	7	30	60	moderately old, recently excavated	1
4	635382	6764010	Gravel	Mulga	4	10	0	very old	6
5	634358	6763891	Gravel	Mulga	8	10	0	very old	6
6	626155	6764918	Gravel	Mulga	3	10	10	very old	1
7	625850	6764970	Gravel	Mulga	6	25	50	recently used, eggshell fragments present	1
8	626612	6764408	Sand	Mulga	5	20	30	moderately old	1
9	626795	6764304	Gravel, Sand	Mulga	4.5	20	40	moderately old, recently excavated	1
10	626798	6764406	Gravel	Mulga	8	10	0	Old	6
11	645881	6763450	Gravel	Mulga	7	30	20	Old, eroded compact rim	1
12	644540	6763032	Gravel	Mulga	6	30	10	Old	1
13	627019	6763007	Sand, Gravel	Mulga	5	40	20	Old	1
14	627198	6764322	Gravel	Mulga	5	20	40	moderately old, recently excavated	1
15	627103	6764287	Gravel	Mulga	4	30	20	Very Old	1
16	627199	6764322	Gravel	Mulga	6	10	40	Old	1
17	639286	6765432	Sand, Gravel	Mulga	6	30	NA	Recently Active Mound – no activity for weeks, perhaps abandoned	4
18	639497	6765341	Sand, Gravel	Mulga	6	20	25	Old	1
19	643434	6762611	Gravel	Mulga	8	50	60	Recently excavated	1
Scats									
1	627714	6763397	Gravel	Mulga	Several fresh scats and feathers collected				

Plates 28 – 37: Malleefowl Mounds recorded from the survey.

Plate 28. Mound 1: Profile 1, old. Raised gravel mound, however central depression eroded.

Plate 29. Mound 2: Profile 6, very old. Highly eroded and flattened mound.

Plate 30. Mound 3: Profile 1, moderately old.
Evidence of recent excavation as mound depth much deeper than ground level, mound partially filled with litter and woody debris surrounding mound. Likely to have been previously used for breeding.

Plate 31. Mound 4: Profile 6, very old. Highly eroded and flattened mound.

Plate 32. Mound 5: Profile 6, very old. Highly eroded and flattened mound.

Plate 33. Mound 6: Profile 1, very old. Vegetation growth and fallen timber on mound.

Plate 34. Mound 7: Profile 1, recently used. Evidence of recent excavation as mound depth much deeper than ground level, eggshell fragments present indicating a recent breeding event.

Plate 35. Mound 8. Profile 1, moderately old. Sand Mound with leaf litter debris in well-defined depression.

Plate 36. Mound 9. Profile 1, moderately old. Mound partially recently excavated.

Plate 37. Mound 10. Profile 6, old. Young mulga shrubs growing on mound indicate some age.

Plate 38. Mound 11. Profile 1, old. Eroded compact rim.

Plate 39. Mound 12. Profile 1, old.

Plate 40. Mound 13. Profile 1, old.

Plate 41. Mound 14. Profile 1, moderately old, recently excavated.

Plate 42. Mound 15. Profile 1, very old.

Plate 43. Mound 16. Profile 1, old.

Plate 44. Mound 17. Profile 4, recently active. Recently Active Mound – no activity for weeks, perhaps abandoned.

Plate 45. Mound 18. Profile 1, old.

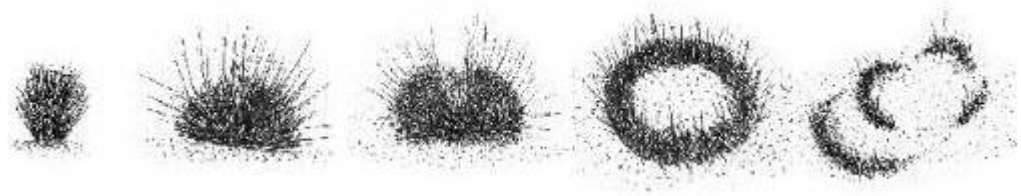
Plate 46. Mound 19. Profile 1, recently excavated.

5.2.2 Sandhill Dunnart

The Sandhill Dunnart is listed as Endangered under the EPBC and WC Acts. In Western Australia the species appears to be restricted to the south western fringe of the Great Victoria Desert inhabiting yellow sand dune systems with long unburnt mature hummock grasslands (*Triodia* spp.) and often in association with Mallee or Marble Gum, Callitris and an associated complex shrub understorey (GHD 2010, Churchill 2009, DPaW, 2013). There is also a disjunct population in southern South Australia, in which the species appears to occupy a broader range of habitats (GHD 2010).

Across its range, Churchill (2009) and GHD (2010) note that Spinifex (*Triodia* spp.) coverage and quality is the critical feature of Sandhill Dunnart habitat. Sandhill dunnarts have been found to use *T. basedowii, T. irritans, T. scariosa* and *T. lanata,* with Spinifex cover ranging from 1 - 70%, however, they are generally caught in coverage of 10 - 70%. Spinifex quality is also of significance as Spinifex hummocks supply cover, hides, and nest sites (Churchill, 2009, GHD, 2010). Spinifex quality is measured by its life stage (Figure 7) with studies in South Australian showing that Stages 2 to 4 are optimal, however Stages 4 and 5 can be utilised by the species using burrows rather than nests (Churchill 2009).

Figure 7. The life stages of Triodia from Churchill 2009.



Stage 1 Stage 2 Stage 3 Stage 4 Stage 5

Sandhill Dunnarts require habitat that is long unburnt (8 - 38 years) to survive due to the time frame required for the re-establishment of Triodia to a suitable life stage (2 - 3.5) that the Dunnarts can use. Fires in the Great Victoria Desert destroy large areas of land, rendering them unsuitable for the species (GHD, 2010).

Four Sandhill Dunnarts were recorded from the survey area (see Table 16 and 17). One male was trapped at a systematic survey site, one individual was observed spotlighting and two individuals were recorded by motion sensitive cameras. The species is identified from other Dunnarts in the local area by its large size, distinctive bi-coloured tail with (darker underside with a terminal crest), large ears and dark forehead.

At all locations (where the Sandhill Dunnart was recorded) vegetation comprised long-unburnt and mature spinifex with a variable and complex shrub layer and in association with a yellow sand dune. The trapped individual was recorded from the base of a yellow sand dune supporting Marble Gum (*E. gongylocarpa*), *Callitris columellaris*, mixed Acacia (including *Acacia ramulosa*, *Acacia ligulata*), *Thryptomene biseriata*, *Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii* and *Triodia* spp. (*Triodia desertorum* or *T. basedowii*) hummock grassland (see Plate 47). This area has been also mapped by Botanica Consulting (2014) as:

"*Eucalyptus gongylocarpa* over *Callitris columellaris*/*Grevillea juncifolia* over *Acacia ligulata*/ *Thryptomene biseriata*/ *Anthotroche pannosa* over *Triodia desertorum* or *T. basedowii* on sand dune".

Spinifex cover was also systematically measured (along a 50 m transect) at 37 % and comprised mostly class ages 3 – 5. Bare ground comprised 44 % cover and *Thryptomene biseriata* 9 % cover (the remaining 10 % comprising litter and herbs).

Table 16. Sandhill Dunnart records from the survey area.

Record	Easting	Northing	Vegetation	Landform	Triodia
Trapped	641230	6763198	*E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.*	Yellow Sand Dune	Age: 3 – 5 Cover: 37 %
Spotlit	621441	6763009	Open Low Woodland of E. gongylocarpa over mallee of *E. youngiana* over Callitris columellaris and *Allocasuarina spinosissima* over moderately dense *Triodia basedowii*	Yellow Sand Dune	Age: 3 – 5 Cover: 10 – 40%
Motion Camera	641205	6763221	*E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.*	Yellow Sand Dune	Age: 3 – 5 Cover: 30 – 40%
Motion Camera	608727	6763471	*E. gongylocarpa, Eucalyptus sp. (Mallee), Callitris columellaris, Triodia spp., Xanthorrhoea thorntonii*	Yellow Sand Dune	Age: 3 – 5 Cover: 10 – 40%

Table 17. Sandhill Dunnart Measurements.

Species	Weight (g)	Tail-length (mm)	Head (mm)	PES short (mm)	PES long (mm)	Sex	Age	Notes
Sandhill Dunnart	47	93	43.4	19.3	24.3	male	adult	hair, tissue & scat collected

Plate 47. Sandhill Dunnart habitat – the capture site.

Plate 48. Sandhill Dunnart habitat – the capture site: dune lower slope.

Plate 49. Sandhill Dunnart trapped from the survey corridor (note dark forehead).

Plate 50. Sandhill Dunnart trapped from the survey corridor (note bi-coloured tail).

Plate 51. Sand dune habitat at location of Sandhill Dunnart spotlight observation.

The Sandhill Dunnart has also been recorded to the south of the survey corridor from Mulga Rock, Queen Victoria Spring Nature Reserve and the Plumridge Lakes access track (GHD, 2010). The nearest record comes from an unburnt yellow sand dune system approximately 30 km south of the survey corridor (recorded in 2006 DPaW, 2013).

The Sandhill Dunnart is rarely recorded, requiring the use of deep pitfall traps or Elliot Traps for detection (DOTE, 2013). Several surveys targeting the Sandhill Dunnart have been conducted in the Tropicana area (Gaikhorst and Lambert 2008, Churchill 2009, ecologia 2009, GHD 2010) and despite large trap efforts the species has not been previously detected. However the lack of captures may not suggest an absence of a population but rather the species is difficult to detect, occurs at low densities and may be patchily distributed through the region. Due to regular fire events across the Great Victoria Desert, the Sandhill Dunnart is expected to have a sparse and fragmented distribution.

Suitable habitat for the Sandhill Dunnart was patchily recorded across the eastern half survey area, with areas of long unburnt yellow sandplain and sand dune systems supporting the optimal habitat – Marble Gum Woodland with Callitris over a complex shrub layer (including *Allocasuarina spinosissima*, Hakea *francisiana, Acacia ramulosa*, *Acacia ligulata*, *Thryptomene biseriata*, *Grevillea juncifolia*, *Anthotroche pannosa*, *Daviesia grahamii, Xanthorrhoea thorntonii*) and mature Triodia hummock grasslands (see Plates 47 - 51). Sandhill Dunnart habitat is mapped in Figure 10.

5.2.3 Southern Marsupial Mole (*Notoryctes typhlops*)

The Southern Marsupial Mole is listed as Endangered under the EPBC and WC Acts as it is known from few and widely scattered records over the sandy deserts of inland Australia. It has a highly subterranean life cycle and favours deep sands within sand dune fields and sandplains (DOTE, 2013).

Due to its highly cryptic lifestyle, the Southern Marsupial Mole is rarely encountered. However the Southern Marsupial Mole is readily detected using standardised trenches which reveal the species underground tunnels (which can persist for several years, Benshemesh, 2005). Ecologia (2009), recorded many Marsupial Mole tunnels in the Tropicana area, particularly from the slopes and crest of yellow sand dunes, however the species was also detected from red sands and interdunal areas.

Within the survey corridor, evidence of the Southern Marsupial Mole (mole tunnels) was recorded at five locations (see Figure 6, Plate 52). The Southern Marsupial Mole was recorded from the crests and slopes of yellow sand dunes within extensive dune fields and supporting Marble Gum and Callitris with a scattered Spinifex Hummock Grassland understorey.

The Southern Marsupial Mole is likely to be widespread in the local area and occur throughout the yellow sand dune fields traversed by the survey corridor. As the

species rarely comes to the surface, records are low for the region (DEC, 2012), however recent surface tracks identified by Tropicana staff indicate a persisting population in the Tropicana area (T. Walsh, pers. comm.).

Plate 52. Marsupial Mole tunnel recorded from the survey corridor.

5.2.4 Brush-tailed Mulgara (*Dasycercus blythi*)

The Brush-tailed Mulgara is listed by the Department of Parks and Wildlife as Priority 4. It occurs across much of Western Australian, favouring spinifex grasslands on granitic red sands. While the species generally occurs in sandplains dominated by Spinifex (*Triodia* spp.) it does also occur within Mulga Woodland with a spinifex understorey (J. Turpin, pers. obs.). The Brush-tailed Mulgara has been recorded from the spinifex grasslands of the Murchison and Great Victoria Desert (DPaW, 2013, J. Turpin, pers. obs.), however there are few records in the Tropicana region.

The species has been recently described as distinct from the Crest-tailed Mulgara which is listed as Vulnerable under the EPBC Act. Woolley (*et. al.*, 2013) has recently reviewed all recent museum specimens held across Australia, with the only confirmed records of the Crest-tailed Mulgara coming from the Canning Stock Route and Rawlinna (200 km south of Tropicana, Woolley *et. al.*, 2013).

The Brush-tailed Mulgara was recorded from 16 locations along the survey corridor. Two females were trapped using Elliot Traps from spinifex sandplain (see Table 18). The females were trapped approximately 400m apart from sandplain habitat dominated by Spinifex (*Triodia* spp.) with scattered low Acacia shrubs (sees Plate 53 - 60) and containing numerous active Mulgara burrows. The females were distinguishable from the Crest-tailed Mulgara by the presence of a brush-tail, six

nipples and long hair folding over 75% of the sole from both sides of the foot (DPaW, 2013). Genetic samples (tissue and hair from tail tips) were also collected from both females and submitted to the Western Australian Museum for analysis (Specimen Numbers TM893 and TM894). The Brush-tailed Mulgara was also recorded on two motion-sensitive cameras, placed near the location were the two females were trapped.

Brush-tailed Mulgara burrows were recorded from a further 14 locations (see Table 18), all from sandplain sites dominated by Spinifex (*Triodia* spp.) with scattered low Acacia shrubs. Burrows were recorded as either active (the presence of freshly excavated soil, Mulgara tracks or scats) or inactive (no recent fresh evidence). Active burrow systems were recorded from nine locations. Burrow systems recorded were either a single burrow or a multi-entranced burrow system with several active entrances. All burrows were recorded under spinifex hummocks.

Most burrow systems were recorded from red, granitic sandplains with a sparse Acacia shrub layer. However, two burrow systems (both active) were recorded from yellow sandplain sites with spinifex and shrub layer including *Allocasuarina acutivalvis* and *Hakea francisiana*.

Table 18. Characters used to identify the Brush-tailed Mulgara.

Species	**Easting**	**Northing**	**Tail**	**Nipples**	**Hindfoot Hair**	**Short PES**	**Long PES**	**Habitat**	**WAM Genetic #**
Mulgara 1	522076	6771625	Brush	6	75% over sole	20.6	26.7	Spinifex Grassland	TM893
Mulgara 2	521782	6771245	Brush	6	75% over sole	20.1	23.5	Spinifex Grassland	TM894

Plate 53. A Brush-tailed Mulgara trapped within the survey corridor.

Plate 54. The six nipples recorded from one of the trapped females.

Plate 55. The “brush tail” of one of the females trapped.

Plate 56. The hindfoot of the Brush-tailed Mulgara.

Plate 57. Brush-tailed Mulgara burrow system within spinifex hummock grassland (red sandplain).

Plate 58. Brush-tailed Mulgara burrow system within spinifex hummock grassland (yellow sandplain).

Plate 59. Brush-tailed Mulgara recorded on motion camera.

Plate 60. Typical Brush-tailed Mulgara habitat – spinifex sandplain with sparse shrubs.

5.2.5 Striated Grasswren (*Amytornis striatus striatus*)

The Sandplain Subspecies of the Striated Grasswren (*Amytornis striatus striatus*) is listed as Priority 4 by DPaW and near threatened under the IUCN. In Western Australia, the subspecies has a scattered distribution, sparsely occurring across the Great Victoria, Gibson and Tanami deserts. An apparently isolated subpopulation occurs at Queen Victoria Spring at the south-western extreme of the species range (BirdLife Australia, 2013). The Sandplain Striated Grasswren inhabits sandplains dominated by mature spinifex (*Triodia* hummock grasslands) with an overstorey of shrubs, usually mallee eucalypts or less frequently heathland dominated by banksias or hakeas (Garnett *et. al.*, 2011).

The Striated Grasswren is primarily threatened by extensive wildfire that burns the mature spinifex hummock grassland on which it depends. It has significantly declined in parts of its range where repeated and intense fires have degraded habitat and removed refuges from which it can recolonise (Garnett *et. al.*, 2011). Given the ongoing process of large scale, intense and repetitive wildfires in central Australian deserts, the decline of the Striated Grasswren is considered to be persisting at 20 – 30 % in three generations and continuing (Garnett *et. al.*, 2011).

The Striated Grasswren (*Amytornis striatus striatus*) was recorded from three locations during the field surveys. A group of four was recorded within the survey corridor, from mature (long-unburnt) spinifex on a pale yellow sandplain with low proteaceous shrubs (*Melaleuca* sp.) and scattered Mallee (see Plate 61, Table 14). This habitat appears highly restricted and was recorded only in a small area along the survey corridor. Additionally, a group of three Striated Grasswrens were recorded from dense, low Acacia shrubs on spinifex sandplain, approximately 4 km north of the survey corridor (see Table 14). The Striated Grasswren had not been recorded on previous fauna surveys in the region, and due to its preference for mature grasslands, is likely to be rare and sparsely distributed in the local area.

Plate 61. Striated Grasswren habitat within the survey corridor - mature spinifex grassland on pale yellow sandplain.

5.2.6 Australian Bustard (*Ardeotis australis*)

The Australian Bustard is listed as Priority 4 by DPaW. This species is associated with a variety of grassland, grassy woodland and shrubland habitats, including spinifex grasslands and tussock grasslands. It will also forage in recently burnt areas (BirdLife Australia, 2013).

The Australian Bustard occurs over much of arid Australia. Historical declines have been recorded in southern parts of its range but current populations appear stable, particularly in the north (BirdLife Australia, 2013). The main threats to its survival include a combination of habitat loss/degradation and predation by feral cats and foxes.

The Australian Bustard was recorded during the survey from spinifex sandplain habitat (see Table 14, Figure 6). It is likely to occur throughout the survey area and region.

5.2.7 Southern Scrub-robin (*Drymodes brunneopygia*)

The Southern Scrub-robin is listed in this report as locally significant due to its historical and ongoing patterns of decline, coupled with its fragmented distribution. It is listed as declining in several publications (eg. BirdLife Australia, 2013, Johnstone and Storr, 2004), was listed as a declining species under the Action Plan of Australian Birds (Garnet and Crowley, 2000) and as a declining woodland species by Saunders and Ingram (1995). While not listed under state or national legislation, Johnstone and Storr (2004) also note some local extinctions in the Western Australia Wheatbelt.

The Southern Scrub-robin occurs in dense shrublands and thickets on sandplains, stony hills and breakaways (Johnstone and Storr, 2004). It has a scattered distribution across the southern, semi-arid zone of south-western Australia and also occurs on Eyre Peninsula and inland, south-eastern Australia. It formerly occurred throughout the Wheatbelt of Western Australia, however due to extensive land clearance, now occurs there in a few fragmented and isolated populations. In the eastern arid interior of its range (in Western Australia) the Southern Scrub-robin inhabits dense shrublands and thickets, particularly of *Acacia, Grevillea, Melaleuca, Senna, Thryptomene* and *Allocasuarina* (Johnstone and Storr, 2004). It has been recorded on sandplains supporting Mallee with a dense shrubby understorey (eg. at Lake Cronin), at the base of banded ironstone ridges where Acacia shrublands form dense thickets (eg. at Extension Hill) and from dense Allocasuarina shrublands (J. Turpin, pers. obs.).

The Southern Scrub-robin has declined across its range and has a highly fragmented distribution due to land clearance (through the Wheatbelt) and habitat specifity (across the inland arid extremes of its range, BirdLife Australia, 2013). Declines have been attributed to habitat loss (land clearance), fragmentation and degradation

(including fire), predation (by feral cats and foxes as the species nests on the ground, Johnstone and Storr, 2004) and the removal of food resources by fire (e.g. changes in the structure and floristics of vegetation, diversity and abundance of invertebrates, BirdLife Australia, 2013).

The Southern Scrub-robin was recorded during the field surveys, representing a significant range extension for the species. The species was recorded from ten locations of dense Mulga Woodland near Tropicana (see Table 19). The nearest known records come from an outlying population near Menzies, over 300 km to the south-west, with the main species range occurring west of Coolgardie, over 350 km to the south-west of Tropicana (Johnstone and Storr, 2004).

All records of the Southern Scrub-robin come from very similar habitat (Table 19, see Plates 62 - 67) – mature, tall and dense Mulga Woodland with a dense understorey including *Acacia ramulosa, Thryptomene biseriata, Eremophila forrestii* (and other Eremophila species) on sandy or gravelly plains between sand dunes. All records also come from relictual, long-unburnt Mulga Woodlands, relatively protected from fire by adjacent, tall and parallel sand dunes.

Table 19. Southern Scrub-Robin observation from the field surveys (UTM Zone 51).

Record	Easting	Northing	Habitat	Comments
1: Plate 64	639291	6765222	Mulga Woodland with dense understorey including *Thryptomene biseriata* on sandy interdune plain.	2 individuals observed
2:	627467	6763152	Mulga Woodland with dense understorey including *Thryptomene biseriata* on low gravelly rise / sand plain between sand dunes.	Heard calling
3: Plate 65	645694	6763579	Mulga Woodland with dense understorey including *Acacia ramulosa, Thryptomene biseriata, Eremophila forrestii* on sandy interdune plain.	2 individuals observed
4: Plate 66	635122	6764021	Mulga Woodland with dense understorey including *Thryptomene biseriata and Eremophila spp.* on low gravelly rise / sand plain between sand dunes.	2 individuals observed
5: Plate 67	626860	6764785	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Heard calling
6	643434	6762611	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Single bird observed
7	639194	6765247	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Pair observed
8	644576	6763298	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Single bird observed
9	627026	6763044	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Single bird observed
10	604177	6729311	Mulga Woodland with dense understorey including *Thryptomene biseriata* on gravelly interdune sandplain.	Pair observed

Fire is a significant threat to the ongoing survival of the Southern Scrub-robin in the Great Victoria Desert. At all locations where the species was recorded, the margins

of the Mulga Woodland showed signs of contraction owing to recent degradation and habitat removal by fire.

As the Southern Scrub-robin favours dense shrublands and woodlands, it seems to only persist in the long-unburnt areas, where a lack of fire (for extended periods) allows for the development of a structurally complex woodland. It is highly likely to be restricted to the few dense Mulga remnants in the Tropicana area. A review of satellite imagery reveals long-unburnt (dense, dark) Mulga Woodland is rare, fragmented and sparsely scattered through the region (see Figures 8 and 9). Most Mulga remnants are small, typically less than 1 km wide and situated on the interdune plains (with tall sand ridges providing some protection from fire). Some of the Mulga patches in the greater area may support additional populations of Scrub-robin, however many are likely to have been too recently burnt and / or support shrublands structurally too sparse to support the species.

The Southern Scrub-robin is therefore likely to have a highly fragmented and isolated distribution in the Tropicana area. As it has not been recorded in the region (despite numerous surveys) the Southern Scrub-robin is likely to be relatively rare and localised. The species has shown to be able to persist in the fragmented landscapes of the Wheatbelt (Johnstone and Storr, 2004) and appears to be similarly persisting in habitat remnants in the Great Victoria Desert. However due to the ongoing fire regime, the Southern Scrub-robin may be declining locally - as fire (and the subsequent replacement of Mulga with spinifex) increasingly fragments and degrades habitat.

Due to the sedentary nature of the Southern Scrub-robin, the population at Tropicana is highly likely to be a relictual population rather than a recent arrival from dispersing birds. It is likely to be a relic from when the species was much more widespread and perhaps formerly occurred continuously from Western Australia to South Australia and Eyre Peninsula. The long-unburnt relictual Mulga Patches may have allowed the species to persist in a landscape increasingly fragmented by altered fire regimes.

The Western Australian Museum is currently reviewing the taxonomy of several Western Australian birds including the Southern Scrub-robin. There appears to be some physical characters that vary across the Scrub-robin's range with northern birds distinct from southern birds (R. Johnstone, pers. comm.). There is the potential for the Tropicana birds to also show some distinctions in physical character from birds occurring over 350 km to the west. Genetic distinction is also possible as the species is highly sedentary (as shown in studies in the Wheatbelt, Johnstone and Storr, 2004) and so the species is likely to have been isolated in the Tropicana area for a long time.

Plate 62. The Southern Scrub-robin recorded near Tropicana.

Plate 63. The Southern Scrub-robin recorded near Tropicana.

Plate 64. Southern Scrub-robin habitat – Site 1 (dense Acacia and Thryptomene).

Plate 65. Southern Scrub-robin habitat – Site 3 (dense Acacia and Thryptomene).

Plate 66. Southern Scrub-robin habitat – Site 4 (dense Acacia and Eremophila).

Plate 67. Southern Scrub-robin habitat – Site 4 (dense Acacia and Thryptomene).

Figure 8. Southern Scrub-robin records from the Tropicana area – all come from dense, dark patches of Mulga between sand dunes.

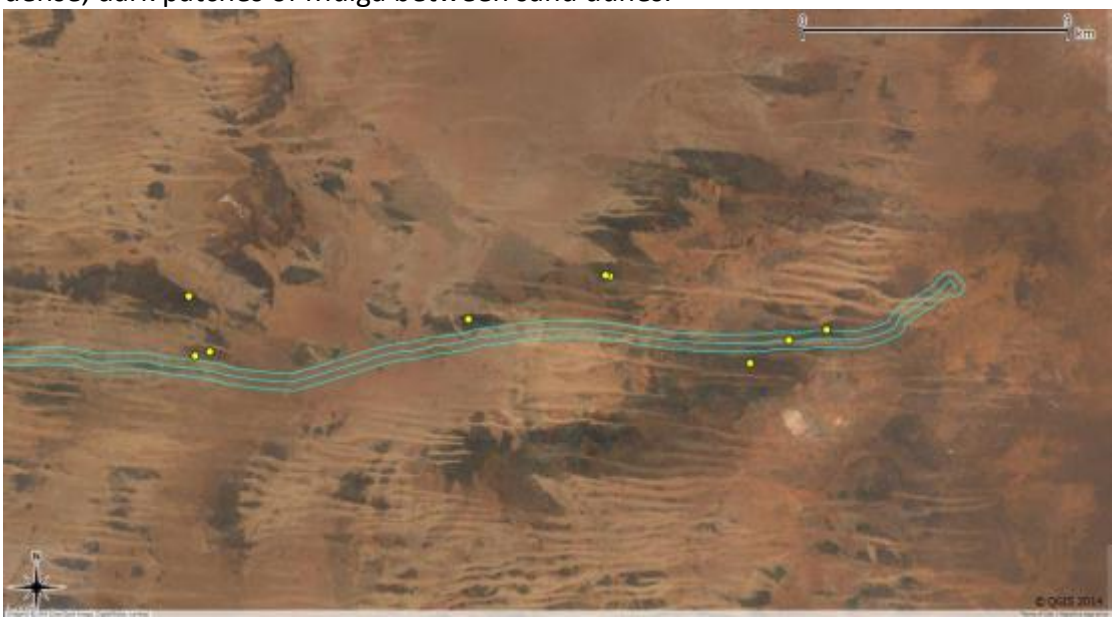


Figure 9. Southern Scrub-robin records from the Tropicana area – showing the highly fragmented habitat in the region. Note record 50 km south-west of Tropicana.

5.2.8 Scarlet-chested Parrot (*Neophema splendida*)

The Scarlet-chested Parrot (*Neophema splendida*) has declined due to extensive habitat clearance in the extremes of its range and has thought to have declined in the Goldfields and Murchison (Garnett and Crowley 2000). It is sparsely distributed throughout the Great Victoria Desert and has been recorded at Tropicana from Mallee / Spinifex Sandplain and from the regenerating fringes of Mulga Woodland (J. Turpin, pers. obs.). This species was recorded to the south of the survey corridor during the field surveys and is likely to occur within the survey area as a resident or breeding visitor.

5.2.9 Rufous Treecreeper (*Climacteris rufus*)

The Rufous Treecreeper is listed in this report as locally significant due to its pattern of distribution and listed decline across the woodlands of the Wheatbelt and Goldfields. Saunders and Ingram (1995) listed the Rufous Tree-creeper as a declining woodland species, where the removal of habitat (particularly the removal of mature trees with hollows) has led to the species decline.

The Rufous Treecreeper occurs in the south-west of Western Australia and southern South Australia. It is also sparsely distributed through the Marble Gum Woodlands of the Great Victoria Desert which may link the two broader populations, separated by the expanse of the Nullarbor Plain. The Rufous Treecreeper inhabits mature stands of Eucalypt Woodland, especially Wandoo (*Eucalyptus wandoo*), Salmon Gum (*Eucalyptus salmonophloia*) and Marble Gum (J. Turpin, pers. obs.). It requires large hollow bearing trees and fallen logs for nesting and foraging (BirdLife Australia 2013).

One party of Rufous Treecreepers was recorded from mature but recently burnt, Marble Gum Woodland (see Figure 6, and Plate 68). Four individuals were recorded with the behaviour of an individual disappearing into a tree hollow indicating a breeding site.

The record of the Rufous Treecreeper is of note as it is likely to have a rare occurrence in the region. The species has not been recorded in the Tropicana area previously despite numerous surveys and the Treecreepers distinctive and penetrating call. The Rufous Treecreeper is likely to be threatened by high intensity fires degrading habitat and removing mature tree hollows and logs.

Plate 68. Burnt Marble Gum Woodland supporting the Rufous Treecreeper.

5.2.10 Rainbow Bee-eater (*Merops ornatus*)

The Rainbow Bee-eater is listed as Migratory under the EPBC Act. It is an abundant, ground-nesting species that catches insects on the wing over a range of environments. The Rainbow Bee-eater is able to nest in a range of habitat types including disturbed environments such as cleared paddocks and vacant residential blocks (J. Turpin, pers. obs.). It was recorded along the survey corridor from both survey sections. Due to its widespread occurrence, the presence of the Rainbow Bee-eater in the survey corridor is not considered significant.

5.2.11 Chestnut Quail-thrush (*Cinclosoma castanotum*)

The Chestnut Quail-thrush is listed in this report as locally significant due to its pattern of distribution and listed declines in the adjacent Goldfields and Wheatbelt regions (Saunders and Ingram, 1995). The Chestnut Quail-thrush inhabits woodlands with a shrubby understorey, including Salmon Gum and Black Oak (*Casuarina pauper*, J. Turpin, pers. obs.). One small group of Chestnut Quail-thrush was recorded from the survey corridor.

5.3 Conservation Significant Fauna Expected within the Survey Area

While several conservation significant fauna species were recorded during the field survey, many additional species are also expected to occur in the area, based on the available habitats present. Many fauna species are cryptic, nomadic, may be difficult to detect, or may only be active at particular times of the year or present in a given area during favourable conditions. As a result, several additional fauna species not recorded during the field surveys are expected to occur within the survey area. These are discussed below.

5.3.1 Great Desert Skink (*Liopholis kintorei*)

The Great Desert Skink is listed as Vulnerable under the EPBC Act and WC Acts. It inhabits red spinifex sandplains. Populations in the Gibson Desert occur on sandplain supporting spinifex hummock grasslands, scattered shrubs and occasional trees (e.g. *Acacia* spp., *Eucalyptus* spp., *Hakea* spp., *Grevillea* spp. and *Allocasuarina decaisneana*, DOTE, 2013). In the Tanami Desert and parts of the Great Sandy Desert, this skink also occurs on paleodrainage lines with giant termite mounds and *Melaleuca* shrubs (DOTE, 2013).

There is a single record of the Great Desert Skink in the vicinity of the survey area, from 39 km east-north-east of Laverton (DOTE, 2013). As the species has been recorded in the region and from habitats traversed by the survey corridor, there is the potential for the Great Desert Skink to occur within the survey area. The species does have distinctive burrows with scat latrines. No evidence of *Liopholis kintorei* was recorded from the survey area despite searching within areas of suitable habitat. As the species has not been recorded in the region since 1967 (DPaW, 2013), it is likely to be sparsely distributed and an uncommon resident.

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

The Slender-billed Thornbill is listed as Vulnerable under the EPBC Act. The Slender-billed Thornbill occurs in shrubland, typically in areas of saltmarsh dominated by Samphire, Bluebush (*Maireana*) or Saltbush (*Atriplex*) around salt lakes or low heath on sandplain (Pavey, 2002). The species occurs in a number of disjunct populations in Western Australia, from Shark Bay to the Nullarbor (Johnstone and Storr, 2004). The Slender-billed Thornbill is considered uncommon, rare (and in some areas locally extinct) in inland Western Australia. The species is declining over much of its range due to the degradation of chenopod vegetation by livestock and rabbits (Johnstone and Storr, 2004). In the Northern Territory, the subspecies is classified as Regionally Extinct (Pavey, 2002).

The Slender-billed Thornbill has been recorded in the local area. Ninox recorded the species at Lake Carey, 2 km west of survey corridor near Sunrise Dam. Several individuals were recorded from Samphire on a gypsiferous dune system fringing the salt lake (Ninox, 1995).

Several areas of habitat suitable for the Slender-billed Thornbill occur within the survey area. These include areas of Samphire on saline drainage systems and adjacent saline plains with or without Bluebush (*Maireana*) or Saltbush (*Atriplex*). Such habitat occurs in the areas fringing Lake Carey and Hope Campbell Lake. Due to the presence of suitable habitat and records in close proximity to the survey area, the Slender-billed Thornbill is likely to occur within the survey area, as a resident or regular visitor.

5.3.3 Princess Parrot (*Polytelis alexandrae*)

The Princess Parrot is listed as Vulnerable under the EPBC Act and Priority 4 by DPaW. It is sparsely distributed through the arid regions of western and central Australia, mainly confined to the Great Sandy, Gibson, Tanami and Great Victoria Deserts and the central ranges (DOTE, 2013). The Princess Parrot inhabits sand dunes and sand flats supporting open woodlands and shrublands that usually consist of scattered stands of *Eucalyptus* (including *E*. *gongylocarpa* and mallee species), *Casuarina* or *Allocasuarina* trees and an understorey of shrubs such as *Acacia* (especially *A*. *aneura*), *Senna*, *Eremophila*, *Grevillea*, *Hakea* and a ground cover dominated by *Triodia* species (DOTE, 2013).

The Princess Parrot has been recorded in the Queen Victoria Spring and Neale Junction Nature Reserves (DPaW, 2013) and is likely to occur periodically in the intervening areas, including the survey area. The Princess Parrot is thought to be highly nomadic and mobile and, at some locations, intervals of more than 20 years can elapse between sightings (DOTE, 2013). Large areas of the survey corridor appear suitable for the Princess Parrot – extensive areas of Marble Gum Woodland. As a result, the Princess Parrot is likely to be a visitor or irregular breeding resident to the survey area. While it may not occur in the survey area for many years, there is the potential for the species to breed in the survey area during favourable conditions.

5.3.4 Crest-tailed Mulgara (*Dasycercus cristicauda*)

The Crest-tailed Mulgara is listed as Vulnerable under the EPBC and WC Acts. The national Department of the Environment recognises the distribution of the species as the southern Simpson Desert where the borders of the Northern Territory, Queensland and South Australia converge, and the Tirari and Strzelecki Deserts of South Australia. Recent work (Woolley *et. al.*, 2013) however, suggests the species does also occur in Western Australia from a few scattered areas, including the Great Sandy Desert and near Rawlinna (200 km south of Tropicana). It has been reported to inhabit sand dunes with sparse cover of Sandhill Canegrass or areas around salt lakes with Nitre Bush (DOTE, 2013).

The closely related Brush-tailed Mulgara (*Dasycercus blythi*) was recorded to occur extensively along the survey corridor inhabiting red and yellow spinifex sandplains. Both Mulgara species have been recorded together in sympatry (DOTE, 2013) and

since the Cres-tailed Mulgara has been confirmed from the Rawlinna area, the possibility of *Dasycercus cristicauda* occurring within the survey area cannot be discounted. However, based on current distribution and habitat information, the presence of the Crest-tailed Mulgara within the survey area appears unlikely.

5.3.5 Long-tailed Dunnart (*Sminthopsis longicaudata*)

The Long-tailed Dunnart is listed as Priority 4 by DPaW. In Western Australia this species has been recorded from widely separated populations in the Pilbara, Murchison, Gibson Desert and southern Carnarvon Basin (DPaW, 2013). The Long-tailed Dunnart appears to be a specialist of rocky habitats (rocky ridges, hills and breakaways) and particularly banded ironstone ridges (DEC, 2007, J. Turpin pers. obs.).

The Long-tailed Dunnart has been recorded in the region with several records from a banded ironstone ridge near Granny Smith mine. The proposed pipeline route passes across some linear banded ironstone ridges and also some ironstone rises and slopes near the Irwin Hills. As a result a resident population is highly likely to occur within the survey area.

5.3.6 Grey Falcon (*Falco hypoleucos*)

The Grey Falcon is listed as Vulnerable under the Wildlife Conservation Act and IUCN. It has a distribution centred around ephemeral or permanent drainage lines, utilising old nests of other bird species situated in the tallest trees along the river systems (Garnett and Crowley 2000). It favours lowland plains (such as sparsely wooded cracking clay plains and acacia shrublands that are crossed by tree-lined watercourses) and frequents wooded arid drainage lines and permanent waterholes (J. Turpin, pers. obs.).

The Grey Falcon has been recorded near Murrin Murrin and near Salt Creek (60 km south-east of Tropicana). As a result it is likely to occur periodically within the survey area, however due to a lack of tree-lined watercourses it is expected as a non-breeding and irregular visitor.

5.3.7 Bush Stone-curlew (*Burhinus grallarius*)

The Bush Stone-curlew is classified as Priority 4 by DPaW. In the Murchison, it is often associated with Acacia woodlands and shrublands (including Mulga), banded ironstone ranges and ephemeral or permanent watercourses (J. Turpin, pers. obs.). However its occurrence near the survey area is limited. The Bush Stone-curlew has been recorded near Leonora from Mulga woodland (J. Turpin pers. obs.) and several areas of suitable habitat occur within the survey area. It is likely to occur in the Mulga woodlands of the survey area, within the Acacia shrublands associated with the banded ironstone ridges and also the dense Acacia shrublands associated with the rocky rises east of Sunrise Dam including the Irwin Hills. However, records of the species across the deserts of Western Australia are few and scattered and as a result

the species may be absent from the lightly wooded sandplains of much of the survey area.

5.3.8 Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is listed under Schedule 4 (Other Specially Protected Fauna) of the Wildlife Conservation Act. This species is found in a variety of habitats, including rocky ledges, cliffs, watercourses, open woodland and acacia shrublands (Johnstone and Storr 1998).

The distribution of the Peregrine Falcon is often tied to the abundance of prey as it predates heavily on other birds. The Peregrine Falcon lays its eggs in recesses of cliff faces, tree hollows or in large abandoned nests of other birds (Johnstone and Storr 1998). The Peregrine Falcon mates for life with pairs maintaining a home range of about 20 -30 km^2. Blakers *et al*. (1984) consider that Australia is one of the strongholds of the species, since it has declined in many other parts of the world. The Peregrine Falcon has been recorded from the vicinity of the project from Leonora, Queen Victoria Spring and Plumridge Lakes Nature Reserves (BirdLife Australia, 2013). This species is likely to occur within the survey area.

5.3.9 Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)

Major Mitchell's Cockatoo is listed under Schedule 4 of the Wildlife Conservation Act. It is sporadically distributed through arid and semi-arid Australia and may occur in sparsely timbered grasslands and shrublands (DEC, 2012). In the Murchison region this species is mostly restricted to the margins of the Murchison River (BirdLife Australia, 2013) where it has been recorded within *Eucalyptus camaldulensis* woodland particularly near water (J Turpin, pers. obs.). Major Mitchell's Cockatoo also occurs in the Great Victoria Desert, with records from Queen Victoria Spring Nature Reserve (DPaW, 2013).

This species has the potential to occur within the survey area and is considered to be an irregular visitor to the area.

5.3.10 EPBC Migratory Birds

Several additional bird species listed as Migratory under the EPBC Act are expected to occur within the survey area. This includes the Fork-tailed Swift (expected as a rare and seasonal visitor) and several migratory waterbirds.

Most waterbird species are expected to occur in the survey corridor only as rare visitors, associated with the irregular flooding of the salt lake habitats (Sandpipers, Red-necked Stint, Common Greenshank, Great Egret). The Fork-tailed Swift is an aerial species that is largely independent of terrestrial habitat types and is considered to occur in the region only as a rare visitor.

5.3.11 Woma (*Aspidites ramsayi*)

The Woma is listed under Schedule 4 of the WA Wildlife Conservation Act. The south-west population of this species is considered threatened and additionally listed as Priority 1 by DPaW. The Woma occurs in a variety of arid sandplain habitats including desert sandplain and dune systems and is strongly associated with red desert sandplains supporting spinifex hummock grasslands (Maryan, 2002). There are two available records of the Woma for the greater region, including near Kookynie, and Kitchener, 100 km south of the survey area. As the Woma is widespread across arid areas of Western Australia a resident population is considered to occur within the survey area.

5.3.12 Dotty-tailed robust slider (*Lerista puncticauda*)

Lerista puncticauda is listed as Priority 2 by the DPaW due to its highly restricted distribution. It is only known from four closely grouped locations within and adjacent to Queen Victoria Spring Nature Reserve (approximately 90 km south of the survey area, DPaW, 2013). *Lerista puncticauda* has been raked from leaf litter under Marble Gum trees on spinifex sandplain and occurs in sympatry with *Lerista desertorum* (B. Maryan, pers. com.). As suitable habitat for this species occurs within the survey area, there is the potential for *Lerista puncticauda* to occur within the proposed infrastructure corridor.

5.3.13 Naretha Blue Bonnet (*Northiella haematogaster narethae*)

The Naretha Blue Bonnet is listed under Schedule 4 of the state Wildlife Conservation Act and was thought to have been trapped in substantial numbers in the past (Garnett and Crowley 2000). The Naretha Blue Bonnet favours the open Acacia (including Western Myall) and Allocasuarina Woodlands that fringe the Nullarbor Plain, particularly with a chenopod understorey (Garnett and Crowley 2000). Several records come from the Plumridge Lakes area, which appears to lie near the western extreme of the species range (BirdLife Australia, 2013). As a result the species is not expected to occur within the survey area, or depend on habitat present there. Due to the presence of a population near Plumridge Lakes there is the potential for vagrants to move through the survey area.

5.3.14 Central Long-eared Bat (*Nyctophilus timoriensis*)

The central form of the Greater Long-eared Bat is listed as Priority 4 by DEC. This species is regarded as locally common in the Coolgardie Bioregion, where it occurs in Eucalypt Woodlands with a tall shrub understorey and roosts in tree hollows. This species also inhabits Mallee and Acacia shrublands and has been found to the fringes of the Nullarbor Plain (DOTE, 2013). It has been recorded from the woodlands north of Queen Victoria Spring Nature Reserve approximately 70 km south of the survey

area and due to the presence of suitable habitat is considered likely to occur within the survey area.

5.3.15 Greater Bilby (*Macrotis lagotis*)

The Greater Bilby is listed as Vulnerable under the EPBC and WC Acts. The species formerly occurred across much of Western Australia but is now patchily distributed across the Great Sandy Desert and scattered populations occur across the northern Pilbara (DPaW, 2013, J. Turpin, pers. obs.). There are historical records of the Greater Bilby from the region including from Laverton, however this species is considered locally extinct in the region (like many other mammals such as the Numbat) and is highly unlikely to occur within the survey area.

5.3.16 Carpet Python (*Morelia spilota imbricata*)

The Carpet Python is listed under Schedule 4 of the Wildlife Conservation Act. *Morelia spilota imbricata* occurs in south-west Western Australia, from Northampton, south to Albany and to east of Kalgoorlie. It occurs in Banksia woodland, Eucalypt woodland, forests, dense coastal scrub, granite and limestone outcrops and along watercourses (Bush *et al*., 2007). Carpet Pythons are arboreal, terrestrial, and rock-dwelling and can shelter in burrows made by other animals, hollow tree limbs, or rock crevices. The South-west Carpet Python has declined in distribution due to the loss of habitat (associated with land clearance), and changed fire regimes. Predation by exotic predators (foxes and feral cats) may have also contributed to the decline of python populations (DEC, 2007).

The Carpet Python has been recorded from within 25 km of Tropicana (ecologia, 2009). Due to the presence of suitable habitat and the occurrence of a local record, the Carpet Python is considered likely to occur in the survey corridor.

5.3.17 Night Parrot *(Pezoporus occidentalis)*

The Night Parrot is listed as Critically Endangered under the EPBC Act and under Schedule 1 under the WC Act. It has been recorded only from arid landscapes of Australia's interior and while seen fairly regularly in the late 19th Century, it was considered by some authorities to be extinct by the middle of the 20th Century despite occasional unconfirmed sightings (Bamford, 2012). The habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments, and of samphire and chenopod shrublands (including *Atriplex* and *Maireana*) on floodplains and claypans, and on the margins of saltlakes and creeks (DOTE, 2013). Recent records come from the Pilbara, south-western Queensland and northern arid New South Wales (DOTE, 2013). A confirmed record of the species during 2013 has sparked renewed interest in the species and the thought that other arid populations may still be extant. There are no available historical records near the survey area and while the survey corridor appears to contain extensive areas of suitable habitat,

based on the current knowledge of the species an extant population in the survey area seems unlikely.

5.3.18 Buff-snouted Blind Snake (*Ramphotyphlops margaretae*)

Ramphotyphlops margaretae is listed as Priority 2 by DPaW. It has been recorded north of the survey area at Neale Junction, at Lake Throssell (80 km east of Tropicana) and has been recently recorded at Maralinga in South Australia, suggesting the species may be much more widespread than previously thought (Hutchinson, 2011). There is the potential for the species to occur within the survey area.

5.3.19 Locally Significant Fauna

Several locally significant fauna species are expected to occur within the survey area. While not listed under state or federal legislation, these species are considered conservation significant due to their habitat limitations and restricted or published declining ranges. These are discussed below:

1. *Aprasia picturata*: has a highly restricted distribution, known from two distinct areas near Leonora and Wiluna. The two records from near Leonora come from 20 km south-west of the survey corridor on greenstone ridges supporting low *Acacia* and *Eremophila* shrubland. The Wiluna record comes from *Triodia* hummock grassland (Wilson and Swan, 2013). Both habitats occur within the infrastructure corridor and as a result the species is considered likely to occur within the survey corridor;
2. Regent Parrot (*Polytelis anthopeplus*): has declined over its range due to clearing for agriculture and the decline of suitable nest trees (Garnett and Crowley, 2000). It has been recorded in the Tropicana area from Marble Gum Woodland (J. Turpin, pers. obs.) and is likely to occur within the survey area;
3. Square-tailed Kite (*Lophoictinia isura*): is sparsely distributed over much of the Australian mainland, with a few scattered records from the region (Birdlife Australia, 2013). There is the potential for this species to occur as a resident or seasonal visitor;
4. Purple-crowned Lorikeet (*Glossopsitta porphyrocephala*): is listed as a declining woodland species (Saunders and Ingram, 1995) and has been recorded from the Tropicana area, from Eucalypt Woodland (J. Turpin, pers. obs.). This species is likely to occur as a seasonal visitor to the survey area;
5. Kultarr (*Antechinomys laniger*): is often associated with stony, granitic plains dominated by Acacia, Eremophila and Senna shrublands (Van Dyck and Strahan, 2008). The Kultarr is uncommon over most of its range, and populations appear to fluctuate seasonally (Van Dyck and Strahan, 2008). This species may occur periodically within the survey area; and
6. Woolley's Pseudantechinus (*Pseudantechinus woolleyae*) was recorded from north of Sunrise Dame (outside the survey corridor) with several scats recorded from a rock crevice on the crest of a banded ironstone ridge. This species is considered likely to occur within the survey area in areas of rocky outcropping.

6. SUMMARY OF FAUNA VALUES

The vertebrate fauna assemblage occurring along the proposed infrastructure corridor is potentially rich because the routes traverse a large and remote area and a variety of habitats. The majority of species recorded or expected are widespread however a number of significant species are present and include several listed under the EPBC Act. The project area does have some notable values:

- Conservation significant fauna species present including the EPBC listed Southern Marsupial Mole, Sandhill Dunnart and Malleefowl, several DPaW priority species including the Brush-tailed Mulgara, Striated Grasswren, Australian Bustard and the locally significant and relictual Southern Scrub-robin;
- A resident population of EPBC listed Slender-billed Thornbill is considered likely to occur in adjacent areas;
- The potential for a resident population of the Great Desert Skink; and
- Remote and intact fauna assemblage with refugia.

Significant Fauna Habitats

The main habitat types occurring within the survey area are described in Section 4 (above). The majority of the infrastructure corridor is comprised of habitats considered widespread and well represented in a regional sense. This includes the sandplain and stony alluvial plain habitats. However several significant fauna habitats were recorded along the proposed infrastructure corridor. Significant fauna habitats included those supporting significant fauna, restricted or relictual habitats and a potential Priority Ecological Community (PEC):

- Dense Mulga Woodland (Malleefowl habitat);
- Yellow sandplain habitats with elements of a Priority Ecological Community;
- Sand dunes (Sandhill Dunnart and Southern Marsupial Mole habitat);
- Mature Spinifex Hummock Grasslands associated with Yellow Sand Dunes (optimal habitat for the Sandhill Dunnart);
- Samphire Shrublands (Slender-billed Thornbill habitat);
- Long-unburnt low proteaceous heath (Striated Grasswren habitat); and
- Isolated rocky outcrops (refugia).

The significant fauna habitats are detailed Table 20 and mapped in Figure 10.

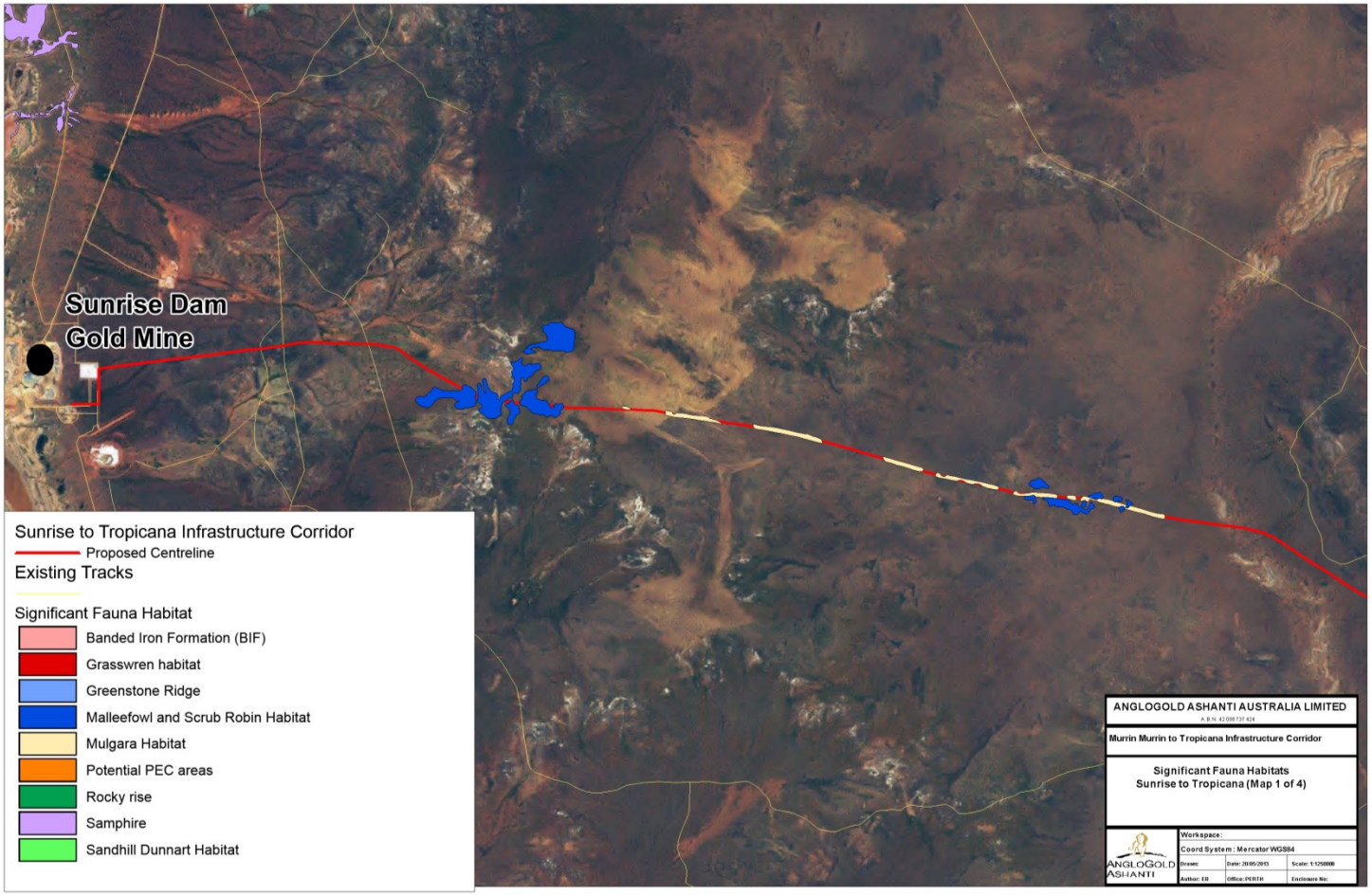
Table 20: Significant Fauna Habitats occurring within the Survey Area.

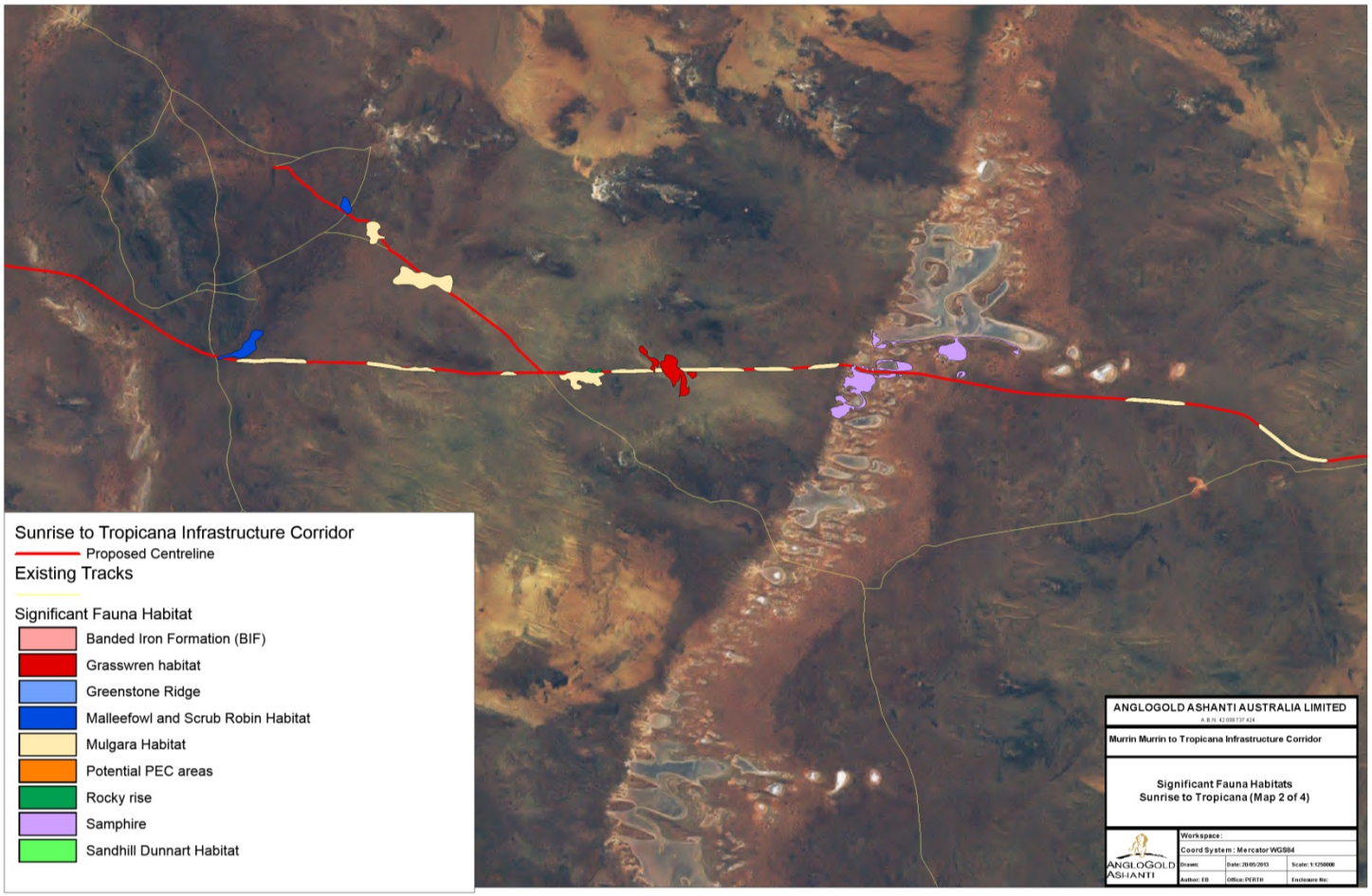
Fauna habitat	Description and occurrence in survey corridor	Conservation Significant Fauna Supported	Significance for Biodiversity	Comments
Mulga Woodland on hardpan / rocky ridges	Restricted to the western fringes of survey corridor (see Figure 10): 1. To a gravelly rise 20 km east of Sunrise Dam; 2. On the flanks of Irwin Hills; 3. Slopes of BIF ridges.	Malleefowl, Southern Scrub-robin, Bush Stone-curlew	Likely to support a restricted fauna assemblage	Minimal occurrence along pipeline route therefore minimal disturbance anticipated.
Mulga Woodland (sandplain)	Occurs in small patches typically less than 1 km wide and typically between sand ridges of the Great Victoria Desert. Its occurrence along the survey corridor is generally within 30 km of Tropicana (see Figure 10). Fragmented in the region.	Malleefowl, Southern Scrub-robin, Bush Stone-curlew	A restricted and relictual habitat, supports a restricted fauna assemblage. Likely refugia. Habitat degraded by fire. Susceptible to weed invasion. Due to repeat high intensity fire events generally occurs as small relics.	Pipeline route avoids most Mulga remnants however does intersect some small areas
Yellow Sandplain (PEC)	While the mapped Yellow Sandplain PEC occurs to the south, several areas resembling the Yellow Sandplain PEC were recorded along the corridor (containing indicator species such as *Xanthorrhoea thorntonii, Allocasuarina acutivalvis, Grevillea secunda* and *Hakea francisiana*. Several areas occur between Hope Campbell Lake and Tropicana. While much of the habitat traversed by the survey corridor had been recently burnt, large areas of mature, intact habitat remain.	Sandhill Dunnart, Brush-tailed Mulgara, Princess Parrot, Southern Marsupial Mole	Supports a "cross-over" assemblage, containing elements of both the temperate south-west and the arid desert interior. Intact habitat threatened by fire.	Widespread along eastern parts of corridor. Therefore large areas of yellow sandplain anticipated to be cleared. Sand dunes mostly avoided.

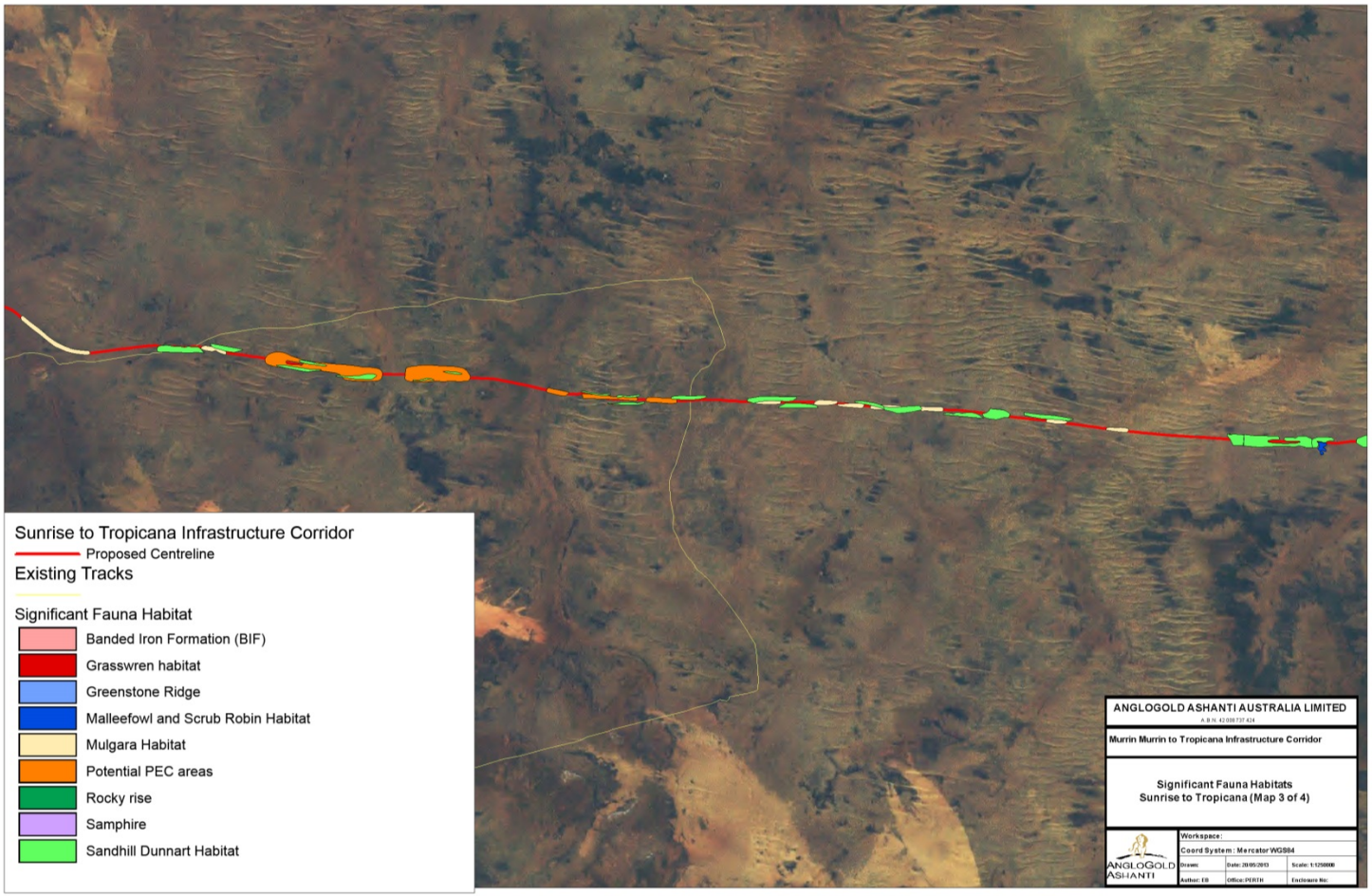
Fauna habitat	Description and occurrence in survey corridor	Conservation Significant Fauna Supported	Significance for Biodiversity	Comments
Yellow Sand Dunes	A subset of the Yellow Sandplain PEC habitat. Several areas of longitudinal yellow sand dunes occur in the vicinity of the survey corridor. However most elevated dunes occur outside the proposed pipeline alignment.	Sandhill Dunnart, Southern Marsupial Mole	Sand dunes support a restricted and specialised fauna assemblage (eg. Southern Marsupial Mole).	Most elevated sand dunes occur outside the pipeline alignment. Possible impacts to minor areas of low lying dunes.
Sandhill Dunnart habitat	Several areas of sand dune and sandplain habitat with long unburnt, mature spinifex (with *Triodia* spp. life stage 2 - 3.5) occur. Along the survey corridor Sandhill Dunnart Habitat has been mapped and is classified as Optimal, Likely, Marginal or Unlikely (see Appendix 7, Figure 10). The Sandhill Dunnart was recorded at four locations. In these areas continuous habitat is considered "Optimal".	Sandhill Dunnart, Southern Marsupial Mole, Brush-tailed Mulgara, Princess Parrot.	The Sandhill Dunnart is a species of high conservation significance and has a highly restricted range in the region. Habitat also likely to support other significant fauna. Intact habitat threatened by fire and due to repeat high intensity fire events generally occurs as small relics.	Occurs patchily along the eastern parts of the survey corridor. Therefore some areas may be cleared.
Banded Ironstone Formation (BIF) Hills and Ridges	Occurs across a small area associated with the Irwin Hills.	Long-tailed Dunnart, Malleefowl, Bush Stone-curlew	BIF supports a restricted fauna assemblage	Small areas occur along northern spur of infrastructure corridor. Minimal disturbance anticipated.
Low rocky outcrops	Minor areas of isolated and low rocky outcrops were recorded. A small area occurs adjacent to pipeline route.	Long-tailed Dunnart	Likely to support a restricted fauna assemblage. Also contain sites of archaeological interest.	A small area lies directly adjacent to pipeline route, but outside disturbance footprint

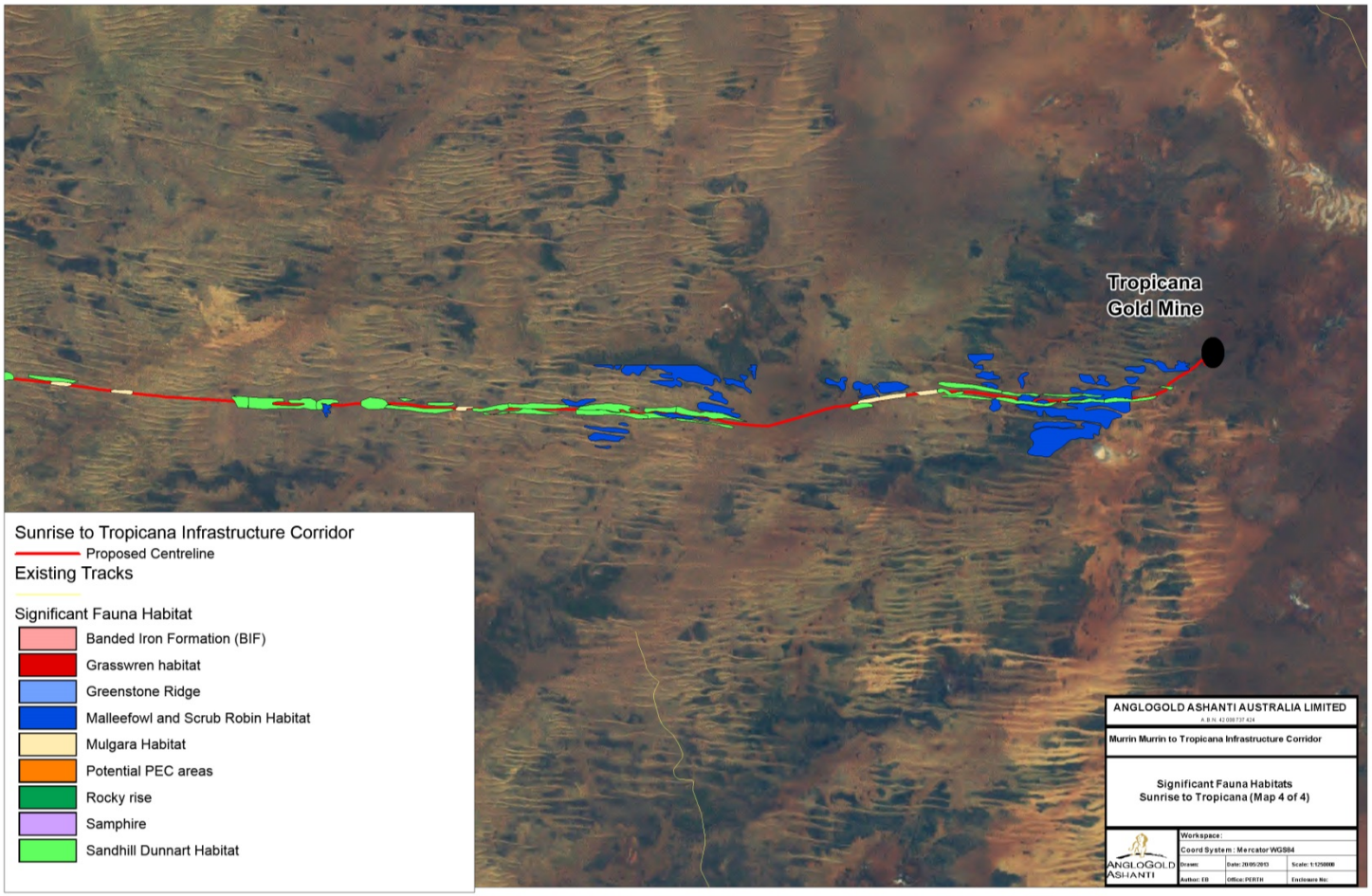
Fauna habitat	Description and occurrence in survey corridor	Conservation Significant Fauna Supported	Significance for Biodiversity	Comments
Samphire shrublands	Fringing Lake Carey and Hope Campbell Salt Lakes, most habitat occurs outside the corridor, some small areas noted inside.	Slender-billed Thornbill	Likely to support a restricted fauna assemblage. Also potential for SRE fauna.	Small areas of Samphire occur adjacent to pipeline route.
Long-unburnt proteaceous heath	Pale yellow sandplain with low proteaceous shrubs (*Melaleuca* sp.) and scattered Mallee. Occurs in a small discrete area west of Hope Campbell Lake.	Striated Grasswren	Likely to support other species of conservation significance such as the Brush-tailed Mulgara.	Small areas occur within corridor and may be cleared.
Red Sandplain	A widespread habitat but generally occurs in discrete areas.	Brush-tailed Mulgara, Great Desert Skink	While widespread, specific subsets of this habitat may support the conservation significant Great Desert Skink.	Large areas of sandplain habitat to be cleared, however habitat is widespread. Avoid important areas containing Great Desert Skink populations and where possible active Mulgara burrows.

Figure 10: Significant Fauna Habitats occurring within the Project Area.




Sunrise to Tropicana Infrastructure Corridor
Proposed Centreline
Existing Tracks
Significant Fauna Habitat
Banded Iron Formation (BIF)
Grasswren habitat
Greenstone Ridge
Malleefowl and Scrub Robin Habitat
Mulgara Habitat
Potential PEC areas
Rocky rise
Samphire
Sandhill Dunnart Habitat
ANGLOGOLD ASHANTI AUSTRALIA LIMITED
Murrin Murrin to Tropicana Infrastructure Corridor
Significant Fauna Habitats
Sunrise to Tropicana (Map 2 of 4)
Workspace:
Coord System : Mercator WGS84
Drawn:
Date: 20/05/2013
Scale: 1:250000
Author: EB
Office: PERTH
Enclosure No:


Sunrise to Tropicana Infrastructure Corridor
Proposed Centreline
Existing Tracks
Significant Fauna Habitat
Banded Iron Formation (BIF)
Grasswren habitat
Greenstone Ridge
Malleefowl and Scrub Robin Habitat
Mulgara Habitat
Potential PEC areas
Rocky rise
Samphire
Sandhill Dunnart Habitat
ANGLOGOLD ASHANTI AUSTRALIA LIMITED
Murrin Murrin to Tropicana Infrastructure Corridor
Significant Fauna Habitats
Sunrise to Tropicana (Map 3 of 4)
ANGLOGOLD ASHANTI
Workspace:
Coord System : Mercator WGS84


Tropicana
Gold Mine
Sunrise to Tropicana Infrastructure Corridor
Proposed Centreline
Existing Tracks
Significant Fauna Habitat
Banded Iron Formation (BIF)
Grasswren habitat
Greenstone Ridge
Malleefowl and Scrub Robin Habitat
Mulgara Habitat
Potential PEC areas
Rocky rise
Samphire
Sandhill Dunnart Habitat
ANGLOGOLD ASHANTI AUSTRALIA LIMITED
Murrin Murrin to Tropicana Infrastructure Corridor
Significant Fauna Habitats
Sunrise to Tropicana (Map 4 of 4)
ANGLOGOLD ASHANTI
Workspace:
Coord System : Mercator WGS84
Drawn:
Date: 20/05/2013
Scale: 1:250000
Author: EB
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Enclosure No:

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Appendix 1. Categories used in the assessment of conservation status.

IUCN categories (based on review by Mace and Stuart 1994) as used for the Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act.

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

Definitions of relevant categories under the EPBC Act.

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

Schedules used in the WA Wildlife Conservation Act.

CATEGORY	DEFINITION
Schedule 1.	Species that are Rare and Likely to become Extinct
Schedule 2.	Species that area presumed Extinct.
Schedule 3	Migratory species listed under international treaties.
Schedule 4.	Other Specially Protected Fauna.

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

CATEGORY	DEFINITION
Priority One (P1)	Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (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 if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	Taxa in need of monitoring Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependant).

Appendix 2: Fauna Survey Sites

Tables 1 – 4 detail the locations of the fauna survey sites sampled during the field surveys.

Table 1. Systematic Trapping Sites 2013:

Site 1: 518827E, 6771918N. *E. gongylocarpa, Acacia* sp., *Callitris columellaris, Hakea francisiana* over *Triodia* Hummock Grassland. Elevated Yellow Sandplain.	
Site 2: 520121E, 6771847N. *E. gongylocarpa, Callitris columellaris, sedges* over *Triodia* Hummock Grassland. Elevated Yellow Sandplain.	

Site 3: 522076E, 6771628N. Scattered Mallee (*Eucalyptus youngiana*) and *Brachychiton gregoryi* over low *Acacia* sp. and Spinifex (*Triodia basedowii*). Low lying red / granitic sandy / clay plain.	
Site 4: 520909E, 6771542N. Scattered Mallee (*Eucalyptus youngiana*) and *Brachychiton gregoryi* over low *Acacia* sp. and Spinifex (*Triodia basedowii*). Low lying red / granitic sandy / clay plain.	
Site 5: 518411E, 6771839N. *E. gongylocarpa, Hakea francisiana,* over *Triodia* sp., sedges. Elevated Yellow / Orange Sandplain	

Site 6: 566657E, 6769651N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* spp., *Xanthorrhoea thorntonii* Yellow Sand Dune.	
Site 7: 569203E, 6769832N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Allocasuarina acutivalvis, Xanthorrhoea thorntonii, Triodia* spp. Yellow Sandplain.	
Site 8: 569848E, 6767087N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, *Triodia* spp. Yellow Sand Dune.	

Site 9: 566614E, 6766862N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Allocasuarina acutivalvis, Xanthorrhoea thorntonii, Triodia* spp. Yellow Sandplain.	
Site 10: 548820E, 6766396N. *Acacia aneura* over *Triodia basedowii.* Red sandy-clay plain.	
Site 11: 603552E, 6763990N. Recently burnt *E. gongylocarpa, Callitris columellaris, Triodia* sp. Yellow Sand Dune.	

Table 2. Systematic Trapping Sites 2014 (Sandhill Dunnart):

Site 1: 646049E, 6763200N. *E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.* Yellow Sand Dune	
Site 2: 645198E, 6763280N. *E. gongylocarpa, Callitris columellaris, Acacia ramulosa, Acacia ligulata, Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii over Triodia spp.* Yellow Sand Dune.	

Site 3: 628047E, 6762304N. *E. gongylocarpa, Callitris columellaris,* mixed *Acacia* shrubs *over Triodia spp.* Orange / Yellow Sand Dune.	
Site 4: 623482E, 6762885N. *E. gongylocarpa, Callitris columellaris, mixed Acacia* shrubs*, Thryptomene biseriata, Anthotroche pannosa, over Triodia spp.* Yellow Sand Dune.	
Site 5: 622992E, 6763018N *E. gongylocarpa, E. youngiana, Callitris columellaris,* mixed Acacia, *Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa over Triodia spp.* Yellow / Orange Sandy rise.	

Site 6: 615615E, 6763153N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, mixed Acacia, *Grevillea juncifolia, Hakea francisiana, Triodia* spp. Yellow Sand Dune.	
Site 7: 612883E, 6763382N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, mixed Acacia, *Grevillea juncifolia, Hakea francisiana, Xanthorrhoea thorntonii Triodia* spp. Yellow Sand Dune.	
Site 8: 608905E, 6763463N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris*, *Xanthorrhoea thorntonii Triodia* spp. Yellow Sand Dune.	

Site 9: 606958E, 6763485N. *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Xanthorrhoea thorntonii, Triodia* spp. Yellow Sandy rise (Long unburnt).	

Table 3. Motion Sensitive Camera Sites

Site	Easting	Northing	Habitat	Survey Nights
1	508182	6772764	Spinifex sandplain with Marble Gum and low Acacia shrubs	5
2	433161	6813533	Banded Ironstone ridge with extensive rock outcropping	7
3	433393	6813243	Banded Ironstone ridge with extensive rock outcropping	7
4	560529	6768554	Yellow Sand Dune with *E. gongylocarpa, Callitris columellaris*, and mature *Triodia* sp.	25
5	559253	6768032	Yellow Sandplain with *E. gongylocarpa, Callitris columellaris*, and mature *Triodia* sp.	4
6	566706	6769743	Yellow Sand Dune with *E. gongylocarpa, Eucalyptus* sp., *Callitris columellaris, Triodia* sp., *Xanthorrhoea thorntonii*	4
7	569099	6770008	Yellow sandplain with Mallee, *Allocasuarina acutivalvis*, *Xanthorrhoea thorntonii, Triodia* sp.	25
8	638052	6764027	Yellow Sand Dune footslope with *E. gongylocarpa, Callitris columellaris*, and mature *Triodia* sp.	34
9	641522	6763060	Yellow Sand Dune footslope with *E. gongylocarpa, Callitris columellaris*, and mature *Triodia* sp.	34
10	642730	6763158	Yellow Sand Dune Footslope with mixed Acacia (*Acacia aneura, Acacia ramulosa*), *Callitris columellaris, Triodia* sp.	3
11	644393	6763398	Yellow Sand Dune footslope with *E. gongylocarpa, Callitris columellaris, Thryptomene biseriata* and mature *Triodia* sp.	3
12	520204	6771881	Yellow sandy rise with *E. gongylocarpa, Callitris columellaris, Triodia* sp., sedges	23
13	517689	6774062	Yellow Sandplain, *Triodia* sp. hummock grassland with low Acacia shrubs	4
14	518691	6771923	Yellow / Orange sandplain, *E. gongylocarpa, Acacia* sp. and *Hakea francisiana*.	4
15	520230	6771849	Yellow / Orange sandplain, *E. gongylocarpa, Callitris columellaris*, *Triodia* sp., sedges	4
16	522076	6771624	Red sandplain, Scattered Mallee and *Brachychiton gregoryi* over low Acacia sp. and Spinifex (*Triodia basedowii*)	4
17	521990	6771578	Red sandplain, Scattered Mallee and *Brachychiton gregoryi* over low Acacia sp. and Spinifex (*Triodia basedowii*)	4

18	521868	6771508	Red sandplain, Scattered Mallee and *Brachychiton gregoryi* over low Acacia sp. and Spinifex (*Triodia basedowii*)	4
19	518411	6771839	Yellow / Orange sandplain, *E. gongylocarpa, Hakea francisiana, Triodia* sp., sedges	4
20	566459	6769663	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus sp. (*Mallee), *Callitris columellaris, Triodia* sp., *Xanthorrhoea thorntonii*	4
21	569101	6769833	Yellow Sandplain, Mallee, *Allocasuarina acutivalvis*, *Xanthorrhoea thorntonii, Triodia* sp.	4
22	569385	6770062	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	4
23	565073	6769086	Yellow sandplain, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Allocasuarina acutivalvis, Xanthorrhoea thorntonii, Triodia* sp.	4
24	603552	6763990	Yellow Sand Dune, recently burnt *E. gongylocarpa, Callitris columellaris, Triodia* sp.	1
25	611458	6763388	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
26	584671	6765440	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
27	591348	6765011	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
28	595535	6764729	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
29	608727	6763472	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
30	612884	6763329	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
31	617950	6763075	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
32	626271	6762821	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
33	639543	6763363	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
34	641205	6763221	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25
35	643050	6763171	Yellow Sand Dune, *E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	25

Table 4. Southern Marsupial Mole Trench Sites:

Site	Easting	Northing	Habitat	Vegetation
1	566706	6769685	Yellow Dune Crest	*E. gongylocarpa, Callitris columellaris*, *Triodia sp.*
2	569817	6767128	Yellow Dune Crest	*E. gongylocarpa, Callitris columellaris, Triodia sp., Xanthorrhoea thorntonii*
3	569867	6767162	Yellow Dune Slope	*E. gongylocarpa, Callitris columellaris*, *Triodia sp.*
4	637938	6763972	Yellow Dune Crest	*E. gongylocarpa, Callitris columellaris*, *Triodia sp.*
5	638899	6763408	Yellow Dune Crest	*Eucalyptus sp. (Mallee)*, *Triodia sp.*
6	641522	6763060	Yellow Dune Slope	*E. gongylocarpa,* mixed Acacia, *Triodia sp.*
7	644393	6763398	Yellow Dune Crest	*E. gongylocarpa,* mixed Acacia, *Triodia sp.*
8	569720	6769970	Yellow Dune Crest	*E. gongylocarpa, Callitris columellaris*, *Triodia sp.*
9	566657	6769651	Yellow Dune Slope	*E. gongylocarpa, Callitris columellaris*, *Triodia sp.*
10	603552	6763990	Yellow Dune Crest	Burnt *E. gongylocarpa, Callitris columellaris*, *Triodia sp.*

Table 5. Bat Detector Sites:

Site	Easting	Northing	Habitat	Survey Nights
1	558557	6767800	*E. gongylocarpa, Callitris columellaris, Triodia* sp.	1
2	642703	6763166	Mulga Woodland interdune	2
3	644437	6763272	Mulga Woodland interdune	1
4	552960	6767597	*Eucalyptus* sp., *Casuarina pauper* Woodland, Mallee, *Triodia* sp.	4
5	553245	6767635	*Eucalyptus* sp., *Casuarina pauper* Woodland, Mallee, *Triodia* sp.	1
6	520121	6771847	*E. gongylocarpa, Callitris columellaris, Triodia* sp., sedges	3
7	569848	6767087	*E. gongylocarpa, Eucalyptus* sp. (Mallee), *Callitris columellaris, Triodia* sp.	2
8	603552	6763990	Yellow sand dune with *E. gongylocarpa, Callitris columellaris*, *Triodia sp.*	1

Appendix 3: Fauna Recorded / Expected to Occur in the Survey Area.

Fauna Recorded from the Survey Area
(Tables 1 to 5).

These lists are derived from the results of database and literature searches and from previous field surveys conducted in the local area. These are:

- NatureMap Database (NM): searched October 2013;
- Birdlife Australia Database (BA): searched October 2013;
- Species recorded from Queen Victoria Spring Nature Reserve (QVS);
- Species recorded from the Tropicana Gold Mine Project Area (TPA) during previous fauna surveys (ecologia 2009);
- Species recorded by Jeff Turpin along the Pinjin Infrastructure Corridor (Turpin 2008 and Biologic 2010);
- Species recorded by Ninox Wildlife Consulting along the Pinjin Infrastructure Corridor (Ninox 2009);
- Species recorded by GHD during the trapping program along the Pinjin Infrastructure Corridor (GHD 2010);
- Species recorded by Ninox during the Level 2 fauna survey of Sunrise Dam (Ninox, 1995);
- Species recorded from the current survey - Kingfisher Environmental Consulting (KEC – 2014).

Key:
Note the conservation status of significant taxa is also listed under “Status”. This includes species listed under the EPBC and Wildlife Conservation Acts, DPAW Priority Fauna and Locally Significant Fauna:

- EPBC Act listed species: End = Endangered, Vul = Vulnerable, Mig = Migratory, CrE = Critically Endangered;
- WC Act listed species: S1 = Schedule 1, S3 = Schedule 3, S4 = Schedule 4;
- DPaW Priority Species: P1 = Priority 1, P2 = Priority 2, P4 = Priority 4;
- Locally Significant species: L = Locally Significant.

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

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	TPA	KEC 2014
HYLIDAE									
Sheep Frog	*Cyclorana maini*		X						
Water-holding Frog	*Cyclorana platycephala*		X		X				
Little Red Tree Frog	*Litoria rubella*		X						
MYOBATRACHIDAE									
Kunapalari Frog	*Neobatrachus kunapalari*		X	X					
Desert Trilling Frog	*Neobatrachus sudellae*		X						
Shoemaker Frog	*Neobatrachus sutor*		X	X	X				X
Wilsmore's Frog	*Neobatrachus wilsmorei*		X		X				
Western Toadlet	*Pseudophryne occidentalis*		X						
TOTAL	8		8	2	3	0	0	0	1

TABLE 2. Reptiles expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
AGAMIDAE										
Long-nosed Dragon	*Amphibolurus longirostris*								X	
Ring-tailed Dragon	*Ctenophorus caudicinctus*		X							
Black-collared Dragon	*Ctenophorus clayi*			X				X	X	
Crested Dragon	*Ctenophorus cristatus*		X	X		X		X	X	X
Mallee Military Dragon	*Ctenophorus fordi*		X	X	X	X			X	X
Military Dragon	*Ctenophorus isolepis*		X	X			X	X	X	X
Central Netted Dragon	*Ctenophorus nuchalis*		X	X	X			X	X	
Western Netted Dragon	*Ctenophorus reticulatus*		X			X			X	
Claypan Dragon	*Ctenophorus salinarum*		X		X	X				
Lozenge-marked Dragon	*Ctenophorus scutulatus*		X			X	X			X
Ctenophorus sp.	*Ctenophorus sp. aff. femoralis*							X		X
Mulga Dragon	*Diporiphora amphiboluroides*								X	
Plain-backed Two-line Dragon	*Diporiphora reginae*		X					X	X	X
Pink Two-lined Dragon	*Diporiphora linga*			X						

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
Grey-striped Western Desert Dragon	*Diporiphora paraconvergens*									
Thorny Devil	*Moloch horridus*			X	X		X	X	X	X
Bearded Dragon	*Pogona minor*		X	X				X	X	X
Pebble Dragon	*Tympanocryptis cephalus*		X		X					
DIPLODACTYLIDAE										
Fat-tailed Gecko	*Diplodactylus conspicillatus*			X						X
Western Stone Gecko	*Diplodactylus granariensis*		X					X	X	
Beautiful Gecko	*Diplodactylus pulcher*		X		X					
Desert Wood Gecko	*Diplodactylus wiru*									
Southern Sand Plain Gecko	*Lucasium bungabinna*									
Beaded Gecko	*Lucasium damaeum*		X	X				X	X	X
Main's Ground Gecko	*Lucasium maini*			X						
Mottled Ground Gecko	*Lucasium squarrosum*		X					X		
Sand-plain Gecko	*Lucasium stenodactylum*									
Beaked Gecko	*Rhynchoedura ornata*		X	X	X			X	X	X
Thorn -tailed Gecko	*Strophurus assimilis*		X	X						X
Jewelled Gecko	*Strophurus elderi*		X	X				X	X	X
Ring-tailed Gecko	*Strophurus strophurus*		X						X	
Western Shield Spiny-tailed Gecko	*Strophurus wellingtonae*		X							
CARPHODACTYLIDAE										
Pale Knob-tailed Gecko	*Nephrurus laevissimus*			X				X	X	X
Smooth Knob-tailed Gecko	*Nephrurus levis levis*			X				X	X	X
Barking Gecko	*Nephrurus milii*		X							
Midline Knob-tail	*Nephrurus vertebralis*		X							
GEKKONIDAE										
Purplish Dtella	*Gehyra purpurascens*		X	X				X	X	X
Tree Dtella	*Gehyra variegata*		X	X	X	X	X	X	X	X
Bynoe's Gecko	*Heteronotia binoei*		X		X	X			X	X
PYGOPODIDAE										
Unbanded Dema	*Delma butleri*		X	X				X	X	
Banded Delma	*Delma demosa*									
Sharp-snouted delma	*Delma nasuta*		X					X	X	X
Peterson's Delma	*Delma petersoni*		X	X					X	X
Burton's Legless-Lizard	*Lialis burtonis*		X	X			X		X	
Western Hooded Scaly-foot	*Pygopus nigriceps*		X	X					X	X
SCINCIDAE										

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
A skink	*Cryptoblepharus australis*		X							
A skink	*Cryptoblepharus buchananii*		X		X					
Southern Mallee Skink	*Ctenotus atlas*			X				X		
A skink	*Ctenotus ariadnae*								X	
A skink	*Ctenotus brooksi*		X	X				X	X	X
A skink	*Ctenotus calurus*			X				X	X	X
A skink	*Ctenotus dux*		X					X	X	X
A skink	*Ctenotus grandis*								X	
A skink	*Ctenotus greeri*		X		X				X	X
A skink	*Ctenotus helenae*		X			X		X	X	X
A skink	*Ctenotus leae*			X				X		
Leonhardi's Ctenotus	*Ctenotus leonhardii*		X		X	X			X	X
A skink	*Ctenotus pantherinus*		X	X			X	X	X	X
A skink	*Ctenotus piankai*									
A skink	*Ctenotus quattuordecimlineatus*		X	X				X	X	X
Barred Wedge-snouted Ctenotus	*Ctenotus schomburgkii*		X	X	X	X	X	X	X	X
Rock Ctenotus	*Ctenotus severus*		X							
Spotted Ctenotus	*Ctenotus uber*		X							
Spinifex Slender Blue-tongue	*Cyclodomorphus melanops*		X	X					X	X
Pygmy Spiny-tailed Skink	*Egernia depressa*		X		X	X				X
Goldfields Crevice Skink	*Egernia formosa*			X	X					
Western Sandswimmer	*Eremiascincus pallidus*							X		
Broad-banded Sandswimmer	*Eremiascincus richardsonii*		X	X				X	X	X
North-western Sandslider	*Lerista bipes*		X	X	X			X	X	X
Central Deserts Robust Slider	*Lerista desertorum*		X	X	X			X	X	X
Common Mulch Lerista	*Lerista kingi*					X				
Southern Robust Slider	*Lerista picturata*			X						
Dotty-tailed Robust Slider	*Lerista puncticauda*	P2		X						
Ribbon Slider	*Lerista taeniata*		X					X	X	
Common Mulch Lerista	*Lerista timda*		X						X	X
Great Desert Skink	*Liopholis kintorei*	Vul								
Desert Skink	*Liopholis inornata*		X	X				X	X	X
Night Skink	*Liopholis striata*			X					X	
Common Dwarf Skink	*Menetia greyii*		X	X				X	X	X
Woodland Dark Fleck Skink	*Morethia butleri*		X	X	X			X	X	X
Western Soil-crevice Skink	*Proablepharus reginae*		X	X				X	X	X

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
Centralian Blue-tongue	*Tiliqua multifasciata*							X	X	
Western Blue-tongue	*Tiliqua occipitalis*		X	X		X			X	X
Bobtail	*Tiliqua rugosa*					X				
VARANIDAE										
Short-tailed Pygmy Monitor	*Varanus brevicauda*				X				X	
Pygmy Mulga Monitor	*Varanus caudolineatus*		X		X					
Pygmy Desert Monitor	*Varanus eremius*							X	X	
Perentie	*Varanus giganteus*								X	X
Mulga Monitor	*Varanus gilleni*		X						X	
Sand Monitor	*Varanus gouldii*		X	X		X	X	X	X	X
Yellow-spotted Monitor	*Varanus panoptes rubidus*		X							X
Racehorse Monitor	*Varanus tristis tristis*							X	X	X
TYPHLOPIDAE										
Dark-spinned Blind Snake	*Ramphotyphlops bicolor*									
Prong-snouted Blind Snake	*Ramphotyphlops bituberculatus*		X							
Interior Blind Snake	*Ramphotyphlops endoterus*		X						X	
Northern Hook-Snouted Blind Snake	*Ramphotyphlops hamatus*		X							
Buff-snouted Blind Snake	*Ramphotyphlops margaretae*	P2								
Common Beaked Blind Snake	*Ramphotyphlops waitii*		X						X	
BOIDAE										
Stimson's Python	*Antaresia stimsoni*		X							
Woma	*Aspidites ramsayi*	Sc4								
Carpet Python	*Morelia spilota imbricata*	Sc4								
ELAPIDAE										
Desert Death Adder	*Acanthophis pyrrhus*								X	
Narrow-banded Shovel-nosed Snake	*Brachyurophis fasciolata*								X	X
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*			X					X	X
Yellow-faced Whipsnake	*Demansia psammophis*			X					X	X
Moon Snake	*Furina ornata*		X							
Black-naped Snake	*Neelaps bimaculatus*		X						X	
Monk Snake	*Parasuta monachus*		X	X	X				X	X
Mulga Snake	*Pseudechis australis*		X	X	X	X			X	
Spotted Mulga Snake	*Pseudechis butleri*		X							
Ringed Brown Snake	*Pseudonaja modesta*								X	
Western Brown Snake	*Pseudonaja mengdeni*				X	X			X	

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
Desert Banded Snake	*Simoselaps anomalus*									
Jan's Banded Snake	*Simoselaps bertholdi*		X	X	X				X	X
Rosen's Snake	*Suta fasciata*		X		X					
Total Number of Species Expected: 115										
Total Recorded:		**5**	**70**	**48**	**25**	**18**	**8**	**41**	**70**	**50**

TABLE 3. Birds expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
CASUARIIDAE										
Emu	*Dromaius novaehollandiae*		X	X	X	X	X		X	X
PHASIANIDAE										
Stubble Quail	*Coturnix pectoralis*		X							
MEGAPODIIDAE										
Malleefowl	*Leipoa ocellata*	Vul				X	X		X	X
ANATIDAE										
Musk Duck	*Biziura lobata*		X							
Black Swan	*Cygnus atratus*		X		X	X				
Australian Shelduck	*Tadorna tadornoides*		X		X	X				
Australian Wood Duck	*Chenonetta jubata*		X		X	X				
Pacific Black Duck	*Anas superciliosa*		X		X	X				
Pink-eared Duck	*Malacorhynchus membranaceus*		X		X	X				
Grey Teal	*Anas gracilis*		X		X	X				
Australasian Shoveler	*Anas rhynchotis*		X		X					
Hardhead	*Aythya australis*		X			X				
PODICIPEDIDAE										
Australasian Grebe	*Tachybaptus novaehollandiae*		X		X	X				
Hoary-headed Grebe	*Poliocephalus poliocephalus*		X			X			X	
COLUMBIDAE										
Common Bronzewing	*Phaps chalcoptera*		X	X	X	X	X	X	X	X
Crested Pigeon	*Ocyphaps lophotes*		X		X	X	X		X	X
Diamond Dove	*Geopelia cuneata*								X	
PODARGIDAE										
Tawny Frogmouth	*Podargus strigoides*		X	X		X			X	X
EUROSTOPODIDAE										
Spotted Nightjar	*Eurostopodus argus*		X			X				X
AEGOTHELIDAE										
Australian Owlet-nightjar	*Aegotheles cristatus*		X		X	X	X		X	X
APODIDAE										
Fork-tailed Swift	*Apus pacificus*	Mig								
ARDEIDAE										
White-faced Heron	*Egretta novaehollandiae*		X		X					
White-necked Heron	*Ardea pacifica*		X							
Eastern Great Egret	*Ardea modesta*	Mig								
ACCIPITRIDAE										
Black-shouldered Kite	*Elanus axillaris*		X							

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
Square-tailed Kite	*Lophoictinia isura*									
Black-breasted Buzzard	*Hamirostra melanosternon*									
Whistling Kite	*Haliastur sphenurus*		X							
Black Kite	*Milvus migrans*									
Brown Goshawk	*Accipiter fasciatus*		X		X		X	X		
Collared Sparrowhawk	*Accipiter cirrocephalus*		X						X	
Spotted Harrier	*Circus assimilis*									
Wedge-tailed Eagle	*Aquila audax*		X	X	X	X	X	X	X	X
Little Eagle	*Hieraaetus morphnoides*		X			X	X		X	X
FALCONIDAE										
Nankeen Kestrel	*Falco cenchroides*		X	X	X	X	X	X	X	X
Brown Falcon	*Falco berigora*		X	X	X	X	X	X	X	X
Australian Hobby	*Falco longipennis*		X		X		X		X	X
Peregrine Falcon	*Falco peregrinus*	Sc4	X		X				X	
Grey Falcon	*Falco hypoleucos*	Vul								
RALLIDAE										
Eurasian Coot	*Fulica atra*		X		X	X			X	
Black-tailed Native-hen	*Tribonyx ventralis*		X							
OTIDIDAE										
Australian Bustard	*Ardeotis australis*	P4	X	X		X	X	X	X	X
BURHINIDAE										
Bush Stone-curlew	*Burhinus grallarius*	P4								
RECURVIROSTRIDAE										
Red-necked Avocet	*Recurvirostra novaehollandiae*					X				
Black-winged Stilt	*Himantopus himantopus*		X			X				
Banded Stilt	*Cladorhynchus leucocephalus*				X					
CHARADRIIDAE										
Red-capped Plover	*Charadrius ruficapillus*		X							X
Black-fronted Dotterel	*Elseyornis melanops*		X		X	X				
Red-kneed Dotterel	*Erythrogonys cinctus*		X							
Inland Dotterel	*Charadrius australis*		X	X						
Oriental Plover	*Charadrius veredus*	Mig								
Banded Lapwing	*Vanellus tricolor*		X		X	X			X	
SCOLOPACIDAE										
Common Greenshank	*Tringa nebularia*	Mig	X			X				
Wood Sandpiper	*Tringa glareola*	Mig	X			X				
Red-necked Stint	*Calidris ruficollis*	Mig	X							
Sharp-tailed Sandpiper	*Calidris acuminata*	Mig								

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
Curlew Sandpiper	*Calidris ferruginea*	Mig								
Common Sandpiper	*Actitis hypoleucos*	Mig								
TURNICIDAE										
Little Button-quail	*Turnix velox*		X	X						
LARIDAE										
Silver Gull	*Larus novaehollandiae*									
CACATUIDAE										
Galah	*Eolophus roseicapillus*		X		X	X	X	X	X	X
Little Corella	*Cacatua sanguinea*									
Cockatiel	*Nymphicus hollandicus*		X		X				X	X
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	Sc4		X						
PSITTACIDAE										
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	L	X			X			X	
Princess Parrot	*Polytelis alexandrae*	Vul		X						
Regent Parrot	*Polytelis anthopeplus*	L		X					X	
Australian Ringneck	*Barnardius zonarius*		X	X		X	X	X	X	X
Mulga Parrot	*Psephotus varius*		X	X	X	X	X		X	X
Budgerigar	*Melopsittacus undulatus*		X		X				X	X
Bourke's Parrot	*Neopsephotus bourkii*		X		X					
Scarlet-chested Parrot	*Neophema splendida*	L		X				X	X	X
Night Parrot	*Pezoporus occidentalis*	CrE								
CUCULIDAE										
Horsfield's Bronze-Cuckoo	*Chalcites basalis*		X		X	X			X	X
Black-eared Cuckoo	*Chalcites osculans*		X					X	X	X
Pallid Cuckoo	*Cacomantis pallidus*		X			X			X	X
STRIGIDAE										
Southern Boobook	*Ninox novaeseelandiae*		X	X		X	X			X
TYTONIDAE										
Eastern Barn Owl	*Tyto alba*									
HALCYONIDAE										
Red-backed Kingfisher	*Todiramphus pyrrhopygius*		X					X	X	X
Sacred Kingfisher	*Todiramphus sanctus*		X							
MEROPIDAE										
Rainbow Bee-eater	*Merops ornatus*	Mig	X			X	X	X	X	X
CLIMACTERIDAE										
White-browed Treecreeper	*Climacteris affinis*		X		X	X			X	
Rufous Treecreeper	*Climacteris rufa*	L								X

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
PTILONORHYNCHIDAE										
Western Bowerbird	*Ptilonorhynchus guttatus*		X							X
MALURIDAE										
Splendid Fairy-wren	*Malurus splendens*		X	X	X	X	X		X	X
White-winged Fairy-wren	*Malurus leucopterus*		X		X	X				X
Variegated Fairy-wren	*Malurus lamberti*		X							
Striated Grasswren	*Amytornis striatus striatus*		X							X
ACANTHIZIDAE										
Rufous Fieldwren	*Calamanthus campestri*									
Redthroat	*Pyrrholaemus brunneus*		X	X	X	X	X	X	X	X
Weebill	*Smicrornis brevirostris*		X	X		X	X	X	X	X
Western Gerygone	*Gerygone fusca*		X					X		
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X	X	X	X	X		X	X
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		X	X	X	X	X		X	X
Slaty-backed Thornbill	*Acanthiza robustirostris*		X		X			X	X	X
Inland Thornbill	*Acanthiza apicalis*		X	X	X	X	X	X	X	X
Slender billed Thornbill	*Acanthiza iredalei*	Vul	X		X					
Southern Whiteface	*Aphelocephala leucopsis*		X		X	X			X	X
PARDALOTIDAE										
Spotted Pardalote	*Pardalotus punctatus*									
Striated Pardalote	*Pardalotus striatus*		X	X		X			X	X
MELIPHAGIDAE										
Pied Honeyeater	*Certhionyx variegatus*		X							
Singing Honeyeater	*Lichenostomus virescens*		X	X	X	X	X		X	X
White-eared Honeyeater	*Lichenostomus leucotis*			X		X				
White-plumed Honeyeater	*Lichenostomus penicillatus*		X							
Grey-fronted Honeyeater	*Lichenostomus plumulus*		X	X		X	X	X	X	X
White-fronted Honeyeater	*Purnella albifrons*		X	X	X	X	X		X	X
Yellow-throated Miner	*Manorina flavigula*		X	X	X	X	X	X	X	X
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X	X	X	X	X		X	X
Red Wattlebird	*Anthochaera carunculata*		X	X		X			X	X
Crimson Chat	*Epthianura tricolor*		X	X	X				X	X
White-fronted Chat	*Epthianura albifrons*		X		X	X				
Orange Chat	*Epthianura aurifrons*									
Black Honeyeater	*Sugomel niger*		X							
Brown Honeyeater	*Lichmera indistincta*		X	X		X	X	X	X	X

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
Brown-headed Honeyeater	*Melithreptus brevirostris*					X		X		
POMATOSTOMIDAE										
White-browed Babbler	*Pomatostomus superciliosus*		X		X	X	X	X	X	X
PSOPHODIDAE										
Chestnut Quail-thrush	*Cinclosoma castanotus*									X
Chestnut-breasted Quail-thrush	*Cinclosoma castaneothorax*		X							
Chiming Wedgebill	*Psophodes occidentalis*		X							
NEOSITTIDAE										
Varied Sittella	*Daphoenositta chrysoptera*								X	X
CAMPEPHAGIDAE										
Ground Cuckoo-shrike	*Coracina maxima*		X	X		X			X	
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		X	X	X	X	X	X	X	X
White-winged Triller	*Lalage sueurii*		X					X		X
PACHYCEPHALIDAE										
Rufous Whistler	*Pachycephala rufiventris*		X	X	X	X	X	X	X	X
Golden Whistler	*Pachycephala pectoralis*									
Gilbert's Whistler	*Pachycephala inornata*			X				X		
Grey Shrike-thrush	*Colluricincla harmonica*		X	X	X	X	X	X	X	X
Crested Bellbird	*Oreoica gutturalis*		X	X	X	X	X	X	X	X
ARTAMIDAE										
Masked Woodswallow	*Artamus personatus*		X	X					X	X
Black-faced Woodswallow	*Artamus cinereus*		X				X	X	X	X
Dusky Woodswallow	*Artamus cyanopterus*									
Little Woodswallow	*Artamus minor*		X							X
Grey Butcherbird	*Cracticus torquatus*		X	X	X	X	X		X	X
Pied Butcherbird	*Cracticus nigrogularis*		X	X	X	X	X	X	X	X
Australian Magpie	*Cracticus tibicen*		X		X	X		X	X	X
Grey Currawong	*Strepera versicolor*		X	X		X	X		X	X
RHIPIDURIDAE										
Grey Fantail	*Rhipidura albiscapa*		X			X		X		
Willie Wagtail	*Rhipidura leucophrys*		X		X	X	X	X	X	X
CORVIDAE										
Little Crow	*Corvus bennetti*		X	X	X	X	X		X	X
Torresian Crow	*Corvus orru*		X		X			X		X
Australian Raven	*Corvus coronoides*					X				
MONARCHIDAE										

Common Name	Species Name	Status	NM / BA	QVS	Ninox 1995	Turpin	Ninox 2009	GHD 2010	TPA	KEC 2014
Magpie-lark	*Grallina cyanoleuca*		X		X	X			X	X
PETROICIDAE										
Red-capped Robin	*Petroica goodenovii*		X	X	X	X	X	X	X	X
Hooded Robin	*Melanodryas cucullata*		X			X	X		X	X
Jacky Winter	*Microeca fascinans*		X			X	X	X	X	X
Southern Scrub-robin	*Drymodes brunneopygia*	L								X
MEGALURIDAE										
Rufous Songlark	*Cincloramphus mathewsi*		X							
Brown Songlark	*Cincloramphus cruralis*		X		X					X
HIRUNDINIDAE										
White-backed Swallow	*Cheramoeca leucosterna*		X		X	X			X	X
Welcome Swallow	*Hirundo neoxena*		X		X	X				X
Fairy Martin	*Petrochelidon ariel*		X			X				X
Tree Martin	*Petrochelidon nigricans*		X						X	X
NECTARINIIDAE										
Mistletoebird	*Dicaeum hirundinaceum*		X	X	X	X	X	X	X	X
ESTRILDIDAE										
Zebra Finch	*Taeniopygia guttata*		X		X	X			X	X
MOTACILLIDAE										
Australasian Pipit	*Anthus novaeseelandiae*		X		X	X	X		X	X
Total Number of Species Expected: 155										
Total Recorded:		**23**	**118**	**45**	**64**	**80**	**45**	**37**	**73**	**78**

TABLE 4. Mammals expected to occur and recorded in the Survey Area.

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
TACHYGLOSSIDAE										
Echidna	*Tachyglossus aculeatus*		X		X	X	X	X	X	X
DASYURIDAE										
Brush-tailed Mulgara	*Dasycercus blythi*	P4		X						X
Ride's Ningaui	*Ningaui ridei*		X	X						
Mallee Ningaui	*Ningaui yvonneae*		X					X	X	X
Kultarr	*Antechinomys laniger*	CS3	X							
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*	CS3								X
Fat-tailed Dunnart	*Sminthopsis crassicaudata*		X						X	
Little Long-tailed Dunnart	*Sminthopsis dolichura*		X	X				X	X	X
Hairy-footed Dunnart	*Sminthopsis hirtipes*		X	X				X	X	X
Long-tailed Dunnart	*Sminthopsis longicaudata*		X							
Stripe-faced Dunnart	*Sminthopsis macruora*		X							
Ooldea Dunanrt	*Sminthopsis ooldea*			X					X	X
Sandhill Dunnart	*Sminthopsis psammophila*	End		X						X
NOTORYCTIDAE										
Southern Marsupial Mole	*Notoryctes typhlops*			X					X	X
BURRAMYIDAE										
Western Pygmy Possum	*Cercartetus concinnus*			X						
MACROPODIDAE										
Western Grey Kangaroo	*Macropus fuliginosus*					X		X	X	X
Euro	*Macropus robustus*		X			X	X		X	X
Red Kangaroo	*Macropus rufus*		X		X		X		X	X
EMBALLONURIDAE										
Hill's Sheathtail Bat	*Taphozous hilli*								X	
MOLOSSIDAE										
Inland Freetail Bat	*Mormopterus sp. 3*								X	X
Southern Freetail Bat	*Mormopterus sp. 4*			X						
White-striped Freetail Bat	*Tadarida australis*			X		X			X	X
VESPERTILIONIDAE										
Gould's Wattled Bat	*Chalinolobus gouldii*			X					X	X
Chocolate Wattled Bat	*Chalinolobus morio*		X							
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X	X	X				X	X
Greater Long-eared Bat	*Nyctophilus timoriensis*	CS2							X	
Inland Broad-nosed Bat	*Scotorepens balstoni*			X					X	

Common Name	Species Name	Status	NM	QVS	Ninox 1995	Turpin 2008	Ninox 2009	GHD 2010	TPA	KEC 2014
Southern Forest Bat	*Vespadelus regulus*			X						
Inland forest bat	*Vespadelus baverstocki*		X							
Inland Cave Bat	*Vespadelus finlaysoni*		X						X	
MURIDAE										
Spinifex Hopping Mouse	*Notomys alexis*		X	X				X	X	X
Mitchell's Hopping Mouse	*Notomys mitchelli*			X						
Bolam's Mouse	*Pseudomys bolami*									
Desert Mouse	*Pseudomys desertor*								X	X
Sandy Inland Mouse	*Pseudomys hermannsburgensis*		X	X				X	X	X
INTRODUCED MAMMALS										
Dingo / Dog	*Canis lupus*				X		X	X	X	X
European Red Fox	*Vulpes vulpes*				X	X			X	X
Feral Cat	*Felis catus*		X		X		X	X	X	X
Rabbit	*Oryctolagus cuniculus*		X		X	X	X		X	X
House Mouse	*Mus musculus*		X	X				X	X	X
Goat	*Capra hircus*									X
Horse	*Equus caballus*									X
Dromedary Camel	*Camelus dromedarius*					X	X	X	X	X
Cattle	*Bos taurus*					X				X
Sheep	*Ovis aries*					X				
Total Number of Native Species: 35		**3**	**17**	**17**	**3**	**4**	**3**	**7**	**21**	**19**
Total Number of Introduced Species: 10			**3**	**1**	**4**	**5**	**4**	**4**	**6**	**9**

Appendix 4. Fauna Species Recorded from the Survey Area.

Tables 1 - 4 present the vertebrates fauna species recorded during the 2013 and 2014 field surveys.

TABLE 1. Frogs and Reptiles recorded from the Survey Area.

Common Name	Species Name	Conservation Status	KEC 2014
MYOBATRACHIDAE			
Shoemaker Frog	*Neobatrachus sutor*		x
AGAMIDAE			
Crested Dragon	*Ctenophorus cristatus*		X
Mallee Military Dragon	*Ctenophorus fordi*		X
Ctenophorus sp.	*Ctenophorus sp. aff. femoralis*		X
Military Dragon	*Ctenophorus isolepis*		X
Lozenge-marked Dragon	*Ctenophorus scutulatus*		X
Plain-backed Two-line Dragon	*Diporiphora reginae*		X
Thorny Devil	*Moloch horridus*		X
Bearded Dragon	*Pogona minor*		X
DIPLODACTYLIDAE			
Fat-tailed Gecko	*Diplodactylus conspicillatus*		X
Beaded Gecko	*Lucasium damaeum*		X
Beaked Gecko	*Rhynchoedura ornata*		X
Thorn -tailed Gecko	*Strophurus assimilis*		X
Jewelled Gecko	*Strophurus elderi*		X
CARPHODACTYLIDAE			
Pale Knob-tailed Gecko	*Nephrurus laevissimus*		X
Smooth Knob-tailed Gecko	*Nephrurus levis levis*		X
GEKKONIDAE			
Purplish Dtella	*Gehyra purpurascens*		X
Tree Dtella	*Gehyra variegate*		X
Bynoe's Gecko	*Heteronotia binoei*		X
PYGOPODIDAE			
Sharp-snouted delma	*Delma nasuta*		X
Peterson's Delma	*Delma petersoni*		X
Western Hooded Scaly-foot	*Pygopus nigriceps*		X
SCINCIDAE			
A skink	*Ctenotus brooksi*		X
A skink	*Ctenotus calurus*		X
A skink	*Ctenotus dux*		X
A skink	*Ctenotus greeri*		X

Common Name	Species Name	Conservation Status	KEC 2014
A skink	*Ctenotus helenae*		X
Leonhardi's Ctenotus	*Ctenotus leonhardii*		X
A skink	*Ctenotus pantherinus*		X
A skink	*Ctenotus quattuordecimlineatus*		X
Barred Wedge-snouted Ctenotus	*Ctenotus schomburgkii*		X
Spinifex Slender Blue-tongue	*Cyclodomorphus melanops*		X
Pygmy Spiny-tailed Skink	*Egernia depressa*		X
Broad-banded Sandswimmer	*Eremiascincus richardsonii*		X
A skink	*Lerista bipes*		X
A skink	*Lerista desertorum*		X
Common Mulch Lerista	*Lerista timda*		X
Desert Skink	*Liopholis inornata*		X
Common Dwarf Skink	*Menetia greyii*		X
Woodland Dark Fleck Skink	*Morethia butleri*		X
Western Soil-crevice Skink	*Proablepharus reginae*		X
Western Blue-tongue	*Tiliqua occipitalis*		X
VARANIDAE			
Perentie	*Varanus giganteus*		X
Sand Monitor	*Varanus gouldii*		X
Yellow-spotted Monitor	*Varanus panoptes rubidus*		X
Racehorse Monitor	*Varanus tristis tristis*		X
ELAPIDAE			
Narrow-banded Shovel-nosed Snake	*Brachyurophis fasciolata*		X
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*		X
Yellow-faced Whipsnake	*Demansia psammophis*		X
Monk Snake	*Parasuta monachus*		X
Jan's Banded Snake	*Simoselaps bertholdi*		X
Total Recorded:			**50**

TABLE 2. Birds recorded from the Survey Area.

Common Name	Species Name	Conservation Status	KEC 2014
CASUARIIDAE			
Emu	*Dromaius novaehollandiae*		X
MEGAPODIIDAE			
Malleefowl	*Leipoa ocellata*	Vulnerable	X
COLUMBIDAE			
Common Bronzewing	*Phaps chalcoptera*		X
Crested Pigeon	*Ocyphaps lophotes*		X
PODARGIDAE			
Tawny Frogmouth	*Podargus strigoides*		X
EUROSTOPODIDAE			
Spotted Nightjar	*Eurostopodus argus*		X
AEGOTHELIDAE			
Australian Owlet-nightjar	*Aegotheles cristatus*		X
ACCIPITRIDAE			
Wedge-tailed Eagle	*Aquila audax*		X
Little Eagle	*Hieraaetus morphnoides*		X
FALCONIDAE			
Nankeen Kestrel	*Falco cenchroides*		X
Brown Falcon	*Falco berigora*		X
Australian Hobby	*Falco longipennis*		X
OTIDIDAE			
Australian Bustard	*Ardeotis australis*	P4	X
CHARADRIIDAE			
Red-capped Plover	*Charadrius ruficapillus*		X
CACATUIDAE			
Galah	*Eolophus roseicapillus*		X
Cockatiel	*Nymphicus hollandicus*		X
PSITTACIDAE			
Australian Ringneck	*Barnardius zonarius*		X
Mulga Parrot	*Psephotus varius*		X
Budgerigar	*Melopsittacus undulates*		X
Scarlet-chested Parrot	*Neophema splendida*	Local	X
CUCULIDAE			
Horsfield's Bronze-Cuckoo	*Chalcites basalis*		X
Black-eared Cuckoo	*Chalcites osculans*		X
Pallid Cuckoo	*Cacomantis pallidus*		X
STRIGIDAE			
Southern Boobook	*Ninox novaeseelandiae*		X
HALCYONIDAE			

Common Name	Species Name	Conservation Status	KEC 2014
Red-backed Kingfisher	*Todiramphus pyrrhopygius*		X
MEROPIDAE			
Rainbow Bee-eater	*Merops ornatus*	Migratory	X
CLIMACTERIDAE			
Rufous Treecreeper	*Climacteris rufa*	Local	X
PTILONORHYNCHIDAE			
Western Bowerbird	*Ptilonorhynchus guttatus*		X
MALURIDAE			
Splendid Fairy-wren	*Malurus splendens*		X
White-winged Fairy-wren	*Malurus leucopterus*		X
Striated Grasswren	*Amytornis striatus striatus*	P4	X
ACANTHIZIDAE			
Redthroat	*Pyrrholaemus brunneus*		X
Weebill	*Smicrornis brevirostris*		X
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		X
Slaty-backed Thornbill	*Acanthiza robustirostris*		X
Inland Thornbill	*Acanthiza apicalis*		X
Southern Whiteface	*Aphelocephala leucopsis*		X
PARDALOTIDAE			
Striated Pardalote	*Pardalotus striatus*		X
MELIPHAGIDAE			
Red Wattlebird	*Anthochaera carunculata*		X
Singing Honeyeater	*Lichenostomus virescens*		X
Grey-fronted Honeyeater	*Lichenostomus plumulus*		X
White-fronted Honeyeater	*Purnella albifrons*		X
Yellow-throated Miner	*Manorina flavigula*		X
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X
Crimson Chat	*Epthianura tricolor*		X
Brown Honeyeater	*Lichmera indistincta*		X
POMATOSTOMIDAE			
White-browed Babbler	*Pomatostomus superciliosus*		X
PSOPHODIDAE			
Chestnut Quail-thrush	*Cinclosoma castanotus*	Local	X
NEOSITTIDAE			
Varied Sittella	*Daphoenositta chrysoptera*		X
CAMPEPHAGIDAE			
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		X
White-winged Triller	*Lalage sueurii*		X

Common Name	Species Name	Conservation Status	KEC 2014
PACHYCEPHALIDAE			
Rufous Whistler	*Pachycephala rufiventris*		X
Grey Shrike-thrush	*Colluricincla harmonica*		X
Crested Bellbird	*Oreoica gutturalis*		X
ARTAMIDAE			
Masked Woodswallow	*Artamus personatus*		X
Black-faced Woodswallow	*Artamus cinereus*		X
Little Woodswallow	*Artamus minor*		X
Grey Butcherbird	*Cracticus torquatus*		X
Pied Butcherbird	*Cracticus nigrogularis*		X
Australian Magpie	*Cracticus tibicen*		X
Grey Currawong	*Strepera versicolor*		X
RHIPIDURIDAE			
Willie Wagtail	*Rhipidura leucophrys*		X
CORVIDAE			
Little Crow	*Corvus bennetti*		X
Torresian Crow	*Corvus orru*		X
MONARCHIDAE			
Magpie-lark	*Grallina cyanoleuca*		X
PETROICIDAE			
Red-capped Robin	*Petroica goodenovii*		X
Hooded Robin	*Melanodryas cucullata*		X
Jacky Winter	*Microeca fascinans*		X
Southern Scrub-robin	*Drymodes brunneopygia*	Local	X
MEGALURIDAE			
Brown Songlark	*Cincloramphus cruralis*		X
HIRUNDINIDAE			
White-backed Swallow	*Cheramoeca leucosterna*		X
Welcome Swallow	*Hirundo neoxena*		X
Fairy Martin	*Petrochelidon ariel*		X
Tree Martin	*Petrochelidon nigricans*		X
NECTARINIIDAE			
Mistletoebird	*Dicaeum hirundinaceum*		X
ESTRILDIDAE			
Zebra Finch	*Taeniopygia guttata*		X
MOTACILLIDAE			
Australasian Pipit	*Anthus novaeseelandiae*		X
TOTAL		8	78

TABLE 3. Mammals recorded from the Survey Area.

Common Name	Species Name	Conservation Status	KEC 2014
TACHYGLOSSIDAE			
Echidna	*Tachyglossus aculeatus*		X
DASYURIDAE			
Brush-tailed Mulgara	*Dasycercus blythi*	P4	X
Mallee Ningaui	*Ningaui yvonneae*		X
Little Long-tailed Dunnart	*Sminthopsis dolichura*		X
Hairy-footed Dunnart	*Sminthopsis hirtipes*		X
Ooldea Dunnart	*Sminthopsis ooldea*		X
Sandhill Dunnart	*Sminthopsis psammophila*	Endangered	X
MACROPODIDAE			
Western Grey Kangaroo	*Macropus fuliginosus*		X
Euro	*Macropus robustus*		X
Red Kangaroo	*Macropus rufus*		X
NOTORYCTIDAE			
Southern Marsupial Mole	*Notoryctes typhlops*	Endangered	X
MOLOSSIDAE			
Inland Freetail Bat	*Mormopterus sp. 3*		X
White-striped Freetail Bat	*Tadarida australis*		X
VESPERTILIONIDAE			
Gould's Wattled Bat	*Chalinolobus gouldii*		X
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		X
MURIDAE			
Spinifex Hopping Mouse	*Notomys alexis*		X
Desert Mouse	*Pseudomys desertor*		X
Sandy Inland Mouse	*Pseudomys hermannsburgensis*		X
INTRODUCED MAMMALS			
Dingo / Dog	*Canis lupus*		X
European Red Fox	*Vulpes vulpes*		X
Feral Cat	*Felis catus*		X
Rabbit	*Oryctolagus cuniculus*		X
House Mouse	*Mus musculus*		X
Goat	*Capra hircus*		X
Horse	*Equus caballus*		X
Dromedary Camel	*Camelus dromedarius*		X
Cattle	*Bos taurus*		X
Total Number of Native Species:		**3**	**19**
Total Number of Introduced Species:			**9**

Appendix 5: Fauna species recorded on Motion Cameras

Species	Number	Comments
Dasycercus blythi	2	Recorded from spinifex sandplain
Sminthopsis psammophila	2	Recorded from yellow sand dunes
Sminthopsis sp.	1	Recorded from yellow sand dunes
Ningaui sp.	1	Recorded from yellow sand dune
Notomys alexis	10	Recorded on two separate sand dunes
Macropus fuliginosus	8	Recorded from two localities
Ctenophorus cristatus	1	Recorded from yellow sand dune
Ctenophorus isolepis	1	Recorded from red sandplain
Ctenophorus fordi	1	Recorded from sandplain
Varanus giganteus	1	Recorded from red sandplain
Varanus gouldii	1	Recorded from red sandplain
Grey Shrike Thrush	1	Recorded from yellow sand dune
Owlet Nightjar	1	Recorded from yellow sand dune
White-browed Babbler	1	Recorded from Mulga
Hooded Robin	1	Recorded from yellow sand dune
Torresian Crow	2	Recorded from BIF Ridge
Crested Bellbird	2	Recorded from yellow sand dunes
Willie Wagtail	1	Recorded from yellow sand dunes
Grey-fronted Honeyeater	1	Recorded from yellow sand dunes
European Red Fox	6	Recorded on Motion Camera, C1, C4
Dog/Dingo	2	Recorded from yellow sand dune
Feral Cat	5	Recorded from yellow sand dune

Appendix 6. Ecological processes.

Ecological processes are processes that maintain ecosystems and biodiversity. They are important for the assessment of impacts of development proposals, because ecological processes make ecosystems sensitive to change. The issue of ecological processes, impacts and conservation of biodiversity has an extensive literature. Following are examples of the sorts of ecological processes that need to be considered.

Ecological processes relevant to the conservation of biodiversity in Australia (Soule *et al.* 2004):

- Critical species interactions (highly interactive species);
- Long distance biological movement;
- Disturbance at local and regional scales;
- Global climate change;
- Hydroecology;
- Coastal zone fluxes;
- Spatially-dependent evolutionary processes (range expansion and gene flow); and
- Geographic and temporal variation of plant productivity across Australia.

(Taken from http://www.wilderness.org.au/articles/wc_science)

Threatening processes (EPBC Act)

Under the EPBC Act, a key threatening process is an ecological interaction that threatens or may threaten the survival, abundance or evolutionary development of a threatened species or ecological community. There are currently 20 key threatening processes listed by the federal Department of the Environment.

- Competition and land degradation by feral/unmanaged Goats (*Capra hircus*);
- Competition and land degradation by feral Rabbits (*Oryctolagus cuniculus*);
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*);
- Incidental catch (bycatch) of Sea Turtles during coastal otter-trawling operations within Australian waters north of 28 degrees South;
- Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations;
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis;
- Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris;
- Land clearance;
- Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, Indian Ocean;
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases;
- Predation by exotic rats on Australian offshore islands of less than 1000 km^2 (100,000 ha);
- Predation by feral Cats (*Felis catus*);
- Predation by the European Red Fox (*Vulpes vulpes*);
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs (*Sus scrofa*);
- Novel biota and their impact on biodiversity;

- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species;
- The biological effects, including lethal toxic ingestion, caused by Cane Toads (Bufo *marinus*);
- The reduction in the biodiversity of Australian native fauna and flora due to the red imported fire ant, *Solenopsis invicta*.

(taken from http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl)

General processes that threaten biodiversity across Australia (The National Land and Water Resources Audit):

- Vegetation clearing;
- Increasing fragmentation, loss of remnants and lack of recruitment;
- Firewood collection;
- Grazing pressure;
- Feral animals;
- Exotic weeds;
- Changed fire regimes;
- Pathogens;
- Changed hydrology—dryland salinity and salt water intrusion;
- Changed hydrology—other such as altered flow regimes affecting riparian vegetation; and
- Pollution.

(taken from Cork S, Sattler P and Alexandra J (2006), 'Biodiversity' theme commentary prepared for the 2006 Australian State of the Environment Committee, Department of the Environment and Heritage, Canberra, http://www.deh.gov.au/soe/2006/commentaries/biodiversity/index.html)

Appendix 7. Sandhill Dunnart Habitat Assessment

All fauna habitats present along the survey corridor were inspected and assessed for the suitability of supporting conservation significant fauna. The Sandhill Dunnart was recorded at four locations and suitable habitat was recorded elsewhere. Several areas of sand dune and sandplain habitat with long unburnt, mature spinifex (with Triodia spp. life stage 2 - 3.5, the optimal habitat for the species) occur along the survey corridor. Sandhill Dunnart Habitat has been mapped and is classified as Optimal, Likely, Marginal or Unlikely (see Tables below). For the purposes of habitat mapping, Sandhill Dunnart habitat has been mapped by combining Prime and Likely habitat.

Table 1. Sandhill Dunnart Habitat Assessment Criteria.

Habitat	Description
Prime	Known habitat (based on field assessment) that can support a breeding population. Includes areas where the species has been trapped previously.
Likely	Meets the majority of the needs of a breeding population including: • sand dune present or swale or plain that has an association with a sand dune; • sand dune yellow to yellow / orange; • Spinifex coverage of 10 - 70%. • Spinifex life stage: 2 to 4; • Vegetation long unburnt (greater than 8 years) and with a variable shrub layer. May contain small, disjunct areas of Prime habitat within a matrix of lower quality habitat. Includes the presence of optimal spinifex cover and age.
Marginal	Does not contain all the elements of suitable habitat – ie. spinifex age or cover is sub optimal, or absent, vegetation community or landform type sub optimal, no dune association or yellow sandy substrate absent.
Unlikely	Not suitable – all elements of suitable habitat absent or recently burnt habitat.

Table 2. Sandhill Dunnart Habitat Assessment sites along the survey corridor.

Site	Field Name	Zone	Easting	Northing	Habitat Assessment
1	sd1	51J	646049.1	6763200	Marginal
2	sd2	51J	645198	6763280	Likely
3	sd3	51J	641256	6763282	Prime
4	sd4	51J	633754	6763152	Marginal
5	sd5	51J	629604.4	6762212	Marginal
6	sd6	51J	628047.1	6762304	Likely
7	sd7	51J	626325.1	6762765	likely to marginal
8	sd 8	51J	624796.2	6762923	Marginal
9	sd9	51J	623929.3	6762809	Likely
10	sd10	51J	622992.3	6763018	Likely
11	sd11	51J	621313.2	6763106	Unlikely
12	sd12	51J	619221	6763120	likely to marginal

Site	Field Name	Zone	Easting	Northing	Habitat Assessment
13	sd13	51J	617925	6763060	Likely
14	sd14	51J	615615.9	6763153	Likely
15	sd15	51J	612883.8	6763382	Likely
16	sd16	51J	609373.6	6763425	Marginal
17	sd17	51J	608905.7	6763463	Prime
18	sd 18	51J	606958.4	6763485	Likely
19	sd19	51J	601957.9	6763950	Marginal
20	sd20	51J	598728	6764336	Marginal
21	sd21	51J	596888.5	6764532	Marginal
22	sd22	51J	595539.8	6764729	Likely
23	sd23	51J	592880	6765086	Marginal
24	sd24	51J	591349.4	6765056	likely to marginal
25	sd25	51J	587266.2	6765441	Unlikely
26	sd26	51J	584659.4	6765407	Likely
27	sd27	51J	583181.6	6765538	Unlikely
28	sd28	51J	581035.6	6765517	Marginal
29	sd29	51J	578813.8	6765577	Marginal
30	sd30	51J	570309.4	6766604	Unlikely
31	sd31	51J	567697.3	6766923	Unlikely
32	sd32	51J	564699.8	6767102	Marginal

Infrastructure Development

EASTERN GOLDFIELDS PIPELINE PROJECT

GENERAL

Supporting Documentation for Applications

Document No		EGP-RP-H-0003			
Rev	**Date**	**Status**	**Originated**	**Checked**	**Approved**
0	28/07/2014	Issued for Use	B Jayatilaka	M Burns	D Wallace
			Environmental Officer	Project Approvals Manager	Senior Project Manager

APA Group

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1 INTRODUCTION

APA Operations Pty Ltd (APA) proposes to construct a 294 km high pressure gas pipeline; the Eastern Goldfields Pipeline (EGP; the project). The new pipeline will be built from the existing supply infrastructure near Laverton (the APA owned and operated Murrin Murrin Gas Pipeline - Pipeline Licence 36) to connect to the AngloGold Ashanti Australia (AGAA) Sunrise Dam Gold Mine (SDGM) and then east to the Tropicana Gold Mine (TGM). The EGP, via two delivery / meter stations will transport natural gas to be used to power mine site operations (Figure 1).

The pipeline project has been divided into two sections for the purpose of description:

1. 84 km from Laverton Road near Murrin Murrin Nickel Mine 50 km south-west of Laverton, to the SDGM located 55 km south of Laverton; and
2. 210 km from SDGM to TGM 330 km north-east of Kalgoorlie.

This project involves the construction of the EGP and associated infrastructure including a permanent access track that runs the full 294 km length of the pipeline, the abovementioned delivery / meter stations, an off-take station, two main line valves, and temporary construction camp for works personnel. As the high pressure gas pipeline is buried, the majority of the environmental disturbance will be rehabilitated following construction.

As APA will be the sole constructor, owner and operator of the EGP, this project is mutually exclusive of all current and future activities associate with the SDGM and TGM operations. The activities associated with this project exclude any changes or upgrades required to the existing power generation facilities at the SDGM or TGM. Additionally, the pipeline has been designed to facilitate other potential users from mines in the area.

All construction activities will be confined to the EGP Construction Pipeline Licence area and the AGAA miscellaneous licences being sought for the project.

The pipeline will be constructed with a 40 year lifespan and operate under an “evergreen” pipeline licence issued and monitored by the Department of Mines and Petroleum (DMP) in Western Australia.

1.1 Purpose and Scope

This document has been prepared to support referrals of the project under section 38 of the State *Environmental Protection Act 1986* (EP Act) and Part 9 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It provides a description of the project, summary of the existing environmental values, potential impacts to these values and management that will be implemented to minimise any impacts.

This supporting document has been prepared for the EGP only, which will transport natural gas to the existing SDGM and TGM sites operated by AGAA. While the pipeline will be designed to be able to accommodate potential future clients, these potential future opportunities are not addressed in the scope of this document.

The EGP project is independent of the established SDGM and TGM mining operations and the existing approvals that are in place for these operations, it is acknowledged that even though the proposed pipeline will overlap the TGM s38 and EPBC approval areas (Figure 2). The EGP will lie within its own dedicated easement / tenure with supporting access agreements..

1.2 The Proponent

The proponent for this EGP project is APA Operations Pty Ltd (APA). The contact person is:

Madonna Burns
Project Approvals Manager
Address: Eastpoint Plaza Level 5, 233 Adelaide Terrace, Perth WA 6000

Phone: 08 6189 4430
Email: Madonna.Burns@apa.com.au

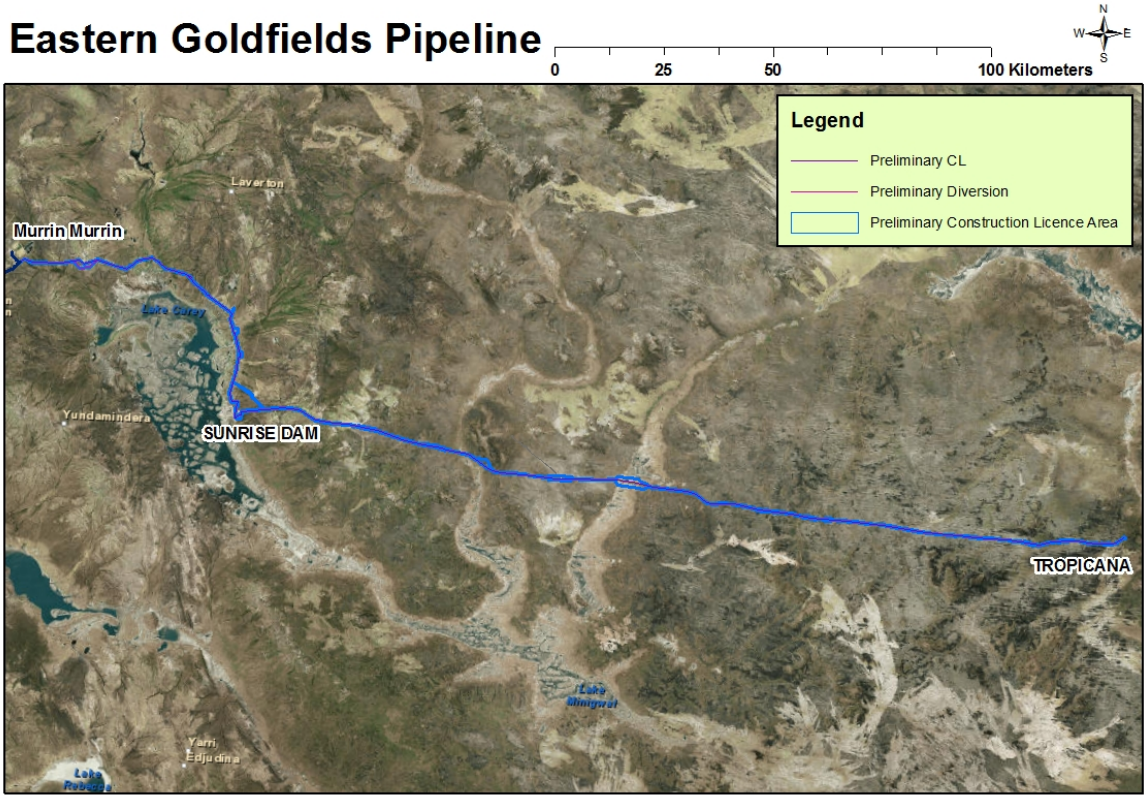


Figure 1: Eastern Goldfields Pipeline project

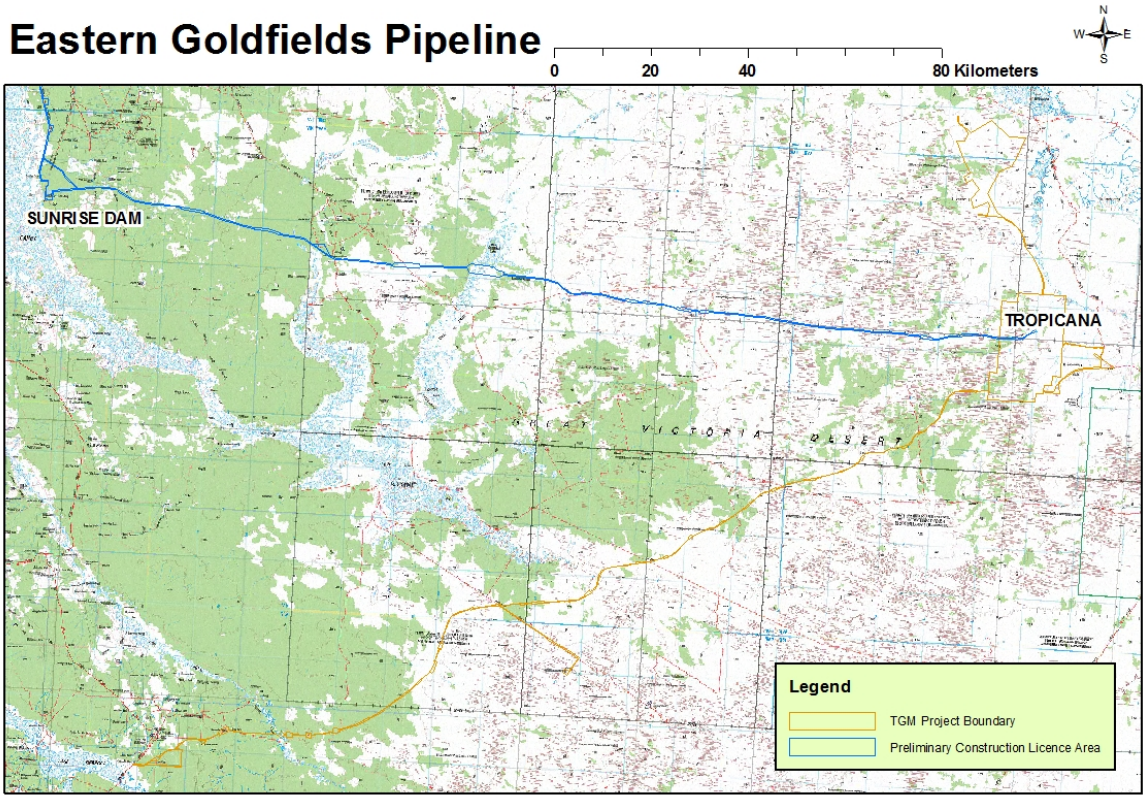


Figure 2: Location of EGP project in relation to TGM approval area

1.3 Abbreviations

The abbreviations utilised throughout this document are outlined in Table 1 below.

Table 1: Abbreviations

Item	Definition
AGAA	AngloGold Ashanti Australia
APIA	Australian Pipeline Industry Association
ASS	Acid Sulphate Soils
BIF	Banded Ironstone Formation
CEP	Construction Environment Plan
ROW	Right-of-Way
DAA	Department of Aboriginal Affairs
DEC	Department of Environment and Conservation
DER	Department of Environment Regulation
DMP	Department of Mines and Petroleum
DoE	Department of the Environment (Commonwealth)
DoW	Department of Water
DPaW	Department of Parks and Wildlife
EGP	Eastern Goldfield Pipeline
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERP	Emergency Response Plan
ESA	Environmental Sensitive Area
ha	Hectare/s
HDD	Horizontal Directional Drilling
IBRA	Interim Biogeographic Regionalisation for Australia
MNES	Matters of National Environmental Significance
NVIS	National Vegetation Information System
OEP	Operational Environmental Plan
P	Priority flora
PDWSA	Public drinking water source areas of Western Australia
PEC	Priority Ecological Community
ppt	Parts per thousand
RWI	*Rights in Water and Irrigation Act 1914*
SDGM	Sunrise Dam Gold Mine
SDS	Safety Data Sheet
tds	Total dissolved salt
TGM	Tropicana Gold Mine
TEC	Threatened Ecological Community
WA	Western Australia
WC Act	*Wildlife Conservation Act 1950*

1.4 Assessment process and applicable legislation

APA is committed to compliance with legislative requirements and industry standards throughout all of its activities.

The pipeline will be constructed pursuant to a licence granted under the State *Petroleum Pipelines Act 1969* (Pipelines Act), which is administered by DMP. As per the future licence conditions, the EGP will be implemented in accordance with the associated Petroleum Pipelines (Environment) Regulations 2012. A condition of this licence will require the preparation of a Construction Environment Plan (CEP) to be approved by the DMP, prior to commencement of construction.

Key steps in the granting of approvals under the Pipelines Act include:

- Issue of the Pipeline licence, following demonstration of proposed alignment and specifications;
- Consent to construct, following acceptance of a Safety Case (SC) and a CEP. Consent to construct will not be issued until DMP is satisfied that all relevant issues are appropriately resolved; and
- Consent to operate, following successful construction and testing of the pipeline and associated facilities, and approval of an accepted Operational Safety Case and Operations Environment Plan (OEP) from DMP. OEPs are assessed by DMP following consultation with appropriate government and local government agencies and other interested stakeholders.

The key legislative requirements relevant to the EGP project, and the associated agencies responsible, are outlined in Table 2.

Table 2: Summary of key legislative requirements

Agency/ Authority	Legislation	Approval / Requirement
DMP	*Petroleum Pipelines Act 1969*	STP-PLA-00025 application Consent to Construct Consent to Operate PL36 Variation
DMP	*Petroleum Pipelines Act 1969* Petroleum Pipelines (Environment) Regulations 2011	Construction Environment Plan (CEP) acceptance
DMP	*Environmental Protection Act 1986* Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Native Vegetation Purpose Permit
Environmental Protection Authority (EPA)	*Environmental Protection Act 1986*	Referral for whether requires assessment - EIA for significant impact
Department of Parks and Wildlife (DPaW)	*Wildlife Conservation Act 1950*	Permits to take
Department of the Environment (DoE)	*Environment Protection and Biodiversity Conservation Act 1999*	Referral – EIA for Matters of National Environmental Significance
Department of Environment Regulation (DER)	*Environmental Protection Act 1986*	Works Approval for prescribed premises associated with camp septics (if > 100 m^3)
Department of Water (DoW)	*Rights in Water and Irrigation Act 1914* (RWI Act)	Construction and operation of a groundwater well (bore)
Shire of Menzies Department of Health	*Heath Act 1911* Health (Treatment of sewage and disposal of effluent and liquid waste) Regulations 1974	Approval for the Waste Water Treatment Plant for the construction camp

There are numerous other State and Commonwealth legislation, regulations and other standards relevant to the EGP project as outlined below (Note: this is not an exhaustive list):

Western Australia

- *Aboriginal Heritage Act 1972;*
- *Agriculture and Related Resources Act 1976;*
- *Bushfires Act 1954;*
- *Conservation and Land Management Act 1984;*
- *Contaminated Site Act 2003;*
- Environmental Protection Regulations 1987;
- Environmental Protection (Noise) Regulations 1997;
- Environmental Protection (Controlled Waste) Regulations 2004;
- *Explosives and Dangerous Goods Act 1961;*
- *Fire and Emergency Services Authority (FESA) of WA Act 1998;*
- *Heritage of Western Australia Act 1990;*
- *Land Administration Act 1997;*
- *Soil and Land Conservation Act 1945;*
- *Town Planning and Development Act 2005; and*
- *Waterways Conservation Act 1976.*

Commonwealth

- *Australian Heritage Commission Act 1975;*
- *Endangered Species Protection Act 1992;*
- *Native Title Act 1993;*
- *National Greenhouse and Energy Reporting Act 2007;*
- *National Environment Protection Measures (Implementation) Act 1998;*
- *Plant Diseases Act 1914;*
- *Quarantine Act 1908* (and regulations);
- National Environment Protection Measure (NEPM) (Air Toxics) 2004;
- NEPM (Ambient Air Quality) 1998;
- NEPM (Assessment of Site Contamination) 1999;
- NEPM (Diesel Vehicle Emissions) 2001; and
- NEPM (National Pollutant Inventory) 1998.

2 STAKEHOLDER CONSULTATION

The key stakeholders identified in relation to the EGP project include the following organisations and people (asterisks indicate where consultation has already commenced with the relevant stakeholder):

- Government;
  - Commonwealth DoE*
  - EPA*
  - DMP* (Environmental Division Perth and Environmental Division Goldfields)
  - DPaW* (Environmental Management Branch, Threatened Species and Community Branch and Goldfield Region)
  - DER (dependant on septics requirements at construction camps)
  - Department of Water
  - Department of Aboriginal Affairs
  - Department of Lands / Department of Regional Development
  - Shire of Menzies*
  - Shire of Laverton*.
- Non-Government;
  - Conservation Council of WA
  - Wildflower Society of WA
  - Wilderness Society
  - Malleefowl Preservation Group
  - National Malleefowl Recovery Team
  - Goldfields Land & Sea Council
  - Central Desert Native Title Service
  - Friends of the Great Victoria Desert
  - Affected land owners and occupiers*.

The consultation with Government has involved meetings with agencies to generally advise of the project and discuss approval requirements and timeframes (including information requirements). Some specific topics have been discussed including licence variations and applications, and species management requirements. It is noted that no major issues of concern in regard to potential project environmental impacts have been raised to date.

Liaison with affected land owners and managers has commenced. A comprehensive line list will be generated for affected landowners / occupiers that identify individual concerns over access to properties as well as requirements regarding impacts and reinstatement. Where applicable or as required, property inspection reports will be prepared to record agreed requirements of landowners / occupiers and to ensure such requirements are complied with.

Affected stakeholders will be kept aware of scheduled activities and impacts as the project progresses.

Ongoing consultation will occur for this project via email/letters, meetings and circulation of updates to relevant stakeholders.

Feedback from all interested parties will be encouraged and monitored during the entire project. A Register will be maintained that records actions taken to address any issues/feedback received.

3 PROJECT OVERVIEW

3.1 Location and land tenure

The pipeline will begin at existing APA infrastructure, from Laverton Road near Murrin Murrin Nickel Mine 50 km south-west of Laverton. From here it will track 84 km, around Lake Carey, to the SDGM 55 km south of Laverton. The final section will traverse 210 km from SDGM to TGM, 330 km north-east of Kalgoorlie.

Section 1 (Murrin Murrin to SDGM) of the pipeline will traverse two pastoral leases (Glenorn and Mount Weld Stations) within a wider area used for mining. As a result, this section of the proposed corridor route largely follows existing access tracks. Although some areas are degraded from pastoral and mining activities, the vegetation in this section of the pipeline corridor has been described as 'Good' to 'Very Good' (refer to Section 4.5.1).

Section 2 (SDGM to TGM) of the pipeline traverses mostly unallocated crown land, overlain with various mining tenure, and traverses mostly remote and undisturbed vegetation.

The pipeline will lie within a Construction Pipeline Licence Area which occupies a corridor within existing AGAA Miscellaneous Licenses and those currently being granted via the *State Mining Act 1978*. Access agreements will be in place to enable land access. In due course (post construction) land access will be via an easement granted under the *Land Administration Act 1997*.

In addition some small sections (deviations) of the pipeline corridor are located on existing mining leases held by AngloGold Ashanti Australia, Dacian Gold and Minara Resources.

Appendix 2 provides a summary of the applicable mining leases and tenure.

3.2 Schedule

Contractual agreements require "first gas" to the AGAA mine sites by January 2016. Based on this, construction is expected to be carried out between February 2015 and December 2015 (subject to obtaining the necessary approvals and other external factors).

Construction is anticipated to be progressive, starting at the western end of the corridor at Murrin Murrin and moving east towards SDGM, and then TGM. It may, however, be necessary for additional construction teams to commence work at multiple locations along the pipeline route to facilitate project completion / schedules.

3.3 Disturbance footprint

All construction work will be confined to the abovementioned Construction Pipeline License Area and the associated underlying tenure. The pipeline corridor refers to the 100 m corridor, 50 m either side of the center line alignment whereas the construction Right-Of-Way (construction ROW) refers to the area to be disturbed (30 m wide; refer to Section 3.5.1). The construction ROW is expected to be a maximum of 30 m wide, with the working width reduced in some areas due to the presence of environmental values. The location of the construction camp, vehicle turnaround bays, temporary storage and laydown areas are yet to be finalised, however, they will be placed so as to utilise existing cleared or degraded areas and to avoid high risk or conservation significant areas, as far as practicable.

The total disturbance footprint is not anticipated to exceed 915 ha (Table 3). The majority of the disturbance will be temporary with reinstatement and rehabilitation occurring after construction is complete. The permanent disturbance is associated with an access track along the entire pipeline route for operational maintenance (approximately 6 m wide for 294 km).

Table 3: Disturbance footprint of the project

Component	Disturbance (ha)
Pipeline corridor (30 m width for approximately 294 km)	882
Construction camp (including laydown area)	11
Above ground facilities (2x MLVs, 2x delivery/metering etc.)	1
Temporary access tracks	~4
Turnaround points	4
Turkey nest dams	3
Borrow pits	10
TOTAL TEMPORARY DISTURBANCE	915
Rehabilitation post-construction	738
TOTAL PERMANENT DISTURBANCE (operational access track [176 ha] and above ground facilities [1 ha])	177

3.4 Pipeline corridor alignment

Murrin Murrin to SDGM (Section 1)

A number of options for pipeline alignment were identified between the Murrin Murrin to SDGM section of the pipeline corridor (Figure 3), and these were associated with the Granny Smith Gold Mine located to the north of SDGM. The identified options were primarily associated with land access challenges and following liaison and agreement with landowners, the preferred option was identified.

During the baseline surveys of the preferred pipeline alignment, a banded ironstone landform formation was identified. The formation is large and would have required significant alignment alteration, and overall increase in length to avoid. This in turn would have resulted in significant additional environmental disturbance. In consultation with the vegetation and flora consultants and pipeline engineers, the corridor alignment was modified which has minimised impacts on the formation. It has been decided that the pipeline will cut directly across the BIF via the shortest possible route, reducing overall impact in the area. In addition, existing tracks in the area will be utilized for access to and from the construction ROW, thus enabling the construction ROW itself to be reduced in width.

SDGM to TGM (Section 2)

A number of potential pipeline alignment options between SDGM and TGM were identified based on topographic data, knowledge obtained from previous surveys conducted in the region, existing aerial photographs and other regional information. The identified options were aimed at minimising impacts on known environmental and heritage values in the region, and minimising challenges associated with topographical, geological, engineering and financial factors. The pipeline alignments that were considered are shown on Figure 4.

A helicopter survey of the preferred alignments was undertaken by engineers, surveyors and environmental personnel to further refine and avoid on-ground constraints along the identified options. A preferred alignment was chosen that minimised the potential impacts to on-ground values and topographical challenges. The preferred alignment predominantly occurred within a 200 m width corridor, however, this increased to 500 m around the potentially sensitive Balpe salt lake system located approximately half way between SDGM and TGM. Baseline surveys were then conducted along the preferred alignment area (i.e. 200 – 500 m width). The results obtained from the baseline surveys were used to determine the preferred pipeline alignment, which aimed at avoiding significant environmental and heritage values including fauna habitat, significant flora species and Aboriginal heritage sites. The pipeline corridor is expected to be a maximum of 30 m wide, with additional space for other requirements (as outlined in Section 3.3).

3.5 Construction aspects

The pipeline will be constructed to comply with all relevant codes and standards including *AS 2885.1 Pipelines — Gas and Liquid Petroleum Design and Construction* (2012) and the Australian Pipeline Industry Association (APIA) Code of Environmental Practice (2013). The construction will also be guided by the environmental requirements specified in the CEP for the EGP project, which will be prepared in accordance with the State Petroleum Environment Regulations (2012) and approved by the DMP.

Pipeline construction activities will include a range of tasks, as described in detail in the subsequent sections.

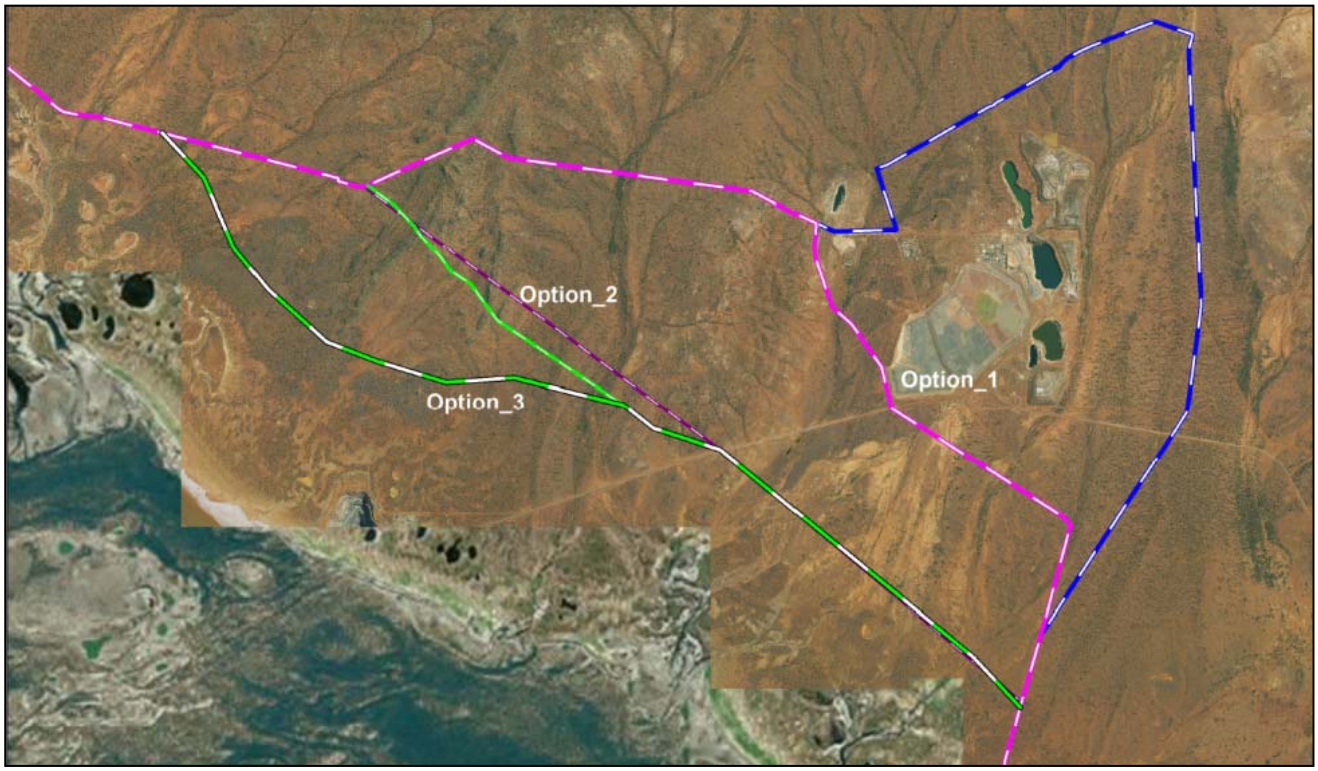


Figure 3: Murrin Murrin to SDGM pipeline corridor alignment options (Granny Smith mine shown)

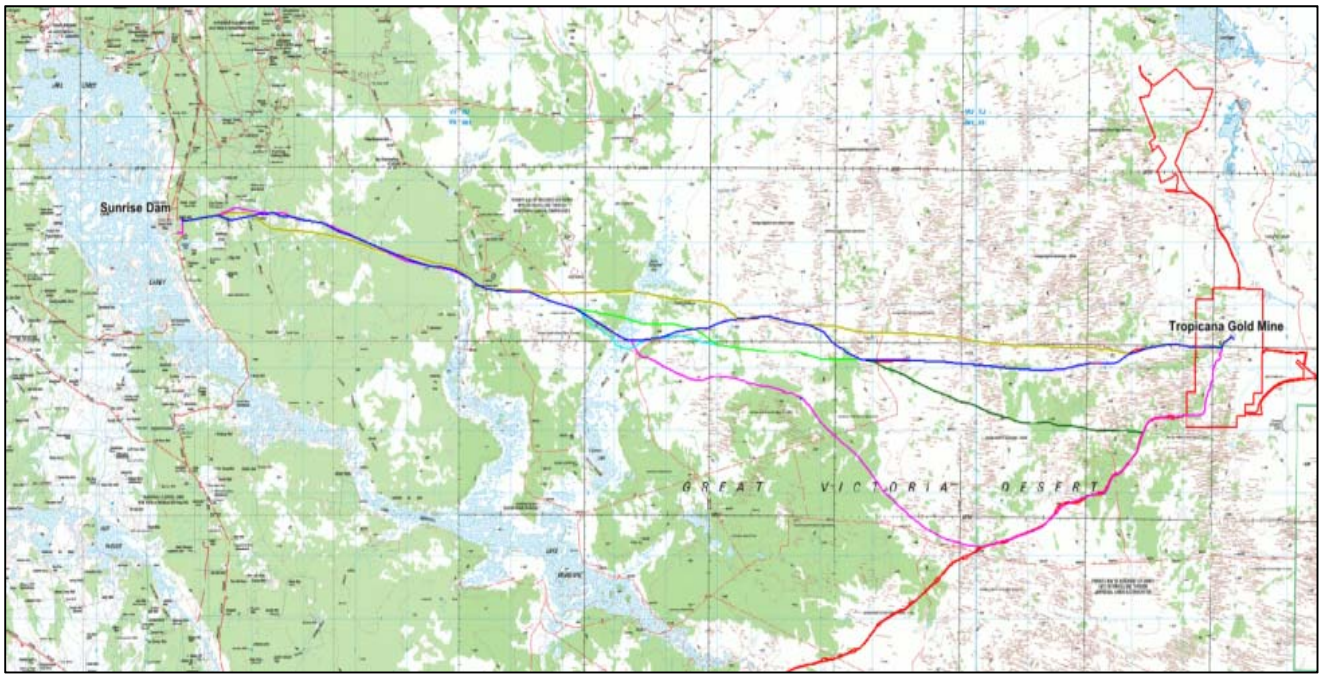


Figure 4: SDGM to TGM pipeline corridor alignment options

3.5.1 Construction ROW

The construction ROW for the project is a temporary construction zone that will accommodate equipment, allow vehicle travel along the construction route and temporary storage of trench spoil and topsoil (Figure 5). The width of the construction ROW ensures that construction activities can be safely performed with minimum risk of any incidents, accident or injury to construction personnel. In order to further minimise impact to the surrounding environment, the construction ROW will be reduced in width wherever possible; especially within conservation significant vegetation/habitat. The construction ROW will generally be 30 m in width but in such areas it will be reduced to 20-25 m. Access to the construction ROW will be via designated access tracks.

Centreline survey

A survey of the centerline of the pipeline and the limits of the construction ROW will be required prior to mobilisation. Boundaries will be marked using pegs and will be retained until the construction ROW restoration is undertaken. Any fences to be cut to allow for construction will also be marked by surveyors.

3.5.2 Temporary construction support areas

Establishment of temporary construction support areas and infrastructure will be required, including:

- Construction camp;
- Site offices;
- Ablutions;
- Equipment laydown areas; and
- Pipe storage areas.

While some of these components may be consolidated at the same site, this is dependent upon construction logistics. Construction support areas for this project are expected to be located within close proximity to the construction ROW.

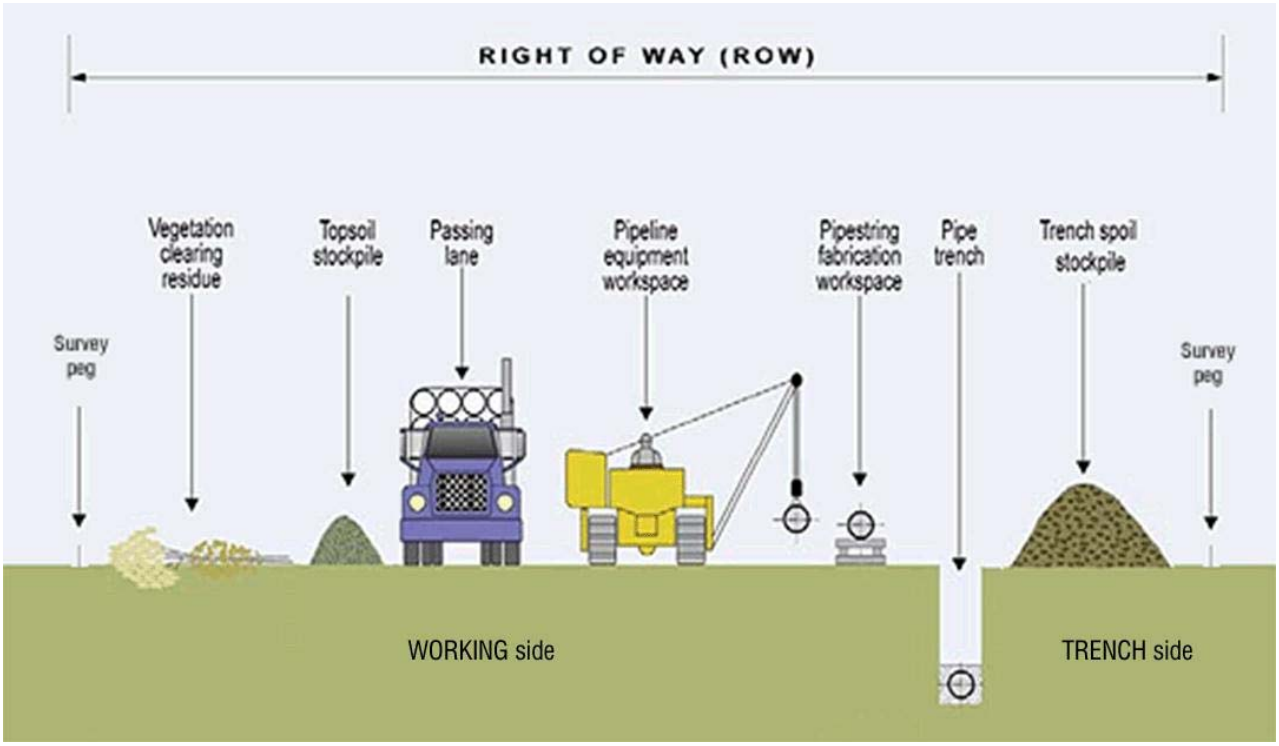


Figure 5: Example of a construction ROW

3.5.3 Access

Access to the construction ROW will primarily be from existing roads and tracks, as well as the new construction ROW track to be constructed (and maintained for operations). Landholders will be consulted for permission regarding any use of existing tracks and maintenance requirements for any access tracks on their properties.

Traffic management

The construction ROW will traverse vast distances and cross several other existing transport corridors. A traffic and or travel management plan will be developed in consultation with key stakeholders as appropriate, prior to the commencement of construction. Sufficient gaps will be provided along the construction ROW for public and private access including the movement of vehicles, farm equipment and livestock.

3.5.4 Clear and grade

Proposed construction methods of the pipeline include a clear and grade process to remove the vegetation and topsoil from the construction ROW. Clear and grade will include the removal of vegetation and the grading of 100 mm of topsoil, depending on the soil profile, using bulldozers and graders. The vegetation will be pushed aside and topsoil will be separately stockpiled (in windrows) along the edge of the construction ROW to permit safe and practical construction access, whilst preserving the topsoil for later reinstatement.

APA will supervise the extent of clearing required and ensure compliance with the CEP. Special features not to be disturbed will be included on alignment sheets and a construction line list, and be clearly marked in the field.

Where sedimentation of water bodies has the potential to occur, erosion and sediment control measures will be installed on stockpiles and spoil at these locations. Erosion and sediment control measures will be inspected and maintained on a regular basis and following rain events for the entire construction area.

Vegetation clearing

Vegetation clearing will be carried out in accordance with the relevant approvals. Clearing of vegetation will be minimised where ever possible and is not anticipated to exceed 915 ha. All disturbances associated with project activities, including soil stockpiles, laydown areas, parking areas and construction works will be contained within approved disturbance footprint and clearing limits.

3.5.5 Excavation and trenching

The trench is anticipated to be approximately 600 mm wide and will be excavated using a range of specialist equipment to a depth that provides an appropriate cover for the pipe (as established in the Safety Management Study – AS2885), commensurate with the terrain and land use characteristics. Trench depth will be increased at infrastructure crossings and around water bodies, as appropriate. As a general rule, the minimum cover over the pipeline will be 750 mm (500 mm through rock); trench depth will therefore be approximately 1000 mm, with infrastructure crossings being approximately 1200 mm. Trench spoil will be stockpiled separately from topsoil on the trench side of the construction ROW.

An excavation at the existing Murrin Murrin Pipeline (PL36) will be undertaken to a depth of 2000 mm to facilitate the hot tap. Excavation and small amounts of trenching will also be required for installation of the facilities and other services associated with the meter stations.

All excavation is to be conducted in accordance with APA Pipeline Excavation Procedures. Works will be appropriately marked and secured, with benching put in place for stability and to allow for fauna egress as required (including ramping of excavations for access).

Ramps of approximately 45 degrees will be installed at regular intervals, providing egress points for any trapped fauna. It is anticipated that these will be located in-line with trench plugs, which will be located at approximately every 1 km. In addition, scramble mats or other egress (branches etc.) and / or fauna refuges (hessian bags or alike) will be placed at intervals not more than 100 m (50 m within Sandhill Dunnart and/or Marsupial Mole habitat) within the trench, providing suitable shelter from the sun and predators. Inspection of the excavation will also occur, as discussed in more detail in Section 5.

3.5.6 Crossings

Directional boring

Horizontal boring methods may be employed in order to avoid disruption or infrastructure corridors such as sealed roads and rail. The installation of the pipeline by horizontal boring involves boring a hole from one bore pit to another bore pit, then pulling the welded pipe string back through the bored hole. Boring is conducted by a specially designed bore rig and operated by a specialist construction contractor.

Horizontal Directional Drilling

It is yet to be determined whether horizontal directional drilling (HDD) will be required for this project as yet. If required, it will involve drilling beneath the water body or existing infrastructure corridor utilising trenchless technology (Figure 6). It will require the excavation of an exit pit approximately 3 m by 3 m by 3 m on the opposite side to where the drilling rig is set up, to contain drilling fluids used to assist the drilling process. A smaller entry pit approximately half the size of the exit pit is excavated on the drilling rig side for the same reason as described above. A bore hole is then drilled beneath the invert of the water body or infrastructure corridor, from one side to the other and the pipe pulled back through the bore hole. The drilling fluids that are used to assist the process are monitored through the logging of fluid inputs and returns.

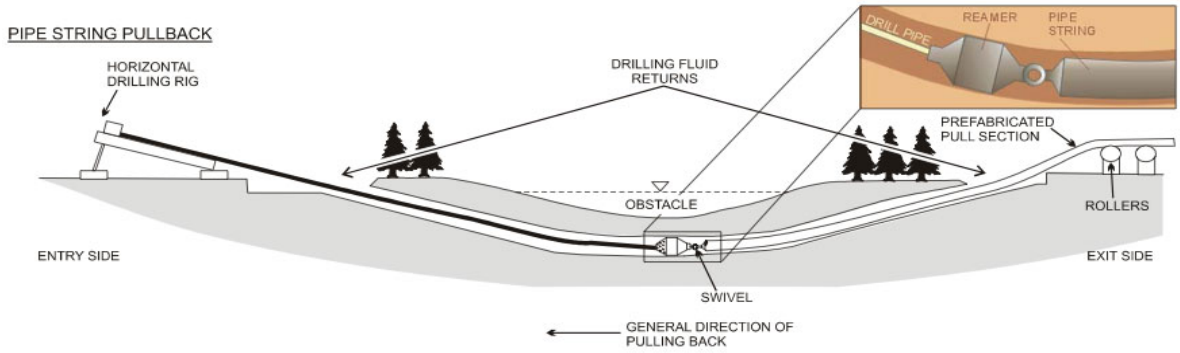


Figure 6: Example of HDD

Wet trench

It is possible that the Hope Campbell Lake crossing will require application of a wet trench method although the preferred method of construction has not been determined. Wet trench method will involve open cut trenching through a wet area without dewatering. Pipe will be weighted, laid and backfilled underwater.

Dewatered construction ROW

The contractor may also decide to dewater (should water be found in an open trench area). If this is the case, “windrows” will be pushed to the side of the trenching area and used to create walls. Pumps will then be used to de-water the trench. Any water will be captured and utilised for dust suppression purposes are alike (i.e. no water will be discharged).

3.5.7 Hot tapping

Following excavation and exposure of the Murrin Murrin Pipeline, the hot tap fittings will be welded onto the existing operating pipeline. Hot tapping is the process of drilling a hole into the operating pipe. Once the hot tap fitting has been installed onto the pipe a valve is installed onto the fitting and a hot tap machine is installed onto the valve. The valve is opened allowing access to the top of the pipe and the inside of the machine is pressurised to the same pressure as the pipeline. Inside the hot tap machine is a hole saw that is rotated and slowly lowered onto the pipe. A pilot hole in the pipe is drilled first and wires extend through the hole and ensure the steel disc to be removed (coupon) does not fall into the pipe. The hole saw cuts into the pipe and completely removes the coupon. The saw is moved back into the machine and the valve closed, sealing the pipe. The gas inside the machine can then be vented off and the machine safely removed.

3.5.8 Pipe assembly

Pipe stringing

Pipe will be delivered to the construction ROW and laid out end-to-end alongside the trench. The pipes are anticipated to be 18 m long and will be placed on raised timber skids or sandbags to protect the pipe from damage, and allow it to be welded into continuous lengths (pipe strings). Gaps will be provided for access.

Bending

Bending may be required to enable the pipe to conform to topographic conditions. Pipe may either be 'cold bent' in the field using hydraulic bending equipment or manufactured by applying heat in a factory to produce the desired shape.

Welding, radiography and joint coating

Pipe segments are welded into continuous lengths before being laid in the trench. Welded joints will be x-ray tested to ensure compliance with *AS2885.2 Pipelines-Gas and Liquid Petroleum-Welding*, garnet blasted to remove surface scale and rust and then coated with a high build epoxy (HBE) to provide a continuous external coating to prevent corrosion.

Lowering in

Once welded, the pipe strings will be placed into the trench by side-boom tractors (or equivalent). Bedding and padding sand will be placed around the pipe to provide protection from sharp objects damaging the pipe coating. This will consist of fine material sourced from the trench material, wherever possible. If this is not possible, it is anticipated that sand will be obtained from local borrow pits on AGAA tenure.

3.5.9 Dewatering

Prior to lowering-in, it may be necessary to dewater the trench if water is present. Any water will be utilised for dust suppression purposes (i.e. no water will be discharged).

3.5.10 Testing

Hydro

The entire pipeline will be hydrostatically tested in accordance with the Australian Standard (AS2885.5) to verify the integrity of the pipeline. Prior to hydrostatic testing, the interior of the pipeline will be pre-cleaned to remove weld debris, dust and surface scale. Once full of water, the pipeline will be pressurised for an extended period (strength test). The pressure (125%) is then lowered and held for 24 hours and monitored for pressure drops (leak detection test). Hydro-test water is anticipated to be sourced from a variety of options including existing sources such as Laverton, mines (SDGM/TGM), and local bores. Should additional water be required water may be obtained from new bores or dewatering wells (if required) subject to licensing from the DoW.

It is expected that no chemicals (biodices etc.) will be added for hydrotesting, as the pipeline is internally coated. However, at some locations chemicals may be needed. Where required, the water will be treated to an appropriate standard before discharge to the environment. Discharge will comply with DoW requirements as set out in Water Quality Protection Note 13 (DoW 2012).

Other testing

Other testing of equipment that will be undertaken onsite prior to commissioning includes:

- Non Destructive Testing (NDT);
- Functional testing of all manual valves;
- Earthing compliance checks;
- Hazardous area checks/inspections; and
- Continuity and point to point testing of circuits.

3.5.11 Backfilling

The period of time that any part of the trench is left open will be minimized (typically not more than 28 days). Wherever possible, stockpiled trench spoil will be returned to the trench and compacted following the lowering-in of the pipe. If required, clean approved locally-sourced fill will be imported to make up any shortfall from soil removed. This is then covered with the stockpiled spoil, where suitable. Topsoil removed during grading will then be re-spread over the construction ROW and contours reinstated.

3.5.12 Clean-up and rehabilitation

Upon completion of works, temporary infrastructure, equipment, waste and other stockpiled material (e.g. stockpiled rocky material that cannot be reused for backfill) will be removed from the site. Waste will be disposed of at the appropriate class landfill facility.

Rehabilitation of the construction ROW will aim to reinstate contours, minimise the potential for erosion, minimise any impact on drainage patterns, minimise weed establishment, minimise the visual impact of the pipeline installation, assist vegetative regrowth and minimise adverse impacts of the pipeline on the existing environment. Erosion and sediment control structures (diversion berms, sediment traps) may be put or left in place to protect water quality around water bodies and to divert run-off away from potentially unstable areas.

Revegetation of the construction ROW will be based on specialist advice and consultation with stakeholders. Landholder's specific requirements and requests will be identified, conditions will be negotiated, and contact will be maintained with the landholder during construction activities. The entire disturbed area of the construction ROW will be subject to weed monitoring, and control programs if required, following construction (as a part of ongoing pipeline operations).

Rehabilitation will involve re-spreading of the stockpiled topsoil and vegetation, as well as redistribution of any mulch from cleared vegetation, over the pipeline construction ROW to facilitate vegetative regrowth. It is noted that a line of site must be maintained and the coating of the pipeline must be protected from damage by plant root systems, which may require selective removal of vegetation during the operation and maintenance phase of the project.

In summary, the rehabilitation works anticipated to be undertaken are as follows:

- Removal of temporary buildings (including ablutions, shelters and site offices) located along the construction ROW or at the construction camp;
- Disturbed areas outside the fenced above ground facility compounds to be scarified to a depth of approximately 100 mm, re-profiled and covered with topsoil to a maximum depth of 100 mm (topsoil depth stipulated to ensure best use of resource); and
- Vegetative material removed during site preparation to be placed over disturbed areas to stabilise area and facilitate regrowth.

Ongoing monitoring of the condition of the EGP will be undertaken indefinitely throughout pipeline operations. Monitoring is typically undertaken on a monthly basis via aerial patrols and at least annually on the ground. In addition, any issues are reported by exception as identified during regular visits to the site for general operational activities.

3.5.13 Commissioning

Commissioning of the EGP will be undertaken as per a project specific commissioning plan. An overview of works undertaken during the commissioning phase of the project is as follows:

- Pre-testing of all mechanical and electrical equipment and instrumentation;
- Commissioning of communications and control systems prior to introduction of gas;
- Progressive introduction of gas, commissioning each item of equipment sequentially until the whole system is capable of operating as a unit; and
- Handover to APA WA Goldfields Operations Department.

3.5.14 Additional requirements

Construction camp

Due to the remote location of the EGP project, a construction camp will be required to provide local accommodation for site construction personnel. The construction camp will be located within the Miscellaneous Licence area, or in association with the SDGM and TGM. The construction camp site will be selected with the following considerations in mind:

- Preferred location within an area previously surveyed for heritage values so that heritage sites can be avoided;
- Preferred location avoiding conservation significant vegetation/habitat where practicable;
- Preferred location adjacent to an existing access track so that new road construction (and associated environmental aspects) can be avoided;
- Minimising impacts on surrounding land use and residents; and
- Preferred location whereby existing access rights are in place.

The camp will comprise a ground surface area of approximately 5 ha and be purpose designed to accommodate up to 200 workers during peak construction. The camp will be complete with auxiliary services such as power, communications, water, ablutions and kitchen facilities.

The camp facility will be designed and installed in accordance with the following requirements:

- Wind ratings;
- Health Department standards;
- Local Authority planning requirements;
- AS/NZS 3000:2007 – Electrical Installations (known as the Australian/New Zealand Wiring Rules); and
- DFES – Built Environments Administration standards.

Water

Water will be required for various uses at the accommodation camp, dust suppression and hydro-testing. The following volumes of water are anticipated to be required:

- Camp/ Potable water: 80 KL / day (400 L pp / day);
- Process water:
  - Dust suppression (untreated bore water): 200 KL / day; and
  - Hydro testing: 1500 KL.

The source of the water is yet to be determined, however, the following or combinations of all are being explored:

- Mine void water
- Established bores:
  - on intersected pastoral properties
  - belonging to the Shire
  - associated with adjacent mining operations (such as Granny Smith, SDGM and TGM).
- The drilling of new bores in suitable locations (including for dewatering for pipeline construction if required).

Any groundwater abstraction will be carried out in accordance with appropriate licenses.

3.5.15 Above ground facilities

Above ground facilities will include the off-take, the delivery/meter stations and two main line valves. At the above ground facilities, site civil works will include:

- Pad construction;
- Minor excavations for slab placement, control hut and meter and filter skids;
- Pouring and placement of concrete slabs for the above;
- Installation of underground conduits and earth cable to the new skids; and
- Erection of site security fencing.

Upon completion of construction, it is expected that aggregate will be laid over ground surface areas within 2 m of above ground equipment, to prevent vegetative regrowth.

In addition, the following work will be required at the meter station sites:

Mechanical works include:

- Assembly of equipment and lifting into position as per civil and mechanical design;
- Installation of free standing equipment and structural steel work for pipe racks, pipe supports and cable tray supports;
- Installation of interconnected piping and cable tray; and
- Installation of instrument air and gas utility lines.

Electrical works include:

- Installation of electrical power distribution and control components, cable trays and underground conduits;
- Installation of power and control cables between equipment and Remote Terminal Unit (RTU) hut; and
- Loop checking, point to point and functional checking.

4 EXISTING ENVIRONMENT

4.1 Biogeographic and regional setting

A biogeographic regionalisation of Australia has been developed collaboratively in which bioregions (broad-scale regionalisations) are formally recognised and mapped: the Interim Biogeographic Regionalisation for Australia (IBRA), currently version 7 (DoE 2013). IBRA version 7 provides a landscape-based approach to the classification of the land surface of Australia, with bioregions being classified according to common climate, geology, landform, native vegetation and species information. Bioregions each reflect a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment across Australia. Subregions are more localised and homogeneous geomorphological units within each bioregion.

The project area occurs within two bioregions: the Murchison and the Great Victoria Desert. Both bioregions are further split into subregions of which three are traversed by the survey corridor: the Eastern Murchison, Great Victoria Desert Shield and Great Victoria Desert Central (Table 4).

Table 4: Subregions of the EGP project

Subregion	Code	Description
The Eastern Murchison	MUR1	Characterised by its internal drainage, broad plains of red-brown soils (hardpan plains) and elevated red desert sandplains with minimal dune development. Other landforms include salt lake systems and breakaway complexes. Vegetation is dominated by Mulga woodlands often rich in ephemerals, hummock grasslands, saltbush and halophytic shrublands.
The Great Victoria Desert Shield	GVD1	Comprises the western margin of the Great Victoria Desert and contains a higher proportion of sandplain communities. Landforms consist of sandplains, sand dune fields, salt lakes, major valley floors and minor areas of out-cropping (silcrete-capped mesas and breakaways). Sandplain vegetation is dominated by Spinifex (*Triodia basedowii*) hummock grassland and mallee (*Eucalyptus kingsmillii*, *E. youngiana*). Marble Gum (*E. gongylocarpa*) and Native Pine (*Callitris*) woodlands occur on the deeper sands. Mulga and mixed acacia woodlands occur mainly on the colluvial and residual soils. Halophytes such as Saltbush (*Atriplex*), Bluebush (*Maireana*), and Samphire (*Tecticornia*) occur on the margins of salt lakes and in saline drainage areas. Yellow sandplain communities are distinctive vegetation communities occurring within the subregion;
Great Victoria Desert Central	GVD2	Ann arid active sand-ridge desert with extensive dune fields. The region is characterised by east-west orientated sand dune fields, sandplains, salt lakes, major valley floors, occasional outcropping (breakaways) and quartzite hills. Vegetation is dominated by Marble Gum (*Eucalyptus gongylocarpa*), Mulga and Mallee (*E. youngiana*) over hummock grassland dominated by *Triodia basedowii*. Acacia dominates colluvial soils with *Eremophila* and *Santalum* species. Halophytes are confined to edges of salt lakes and saline drainage systems.

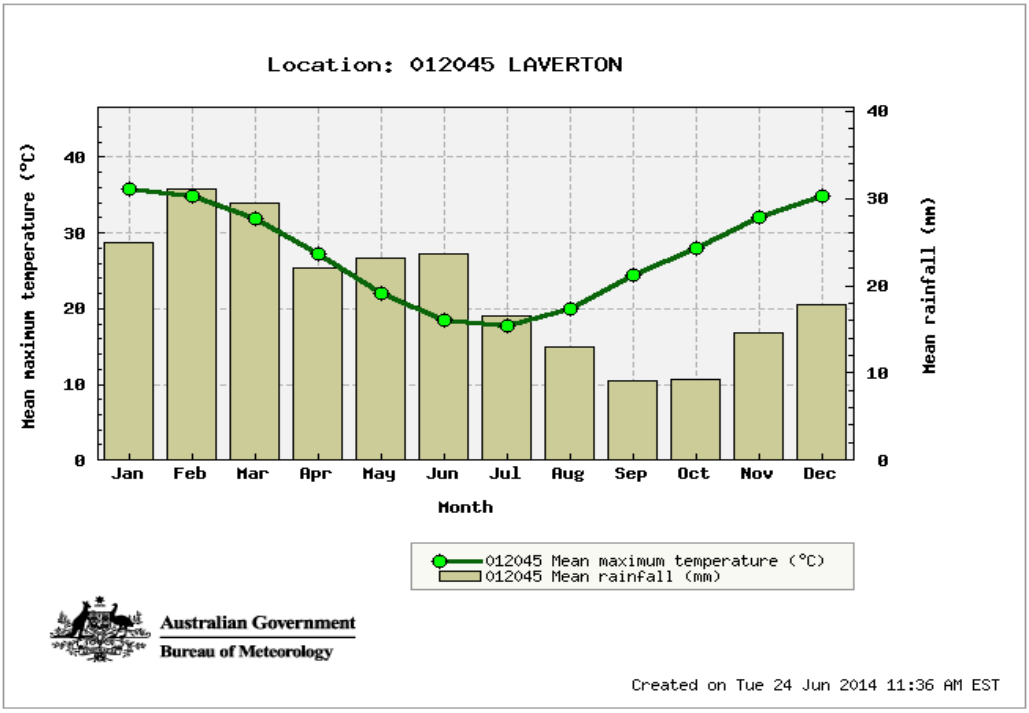
*adapted from Kingfisher 2014a, 2014b

4.2 Climate

The region is considered to have a desert climate of hot summers and mild winters. Mean temperatures range between 6°C and 38°C. Rainfall is low and relatively evenly spread throughout the year (Dames and Moore 1994).

Regional wind patterns consist of morning north-easterly, easterly and south-easterly winds of up to 40 km/hr throughout the year. Afternoon wind patterns vary seasonally from east to south-easterly winds in the summer and autumn, and more varied northwest to south-easterly winds in the winter and spring (Dames and Moore 1994).

The nearest weather station to the EGP is located in Laverton. Data collected from this BoM weather station has been used to provide climate information for the site (Figure 7). In summary, monthly mean maximum temperatures at the Laverton weather station range from 17.8°C in July to 35.8 °C in January. Mean monthly rainfall ranges from 9.1 mm in September to 31.1 mm in February. Average annual rainfall is 234.5 mm per annum (BoM 2014).



Source: BoM, 2014

Figure 7: Mean Monthly Rainfall and Maximum Temperatures – Laverton (Rainfall: 1899-2014; Temperatures 1900-1971)

4.3 Topography, landform, geology and soils

The landscape of the Murchison IBRA bioregion comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains (Commonwealth Government 2008a). It is dominated by the Archaean (over 2500 million years ago) granite greenstone terrain of the Yilgarn Craton (Commonwealth Government 2008a). Alluvial soils and sands mantle the granitic and greenstone units of the Yilgarn Craton. These soils are shallow, sandy and infertile. Underlying the soils in low areas is a red-brown siliceous hard pan (Curry et al. 1994). The soils in the eastern half of the bioregion are typically red sands, lithosols, calcareous red earth soil, duplex soil and clays.

The Eastern Murchison subregion is characterised by its internal drainage and extensive area of elevated red desert sandplains (Cowan 2001). Another important feature of the system is the salt lake systems associated with the occluded Paleodrainage system. Beard (1990) describes the topography of the region as undulating with occasional ranges of low hills and extensive sandplains located in the East. The dominant soil type is a shallow earthy loam, overlying red-brown hardpan. Red earthy sands can be found on the sandplains (Cowan 2001).

The Great Victoria Desert Region forms the southern part of the anti-clockwise whorl of dunefields of Australia. The dominating landforms are dunes and swales. There are local occurrences of playa lakes, associated lee-sided mounds (lunettes) and rocky prominences (Commonwealth Government 2008b). Playa lakes are a minor, but locally significant landform in the desert, occurring in topographically low-lying regions and many represent the dried remnants of former drainage channels (Shephard 1995). It consists of active sand-ridge desert of deep Quaternary (less than 65 million years ago) aeolian sands overlying Permian (251 – 298 million years ago) and Mesozoic (65 - 251 million years ago) units of the Office Basin (Commonwealth Government 2008b). The GVD is underlain on its eastern, western and northern margins by an ancient crystalline basement comprising rocks at least 1000 million years old (Shephard 1995).

The western end of the Shield subregion is underlain by Yilgarn Craton. There is a higher proportion of sandplains in comparison to the entire bioregion. To the east is an arid active sand-ridge desert of deep Quaternary aeolian sands overlying Permian and Mesozoic strata of the Officer Basin. Landforms consist of salt lakes and major valley floors with lake derived dunes. Sandplains with patches of seif dunes running east-west. Areas of moderate relief with out-cropping and silcrete-capped mesas and plateaus (breakaways). The subregion contains major a paleochannel of Ponton Creek (Cowan 2001).

The Central subregion is characterised as an Arid active sand-ridge desert with extensive dune fields of deep Quaternary aeolian sands overlying Permian strata of the Gunbarrel Basin. Landforms consist of salt lakes and major valley floors with lake derived dunes.

The study area crosses 14 Landsystems (Table 5). Five of these dominate much of the pipeline corridor: Carnegie, Jundee, Monk, Mileura and Monitor (Kingfisher 2014). These comprise broad plains with vegetation dominated by Mulga or chenopod communities. Most of the southern half is composed of the Carnegie Landsystem, comprising extensive saline plains supporting low halophytic shrublands and scattered acacia shrublands. The Jundee, Monk, Mileura and Monitor Landsystems cover much of the western half of the corridor. These systems comprise hardpan plains with Mulga shrublands and alluvial plains supporting mulga/chenopod shrublands. Smaller areas of banded ironstone and greenstone hills and ridges (with mixed acacia shrublands) also occur (Kingfisher 2014).

Table 5: Land systems traversed by the EGP project

Code	Land System	Landform
JUN	Jundee	Hardpan plains with ironstone gravel mantles and occasional sandy banks supporting mulga shrublands.
MOK	Monk	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.
TEU	Teutonic	Hills and stony plains on acid volcanic rocks supporting acacia shrublands.
SUN	Sunrise	Stony plains supporting mulga shrublands.
BRK	Brooking	Prominent ridges of banded iron formation supporting mulga shrublands.
LEO	Leonora	Low greenstone hills and stony plains supporting mixed stony chenopod shrublands.
GUN	Gundockerta	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.
HOO	Hootanui	Breakaways, hills and ridges with extensive saline gravelly and stony lower plains supporting scattered halophytic low shrublands.
MIL	Mileura	Saline and non-saline calcreted river plains, with clayey flood plains interrupted by raised calcrete platforms supporting diverse and tall shrublands, mixed halophytic shrublands and shrubby grasslands.
CAR	Carnegie	Salt lakes with extensively fringing saline plains, dunes and sandy banks, supporting low halophytic shrublands, scattered acacia shrublands; lake beds are highly saline and mainly unvegetated.
MOT	Monitor	Distributary alluvial fans and wash plains supporting mulga - chenopod shrublands.
BEV	Bevon	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.
STE	Steer	Gravelly alluvial plains with halophytic shrublands.
RAI	Rainbow	Hardpan plains supporting mulga shrublands.

4.3.1 Acid sulphate soils

Acid sulphate soils (ASS) are naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the water table, these soils are benign and not acidic. However if the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid (CSIRO 2009). Flushing of acidic leachate to ground-water and surface waters can cause off site impacts including impacts to aquatic and riparian ecosystems, agriculture and contamination of groundwater.

The EGP does intersect areas mapped as having a high potential for occurrence of acid sulphate soils, specifically around Lake Carey and the Hope Campbell Lake area. The presence/absence of any areas of ASS that could potentially be disturbed through excavation or dewatering will be confirmed following geotechnical investigations. If confirmed, an Acid Sulphate Soil and Dewatering Management Plan will be prepared and implemented to manage any potential impacts.

4.3.2 Contaminated sites

A small reserve 4388, located south of the Mount Morgans town site, has historically been used to dispose of sewage and will be intersected by the pipeline corridor. This site is not listed on the contaminated sites register.

4.4 Hydrological processes

The surficial hydrology of the east Murchison Region consists of internally draining, intermittent rivers. Infrequent surface runoff (resulting from low, unreliable rainfall rates) forms ephemeral drainage lines which feed into salt lake systems experiencing high evaporation rates. Dry river and creek beds predominate, which flood in heavy rain events.

4.4.1 Surface water

The two main water systems in proximity to the project are Lake Carey and Hope Campbell Lakes, both of which are hypersaline. Lake Carey is part of a chain of lakes that follow the Cary Paleoriver basin. The Carey Paleoriver is one of five paleo drainage systems that drain into The Great Australian Bight (Coleman 2003). These ephemeral river and creek beds and waterways are generally dry and have a high salinity. Depending on the climatic conditions, these areas can be subject to inundation. This also applies to the waterways, tributaries and drainage lines that are associated with these lakes. Water from Lake Carey can flow into Lake Minigwal to the south-east. Like Lake Carey, this is also an ephemeral system.

Other than the Lakes that have been mentioned above, the pipeline does not intersect with any significant watercourses, Ramsar wetland sites, wetlands of national significance or perennial waterways. It does however cross some minor ephemeral drainage lines and waterways that can be inundated. The majority of these minor ephemeral waterways are predominately situated to the west near SDGM. As the pipeline extends further east to towards TGM, the number of minor waterways decreases. There are a few non-perennial lakes that are close to but not intersecting the pipeline corridor.

4.4.2 Groundwater

The project lies within the Goldfields Ground Water Area and the sub areas of Lake Carey and Minigwal, on the Western Plateau. Specifically, it lies within the Lake Carey Catchment, and is in the region of the Salt Lake Basin (reservoir).

Murrin Murrin and the surrounding Murchison areas are dominated by fractured Archaean bedrock. This bedrock is covered by palaeochannel deposits, alluvium, colluvium and lake deposits (Johnson, Commander and O'Boy 1999). The internal drainage system is dominated by calcrete aquifers located in ancient river channels which feed salt lakes with groundwater containing between 1000 and 10,000 mg/L total dissolved salts (tds). In addition, colluvial aquifers located at the base of outcrop hills hold groundwater of around 500 parts per thousand (ppt) tds and alluvial aquifers are present in ephemeral drainage lines (Dames and Moore 1994).

Salinity levels tend to be related to topography, recharge levels and seasonality. Areas with lower recharge levels will generally have a higher salinity than others. Due to the variable climate in this region, the salinity will vary throughout the year.

The TGM is in a hyper-salinity area also. The recharge rate for the areas surrounding the TGM is an estimated 0.5% of the annual rainfall. Consequently, this area has high salinity levels ranging from 15,000 to 30,000 mg/L tds (EPA, 2010).

The pipeline stretches between these two locations and shares the same characteristics throughout the area. There are large portions of rocks with low permeability that are fractured and weathered with local aquifers. These local aquifers tend to be shallow and dependent upon rainfall to be recharged. Due to the low average rainfall across the year, groundwater levels are low in these aquifers.

The project does not intersect any PDWSA. The closest PDWSA is located 25 km north; the Laverton Water Reserve Catchment Area.

4.5 Flora and vegetation

A number of flora and vegetation surveys have been undertaken along the pipeline corridor including the following:

- A Level 1 flora and vegetation survey of the proposed pipeline from Murrin Murrin to Sunrise Dam Gold Mine (Botanica 2014a); and
- A Level 1 flora and vegetation survey of the proposed pipeline from Sunrise Dam Gold Mine to Tropicana Gold Mine (Botanica 2014b).

The surveys included a detailed literature review, database searches and Level 1 flora and vegetation survey. Both surveys were undertaken in accordance with EPA Guidance Statement No 51 (EPA 2004a) and EPA Position Statement No. 3 (EPA 2002). The reports are provided in full as a part of the referral submission and the key findings are summarised below.

4.5.1 Murrin Murrin to SDGM

A Level 1 flora and vegetation survey was undertaken of approximately 84km of the proposed gas pipeline alignment from the Laverton Leonora Road, near Murrin Murrin Nickel Cobalt Mine, to the SDGM located approximately 50 km south-west of Laverton (Botanica 2014a). The survey covered an area of approximately 3,339 ha (survey area) and covered the entire pipeline corridor as well as areas outside the pipeline corridor.

Conservation significant flora

No Threatened flora was identified within the survey area. One Priority Flora, *Grevillea inconspicua* (P4) was recorded at 12 locations within the survey area, all of which were recorded within the pipeline corridor (Map 1 in Appendix A). An additional 18 Priority flora were identified as potentially occurring but were not recorded during the survey. Two undescribed taxa of *Tecticornia* (as identified by K.A Shepherd 867) were also identified in the survey area, and within the pipeline corridor, and are considered to be of conservation significance.

Introduced flora

Five introduced taxa were identified within the pipeline corridor including:

- *Cenchrus ciliaris* (Buffel Grass);
- *Centaurea melitensis* (Maltese Cockspur);
- *Lysimachia arvensis* (Blue Pimpernel);
- *Salvia verbenaca* (Wild Sage); and
- *Sonchus oleraceus* (Common Sowthistle).

None of the introduced taxa are listed as a Declared Pest under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Broad vegetation associations

Three broad vegetation associations occur within the pipeline corridor based on Beard (1990) (Table 6).

Table 6: Beard Vegetation Associations within the pipeline corridor from Murrin Murrin to SDGM

Vegetation association	Vegetation Description (Beard 1990)	Pre-European extent remaining (%)
Laverton 18	Low woodland; mulga (*Acacia aneura*)	99.40
Laverton 39	Shrublands; mulga scrub	97.53
Laverton 389	Succulent steppe with open low woodland; mulga over saltbush	98.78

Source: Government of Western Australia 2011, based on Beard (1975)

Vegetation communities

Twenty five vegetation communities were identified by surveys within the pipeline corridor (Botanica 2014a). These were represented by a total of 34 families, 77 genera and 200 taxa. These vegetation communities belong to five broad landform types and five vegetation groups (according to the National Vegetation Information System (NVIS) classifications; Appendix C). Acacia open woodland was the dominant vegetation group followed by chenopod shrublands, samphire shrublands and forblands on clay-loam plains. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the EPBC Act.

Vegetation condition

The majority of this section of the pipeline corridor has been subjected to pastoral land use and exploration/mining activities with numerous access tracks within the area. An assessment of the general vegetation condition of each vegetation community along the corridor was undertaken based on Keighery's (1994) vegetation condition rating scale. Ten of the 25 vegetation communities were rated as being in 'Good' condition, 15 were rated as being 'Very Good' and approximately 8 ha was rated as being 'Disturbed'.

Environmentally sensitive areas/conservation areas

There are no Environmentally Sensitive Areas (ESAs) within the pipeline corridor. However, the pipeline corridor does intersect approximately 16 ha of a Schedule 1 Area (as described in Regulation 6 and Schedule 1 clause 4 of the Environmental Protection [Clearing of Vegetation] Regulations 2004). This Schedule 1 Area is centered on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south-west of Mt Morgan.

The pipeline corridor does not intersect any conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991).

Threatened and Priority Ecological Communities (TECs/PECs)

No Threatened Ecological Communities (TEC) or Priority Ecology Communities (PECs) were identified along the pipeline corridor. However the pipeline corridor does intersect through the buffer zone of two PECs, Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station and Mount Jumbo Range Vegetation Complex (Table 7).

Table 7: Summary of Priority Ecological Community buffers intersected by the pipeline corridor

Community ID	Community Description	Conservation Status
Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mount Weld Station	Priority 1	Unique assemblages of invertebrates have been identified in the groundwater calcretes. The following taxa (by strata) are dominant and/or common: • Trees: *Casuarina cristata* and *Eucalyptus clelandii*. • Tall Shrubs: *Acacia tetragonophylla*, *Acacia aneura*, *A. burkittii*, A. colletioides, *A. grasbyi, A. oswaldii* and *Melaleuca sheathiana*. • Mid shrubs: *Lycium australe*, *Eremophila pantonii*, *E. scoparia*, *Cassia nemophila*. • Low shrubs: *Maireana trichoptera*, *Ptilotus obovatus*, and *Lycium australe*. • Perennial grasses: *Austrostipa elegantissima*.
Mount Jumbo Range Vegetation Complex	Priority 3	A banded ironstone hill near Mt Jumbo south-west of Laverton in the south-eastern corner of the Laverton-Leonora Study Area supported *Acacia aneura* Low Woodland.

One of the vegetation communities identified within the survey area was representative of vegetation that characterises the Mount Jumbo Range Vegetation Complex PEC: vegetation community RS-AFW3 (Low Forest of *Acacia caesaneura* and *Acacia incurvaneura* over *Acacia ramulosa* var. *ramulosa*, *Dodonaea rigida*, *Senna artemisioides* subsp. *artemisioides*, *Senna artemisioides* subsp. *Helmsii, Senna cardiosperma* and *Ptilotus obovatus* on Banded Ironstone Hill).

Other Significant Features

The pipeline will intersect a Banded Iron Formation (BIF) range in the area. BIF ranges are considered (generally) of very significant biodiversity value as a consequence of their unique geology, soils and relative isolation. However, surveys carried out on, and around the BIF have discovered no declared rare or priority flora in the area. This Goldfields BIF is therefore considered to be relatively be relatively benign as compared to others throughout the State. Notwithstanding, it has been confirmed the area around and including the BIF is highly likely to support conservation significant species such as Long-tailed Dunnart, Malleefowl and Bush Stone-curlew.

Therefore, the route through this area has been designed to minimise impacts and disturbance (for more detail see Section 3.4), in addition, the ROW will be reduced in width to 20 - 25m where it is safe to do so.

4.5.2 SDGM to TGM

A Level 1 flora and vegetation survey was undertaken of approximately 208 km of the proposed gas pipeline alignment from the SDGM to the TGM (Botanica 2014b). The survey covered an area of approximately 14,060 ha and included areas both inside and outside the pipeline corridor (SDGM to TGM survey area).

Conservation significant flora

No Declared Rare Flora or Threatened flora was identified as potentially occurring within the SDGM to TGM survey area and none were recorded during the survey.

Seven Priority flora species were recorded within the SDGM to TGM survey area, all within the pipeline corridor (Appendix A):

- *Caesia talingka (P2);*
- *Acacia eremophila numerous-nerved variant (A.S. George 11924) (P3);*
- *Labichea eremaea (P3);*
- *Melaleuca apostiba (P3);*
- *Dicrastylis cundeeleensis (P4);*
- *Grevillea secunda (P4); and*
- *Olearia arida (P4).*

An additional 18 Priority flora have the potential to occur within the pipeline corridor but were not recorded during the survey.

Introduced flora

No introduced taxa were identified within the SDGM to TGM survey area.

Broad vegetation associations

Eight broad vegetation associations occur within the SDGM to TGM survey area, all of which occur within the pipeline corridor (Table 8).

Table 8: Beard vegetation associations of the pipeline corridor from SDGM to TGM

IBRA subregion	Vegetation Association	Pre-European extent remaining (%)	Vegetation Description (Beard, 1990)
Eastern Murchison	Laverton 18	99.40	Low woodland; mulga (*Acacia aneura*)
Shield	Great Victoria Desert 18	100.00	Low woodland; mulga (*Acacia aneura*)
	Great Victoria Desert 389	100.00	Succulent steppe with open low woodland; mulga over saltbush
	Great Victoria Desert 1239	100.00	Hummock grasslands, open medium tree & mallee steppe; marble gum & mallee (*E. youngiana*) over hard spinifex *Triodia basedowii* on sandplain

IBRA subregion	Vegetation Association	Pre-European extent remaining (%)	Vegetation Description (Beard, 1990)
Central	Great Victoria Desert 18	100.00	Low woodland; mulga (*Acacia aneura*)
	Great Victoria Desert 19	100.00	Low woodland; mulga between sandridges
	Great Victoria Desert 84	100.00	Hummock grasslands, open low tree & mallee steppe; marble gum & mallee (*Eucalyptus youngiana*) over hard spinifex *Triodia basedowii* between sandhills
	Great Victoria Desert 1239	100.00	Hummock grasslands, open medium tree & mallee steppe; marble gum & mallee (*E. youngiana*) over hard spinifex *Triodia basedowii* on sandplain

Source: Government of Western Australia 2011, based on Beard (1975)

Vegetation communities

One hundred and four (104) vegetation communities were identified within the SDGM to TGM survey area, all of which occur inside the Pipeline corridor. These vegetation communities were represented by a total of 43 Families, 114 Genera and 280 Taxa (including sub-species and variants) (Botanica 2014b). These vegetation communities belong to five broad landform types and 23 broad vegetation groups (according to the NVIS classifications; Appendix C). Mallee woodlands and shrublands on interdune swales and sandplains was the dominant vegetation group, closely followed by Acacia forests and woodlands on clay-loam plains. None of the vegetation communities identified during the survey have National Environmental Significance as defined by the EPBC Act.

Vegetation condition

An assessment of vegetation condition was undertaken based on Keighery's (1994) vegetation condition rating scale. The majority of the SDGM to TGM survey area remains undisturbed with minimal access tracks, mining and exploration activities within the area. Ten of the 87 104 vegetation communities were described as 'Good' and 77 94 were described as 'Very Good'.

Environmentally sensitive areas/conservation areas

The SDGM to TGM survey area is not located in an ESA or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the Environmental Protection (Clearing of Vegetation) Regulation 2004.

There are no conservation reserves listed by the DPaW or proposed by the EPA Red Books listing (1976-1991) located within the SDGM to TGM survey area.

TECs/PECs

No TECs or PECs were identified within the SDGM to TGM survey area.

One of the vegetation communities identified within the SDGM to TGM survey area was representative of vegetation that characterizes the *Yellow Sandplain Communities of the Great Victoria Desert* Ecological Community (Priority 3): vegetation community D-MWS1, described as '*Occasional Shrub Mallee of Eucalyptus youngiana over sparse scrub of Callitris preissii and Thryptomene biseriata over moderately dense Triodia basedowii on sand dune'.*

The DPaW have also identified other communities under threat (described by Pringle 1994) in the Murchison Region that are not formally protected as PEC or TEC, which were represented within the survey area. These include:

- Plain mixed halophyte low shrublands of the north-east Goldfields;
- Mixed Chenopod shrublands with Mulga (*Acacia aneura*) overstorey of the north-east Goldfields; and
- Acacia aneura shrublands with scattered Chenopod low shrubs of the north-east Goldfields.

4.6 Terrestrial fauna

A number of terrestrial fauna surveys have been undertaken along the pipeline alignment including the following:

- A Level 1 fauna survey of the proposed pipeline alignment from Murrin Murrin to Sunrise Dam (Kingfisher 2014a); and
- A Level 1 fauna survey of the proposed pipeline alignment from Sunrise Dam to Tropicana Gold Mine (Kingfisher 2014b).

The surveys both comprised detailed literature reviews, database searches and a Level 1 fauna survey of both sections of the pipeline alignment. Both surveys were undertaken in accordance with EPA Guidance Statement No 56 (EPA 2004b), Position Statement No. 3 (EPA 2002) and the EPA and DEC technical guide to terrestrial vertebrate fauna surveys (EPA and DEC 2010). The reports are provided in full as a part of the referral submission and the key findings are summarised below.

4.6.1 Terrestrial fauna habitat

A total of 31 major fauna habitats were identified within the pipeline corridor (Table 9). Nine of these habitats occur along the Murrin Murrin to SDGM section of the proposed pipeline alignment, and 25 habitats occur along the SDGM to TGM of the proposed pipeline alignment.

Table 9: Fauna habitats occurring along the pipeline corridor

Major landform type	Major fauna habitat
Salt Lake Systems	Salt lakes and saline drainage systems with fringing saline plains supporting halophytic shrublands (*Tecticornia* sp.) and scattered tall acacia shrubs
	Sandy rises and low sand dunes fringing salt lakes supporting mixed Acacia shrublands with *Dodenia viscosa;*
	Saline plains supporting low Saltbush (*Atriplex* sp.) and Bluebush (*Maireana* sp.) chenopod shrublands
	Gypsiferous rises fringing salt lakes supporting mixed Acacia shrubs, *Casuarina pauper* and *Lawrenceia helmsii*
Broad Stony/Hardpan Plains	Stony alluvial plains supporting low Bluebush (*Maireana* sp.) and Saltbush (*Atriplex* sp.) shrublands
	Stony plains supporting sparse Mulga (*Acacia aneura*) and other mixed acacia shrublands over soft sparse soft grasses
	Broad drainage tracts supporting dense Mulga (*Acacia aneura*) and mixed acacia shrublands
	Gently undulating gravelly plains and low stony rises supporting mixed acacia (*A. aneura* and *A. ramulosa*) shrublands with areas of patchy halophytic shrublands
	Hardpan clay plains supporting Mulga (*Acacia aneura*) woodland over mixed shrubs (*Acacia and Eremophila* sp.) and soft grasses
Sandplains:	Sandplains supporting Mulga woodland over Wanderrie grasses with mixed acacia and *Eremophila* sp. shrubs;
Banded Ironstone Hills and Ridges	Banded Ironstone Formation (BIF) Ridges supporting acacia shrublands (particularly *A. aneura*)
Greenstone Hills and Ridges:	Greenstone Hills supporting mixed acacia shrublands (particularly *A. aneura*) with *Eremophila*, *Senna* and *Ptilotus* species;
Low Gravelly Rises	Gently undulating gravelly plains and low stony rises supporting mixed Acacia (*Acacia aneura and Acacia ramulosa*) shrublands with areas of *Casuarina pauper* and patchy halophytic shrublands;
	Low gravelly rises and plateaus supporting dense Acacia (particularly *Acacia aneura*, *Acacia quadramarginea* and *Acacia ramulosa*) and *Allocasuarina campestris* thickets;

Major landform type	Major fauna habitat
Loam Plains	Loam plains supporting Goldfields Black Butt (*Eucalyptus lesouefii*) Woodland with Gimlet (*Eucalyptus salubris*) and scattered mixed shrubs particularly *Eremophila scoparia*;
Great Victoria Desert Sandplains	Low lying sandplains supporting Spinifex (*Triodia basedowii*) Hummock Grassland with scattered low Acacia shrubs
	Sandplain supporting Mallee (*Eucalyptus youngiana*) over Spinifex (*Triodia basedowii*) Hummock Grasslands
	Elevated sandplain supporting Marble Gum (*E. gongylocarpa*) Woodland over Spinifex (*Triodia basedowii*) Hummock Grassland
	Elevated Sandplain supporting mixed Woodland, particularly of *Callitris columellaris, E. gongylocarpa*, *Eucalyptus* youngiana over Spinifex (*Triodia basedowii*) Hummock Grassland
	Yellow Sandplain Communities supporting Marble Gum (*Eucalyptus gongylocarpa*), Mallee (*Eucalyptus mannensis, Eucalyptus undulans, Eucalyptus youngiana* and *Eucalyptus platycorys*), *Acacia heteroneura, Acacia helmsiana, Allocasuarina acutivalvis, Bertya dimerostigma, Hakea francisiana, Triodia desertorum* or *Triodia scariosa* and *Xanthorrhoea thorntonii*
	Sandy clay plains supporting Mulga (*Acacia aneura*) over Spinifex (*Triodia basedowii*) Hummock Grassland
	Dense Mallee (*Eucalyptus* sp.) over Spinifex (*Triodia* p.) Hummock Grasslands
	Pale Yellow sandplain supporting low Proteaceous heath (*Melaleuca* sp., *Banksia* sp.), scattered Mallee (*Eucalyptus* sp.) and Spinifex (*Triodia* sp.) Hummock Grasslands
	Orange Sandplain Communities supporting mixed Eucalypt Woodland/Mallee (*Eucalyptus gongylocarpa, Eucalyptus youngiana*) with Spinifex (*Triodia basedowii*) Hummock Grassland.
Sand Dune Systems	Sand dunes supporting Marble Gum (*E. gongylocarpa*), *Callitris columellaris*, mixed shrublands (including *Acacia* sp. and *Thryptomene biseriata*) over sparse *Triodia* sp. hummock grasslands and sedge like perennials
	Sandy rises supporting dense Acacia shrublands (*Acacia aneura, Acacia ramulosa*) and *Thryptomene biseriata*
	Long-unburnt (relictual) patches of Mulga (*Acacia aneura*) with *Eremophila forrestii* and *Thryptomene biseriata* understorey, on interdunal flats between sand ridges
Calcareous Plains	Calcareous plains supporting *Casuarina pauper* woodland over *Eremophila scoparia*;
Low Hills and Outcrops	Low silcrete/granitic rocky hills and outcrops supporting mixed *Acacia* shrublands (including *Acacia aneura*, *Acacia quadramarginea*)
	Gravelly breakaways fringing saline depressions supporting Mallee (*Eucalyptus* sp.)
	Ironstone hills and stony rises supporting *Acacia aneura* Woodland

4.6.2 Terrestrial fauna species

The data and literature reviews identified that 323 fauna potentially occur within the pipeline corridor including eight frogs, 115 reptiles, 155 birds, 35 native mammals, and 10 introduced mammal species. This includes 33 species of conservation significance (Table 10).

During the field surveys, 157 fauna species of the above-mentioned 323 were recorded including one frog, 50 reptile, 78 bird, 19 native mammal and nine introduced mammal species.

4.6.1 Conservation significant fauna

Eleven species of conservation significance were recorded from the pipeline corridor including three species listed as either Endangered or Vulnerable under the EPBC Act, one listed as Migratory under the EPBC Act, three species listed only under the WC Act or by DPaW and four species considered locally significant (Table 10). A further 23 species of conservation significance are considered as potential or likely to occur based on existence of suitable habitat and/or nearby records.

Table 10: Conservation significant species

Common Name	Species	Conservation Status		Likelihood of occurrence	
		EPBC Act	WC Act/ DPaW	Section 1 (Murrin Murrin to SDGM)	Section 2 (SDGM to TGM)
Mammals					
Southern Marsupial Mole	*Notoryctes typhlops*	End	S1	Unlikely: Suitable habitat does not exist along this section of the pipeline corridor.	Recorded (mole tunnels): Mole tunnels recorded at five locations Persisting population in the Tropicana area
Sandhill Dunnart	*Sminthopsis psammophila*	End	S1	Unlikely: Suitable habitat does not exist along this section of the pipeline corridor.	Recorded: The species was recorded at four locations along the pipeline corridor. One individual was trapped, one was spotted during spotlighting and two were recorded on motion cameras. Suitable habitat (optimal, marginal and potential) occurs throughout the pipeline corridor.
Long-tailed Dunnart	*Sminthopsis longicaudata*		P4	Likely: Suspected significant resident populations records exist approximately 3 km from the pipeline corridor from Granny Smith mine. Suitable habitat exists along the pipeline corridor within Banded Ironstone Ridges.	
Brush-tailed Mulgara	*Dasycercus blythi*		P4	Unlikely: Suitable habitat (Red Spinifex sandplains) is not present along this section of the proposed pipeline.	Recorded: Specimens were recorded from 16 locations along the pipeline corridor. In addition, a further 14 locations (burrows) were recorded.
Central Long-eared Bat	*Nyctophilus timoriensis*		P4	Likely: Recorded from Queen Victoria Spring Nature Reserve approximately 70 km south of the pipeline corridor and suitable habitat is present.	Likely: Previously recorded from the Tropicana Gold Mine.
Kultarr	*Antechinomys laniger*	Locally significant		Likely: Suitable habitat exists and closest records are 3 km east of pipeline corridor.	

Common Name	Species	Conservation Status		Likelihood of occurrence	
		EPBC Act	WC Act/ DPaW	Section 1 (Murrin Murrin to SDGM)	Section 2 (SDGM to TGM)
Woolley's Pseudantechinus	*Pseudantechinus woolleyae*	Locally significant		Recorded: Scats recorded during the survey. Suitable habitat exists within banded ironstone formations on which the species is dependent.	
Birds					
Malleefowl	*Leipoa ocellata*	Vul	S1	Recorded: One mound was recorded approximately 20 km east of the SDGM. Areas of suitable habitat exist along the pipeline corridor.	Recorded (mounds): 18 mounds recorded during the survey, at least two of which were active. Scats and feathers were also recorded in the vicinity of the active mound.
Princess Parrot	*Polytelis alexandrae*	Vul		Unlikely: Suitable habitat does not exist along the pipeline corridor. Not recorded from nearby areas.	Potential: May occasionally visit the area. Suitable habitat exists along the pipeline corridor.
Rainbow Bee-eater	*Merops ornatus*	Mig	S3	Recorded: Recorded at several locations throughout the pipeline corridor.	
Fork-tailed Swift	*Apus pacificus*	Mig		Likely: Likely to occasionally forage over the pipeline corridor. Aerial species so unlikely to be affected by ground activities.	
Grey Falcon	*Falco hypoleucos*		S1	Potential (occasional, non-breeding visitor): Suitable habitat exists along the pipeline corridor. Records from Murrin Murrin and near Salt Creek (60 km south-east of Tropicana)	
Peregrine Falcon	*Falco peregrinus*		S4	Likely: Suitable habitat exists along the pipeline corridor. Previously recorded from 5 km north of pipeline corridor at Murrin Murrin, and from the Tropicana Gold Mine.	
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*		S4	Potential (occasional, non-breeding visitor): Known to occur within the region, however there is a lack of suitable breeding habitat. May potentially occur on an occasional basis.	
Striated Grasswren	*Amytornis striatus striatus*		P4	Unlikely: No suitable habitat exists along the pipeline corridor.	Recorded: Recorded at two locations during the survey. Distribution is likely to be sparse due to habitat.

Common Name	Species	Conservation Status		Likelihood of occurrence	
		EPBC Act	WC Act/ DPaW	Section 1 (Murrin Murrin to SDGM)	Section 2 (SDGM to TGM)
Australian Bustard	*Ardeotis australis*		P4	Likely: The species was recorded along section 2 of the pipeline corridor. Suitable habitat exists along the length of the pipeline corridor.	
Bush Stone-curlew	*Burhinus grallarius*		P4	Likely: Has previously been recorded in areas close to the pipeline corridor. Suitable habitats exist along the length of the pipeline corridor.	
Southern Scrub-robin	*Drymodes brunneopygia*	Locally significant		Potential: Suitable habitat exists along Section 1 of the pipeline corridor. Was recorded within Section 2 of the pipeline.	Recorded: The species was recorded at ten locations within the pipeline corridor. Also previously recorded close to Tropicana Gold Mine. Suitable habitat exists along the pipeline corridor.
Scarlet-chested Parrot	*Neophema splendida*	Locally significant		Unlikely: Suitable habitat does not exist along Section 1 of the pipeline corridor.	Recorded: A pair were recorded to the south of the pipeline corridor. Suitable habitat is present throughout the pipeline corridor.
Rufous Tree-creeper	*Climacteris rufus*	Locally significant		Unlikely: Suitable habitat does not exist along Section 1 of the pipeline corridor.	Recorded: Four individuals were recorded at one location within the pipeline corridor. Suitable habitat exists within the Marble Gum woodlands found in the pipeline corridor.
Chestnut Quail-Thrush	*Cinclosoma castanotum*	Locally significant		Unlikely: Suitable habitat does not exist along Section 1 of the pipeline corridor.	Recorded: One small group was recorded within the pipeline corridor. Suitable habitat exists along the pipeline corridor.
EPBC listed Migratory waterbirds					
Eastern Great Egret	*Ardea modesta*	Mig	S3	Likely on an occasional basis: Most waterbird species are expected to occur in the pipeline corridor only as rare visitors, associated with the irregular flooding of the salt lake habitats	
Oriental Plover	*Charadrius veredus*	Mig	S3		
Common Greenshank	*Tringa nebularia*	Mig	S3		
Wood Sandpiper	*Tringa glareola*	Mig	S3		
Red-necked Stint	*Calidris ruficollis*	Mig	S3		

Common Name	Species	Conservation Status		Likelihood of occurrence	
		EPBC Act	WC Act/ DPaW	Section 1 (Murrin Murrin to SDGM)	Section 2 (SDGM to TGM)
Sharp-tailed Sandpiper	*Calidris acuminata*	Mig	S3		
Curlew Sandpiper	*Calidris ferruginea*	Mig	S3		
Common Sandpiper	*Actitis hypoleucos*	Mig	S3		
Reptiles					
Great Desert Skink	*Liopholis kintorei*	Vul	S1	Unlikely: No suitable habitat exists along Section 1 of the pipeline corridor. No nearby records.	Potential: Suitable habitat exists along the pipeline corridor, and nearby records exist approximately 40 km away. However, the species does have distinctive burrows with scat latrines and despite targeted searches, no evidence of the species was recorded. Also, the species has not been recorded in the region since 1967 (DPaW, 2013).
Carpet Python	*Morelia spilota imbricata*		S4/ P4	Unlikely: No suitable habitat or nearby records exist along Section 2 of the pipeline corridor.	Likely: Suitable habitat exists along Section 2 of the pipeline corridor. Nearby record approximately 25 km from Tropicana.
Woma	*Aspidites ramsayi*		S4/P1	Unlikely: No suitable habitat or nearby records exist for Section 1 of the pipeline corridor.	Potential: Suitable habitat exists along the pipeline corridor, and records exist approximately 80 km away.
Great Victoria Desert / Dotty-tailed robust slider	*Lerista puncticauda*		P2	Unlikely: No suitable habitat or nearby records exist for Section 1 of the pipeline corridor.	Potential: Suitable habitat occurs along Section 2 of the pipeline corridor.
Buff-snouted Blind Snake	*Ramphotyphlops margaretae*		P2	Unlikely: No suitable habitat or nearby records exist for Section 1 of the pipeline corridor.	Potential: Suitable habitat exists along the pipeline corridor, and records exist approximately 80 km away.

Common Name	Species	Conservation Status		Likelihood of occurrence	
		EPBC Act	WC Act/ DPaW	Section 1 (Murrin Murrin to SDGM)	Section 2 (SDGM to TGM)
Black-headed Worm-lizard	*Aprasia picturata*	Locally significant		Likely: Suitable habitat exists along Section1 of the pipeline corridor. In addition, nearby records exist approximately 20 km away near Leonara.	Potential: Suitable habitat exists along Section 2 of the pipeline corridor.

EPBC Act listed species: End = Endangered, Vul = Vulnerable, Mig = Migratory, CrE = Critically Endangered

WC Act listed species: S1 = Schedule 1, S3 = Schedule 3, S4 = Schedule 4, DPaW Priority Species: P1 = Priority 1, P4 = Priority 4

4.6.2 Matters of National Environmental Significant (MNES)

Notoryctes typhlops (Southern Marsupial Mole)

Notoryctes typhlops (Southern Marsupial Mole) is listed as Endangered under the EPBC Act and as 'fauna that is rare or is likely to become extinct' (Schedule 1) under the WC Act (DoE 2014a).

The Southern Marsupial Mole is widely distributed throughout the arid areas of central Australia, mainly in the central deserts of the Northern Territory, Western Australia and South Australia (DoE 2014a). It has a huge potential range; however there is currently not enough information on the abundance across the species' range to give an accurate estimate of population (DoE 2014a). It has a highly subterranean life cycle and is rarely encountered during surveys but can be successfully trapped using trenches or by observing signs such as tracks during targeted surveys (Kingfisher Consulting 2014b). It favours deep sands within sand dune fields and sandplains (DoE 2014a) and many tunnels have been recorded in the Tropicana area, particularly from the slopes and crest of yellow sand dunes, as well as from red sands and interdunal areas (Ecologia 2009). In addition, recent surface tracks identified by Tropicana staff indicate a persisting population in the Tropicana area (Kingfisher Environmental Consulting 2014a).

Evidence of the Southern Marsupial Mole (mole tunnels) was recorded at five locations within Section 2 of the pipeline corridor; from the crests and slopes of yellow sand dunes within extensive dune fields and supporting Marble Gum and Callitris with a scattered Spinifex Hummock Grassland understorey (Figures 25, 26, 34, and 35 in Appendix A; Kingfisher Environmental Consulting 2014a). Whilst the proposed pipeline route does avoid most sand dune habitat, it does intersect elevated sandplain habitat between dunes and thus, likely dispersal habitat for the Southern Marsupial Mole (Kingfisher Environmental Consulting 2014a).

The Southern Marsupial Mole is likely to be widespread in the local area due to the availability of suitable habitat, and occur throughout the yellow sand dune fields traversed by the pipeline corridor (Kingfisher Environmental Consulting 2014a).

Sminthopsis psammophila (Sandhill Dunnart)

Sminthopsis psammophila (Sandhill Dunnart) is listed as Endangered under the EPBC Act and as Schedule 1 under the WC Act (DoE 2014b). In Western Australia the species appears to be restricted to the south western fringe of the Great Victoria Desert inhabiting yellow sand dune systems with long unburnt mature hummock grasslands (*Triodia* sp.) and often in association with Mallee or Marble Gum, *Callitris* and an associated complex shrub understorey (GHD 2010, Churchill 2009, DPaW, 2013) (Kingfisher Environmental Consulting 2014a).

Spinifex (*Triodia* sp.) coverage and quality is the critical feature of Sandhill Dunnart habitat (Kingfisher Environmental Consulting 2014a). Sandhill Dunnarts require habitat that is long unburnt (8 - 38 years) to survive due to the time frame required for re-establishment of Triodia to a suitable life stage that the Dunnarts can use.

Four Sandhill Dunnarts were recorded from the pipeline corridor. One male was trapped at a systematic survey site, one individual was observed during spotlighting and two individuals were recorded by motion sensitive cameras. The Sandhill Dunnart has also previously been recorded to the south of the survey corridor from Mulga Rock, Queen Victoria Spring Nature Reserve and the Plumridge Lakes access track (GHD 2010).

At all locations (where the Sandhill Dunnart was recorded) vegetation comprised long-unburnt and mature spinifex with a variable and complex shrub layer and in association with yellow sand dunes. The trapped individual was recorded from the base of a yellow sand dune supporting Marble Gum (*E. gongylocarpa*), *Callitris columellaris*, mixed Acacia (including *Acacia ramulosa*, *Acacia ligulata*), Thryptomene biseriata, Grevillea juncifolia, Anthotroche pannosa, Daviesia grahamii and Triodia spp. (Triodia desertorum or *T. basedowii*) hummock grassland (see Plate 47).

Spinifex cover was also systematically measured (along a 50 m transect) at 37 % and comprised mostly class ages 3 – 5. Bare ground comprised 44 % cover and *Thryptomene biseriata* 9 % cover (the remaining 10 % comprising litter and herbs).

Suitable habitat for the Sandhill Dunnart is present throughout Section 2 of the pipeline corridor, with areas of long unburnt yellow sandplain and sand dune systems supporting the optimal habitat – Marble Gum Woodland with Callitris over a complex shrub layer (including *Allocasuarina acutivalvis*, *Hakea francisiana*) and mature Triodia hummock grasslands (Figures 25-36 in Appendix A).

Leipoa ocellata (Malleefowl)

Leipoa ocellata (Malleefowl) is listed as Vulnerable under the EPBC Act and as Schedule 1 under the WC Act (DoE 2014c). In Western Australia, Malleefowl occur mainly in scrubs and thickets of Mallee (*Eucalyptus* sp.), Boree (*Melaleuca lanceolata*), Bowgada (*Acacia linophylla*), and also other dense litter-forming shrublands including Mulga (*Acacia aneura*) shrublands (Johnstone and Storr, 2004). The species distribution is fragmented, due to widespread clearing of suitable habitat, degradation of habitat by fire and livestock, and predation (Johnstone and Storr, 2004) (Kingfisher Environmental Consulting 2014a).

Nineteen Malleefowl mounds were recorded within the survey area in addition to fresh Malleefowl scats and feathers. One mound was recorded 20 km east of the SDGM, whilst the remaining 18 were recorded around Section 2 of the pipeline corridor (Kingfisher Environmental Consulting 2014b; Figure 31-36 in Appendix A). At least two mounds were considered active due to the presence of broken egg shell, scats or feathers. In addition, recent observations of Malleefowl near Murrin Murrin mine suggests they persist in the local area (DPaW 2013). As a result the Malleefowl is expected to occur within the pipeline corridor and may forage and potentially breed in the area (Kingfisher Environmental Consulting 2014b).

Polytelis alexandrae (Princess Parrot)

Polytelis alexandrae (Princess Parrot) is listed as Vulnerable under the EPBC Act and as Priority 4 fauna by DPaW (DoE 2014d). The species is sparsely distributed through the arid regions of western and central Australia, mainly confined to the Great Sandy, Gibson, Tanami and Great Victoria Deserts and the central ranges (DoE 2014d). The Princess Parrot inhabits sand dunes and sand flats supporting open woodlands and shrublands that usually consist of scattered stands of *Eucalyptus* (including *E. gongylocarpa* and mallee species), *Casuarina* or *Allocasuarina* trees and an understorey of shrubs such as *Acacia* (especially *A. aneura*), *Senna*, *Eremophila*, *Grevillea*, *Hakea* and a ground cover dominated by *Triodia* species (DoE 2014d).

The Princess Parrot has been recorded in the Queen Victoria Spring and Neale Junction Nature Reserves (DPaW 2013) approximately 100 km and 150 km from the pipeline corridor. Large areas of suitable habitat (Marble Gum woodland) are present within the SRD to TGM survey area (Kingfisher Consulting 2014b). This, in addition to the highly mobile and nomadic nature of the species, means that the species has the potential occur periodically in the pipeline corridor where it is likely to occur as an occasional visitor or irregular breeding resident. There is also the potential for the species to breed in the survey area during favourable conditions.

Merops ornatus (Rainbow Bee-eater)

Merops ornatus (Rainbow Bee-eater) is listed as Migratory under the EPBC Act and as 'migratory birds protected under an international agreement' (Schedule 3) under the WC Act (DoE 2014e. It is an abundant, ground-nesting species that catches insects on the wing over a range of environments. The Rainbow Bee-eater is able to nest in a range of habitat types including disturbed environments such as cleared paddocks and vacant residential blocks (DoE 2014e).

The Rainbow Bee-eater was recorded along the pipeline corridor from both survey sections. Due to its widespread occurrence, the presence of the Rainbow Bee-eater in the pipeline corridor is not considered significant.

Apus pacificus (Fork-tailed Swift)

Apus pacificus (Fork-tailed Swift) is listed as Migratory under the EPBC Act and as Schedule 3 under the WC Act (DoE 2014f). The Fork-tailed Swift is an aerial species that is largely independent of terrestrial habitat types. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas.

This species is considered as likely to occur in the pipeline corridor only as an occasional visitor. Due to the largely aerial nature of this species, the occurrence within the pipeline corridor is not considered significant.

Migratory birds

A number of EPBC listed Migratory waterbirds are considered as likely to occur within the pipeline corridor as rare visitors associated with the irregular flooding of the salt lake habitats and include:

- *Ardea modesta* (Eastern Great Egret; DoE 2014g);
- *Charadrius veredus* (Oriental Plover; DoE 2014h);
- *Tringa nebularia* (Common Greenshank; DoE 2014i);
- *Tringa glareola* (Wood Sandpiper; DoE 2014j);
- *Calidris ruficollis* (Red-necked Stint; DoE 2014k);

- *Calidris acuminata* (Sharp-tailed Sandpiper; DoE 2014l);
- *Calidris ferruginea* (Curlew Sandpiper; DoE 2014m); and
- *Actitis hypoleucos* (Common Sandpiper; DoE 2014n).

None of these species would be restricted to the pipeline corridor, and all are highly mobile and nomadic in nature.

Liopholis kintorei (Great Desert Skink)

Liopholis kintorei (Great Desert Skink) is listed as Vulnerable under both the EPBC and WC Acts (DoE 2014o) It inhabits red spinifex sandplains. Populations in the Gibson Desert occur on sandplain supporting spinifex hummock grasslands, scattered shrubs and occasional trees (DoE 2014o). In the Tanami Desert and parts of the Great Sandy Desert, this skink also occurs on paleodrainage lines with giant termite mounds and Melaleuca shrubs (DoE 2014o).

There is a single record of the Great Desert Skink approximately 39 km east-north-east of Laverton (DoE 2014o). As the species has been recorded in the region and from habitats that occur within the pipeline corridor, there is the potential for the Great Desert Skink to occur. However, despite having distinctive burrows with scat latrines no evidence of the Great Desert Skink was recorded during the recent surveys (Kingfisher Consulting 2014b).

4.7 Social surroundings

4.7.1 Land use and tenure

The EGP is located predominantly within unallocated crown land; remote from residential and other areas sensitive to industrial activity. The dominant land uses of the area is pastoral (predominantly the first half of the route) and mining and exploration.

This being the case construction and operational activities associated with the proposed EGP are not expected to interfere with surrounding land use. Notwithstanding, social factors were considered during the initial project risk assessment and will be managed as per sections 5 of this document. Another risk assessment will be carried out with the presence of DMP in order to further advise the CEP.

APA is committed to maintaining positive relations with all stakeholders throughout the duration of its activities and as such has been engaging in consultation with the affected landholders and impacted tenement holders (via AGAA license application process) since project conception. AGAA has also had ongoing relations with the impacted Stations as a part of the SDGM ongoing operations.

4.7.2 Aboriginal heritage and Native title

Ethnographic and archaeological surveys (Waru Consulting Pty Ltd; February 2014) have been undertaken to determine if there were any places of importance or significance as defined by Section 5 of the *Aboriginal Heritage Act 1972* (AHA). No ethnographic sites were identified. Archaeological sites identified are described below.

As with the flora and fauna surveys, a separate heritage assessment was undertaken of the two sections.

In the (first) section from Murrin Murrin (MM) to SDGM, no (new) archaeological sites were discovered that meet the criteria of section 5 of the AHA. Two previously known archaeological locations sites were located in the field (MMSD 13-01 and MMSD 13-02). These were small artefact scatters, likely representing small campsites and consisted of small concentrations of mundane artefacts with little integrity or significance (basic level), sufficient to characterise them and their contents. They are not considered protected heritage sites under the AHA. Notwithstanding this, the EGP project will avoided these sites.

In addition, within 200 m of the corridor there was:

- 1 registered archaeological site
  - (DAA #201 Mt Margaret Pipeline 2)
- 1 heritage place
  - (DAA #216 Sunrise Dam 01).

Outside of the pipeline corridor, site DAA #201 was found and re-recorded and DAA #216, previously subject to a section 18 Notice, was confirmed destroyed.

In the (second) section from SDGM to TGM no archaeological sites were identified within the survey area. In addition, no heritage sites are listed on the Register of Aboriginal Sites within, or close to the survey area.

However, immediately north of the survey corridor two places with archaeological material were found and recorded. These were:

- Archaeological location "SDTP 13-01" - containing 2 gnammas (rockholes that are ephemeral water sources) and a manuport (a natural object from another region)
- Archaeological location "SDTP 13-02", which is a discrete collection of 7 artefacts.

As with those mentioned above, these archaeological locations have been assessed and do not meet the criteria for a heritage site under section 5 of the AHA, because they have negligible archaeological significance or importance.

In addition, approximately 1 km south of the corridor an archaeological site (silcrete quarry SDTP 13-03) and a potential archaeological site (rockshelter with potential archaeological deposit SDTP 13-04) were located.

Waru Consulting (2014) anticipate that the reason for the absence of heritage materials within the corridor is predominantly due to no reliable water sources such as claypans, gilgais or creeklines. In addition, a lack of key topographical or geological features such as hills or ridges containing cavities, means there is no potential for rockshelter sites. Finally, mining and pastoral activities have resulted in a degree of denudation of trees from the plains, and so there is little potential for culturally scarred trees to have survived.

No native title claims have been determined over the area traversed by the EGP.

5 IMPACTS AND MANAGEMENT

5.1 Risk register

A preliminary environmental risk assessment has been undertaken for the project, with a range of potential impacts identified (Table 11). The potential impacts are further discussed in Section 5.2 below for the relevant environmental factor.

Table 11: Risk register – aspects and potential impacts

Aspect	Potential impact
Clear vegetation and grade	Loss or degradation/fragmentation of vegetation, flora and fauna habitat (including cons. sig. species)
	Loss/mortality of individual fauna (including cons. sig. fauna)
	Introduction or spread of weeds and/or disease
	Alteration of local surface water flows (e.g. for access roads and the pipeline itself?)
	Generation of dust, with associated impacts to sensitive premises and flora/fauna
	Generation of noise, with associated alteration of fauna behaviour/movement
	Disturbance of Aboriginal heritage (archaeological or ethnographic) sites
	Potential bushfire, with associated impacts of loss of habitat or fauna, altered vegetation structure and potential increased proliferation of invasive flora
	Impacts on surface water bodies
Excavation of topsoil and trenching	Loss of or reduced productivity of topsoil after inappropriate stripping and stockpiling
	Loss of growth medium due to erosion (wind and water) and potential release of sediment to surface water bodies
	Loss of individual fauna
	Entrapment (and potential loss or injury) of fauna in open trenches
	Alteration of surface water flow in area and potential sedimentation
	Disturbance of acid sulphate soils (ASS) leading to soil acidification or generation of acidic leachate
	Generation of dust
	Generation of noise and vibration associated with blasting of rock
	Soil erosion (particularly in sand dune areas)
Construction camp operation	Incorrect disposal of waste leads to pollution/contamination of environment, attraction of feral and native animals (with potential for alien substances to poison animals upon ingestion) and odours
	Introduction of weeds
	Introduction of pests/vermin
	Generation of noise
	Generation of light
	Potential bushfire resulting from cigarette smoking/disposal or camp fires
	Air emissions from operating power generators
	Pollution/contamination of environment (soils, surface water or groundwater) due to fuel or chemical spills

Aspect	Potential impact
Fuel and chemical handling and storage	Pollution/contamination of environment (soils, surface water or groundwater)
	Potential bushfire resulting from inappropriate storage
	Poisoning of fauna
Vehicle and machinery movements	Injury or loss of individual fauna (including cons. sig. species)
	Introduction or spread of weeds and/or diseases
	Erosion and compaction of authorised access roads
	Erosion and compaction of substrate from unauthorised off-road driving
	Clearing of vegetation from unauthorised off-road driving (e.g. tracks associated with bogged vehicles)
	Generation of dust
	Generation of noise
	Air emissions
	Borrow pits required for construction of access roads (gravel) and issues associated with water pooling
Water use and management	Drawdown of groundwater (from bore use or dewatering), potential effects groundwater dependent communities and ASS
	Water release from standpipes leads to salinisation of soil or vegetation
	Establishment of turkey nests and water storage could lead to salinisation of soil and surrounding vegetation (including any overflow from turkey nest) as well as potential impacts to fauna (i.e. drowning, attraction of feral animals)
	Salinisation of soil or vegetation death from hyper-saline water use for dust suppression
	Incorrect storage, treatment and disposal of sewage leads to pollution/contamination of environment and odours
Welding, lowering-in and backfilling	Potential bushfire
	Entrapment of fauna in open trenches or pipelines
	Introduction of weeds and/or diseases (based on importing fill or sand from borrow pits)
	Generation of dust
Hot tapping	Uncontrolled gas release to environment
Testing	Water storage in turkey nest attracts fauna and could potentially lead to drowning of animals
	Release of hydro-test water leading to soil erosion and potential contamination (if contains chemicals or is not fresh water)
Commissioning	Uncontrolled gas release to environment
	Generation of noise
Demobilisation, site clean-up and remediation	Inappropriate rehabilitation leads to soil erosion (particularly in sand dune areas) and potential effects to surface water bodies, and increased weed density (altered vegetation and fauna habitat)
	Generation of dust

Aspect	Potential impact
Opening up country (initial vegetation clearing, access road to remain for maintenance, inspections after rehabilitation has occurred)	Degradation of tracks (e.g. erosion) due to increased traffic (including other stakeholders in area)
	Increased recreation in the area due to increased access
	Potential facilitation of movement of feral animals (particularly goats) into new areas

5.2 Environmental factors and impacts

5.2.1 Flora and vegetation

A description of the flora and vegetation values of the pipeline corridor and surrounds is provided in Section 4.5.

The project has the potential to impact flora and vegetation through:

- Clearing of vegetation for the construction of the pipeline trench, access road and other infrastructure, which will result in the disturbance and/or removal of flora and vegetation
- Vehicle movement and earthworks, which may increase the spread of weeds in the area as well as generate dust which may be deposited on native vegetation
- Ignition sources such as machinery and generators, which may increase fire risk.

Clearing vegetation

Vegetation clearing is required to enable the construction of the pipeline and associated infrastructure that were outlined in Section 3. Clearing requirements for the project will result in the clearing of up to a maximum of 915 ha of vegetation. However, impacts will be temporary with approximately 81% of the area disturbed to be progressively rehabilitated following construction. An area of approximately 177 ha will be permanently disturbed to allow for a 4WD access track for the ongoing maintenance of the pipeline and small (<1 ha) above ground facilities.

Eight Priority flora species were recorded within the pipeline licence area, with six of these species recorded within the pipeline corridor. Five species were recorded within the construction ROW where they will be directly impacted by vegetation clearing (Table 12). Two species were recorded within the wider pipeline licence area but do not occur within the pipeline corridor or pipeline ROW: *Caesia talingka* and *Melaleuca apostiba*. One species was recorded during recent surveys but was outside the pipeline licence area: *Labichea eremaea* (P3).

Clearing will result in the loss of some individuals of Priority flora. Avoidance of all Priority flora locations is not possible. For example, five species will be directly impacted by proposed clearing (Table 12). However, these species are known from the wider pipeline licence area and also occur in the wider region (DPaW 2013). Provisions for avoiding disturbance to known locations of Priority flora will be applied during design planning to minimise the number of individuals that will be subject to disturbance (refer to Section 5.3).

Table 12: Impacts to Priority flora

Priority flora/priority flora region	Total number of Individuals within pipeline licence area	Individuals within pipeline corridor	Individuals to be impacted*
*Caesia talingka** (P2)	2	0	0
Labichea eremaea (P3)[1]	0	0	0
Melaleuca apostiba (P3)	4	1	0

Priority flora/priority flora region	Total number of Individuals within pipeline licence area	Individuals within pipeline corridor	Individuals to be impacted*
Dicrastylis cundeeleensis (P4)	5	3	1
Grevillea secunda (P4)	30	21	7
Olearia arida (P4)	17	8	4
Grevillea inconspicua (P4)	9	4	1
Acacia eremophila numerous-nerved variant (P4)	5	2	1

* within 30 m construction ROW

[1] was recorded within the survey area, but outside the pipeline licence area

Fourteen NVIS broad vegetation groups were identified within the pipeline corridor, with 87 vegetation communities described from these (refer to Section 4.5). Estimated impacts to each broad vegetation group are provided in Table 13. All of the vegetation groups are widespread in the local region, and none are restricted to the pipeline corridor. None of the vegetation communities identified during the survey are listed as Matters of NES under the EPBC Act. Acacia Open Woodlands will be impacted the most (18.5%). However, this vegetation group accounts for the majority of the pipeline corridor (623 ha) along with Mallee Woodlands and Shrublands which will only be impacted by 10.5 %. Impacts to the majority of the vegetation groups are below 15 % of that remaining within the wider pipeline licence area. Management measures will be implemented throughout pipeline construction to avoid or minimise impacts to vegetation as far as practicable (refer to Section 5.3).

Table 13: NVIS vegetation groups estimated area impacts

NVIS vegetation group	Total area (i.e. within pipeline licence area [ha])	Area within pipeline corridor (ha)	Area to be impacted (ha)	% area to be impacted
Acacia Forest and Woodlands	1459.6	495.1	147.9	10.1
Acacia Open Woodlands	1087.2	651.3	195.4	17.9
Acacia Shrubland	319.9	18.5	5.8	1.8
Casuarina Forest and Woodlands	121.9	26.5	7.9	6.5
Chenopod Shrubland, Samphire Shrubland and Forblands	306.6	137.9	42.5	13.9
Disturbed	36.1	7.1	0.9	2.5
Eucalyptus Open Woodland/Mallee Woodland and Shrublands	356.6	164.1	49.2	13.8
Eucalyptus Woodlands	747.4	263.2	78.7	10.5
Eucalyptus Woodlands/Mallee Woodland and Shrublands	893.7	364.5	109.5	12.3
Heathlands	66.0	30.2	9.1	13.8
Mallee Woodlands and Shrublands	1871.2	656.6	196.8	10.5

NVIS vegetation group	Total area (i.e. within pipeline licence area [ha])	Area within pipeline corridor (ha)	Area to be impacted (ha)	% area to be impacted
Other Shrublands	137.5	10.3	2.9	2.1
Regrowth, Modified Native Vegetation	425.9	192.1	58.6	13.8
Salt Lake	112.7	0	0	0
Vegetation mapping not available	906.5	39.3	0.27	0

Two vegetation communities identified within the pipeline corridor shared floristic aspects with two PECs: the Mount Jumbo Range Vegetation Complex PEC (P3) and the Yellow Sandplain Communities of the Great Victoria Desert PEC (P3) (refer to Section 4.5). Approximately 10 % of these potential PEC areas will be impacted (Table 14).

Complete avoidance of the two vegetation communities sharing floristic characteristics with PECs is not possible. However, these communities extend beyond the area to be disturbed and are not restricted to the pipeline construction ROW. Areas representing these two vegetation communities outside the pipeline construction ROW will be clearly demarcated as 'no go zones' and vehicle and personnel will be prohibited from entering these areas to reduce risks associated with disturbance and spread of weeds. Additional management measures will be implemented where necessary to further reduce impacts to these areas (refer to Section 5.3).

Table 14: Impacts to vegetation communities that share floristic aspects with PECs

Vegetation community	Related PEC	Area within pipeline licence area (ha)	Area within pipeline corridor (ha)	Area to be impacted (ha)	% area to be impacted
RS-AFW3 D-MWS1	Potential PEC areas	338.8	116.1	34.0	10

Introduction or spread of weeds

Weeds can spread into natural environments by many vectors, including wind, water, and the movement of soils, people, vehicles, machinery and fauna (including native animals and stock). The most relevant of these in relation to the Project are the movement of vehicles and machinery, particularly during construction. Weeds are often able to rapidly invade locations subject to disturbance, land clearing and/or altered fire regimes, and can smother and replace native plants and dominate and simplify natural ecosystems.

The most common areas within the pipeline corridor in which weeds were recorded was throughout the MM to SDM section of the pipeline corridor where five weed species were recorded. The majority of this section of the pipeline corridor has been subjected to pastoral land use and exploration/mining activities with numerous access tracks within the area.

No introduced species were recorded within the SDM to TGM section of the pipeline corridor and so management measures will be implemented to ensure that weed species are not introduced into these areas.

Weed management measures to be implemented as part of the Project include (but are not limited to; refer to Section 5.3):

- Setting up wash down points between contaminated and weed free zones (for example, a wash-down will occur upon exiting pastoral land were vegetation becomes relatively "undisturbed")
- Ensuring that all vehicles, equipment and portable infrastructure are clean/washed-down (free of soil and organic matter) prior to entering the construction area/mobilising
- Confining all vehicle and equipment movement to the construction ROW, designated access tracks/roads and allocated parking areas

- Prohibiting unauthorised off-road driving
- Undertaking regular inspections to record new observations of invasive flora infestations or changes in invasive flora distribution

After management measures have been implemented, it is anticipated that potential impacts from the introduction and spread of weeds will be low.

Increased fire risk

Increases in local fire regimes can affect all aspects of the ecology of an environment and can have various effects ranging from major short-term impacts associated with frequent high-intensity fires, through to slower, longer-term changes associated with total fire exclusion. Fires within the pipeline corridor could potentially destroy Good to Very Good native vegetation, Priority flora and/or potential PEC areas.

During construction, the greatest risk relating to fire is an increase in the number and spatial extent of fire events or in the fire intensity. Potential vectors are the establishment of weeds and/or the generation of sparks from construction equipment and the use of flammable products and welders.

Fire management measures to be implemented as part of the Project include (but are not limited to; refer to Section 5.3):

- Maintaining fire fighting equipment and complying with relevant fire safety standards
- Developing a Project Emergency Response Plan (ERP)
- Training all personnel in the use of fire fighting equipment, and in being familiar with the equipment located within their specific work areas and campsites
- Carrying out welding/grinding within cleared ROW – following the necessary job hazard analysis; including spotters
- Stockpiling of waste (fuels sources) will occur away from high risk areas
- Not permitting open fires.

5.2.2 Terrestrial fauna

A description of the terrestrial fauna values of the pipeline corridor and surrounds is provided in Section 4.6.

The project has the potential to impact terrestrial fauna through:

- Clearing of vegetation, which will remove, degrade and/or fragment fauna habitat;
- Open stretches of pipeline trench, which can potentially trap terrestrial fauna resulting in individual loss;
- Wet trenching/dewatering;
- Vehicle strikes which can result in loss of individuals.
- Indirect impacts associated with:
    - behavioural responses to noise and vibrations from blasting activities
    - introduction or spread of introduced species (i.e. weeds or feral animals)
    - changes in fire regimes.

Removal and degradation of fauna habitat

Clearing of vegetation for construction of the project can lead to direct impacts such as habitat loss or indirect impacts from habitat degradation associated with introduction or spread of weeds or feral animals, or changes in local fire regimes. Both direct and indirect impacts can result in a decline in population size for local fauna species.

Clearing of vegetation for construction of the project would have a direct impact on terrestrial fauna by removing up to a maximum of 915 ha of fauna habitat and fragmenting the habitat. However, disturbance will be temporary, with approximately 81% of the fauna habitats to be rehabilitated progressively following construction.

A number of significant fauna habitats occur within the pipeline corridor, either due to having high environmental significance or by providing habitat for conservation significant fauna. An assessment of the potential impact to each significant habitat type is provided in Table 15.

Table 15: Potential impacts to significant fauna habitats

Significant habitat	Area within pipeline licence area	Area within 100m pipeline corridor	Area within 30m pipeline ROW	% impacted
BIF hills and ridges	34.8	18.9	5.8	16.6
Greenstone hills and ridges	12.2	14.3	3.9	31.9
Malleefowl habitat	202.3	77.1	24.2	11.9
Areas sharing floristics aspects of the YSP PEC (potential PEC areas)	338.8	116.1	34.0	10
Samphire shrublands fringing salt lakes	240.9	21.8	6.5	2.7
Sand ridges (Southern Marsupial Mole habitat)	68.5	13.3	3.2	4.7
Mulgara habitat	984.9	482.9	148.6	15.1
Long-unburnt proteaceous heath (Grasswren habitat)	17.4	9.8	2.8	16.1
Low rocky outcrops	6.5	0.2	0.0	0
Fauna habitat mapping unavailable	6295.6	2004.6	600.5	9.5
Sandhill Dunnart habitat	598.9	235.8	67.14	11.2

Of the significant fauna habitats, the Greenstone hills and ridges habitat will be impacted the most (31.9 %). Impacts to the remaining significant fauna habitats are relatively small, with all habitats to be rehabilitated following construction. None of the significant fauna habitats are restricted to the pipeline corridor, and all extend into the wider local area. However, management actions will be aimed at avoiding significant fauna habitats where practicable (refer to Section 5.3). With appropriate management measures, removal of fauna habitat (including significant fauna habitats) is not expected to cause a significant impact (refer to Section 5.2.9 for further details on specific MNES).

Fauna mortality from trench excavation

Construction of the project has the potential to result in fauna mortality from individuals becoming trapped in the open trench during construction. Individual animals that are captured in trenches can be exposed to various elements such as stress, predators, heat and subsequent dehydration.

It is inevitable that some animals will be trapped in open trenches and therefore appropriate measures will be put in place to facilitate their escape or assisted removal. For example, escape ramps and shelters will be placed frequently along the open trench and fauna teams will regularly inspect the trench for captured animals. In addition, the duration of construction (and the period during which there would be open trench) will be limited to 28 days (14 days in threatened fauna habitat) (refer to Section 5.3).

With the appropriate management measures in place, it is considered unlikely that native fauna species populations will be significantly impacted by excavation.

Wet trenching/dewatering

Wet trenching/dewatering has the potential to alter surface water flow regimes and/or deteriorate surface and ground water quality which may have a knock on effect to the salt lake systems in the surrounding area. These salt lake systems provide habitat for many fauna species including EPBC listed migratory waterbirds.

The proposed pipeline alignment traverses through a section of samphire habitat associated with Hope Campbell Lake which is a salt lake system that provides habitat for a number of fauna including migratory waterbirds. Whilst this salt lake system is dry for most of the year, there are periods of inundation following rainfall events when the lake contains water. In the event that construction occurs when water is present in the area, wet trenching and/or dewatering for construction may be required. This has the potential to impact upon Hope Campbell Lake by degrading surface water quality and fauna habitats.

Whilst Lake Carey is located outside the pipeline licence area, it may still be subject to indirect impacts associated with habitat degradation from dewatering if not appropriately managed.

It is currently unknown whether wet trenching and/or dewatering will be required for the Project. It may be necessary to dewater the trench if water is present during construction. In the event that wet trenching / dewatering is required, the following management measures will be implemented to ensure that surface water quality and fauna habitats are not impacted and include:

- Dewatering operations will be limited such that they represent only small localised footprints;
- Any water will be utilised for dust suppression purposes and will not be discharged into surrounding drainage/waterways;
- Erosion and sediment control measures, such as geofabric, would be used to stabilise surfaces;
- The appropriate RWI Act/DoW licences will be acquired prior to dewatering; and
- Following trenching, the lake bed would be reinstated to its original condition and profile.

Vehicle strike

Vehicle movements associated with construction activities have the potential to cause the loss of some individuals through collisions with vehicles (vehicle strike), particularly those species that are less-mobile such as reptiles or when passing through conservation significant fauna habitat during breeding seasons.

To reduce the occurrence of vehicle strike, the majority of work will be done during daylight hours. Reduced speed limits will be enforced on roads within the project area during construction and operation, to reduce the risk of fauna strikes and signage will be used in conservation significant fauna habitats. Native fauna encountered along access tracks during construction and operation will be avoided and given an opportunity to move on.

The application of management measures, during construction and operation, is expected to reduce the potential for mortality of individual fauna through vehicle strike to a negligible and therefore acceptable level (refer to Section 5.3).

Indirect impacts

Vegetation clearing, ground disturbance and vehicle movements may result in the introduction or encouragement of dispersal of feral animals, increasing predation of, or competition with, native fauna. Nine introduced fauna species have been recorded in the area to date including the goat. Feral animal management measures will be implemented (refer to Section 5.3).

Noise and vibration emissions from construction activities such as blasting, may affect native fauna by deterring individuals from their habitats and/or altering species' foraging, roosting or breeding behaviour. Management measures will be aimed at avoiding blasting activity in significant fauna habitats. In addition, where blasting is required, several small blasts will be undertaken, as opposed to single blasts, to minimise vibration emissions (refer to Section 5.3).

Native fauna species and habitats could be impacted by changes in the fire regime within the project area during construction of the project and following construction if fires were inadvertently lit and not quickly extinguished. Individual fauna species may be impacted by silt and ash resulting from a fire, or could be subject to direct mortality from being burnt. The quality of the fauna habitat within and surrounding the project area could be reduced by fire, therefore decreasing the availability of higher quality fauna habitat.

During construction, the fire regime of the local area may be altered through a potential increase in the number, intensity and spatial extent of fires from the accidental ignition of fires from vehicles (or their occupants), sparks from equipment or from the use of flammable products. Management measures will be implemented to minimise inadvertent ignition of fires (refer to Section 5.3).

5.2.3 Terrestrial environmental quality

A description of the terrestrial environmental values for the pipeline corridor and the surrounding areas is provided in section 4.

The following aspects have the potential to impact the terrestrial environmental quality:

- Excavation of topsoil and trenching;
- Contaminated site;
- Opening up of country;
- Waste;
- Hazardous fuel and hazardous chemical handling and storage; and
- Fire.

Excavation of topsoil and trenching

The removal of topsoil during constructions works along the ROW and within temporary construction areas will affect approximately 915 ha of the terrestrial environment. The stripping and removal process directly impacts the productivity of the topsoil. This can occur through the stockpiling process but the extent of this can be reduced by minimising storage time and re-spreading as soon as possible. Clearing and excavation will also expose soil to increased erosion (wind and water). This will reduce the amount of topsoil available to be used in rehabilitation and also reduces the productivity of the soil. As 81% of the cleared area is to be rehabilitated, management measures of the CEP will aim to maintain the health of the soil and any vegetation that is removed, as seen in Table 16.

Trenching brings issues with quality of the terrestrial environment including disturbance of acid sulphate soils (ASS). Areas of known ASS are still to be identified but initial review indicates that there are some areas of high potential for ASS areas including to the south and in proximity to Hope Campbell Lake. When excavating area for the trench, ASS need to be kept separate from the other cleared soil and treated separately. Incorrect management of such soils could result in ongoing impacts to soil quality through acidification and mobilization of heavy metals. This would also lower the productivity of the soil and make it inhospitable for some flora and fauna. If acid sulphate soils are in an area of trenching, a suitable treatment plan will be implemented. These could include lime treatments and ensuring that dewatering, if required during trenching in wet areas, is limited so that deeper acid sulphate soils are not oxidised. Should Geotechnical investigations or construction uncover ASS, an ASS Dewatering Management Plan will be developed and implemented.

Stockpiled soil should be kept separate and stabilised to prevent wash off into surface water bodies. This is to reduce the likelihood of impacting surface water drainage, flow and sedimentation, as does reducing the amount of time stored soil is exposed.

Contaminated Sites

A small reserve 4388, located south of the Mount Morgans town site in proximity to the project, has historically been used to dispose of sewage. This site is not listed on the contaminated sites register. Should contaminated soils be discovered appropriate management will be put into place.

Opening up of country

The pipeline will stretch from SDGM to TGM, extending a distance of 210 km. This involves the clearing of vegetation throughout this entire area to a maximum width of 30 m (not considering laydown areas, turnaround points etc.), which will create a temporary disturbance corridor across largely uncleared land. By having such an extensive distance, the physical footprint will be large but in some areas this will be mostly temporary. A permanent access track will have to be maintained the entire length of the pipe all year around for continual access to the pipeline if required. Other than the disturbance itself, this also brings others issues that must be managed. The access track has the potential to provide access to the general public and other stakeholders who would be able to access it throughout the year. This can lead to further degradation of the physical environment through erosion of the track and accessibility being increased. It also allows for introduced fauna to move throughout an area that it may have previously not been able to access, in particular goats.

Waste

Waste can refer to construction waste (e.g. packaging, wooden pallets, builder's rubble, etc.), putrescible (e.g. food scraps and general waste) or fuels and oils. All waste that is produced should first be recycled if possible and then appropriately disposed of. All wastes should be separately stockpiled or stored onsite and will be removed as regularly as required. Off-site disposal of waste products, including recyclables, would require established agreements with specialists who deal in waste management. If not managed correctly,

waste could lead to the contamination of an area. To manage this aspect, measures will be implemented to minimise any waste hazards that may occur throughout the construction of the pipeline (Refer to section 5.3)

Hazardous fuels and hazardous chemical handling and storage

Fuel and chemical handling and storage are required to make sure there is no pollution or contamination of the environment including soil, surface and ground water. Hydrocarbon management will aim to minimise the risk of potential hydrocarbon spills and resultant contamination. Measures would include bunding hydrocarbon storage facilities, refueling locations and stationary hydrocarbon usage areas in compliance with relevant Australian Standards. All hazardous fuels and chemicals will require trained personnel and the correct SDS to be stored with them. Like with the hydrocarbons, all other chemicals must also be suitably stored. All hazardous materials should be stored in a well-ventilated area. This limits the buildup of poisonous and combustible gases. To manage this aspect, measures will be implemented to minimise any hazards that may occur throughout the construction of the pipeline due to the incorrect storage of hazardous fuels and chemicals (Refer to section 5.3).

Fire

The stockpiling of cleared vegetation can become an ignition source for the area, which could result in a bushfire spreading not only in the pipeline corridor but to the surrounding areas. Other work that occurs in line with construction, such as grinding, also increases the likelihood of a bushfire due to a new ignition source. To reduce the likelihood of sparking fires, it will be conducted under permit, generally in fire retardant tents and in a cleared area away from vegetation to reduce the potential of a bushfire hazard. Welding is also carried out within the cleared construction ROW which acts as a fire break.

In areas of extensive construction such as the main camp, a fire break would be used between the area and native vegetation. This protects both the camp and vegetation if a fire is ignited in either area. Fire breaks are anticipated to be greater than or equal to 3 m in width.

To manage this aspect, measures will be implemented to minimise any potential bushfire hazards that may occur throughout the construction of the pipeline (Refer to section 5.3).

5.2.4 Hydrological processes and inland waters environmental quality

A description of the hydrological values of the pipeline corridor and the surrounding areas is provided in section 4.4.

The following aspects have the potential to impact the hydrology of the area:

- The physical disturbance of watercourses through the construction of the pipeline corridor – alterations to the surface water flow regimes;
- Ground water use;
- Deterioration in surface water and groundwater quality; and
- Waste water.

Physical disturbance and alterations to the surface water flow regimes

Physical disturbance and alteration of surface topography can occur through a number of aspects that negatively impact the surface hydrology and inland waters environmental quality. These activities include clearing of vegetation, grading, removal of topsoil, trenching and construction.

Vegetation clearing and excavation (and subsequent rehabilitation) can cause alterations to micro topography and in some cases disruptions to the existing drainage patterns through an area. These changes of the topography with construction and clearing could redirect the drainage lines to new areas that previously did not receive water flow. Changing local drainage patterns could cause a reduction in the already low recharge rates of groundwater levels, reduce growth rates of vegetation and change fauna habitats (See sections 4.5 and 4.6 for further information on flora and fauna).

Changes to watercourse flow regimes have further implications on natural drainage as well. As previously mentioned, the pipeline corridor is situated on some minor ephemeral drainage lines; the disturbance of these drainage lines will be managed so that drainage is not impeded (e.g. could potentially install pipes beneath construction ROW to maintain flow and vehicle access).

To limit the impact of the physical disturbances, infrastructure will be aligned with already existing areas where practical to do so. Stockpiling of topsoil should occur as much as possible for rehabilitation and pipes should be used to encourage flow between disturbed

areas. Management measures will be implemented to minimise potential impact of the physical disturbance to the environment (Refer to section 5.3) including ground stabilization.

Ground water use

To access water in the area, a number of bores will potentially be constructed but exact locations are currently unknown. This will need to be approved by the Department of Water. A drawdown process is used to access groundwater levels. The use of ground water can lower the water table causing a drawdown cone that could affect surrounding water bodies and groundwater dependent ecosystems. To reduce the effect of this aspect, the drawdown process must be limited. Ideally this would limit salinisation and acidification.

To manage this aspect, measures will be implemented to minimize the amount of groundwater that is taken (Refer to section 5.3).

Deterioration of surface water and ground water quality

Deterioration of the surface water and ground quality has the potential to be affected by physical disturbances from construction if not appropriately planned and managed. The construction ROW will be maintained during construction to minimise erosion and rehabilitated and its condition monitoring to ensure there is no loss of sediment into adjacent drainage lines or waterbodies.

If trenching occurs for pipeline construction through an area of shallow groundwater or in surface water areas there is the potential for dewatering to be required if wet trenching is not practicable or appropriate. Excess water produced by dewatering will be used for dust suppression (a contingency for transport to SDGM or TGM for water use will be provided for) to avoid need for discharge into the surrounding area, which would be subject to approval. The dewatering can result in a cone of depression exposing potential acid sulphate soils to air and could cause their oxidization. This could cause the soils to become acidic, resulting in the degrading of the soil and water quality. Dewatering operations in such areas would be subject to ASS management measures according to the CEP to prevent significant acid generating events. Dewatering rates will be limited such that the drawdown cone will not affect surrounding water bodies and groundwater dependent ecosystems (if present) (i.e. no significant drawdown at surface water bodies).

Construction camp operation has the potential to result in surface and ground water pollution too. Fuel and chemical spills can spread into surface water or on top of soil. These spills, if not managed correctly, could leach into the groundwater system and result in further contamination. To store excess water, turkey nests will be constructed. Turkey nests could cause salinisation of immediate and surrounding areas if incorrectly stored. These require buffers between the water and the soil to stop absorption. It must also be managed so that these do not overfill, causing spillage into the areas surrounding the turkey nest. These also have issues of attracting fauna into areas of construction and can have adverse effects on fauna health. To manage this, construction should potentially occur in times where there is less likelihood of inundation in areas such as Hope Campbell Lake, which is ephemeral. Management measures will be implemented to minimise potential impact on the quality of surface and ground water (Refer to section 5.3). It is considered unlikely that there will be major impacts on hydrology and water quality as a result of the planning and management measures proposed.

Waste Water

Incorrect storage, treatment and disposal of effluent can lead to contamination of the environment. These can either be a direct result of the construction or through the camp areas. Where possible, waste water will be reused, however for some waste this is not possible. Management measures will be implemented to minimise potential impact on hydrology from waste water (Refer to section 5.3).

5.2.5 Air quality

The keys issues with regard to air quality are dust and greenhouse gas emissions. Dust will be generated by a number of activities associated with construction of the pipeline however, the following management measures will be implemented to limit impacts:

- Avoiding certain activities during unfavourable weather conditions; and
- Implementing dust suppression techniques, mostly water application to the construction ROW.

Greenhouse gas emissions will result from vehicle/machinery or generator use on-site and commissioning of the pipeline, however, these emissions are expected to be minimal. The operation of the pipeline will result in a net reduction in greenhouse gas emissions regionally through the replacement of diesel generation with gas at the SDGM and TGM.

5.2.6 Amenity

During construction of the pipeline there will be impacts to amenity as a result of noise, vibration and light. Noise will be managed in accordance with the Noise Regulations. Vibration could be associated with blasting of rock areas, if required, however this is expected to be a limited to specific locations of rock. Light emissions will primarily be associated with the construction camp, however, this will be in place for a limited period of time and will be managed to minimise any impacts to surrounding land users.

5.2.7 Heritage

No aboriginal heritage sites have been identified within the pipeline corridor (refer to Section 4.7.2), and the sites that have been identified nearby will also be avoided by any direct disturbance associated with the pipeline construction. A CEP will be prepared to outline the management required to be implemented in the even that any unexpected potential heritage material is identified.

5.2.8 Rehabilitation

Rehabilitation of pipelines is a well-established process (refer to Section 3.5.12 for description), with rehabilitation occurring as soon as possible after construction is complete. This will limit the length of time that rehabilitation material is stockpiled for, optimising the success of the restoration activities. Future monitoring will be undertaken, with some operational vegetation pruning potentially required to protect the integrity of the pipeline.

5.2.9 Matters of NES

A description of the MNES values of the pipeline corridor and surrounds is provided in Section 4.6.4.

The project has the potential to impact the following MNES:

- Southern Marsupial Mole;
- Sandhill Dunnart;
- Malleefowl;
- Princess Parrot;
- Rainbow Bee-eater;
- Fork-tailed Swift;
- EPBC listed Migratory birds; and
- Great Desert Skink.

The potential impacts to each MNES are described in detail below.

Southern Marsupial Mole

The project has the potential to impact upon the Southern Marsupial Mole by:

- Loss of habitat;
- Mortality from trench entrapment.

The pipeline alignment has largely avoided areas of sand dune habitat with most elevated sand dunes (optimal habitat for the Marsupial Mole) occurring outside the pipeline alignment. However, some small areas of low lying dunes will still be traversed and excavation of the pipeline trench will result in the removal of an estimated 3 ha of Sand Ridge habitat that provides suitable foraging or dispersal habitat for the Marsupial Mole (Table 15; It should be noted that this is an estimate only and based on habitat mapping of sand ridge habitat). This represents approximately 4.7% of this habitat type available in the wider surrounding pipeline licence area. In addition, areas sharing floristics aspects of the YSP PEC are also considered as potential Marsupial Mole habitat. This habitat will be impacted by 10% of that available in the pipeline licence area (Table 15). These habitats potentially represent habitat critical to the survival of the Marsupial Mole as described in the National Recovery Plan for Marsupial Moles (Benshemesh 2004), as they may be necessary for activities such as foraging, breeding, or nesting (DoE 2014c). The Marsupial Mole is likely to utilise sand dune habitat as dispersal corridors and so consequently it is understood that, any disruption to the sand dunes has the potential to disrupt the movement of the Marsupial Mole, and ultimately genes, through the landscape. However, numerous records of the Marsupial Mole were recorded both inside and outside the areas to be impacted, some at considerable distance from each other, suggesting the mole is widespread throughout the general area (refer to Section 4.6.4). In addition, suitable habitat for the Marsupial Mole including both optimal habitat

and foraging/dispersal habitat, is widely available throughout the local area. Due to the availability of suitable habitat in the wider surrounding area, and the temporary nature of the disturbance (i.e. sand dune habitat will be progressively rehabilitated following construction) any impacts to movement are expected to be highly localised and therefore low. Operation of the pipeline is unlikely to interfere with Marsupial Mole activity as moles are generally found in the top 50cm of soil, above the minimum cover of the pipeline.

Due to the widespread nature of the Marsupial Mole habitat in the local area and more broadly in the region, complete avoidance of this habitat by the pipeline corridor is not possible although the alignment has largely avoided optimal Marsupial Mole habitat. Management measures will therefore focus on minimisation of impacts to the Marsupial Mole which are likely to arise from trench entrapment (refer to Section 5.3). These will include (but not limited to):

- Install awareness signage for construction workers in areas of Marsupial Mole habitat;
- Minimising trench open times to a maximum of 14 days in areas of Marsupial Mole habitat;
- Reducing the construction ROW to 25 m wide in Marsupial Mole habitat;
- Additional trench inspection surveys (i.e. 3 x daily during morning, early afternoon and late afternoon);
- Additional shelters/areas of refuge placed every 50 m along open trench in areas of Marsupial Mole habitat; and
- Shallow rip/scarify construction access roads after construction is complete to limit compaction impacts.

Once the appropriate management measures are implemented, impacts to the Marsupial Mole are expected to be low and are unlikely to represent significant impact criteria (refer to Table 18).

Sandhill Dunnart

The project has the potential to impact upon the Sandhill Dunnart by:

- Loss of habitat;
- Trench entrapment; and
- Vehicle strike.

The pipeline alignment has largely avoided areas of long unburnt yellow sandplains and sand dune systems supporting optimal habitat for the Sandhill Dunnart. However, there are still substantial areas of suitable habitat that will be traversed and, as a result, excavation of the pipeline trench will remove approximately 67.14 ha (11.2%) of habitat (Table 15**Error! Reference source not found.**). A further 531.86 ha will remain undisturbed within the wider pipeline licence area. In addition, optimal and potential habitat is available throughout the wider locality.

The Sandhill Dunnart was recorded at four locations within the pipeline corridor. The species is likely to have a highly restricted range in the region. However, extensive areas of optimal habitat occur outside the areas to be disturbed.

Due to the widespread nature of suitable habitat, complete avoidance of Sandhill Dunnart habitat is not possible. Management measures will therefore focus on minimisation of impacts to the Sandhill Dunnart that are likely to arise from trench entrapment and vehicle strike (refer to Section 5.3). Management measures for the Sandhill Dunnart include (but are not limited to):

- Install awareness signage for construction workers in areas of Sandhill Dunnart habitat;
- Minimising trench open times to a maximum of 14 days in areas of Sandhill Dunnart habitat;
- Additional trench inspection surveys (i.e. 3 x daily during morning, early afternoon and late afternoon);
- Additional ramps and shelters/areas of refuge placed every 50 m along open trench in areas of Sandhill Dunnart habitat; and
- Limit vehicle speeds further in areas of Sandhill Dunnart habitat.

Assessment of the significant impact criteria for this species is outlined in Table 18.

Malleefowl

The project has the potential to impact upon the Malleefowl by:

- Loss of habitat;
- Trench entrapment;
- Vehicle strike; and
- Indirect impacts from (fire, feral predators).

The proposed pipeline route has been designed to avoid the majority of Mulga woodlands which may represent habitat critical to the survival of the Malleefowl as defined in the National Recovery Plan for Malleefowl (Benshemesh 2007), as they may be necessary for activities such as foraging, breeding, or nesting (DoE 2014c). However, some small areas of potential foraging/dispersal habitat are traversed by the pipeline corridor and as a result approximately 24.2 ha (11.9%) of potential Malleefowl habitat will be disturbed during

excavation (Table 15). Despite this, a further 178 ha will remain within the wider pipeline licence area in addition to habitat found in the wider surrounding locality.

During recent surveys, 19 Malleefowl mounds were recorded at locations in proximity to the pipeline corridor (the closest being 1.5 km away). At least two mounds were active suggesting there are two breeding pairs in the local area. During breeding season, Malleefowl tend to be largely sedentary. However, outside breeding season they are known to forage over several kilometres and as such may be present within the pipeline corridor where they would be subject to potential impacts from trench entrapment and vehicle strike. Management measures will include implementing buffers as 'no go' areas around existing Malleefowl mounds.

Management measures for the Malleefowl are mainly aimed at minimising impacts from mortality associated with trench entrapment and vehicle strike, and indirect impacts associated with habitat degradation from feral predators and altered fire regimes (refer to Section 5.3).

Management measures for the Malleefowl include (but are not limited to):

- Avoidance of existing Malleefowl mounds;
- Minimise disturbance to Mulga woodland habitat;
- Signage for Malleefowl erected in areas close to known Malleefowl mounds;
- No-go-zone (anticipated 50m) around known mounds, both active and inactive;
- Vehicle speeds further reduced in Malleefowl habitat or in areas close to existing mounds;
- Trench fauna inspections carried out twice daily with a fauna expert for any subsequent fauna relocations;
- Appropriate fire management; and
- Appropriate feral predator management.

Once the appropriate management measures are implemented, impacts to the Malleefowl are expected to be low and are unlikely to represent significant impact criteria (refer to Table 18).

Princess Parrot

The project has the potential to impact upon the Princess Parrot by:

- Loss of habitat; and
- Vehicle strike.

The proposed pipeline route does traverse areas of suitable habitat for the Princess Parrot (i.e. Marble Gum woodland) within section two of the pipeline corridor. Although habitat critical to the survival of the Princess Parrot has not been explicitly defined by DoE, large Marble Gum trees may represent suitable breeding habitat for this species. Construction of the pipeline may result in the removal of some large Marble Gum trees that may represent suitable breeding habitat for the Princess Parrot.

The Princess Parrot has not been recorded within the pipeline corridor, with the closest records being over 100 km away. However, due to the highly mobile and nomadic nature of the species, it is considered to have the potential to occur periodically in the pipeline corridor where it is likely to occur as an occasional visitor or irregular breeding resident. There is also the potential for the species to breed in the local area during favourable conditions. Impacts to the Princess Parrot are therefore aimed at minimising disturbance to potential breeding habitat (i.e. mature, hollow bearing Marble Gum trees), and minimising impacts associated with vehicle strike (refer to Section 5.3). Management measures for the Princess Parrot include (but are not limited to):

- Avoidance of mature, hollow bearing Marble Gum trees;
- Where mature, hollow bearing Marble Gum trees cannot be avoided, prune branches if possible to retain tree or a pre-clearance survey will be undertaken to inspect the tree for evidence of the Princess Parrot; and
- Vehicle speeds will be reduced through Yellow Sand Plain Community habitat (potential breeding habitat for the Princess Parrot).

Once the appropriate management measures are implemented, impacts to the Princess Parrot are expected to be low (if present) and are unlikely to represent significant impact criteria (refer to Table 18).

Rainbow Bee-eater

The project has the potential to impact upon the Rainbow Bee-eater by removal of habitat. However, habitat critical to the survival of this species has not been identified within the pipeline corridor. In addition, vegetation clearing will not result in substantial modification of habitat for the Rainbow Bee-eater which is adapted to a variety of habitats. Only a small amount of temporary clearing (30 m wide

corridor, reduced in water areas) will occur in any one area, with rehabilitation of almost the entire corridor (excluding an access track and small above ground facilities) post-construction. As a result, any impacts to the Rainbow Bee-eater are expected to be low.

Fork-tailed Swift

The Fork-tailed Swift is an aerial species that does not rely on terrestrial habitats and will therefore not be impacted by the project.

EPBC listed Migratory waterbirds

The project has the potential to impact upon EPBC listed waterbirds by wet trenching/dewatering. Wet trenching/dewatering has the potential to impact upon EPBC migratory waterbirds by degrading habitat associated with Salt Lake systems such as Lake Carey or Hope Campbell Lake.

The majority, if not all, of these species would likely occur at Lake Carey which lies outside the pipeline licence area and outside any areas to be disturbed. Despite this, management measures will still be implemented to ensure no indirect impacts occur at Lake Carey as a result of dewatering, wet trenching or habitat degradation.

A small amount of salt lake habitat associated with Hope Campbell Lake does occur within the pipeline licence area but lies outside the pipeline corridor and outside any areas to be impacted (refer to Table 13; 112.7 ha). Despite this, management measures will still be implemented to ensure no indirect impacts occur within salt lake habitat associated with Hope Campbell Lake as a result of dewatering, wet trenching or habitat degradation (refer to Section 5.2.2, 5.2.4 and 5.3).

Whilst the salt lake habitats may provide occasional habitat for migratory waterbirds during periodic flood events, this habitat type is considered marginal and only likely to support small numbers or vagrants for a limited period. As a result the habitat within the pipeline licence area is not considered to be “important” under the EPBC criteria and once management measures are implemented, is not expected to be impacted by the Project.

Great Desert Skink

The project has the potential to impact upon the Great Desert Skink by:

- Loss of habitat;
- Trench entrapment; and
- Indirect impacts (fire and introduced predators).

Suitable habitat for the species has been identified within section two of the pipeline corridor (i.e. sandplain habitat). Excavation will remove some areas of suitable habitat for the species. It should be noted that specific habitat mapping for the Great Desert Skink has not been undertaken and so the exact area of impact to suitable habitat is currently unknown.

Habitat critical to the survival of the Great Desert Skink has not been defined due to inadequacies with distribution data (McAlpin 2001) and no evidence of the Great Desert Skink has been recorded in the pipeline corroder despite the species having distinct burrows and scats. In addition, the Great Desert Skinks occupies a variety of habitat types within the western deserts region and the area of potentially suitable habitat within the region is likely to be in tens of thousands of square kilometres (McAlpin 2001).

Management measures to reduce potential impacts to the species (if present) are largely aimed at minimising mortality associated with trench entrapment and/or vehicle strike, in addition to indirect impacts associated with fire and introduced predators (refer to Section 5.3).

Once the appropriate management measures are implemented, impacts to the Great Desert Skink are expected to be low (if present) and are unlikely to represent significant impact criteria (refer to Table 18).

5.3 Environmental management

Table 16 outlines the management actions, including timing and responsibilities, which have been developed for each of the potential impacts identified for the environmental factors relevant to this Project. These management actions will be included in a Construction Environmental Plan that will be prepared for the project, in accordance with the Pipelines Act.

Table 16: Management actions, timing and responsibilities

Issue	Action	Timing
Flora and vegetation		
Vegetation clearing	Clearing will be minimised by utilising degraded areas and existing access tracks/infrastructure where possible	Prior to clearing
	Clearing boundaries will be clearly demarcated prior to ground disturbance activities, with no clearing or disturbance during construction permitted outside of pre-defined clearing areas	Prior to clearing
	Vegetation to be retained or areas not to be disturbed will be identified and located on the construction alignment sheets and flagged in the field as not to be disturbed	Prior to clearing
	Avoiding removal of large trees as far as practical: • Tree protection, if required, will be in accordance with the Australian Standard - AS 4970-2009 Protection of trees on development sites • Where large trees (>300mm Diameter at breast height) are removed they will be salvaged and stockpiled for use during rehabilitation	At all times
	The width of the construction ROW will be reduced to: • 25 m where it intersects conservation significant habitat for threatened species; Malleefowl, Sandhill Dunnart or Marsupial Mole habitat; and yellow sandplains areas • 20 m through Priority Ecological Communities • 20 m through Lake areas	At all times
	Known locations of Priority flora will be avoided where reasonably practicable	During clearing
	DPaW and specialist consultants will be liaised with regarding the management of conservation significant flora	Prior to clearing
	Clearing in spinifex habitat for temporary facilities located outside the construction ROW will be avoided where possible	At all times
	No works, including loading and unloading, storage of materials, dumping of waste, vehicle access and parking or other construction activity, will occur within areas of retained vegetation	At all times
	Areas will be rehabilitated/revegetated progressively where possible	As soon as possible following back-filling
Weed management	Prior to clear and grade, wash down points will be set up at locations when moving from an identified contaminated area to a weed free area	Prior to clearing
	All vehicles, equipment and portable infrastructure will be clean/ washed-down (free of soil and organic matter) prior to entering the construction area/mobilising to prevent the introduction of weeds	At all times
	A visual inspection will be undertaken and documented prior to acceptance of the vehicle, equipment or portable infrastructure onto the construction area	At all times
	Wash-down will occur upon exiting pastoral land were vegetation becomes relatively “undisturbed”	At all times
	Wash-down details will be recorded in a Wash-Down Register	At all times

Issue	Action	Timing
	Soil from the construction ROW will be graded to minimise the transfer of soil between properties	During clearing
	Where the works require the importation of material, such as sand, gravel or spoil, the material will be sourced (preferably) locally and be certified clean (weed free)	At all times
	All vehicle and equipment movement will be confined to the construction ROW, designated access tracks/roads and allocated parking areas	At all times
	Unauthorised off-road driving will be prohibited	At all times
	Regular inspections will be undertaken to record new observations of invasive flora infestations or changes in invasive flora distribution	At all times
Terrestrial fauna		
Fauna habitat	Pre-clearing inspections will be undertaken to identify and relocate (where possible) fauna from the pipeline corridor within any hollows	Prior to clearing
	The removal of large potential hollow bearing/habitat trees will be avoided	During clearing
	Habitat features, such as rocks and large woody debris, that need to be cleared will be retained and relocated into the construction ROW during rehabilitation, to provide continuity of habitat and microhabitats for fauna	During clearing
Fauna behaviour and vehicle interactions	The feeding of animals, hunting, or keeping of firearms or pets on the construction site and camps will be prohibited	At all times
	Safe speed limits will be implemented on roads to minimise the potential for collision with fauna as per Traffic and Travel Management Plans (TMP) • 80 km/hour and drive to conditions (i.e. rain = 20km/hr. or less) • Reduced speeds through conservation significant habitat for threatened species • 10 km/hr or walking pace in working areas • Reduced speeds during dawn and dusk (i.e. 60 km/hr.)	At all times
Fauna trench entrapment	The fauna handling team will comprise of Fauna Handlers who have completed sufficient training and hold a relevant Licence to take fauna	At all times
	The length of open trench will be minimised wherever possible, and limited to the total length that is capable of being inspected by approved fauna personnel within 3 hours after sunrise (within 2.5 hours if daily temperatures expected to exceed 35°C), with inspections to be repeated before sunset (i.e. between 3-6 pm)	At all times
	The duration of construction (and the period during which there would be open trench) will be limited to a maximum of 28 days (14 days in Marsupial Mole and Sandhill Dunnart habitat)	At all times
	All open trench/excavations are to be inspected at least twice daily for trapped fauna. This is to be undertaken as follows: first clearing shall occur no later than three hours after sunrise; second clearing shall occur between the hours of 3-6pm. During extreme temperatures (37 degrees or above), fauna inspections will also occur at midday	At all times
	Fauna inspection teams will consist of a minimum of two personnel	At all times
	Ramps providing egress points (approximately 45 degree slopes) will be located every 1 km and fauna refuges (e.g. cardboard boxes, hessian bags, commercial egg cartons) providing suitable shelter from the sun and predators will be placed at intervals not exceeding 50 m in the open trench	At all times

Issue	Action	Timing
	Where rainfall and flooding of open trenches is expected, floating fauna refuges (e.g. logs) will be installed in the trench at not more than 50 m intervals	At all times
	End caps will be used on pipe strings to prevent entry of fauna prior to laying	At all times
	Pipeline sections will be inspected for fauna immediately prior to welding	At all times
	The open trench will be checked for fauna and any trapped animals will be removed prior to backfilling. Any fauna relocation will be undertaken by a suitably qualified and experienced animal handler	At all times
	Relocated fauna will be relocated a minimum distance of 50 m from the trench; for threatened species into suitable habitat as determined by fauna specialist	At all times
	All deceased fauna will be removed from the trench to prevent further fauna entering (e.g. to scavenge)	As required
	Records of fauna inspections to be included in a Fauna Removal Log. Records to be maintained include sunrise time, time of inspections, details of inspections (e.g. trench length, personnel involved), the species (or if not known a photo and description provided) and number of fauna cleared from the trenches, fauna interactions, fauna mortalities and all actions taken	At all times
Threatened fauna/MNES management	The width of the construction ROW will be reduced to: • At least 25 m (or 20 m where possible) where it intersects a threatened species; Malleefowl, Sandhill Dunnart or Marsupial Mole habitat; and yellow sandplains areas	At all times
	Known locations of conservation significant fauna habitat such as Malleefowl mounds (50 m buffer) and dune systems with evidence of Marsupial Mole activity will be clearly demarcated in the field and designated as 'no go' areas	At all times
	Signs indicating the likely presence of threatened fauna in areas of significant habitat will be erected to increase driver awareness of the risk to fauna for the following species: • Southern Marsupial Mole • Sandhill Dunnart • Malleefowl	At all times
	Translocation of threatened fauna will occur following morning trench inspections to suitable habitat at a suitable distance from disturbance and done in a manner to minimise stress to the animal (as advised by a qualified zoologist)	At all times
	Sightings or potential records of threatened species encountered by the workforce during clearing operations will be reported to site Environmental Advisors	At all times
Terrestrial Environmental Quality		
Excavation of soils and erosion	The width of the trench for the transmission pipeline will be minimised where possible (to be 600 mm)	At all times
	Topsoil will be stripped to a depth of 100 mm	During clearing
	Any topsoil to be removed shall be stripped and stockpiled immediately adjacent to where it was stripped, separately from subsoil, within the construction ROW	During clearing
	All excavated soil will be stockpiled in cleared areas within the construction ROW, not on or near to native vegetation	During clearing/ construction

Issue	Action	Timing
	Stockpiles will be stored away from areas of surface water and not impede surface drainage or water flow	During clearing/ construction
	Temporary sediment fences will be used to contain any potential sediment movement by wind and rain from stockpiled soil	During clearing/ construction
	Cleared Growth medium will be stockpiled away from drainage lines	During clearing/ construction
	The time that unconsolidated soils and stockpiles are exposed will be minimised to prevent surface water run-off and sedimentation	During clearing/ construction
	To prevent sediment release from cleared areas near drainage lines or surface water areas, ground disturbance work will be scheduled to occur predominantly outside traditional high rainfall event times such as December-May. In areas where there is still a possibility that sediment may be released, sediment collection systems will be considered	During clearing/ construction
	Utilise gravel on access roads to minimise erosion in sand dune areas	During clearing/ construction
	Rehabilitate corridor in sand dune areas as soon as practicable (majority of disturbance is expected to be temporary)	During clearing/ construction
	Access tracks will be inspected regularly as a part of the audit program to ensure erosion is not occurring. If it is then rectification measures will be implemented Any potential track erosion issues noted by staff will be reported by exception vas the hazard and incident reporting system	Post construction
ASS	If required/pending outcome of geotechnical surveys, prepare and implement a management plan to define ASS areas and treatment requirements (e.g. limit dewatering so deeper ASS not oxidised, lime treatments)	Prior to clearing
Opening up of Country	The effective burial, compaction and reinstatement of the pipeline trench and associated areas will be undertaken to ensure no water pooling along the alignment	Post construction
	One small ROW access track will be maintained post construction for operational purposes	Post construction
	Pipeline Marker Signs will be installed	Post construction
	Tracks will be inspected as a part of the audit program to identify evidence of goat activity. If identified surveys will be undertaken to determine abundance and control measures will be implement as required (in consultation with DPaW)	Post construction
Waste	All waste will be removed from site for reuse/recycling or disposal at appropriately licenced facility	At all times
	All waste will be collected in appropriately labelled and lidded containers for off-site disposal by a licenced contractor	At all times
	All general waste bins will contain secure lids	At all times
	Waste from ablution associated with camps will be treated prior to disposal and in areas remote of water bodies	At all times
	A licensed waste contractor(s) will be used to transport ablutions waste off site	At all times
	All waste storage containers will be regularly emptied and waste removed from site	At all times
	Regular inspections and monitoring will be undertaken to ensure prevention of over flow or dispersal of waste	At all times

Issue	Action	Timing
	Sewage management facilities will be approved by the relevant authorities (Local Council, Department of Health, Department of Environment Regulation)	During camp construction
	Warning system such as alarms or flashing lights will be installed to all demountable toilet blocks to indicate that the facility is nearing capacity	During camp construction
Fuel and hazardous chemical handling and storage	All environmentally hazardous substances will be stored in accordance with statutory requirements, or where no requirements are legislated in a low permeability bunded area that holds 110% of volume being stored or 25% of any interconnected tanks or in accordance with Dangerous Goods Storage Licence	At all times
	All fuels and chemicals will be stored in sealed containers, bunded and locked storage areas	At all times
	All equipment (e.g. welders, small generators) that holds >10L of hydrocarbon or chemical will be stored in a containment area when not being used	At all times
	Concrete aprons, suitable lining or dedicated drainage will be used at refuelling bays (including double skinned tanks) to contain any spills	At all times
	Bunding protection systems will be maintained to reduce the likelihood of damage by vehicle/equipment	At all times
	SDS sheets will be available for all hazardous substances onsite	At all times
	An onsite chemical register will be maintained for chemicals brought to site	At all times
	Chemical storage in bunded area (anticipated sea container)	At all times
	Generators will be self-bunded	At all times
	Bund capacities will be sufficient to contain quantity of largest stored container	At all times
	Hazardous substances will be stored within a dedicated chemical storage area which will be bunded and located away from busy construction and/or operational areas	At all times
	Spill kits will be located in close proximity to stored and used fuels and chemicals	At all times
	Dedicated refuelling areas will be bunded	At all times
	A Project Emergency Response Plan (ERP) will be developed and implemented. This will include an Oil Spill Contingency Plan (OSCP)	At all times
	All bunded areas will be located within a secondary containment area to prevent pollution in the event that primary containment systems are breached	At all times
Fire	Fire fighting equipment will be maintained and operated to comply with relevant fire safety standards	At all times
	A Project Emergency Response Plan (ERP) will be developed and implemented	Prior to construction
	All personnel will be trained in the use of fire fighting equipment, and will be familiar with the equipment located within their specific work areas and campsites	At all times
	All grinding/welding will be carried out within cleared ROW	At all times
	Stockpiling of waste (fuels sources) will occur away from high risk areas	At all times

Issue	Action	Timing
	Open fires will not permitted	At all times
	Smoking will only be permitted within designated areas only around the office and camp facilities; designated receptacles will be provided in all working areas	At all times
	Fire extinguishers will be available in all temporary buildings and site vehicles to control localised outbreaks of fire	At all times
	Fire extinguishers will be tagged by an approved inspector prior to mobilisation	At all times
	Grinding/welding will be carried out under permitting processes and procedures/Fire watchman (spotter) for all hot works/live line welding	At all times
	Dry vegetation material will not be permitted to build up on equipment involved in vegetation clearing	At all times
	All vehicles and where possible mobile equipment will utilise diesel (rather than petrol)	At all times
	Vegetation stockpiles will be placed at a sufficient distance from ignition sources	At all times
	Fire breaks of sufficient distance will be implemented between construction camp extent and native vegetation	At all times
	Any fires started on-site will be reported and investigated via the hazard and incident reporting system	At all times
Hydrological processes and inland waters environmental quality		
Watercourse crossings	Watercourse crossings will be aligned with other existing infrastructure or access tracks where practical	During construction
	Boundaries through water bodies which will be disturbed will be clearly demarcated in the field	During construction
Surface water quality	Cleared vegetation will be stockpiled away from drainage lines	During clearing
	Rehabilitate corridor as soon as practicable (majority of disturbance is expected to be temporary)	Post construction
	Implement measures to maintain surface water flows (e.g. pipes installed beneath access roads to maintain connectivity)	During construction
	Standpipe areas will drain internally to limit any runoff and salinisation of surrounding vegetation	At all times
	Any potential salinisation issues will be corrected prior to remediation	At all times
Water usage and dewatering	Water usage will be minimised, and recycled/reused wherever possible	At all times
	Dewatering rates will be limited such that the drawdown cone will not affect surrounding water bodies and groundwater dependent ecosystems (if present) (i.e. no significant drawdown at surface water bodies)	At all times
	Dewatering product in potential acid sulphate soil risk areas identified by geotechnical investigations will be treated in accordance with specific requirements set out in the CEP	At all times
	Water from trench de-watering will be reused (e.g. dust suppression) or gifted to mine sites.	At all times
	Safety measures will be implemented at standpipe such that water release does not occur	At all times
	Impervious drainage measures will be installed where refilling from standpipe to collect any accidental water release	At all times

Issue	Action	Timing
	Time that standpipe is required will be limited	At all times
Turkey nests	The following management actions will be implemented for turkey nests: • Turkey nests will have an impervious surface • The time that turkey nests are required to store saline water will be limited • Areas will be remediated sufficient to correct any potential salinisation issues for rehabilitation purposes • Fencing will be installed around turkey nests	At all times
Air quality		
Dust	Work areas will only be cleared as they are required	As required
	Water, or other appropriate suppressants will be applied to work areas: • Hypersaline water will not be used for dust suppression on soil/growth medium stockpiles • If hypersaline water is to be used for dust suppression, control systems will be established to prevent salinisation of adjacent vegetation	As required
	Speed limits will be enforced on roads as per TMP	At all times
	Soil stockpile heights will be limiting to minimise wind erosion	As required
	Burning of vegetation will be prohibited	At all times
	Weather conditions will be reviewed prior to relocating material, and activity postponed if excessive winds would result in loss of significant rehabilitation material	At all times
Gas emissions	Equipment/plant will be designed for purpose to AS2885 standards	At all times
	Power generators will be limited to that which is necessary	As required
	A maintenance program will be implemented to ensure power generators are operating as efficiently as possible	Ongoing
	Hot tapping will be undertaken by trained personnel: • Valves will be tested prior to installation • Signage and exclusion zones will be in place during hot tapping	As required
	Commissioning activities to be planned and undertaken by trained personnel, with the introduction of gas being gradual (as per the Commissioning Procedures)	During commissioning
Amenity/Human health		
Noise and vibration	All activities to be conducted in compliance with the Environmental Protection (Noise) Regulations 1997	At all times
	All machinery and equipment will be appropriately fitted, maintained or substituted with noise reduction devices if necessary	At all times
	Where construction is required out of hours or on Sundays and/or public holidays, noise emissions will comply with the assigned levels provided in Regulation 7 of the Environmental Protection (Noise) Regulations 1997	At all times
	Activities shall be managed according to weather conditions and proximity to noise sensitive areas	At all times

Issue	Action	Timing
	Blasting will be limited to certain small sections of the pipeline corridor	During construction
	Size of blast will be limited to only that necessary for pipeline corridor excavation	During construction
	No excessive noise will be permitted beyond 10:00 pm	During construction
	Equipment (e.g. power generation) will be subject to noise mufflers or be in enclosed area to limit noise emissions	During construction
Heritage		
Heritage	Indigenous monitors will be engaged to assist during clearing to ensure previously unidentified archeologically material is managed appropriately	During Construction
	Any disturbance outside the pipeline corridor will be undertaken considering the known heritage locations (based on surveys undertaken for this project), with these locations being avoided	Prior to clearing
	In the event that suspected heritage material is uncovered, all work will cease and will be managed in accordance with the CEP and other applicable site procedures	At all times
Rehabilitation		
Rehabilitation	Cleared vegetation and soil/growth medium will be retained for later use in rehabilitation (stockpiled separately)	During rehabilitation
	When possible, soil/growth medium will not be stripped or stockpiled in wet conditions	During rehabilitation
	Areas no longer required will be rehabilitated as soon as is practicable. Rehabilitation will include placing cleared vegetation and logs within the area to provide fauna refuge	During rehabilitation
	Clean seeds (if required) will be used for rehabilitation	During rehabilitation
	Seed will be harvested locally to reduce the risk of new invasive flora introduction	During rehabilitation
	Demarcation will be removed at the end of construction to discourage people from investigating the areas	Post construction
	Following rehabilitation, areas will be monitored and treated for invasive flora invasion, if necessary	During rehabilitation
	Post-construction weed monitoring and control will be carried out throughout the project life/pipeline operations to minimise environmental weeds colonising disturbed areas and to control and prevent the spread of declared noxious weeds	Post construction

6 SIGNIFICANCE ASSESSMENTS

6.1 EPA significance test criteria

The completed referral form, together with this Supporting Document, has been prepared to provide sufficient information to allow the EPA to make a decision on whether to formally assess the project under Part IV of the EP Act. To further support this process, an assessment of whether the project is likely to have a significant effect on the environment as per Section 7 of the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012* is provided in Table 17.

Table 17: State Significance Test

Matters	Information for Assessment
(a) values, sensitivity and quality of the environment which is likely to be impacted	The environment likely to be impacted is described in Section 4 – Existing environment.
(b) extent (intensity, duration, magnitude and geographic footprint) of the likely impacts	The impacts associated with the project are outlined in Section 5 – Impacts and management. Impacts associated with the project will be largely temporary with a total of 915 ha of native vegetation to be cleared, of which 738 ha (81%) will be rehabilitated. A total of 177 ha will be permanently impacted due the access track and small above ground facilities.
(c) consequence of the likely impacts (or change)	The consequence of impacts associated with the project is outlined in Section 5 – Impacts and management. Key impacts are considered to arise from vegetation clearing and loss of habitat, as well as trench entrapment of fauna or collision with vehicles. Impacts will be effectively managed and will be consistent with the management outlined in this document.
(d) resilience of the environment to cope with the impacts or change	Buried high pressure gas pipeline corridors can be almost fully rehabilitated, and it is anticipated that the majority of the project area will return to a natural vegetated state. Approximately 81% of the area proposed for clearing will be rehabilitated following construction. Management measures will be implemented to minimise direct and indirect impacts to flora and vegetation, terrestrial fauna and hydrological values of the Project area.
(e) cumulative impact with other projects	The EGP project will transport natural gas to the existing SDGM and TGM. The pipeline will also be designed to be able to facilitate (potential) future clients, or synergies with other mines in the area. The Project area does not overlie the footprint of any other major projects in the region other than the SDGM and TGM approved footprint. The pipeline corridor has been aligned with degraded areas, where practicable, to minimise cumulative disturbance in the region.
(f) level of confidence in the prediction of impacts and the success of proposed mitigation	The proponent is highly experienced with environmental management of the installation of pipelines similar to this project. As such, potential impacts and relevant management measures are well understood and will be thoroughly addressed (refer to Section 5 – Impacts and management).
(g) objects of the Act, policies, guidelines, procedures and standards against which a project can be assessed	Section 1.4 describes the legal framework and assessment process, and Section 7 refers to APA's consideration of EPA Principles of Environmental Protection.
(h) presence of strategic planning policy framework	This criterion is not applicable to the Project.

Matters	Information for Assessment
(i) presence of other statutory decision making processes which regulate the mitigation of the potential effects on the environment to meet the EPA's objectives and principles for EIA	No works will commence until the DMP, regulators of the Pipelines Act, have issued Consent to Construct (and subsequently Consent to Operate). In order for Consent to Construct to be issued, a range of design and safety documentation must be accepted and submitted, in line with the *Petroleum Environment Regulations 2012*. This documentation is based on a comprehensive risk identification and assessment process, and will include a CEP that includes a number of mitigation measures. Additionally, the DoW will be responsible for issuing any licences for access to water (i.e. licence to construct and operate a well). Refer to Section 1.4 – Assessment process and applicable legislation for further information regarding other statutory decision making processes relevant to this project.
(j) public concern about the likely effect of the project, if implemented, on the environment	Initial meetings with some relevant government departments have already occurred, with further consultation required. No significant issues have been raised at this stage. Liaison with affected land owners and managers is also progressing. Refer to Section 2 – Stakeholder Consultation for further information.

6.2 EPBC assessment of significant impact criteria for threatened species

The completed referral form, together with this Supporting Document have been prepared to provide sufficient information to allow the DoE to make a decision on whether or not the project is likely to have a significant impact on any Matters of NES. To further support this process, an assessment of the significant impact criteria for threatened species that may potentially be impacted by the project (Malleefowl, Southern Marsupial Mole and Sandhill Dunnart) is provided below in Table 18.

An assessment of the significant impact criteria for migratory birds has also been provided in Table 19, which addresses the following species:

- *Ardea modesta* (Eastern Great Egret; DoE 2014g)
- *Charadrius veredus* (Oriental Plover; DoE 2014h)
- *Tringa nebularia* (Common Greenshank; DoE 2014i)
- *Tringa glareola* (Wood Sandpiper; DoE 2014j)
- *Calidris ruficollis* (Red-necked Stint; DoE 2014k)
- *Calidris acuminata* (Sharp-tailed Sandpiper; DoE 2014l)
- *Calidris ferruginea* (Curlew Sandpiper; DoE 2014m)
- *Actitis hypoleucos* (Common Sandpiper; DoE 2014n).

Table 18: Assessment of significant impact criteria for Threatened species

Species	Status	Significant impact criteria	Likelihood	Comments
Southern Marsupial Mole	End	Lead to a long-term decrease in the size of a population	Unlikely	Habitat for the Southern Marsupial Mole, along with evidence of its presence (mole tunnels) was found along the pipeline corridor throughout the yellow sand dune fields. Records were identified both inside and outside the pipeline corridor, some at distances over 10 km apart from each other, and one over 2 km from the boundary of the pipeline licence area, suggesting the Marsupial Mole is widespread throughout the local area. Optimal and potential habitat is also widespread, extending beyond the areas to be impacted (Refer to Section 4.6.4 and Section 5.2.9). Impacts to known Marsupial Mole habitat will be minimised wherever possible and management measures will be implemented to minimise disturbances from trench entrapment and subsequent mortality. In addition, any disturbances from construction of the pipeline will be small and temporary with only small areas of yellow sand dunes to be impacted (refer to Section 5.2.9). The project is therefore considered unlikely to lead to a long-term decrease in the size of a population.
		Reduce the area of occupancy of the species	Possible but highly localised	The proposed disturbance will be temporary and short term. In addition, suitable habitat is widespread in the areas surrounding the pipeline corridor that lie outside the disturbance footprint. Minimisation of disturbance in the dune areas will occur where possible. Following construction the full width of the ROW will be rehabilitated excluding a single 4wd track and small (< 1 ha) above ground facilities. Although it is considered possible that the project will reduce the area of occupancy of the Marsupial Mole, this impact will be temporary and is only expected to have a very localised effect. Optimal habitat has largely been avoided and is widespread throughout the wider region in areas outside those to be disturbed. It is therefore not considered a significant impact.
		Fragment an existing population into two or more populations	Unlikely (although some temporary fragmentation of habitat while trench is open)	Records of the species were encountered throughout the pipeline corridor and wider surrounding area. In addition, there is a resident population occurring at the TGM. The disturbance footprint is small and temporary, with the trench not to be open longer than 14 days through habitat and 81% of the construction ROW to be rehabilitated. The depth of cover for the pipeline will be a minimum of 750mm which is deeper than the area of occupancy for the Marsupial Mole which generally occupies the top 50 cm. There the project is considered unlikely to permanently fragment an existing population into two or more populations.

Species	Status	Significant impact criteria	Likelihood	Comments
		Adversely affect habitat critical to the survival of a species	Likely (temporary only)	Habitat for the species was recorded along the pipeline corridor. These habitats potentially represent habitat critical to the survival of the Marsupial Mole as described in the National Recovery Plan for Marsupial Moles (Benshemesh 2004), as they may be necessary for activities such as foraging, breeding, or nesting (DoE 2014c). The project will involve the removal of an estimated 37 ha of Marsupial Mole habitat (3 ha of sand ridge habitat and 24 ha of yellow sand plain habitat) and as a result it is considered that the project will adversely affect habitat critical to the survival of the species. However, the majority of the habitat to be disturbed is considered dispersal habitat rather than optimal habitat. In addition, optimal Marsupial Mole habitat is widespread in the local area, extending beyond the area to be disturbed. Impacts to Marsupial Mole habitat will be temporary as 81% of the pipeline route will be rehabilitated post construction. In addition, management measures will be implemented to minimise disturbances to the Mole from mortality associated with trench entrapment and/or vehicle strike (refer to Section 5.3). Although it is considered likely that the project will adversely affect habitat critical to the survival of the species, this impact will be temporary and due to the widespread nature of optimal habitat in the region, is not considered significant.
Southern Marsupial Mole	End	Disrupt the breeding cycle of a population	Unlikely	It is currently unknown if the project will disrupt the breeding cycle of an important population of Marsupial Mole as the breading and rearing habits of this species are largely unknown. Benshemesh (2004) suggests that breeding season occurs in or around November. However, this is based on historical records and is unlikely to be accurate. Management actions will be implemented to reduce any potential impacts to the Marsupial Mole including pre-clearance surveys to identify Marsupial Mole activity (dune systems with evidence of Marsupial Mole activity will be clearly demarcated in the field and designated as 'no go' areas) and minimising disturbance through inter-dunal habitats. Due to all the reasons above, and the widespread nature of the Mole in the surrounding area, it is considered unlikely that the project will disrupt the breeding cycle of a population.
		Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is Likely to decline	Unlikely	Although some Marsupial Mole habitat will be lost during construction, this disturbance will be temporary and short-term. The construction ROW will be fully rehabilitated post construction (excluding a single 4WD track and small (< 1 ha) above ground facilities) such that it is unlikely to cause a decline in the species. In addition, suitable habitat and species records are known from the wider area surrounding the pipeline corridor where the species is likely to persist. The project is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Species	Status	Significant impact criteria	Likelihood	Comments
		Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	Management measures such as vehicle hygiene, waste management and effective reinstatement will be implemented to minimise risk of the introduction of invasive species across the pipeline corridor. The project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered species' habitat.
		Introduce disease that may cause the species to decline	Unlikely	There are no known diseases in the area. Management measures such as vehicle and machinery hygiene will be implemented to minimise risk of the introduction of any disease along the pipeline corridor. The project is unlikely to introduce disease that may cause the species to decline
Southern Marsupial Mole	End	Interfere with the recovery of the species	Unlikely	EGP corridor disturbance is temporary and short term (construction ~9months). The entire corridor will be rehabilitated excluding a single 4WD access track and small above ground facilities. In addition, optimal habitat is found in the wider area surrounding the pipeline corridor. The project is unlikely to interfere with the recovery of the species.
Sandhill Dunnart	End	Lead to a long-term decrease in the size of a population	Unlikely	The species was recorded at four locations along the pipeline corridor, and optimal and potential habitat is present throughout Section 2 of the pipeline corridor. However, the project is considered unlikely to lead to a long-term decrease in the size of a population of the Sandhill Dunnart due to the extent and availability of optimal and potential habitat in the wider surrounding area. In addition, optimal Sandhill Dunnart habitat has been avoided where practicable, and where not practicable additional management measures will be put in place to minimise impacts from mortality associated with trench entrapment. Any disturbances to Sandhill Dunnart habitat will be small, temporary and short-term, with areas to be progressively rehabilitated following construction. In addition, upon finalisation of the alignment, and prior to construction, a walk through will be carried out with fauna/flora specialists to further identify any avoidance areas, and where the construction ROW can be further reduced to minimise impact. The project is unlikely to lead to a long-term decrease in the size of a population.

Species	Status	Significant impact criteria	Likelihood	Comments
		Reduce the area of occupancy of the species	Possible	The excavation of the pipeline will result in the removal of approximately 67.14 ha (11.2%) of habitat. However, this disturbance is temporary and habitat will be progressively rehabilitated following construction. Due to the removal of habitat for the Sandhill Dunnart, it is possible that the project will temporarily reduce the area of occupancy of the species. The disturbance will be temporary (construction will occur for 10 months duration) and optimal and potential Sandhill Dunnart habitat is available in areas that extend beyond the pipeline corridor that will not be disturbed (less than 15% of habitat available within the pipeline licence area, with habitat also occurring beyond the pipeline licence area, will be impacted). In addition, management measures will be implemented to minimise impacts to the species.
		Fragment an existing population into two or more populations	Possible	Sandhill Dunnarts were recorded at four locations along the pipeline corridor. There will be some temporary fragmentation of habitat during trenching however this will only occur for a maximum of 14 days before the trench is filled in. The entire project disturbance will be rehabilitated, excluding a 4WD track and the small, above ground facilities. Although spinifex will take some time to re-establish, project impacts will be largely temporary and so will not result in a large above ground impact. Sandhill Dunnart habitat will over time regenerate and reconnect either side of the narrow corridor and so the project is considered unlikely to fragment an existing population into two or more populations.
		Adversely affect habitat critical to the survival of a species	Unlikely (some temporary effect only)	Habitat critical to the survival' of the Sandhill Dunnart has not been explicitly defined within the Species Profile and Threats Database (DoE) or within any recovery plan for the species. However, suitable habitat of the Great Victoria Desert populations in Western Australia include mosaics of Marble Gum (*Eucalyptus gongylocarpa*) and mallee woodlands, both with spinifex and some shrubs as the understorey (DoE 2014b). Optimal habitat, and potential habitat, for the Sandhill Dunnart has been recorded along the pipeline alignment. Approximately 67.14 ha (11.2%) will be removed during excavation. Therefore the project is likely to adversely affect habitat critical to the survival of the species. However, optimal and potential habitat is available in the wider surrounding areas and any disturbances to Sandhill Dunnart habitat from the project will be small scale, temporary and short-term. In addition, disturbance to Sandhill Dunnart habitat will be minimised as far as practicable, with additional management measures aimed at reducing impacts to the species from mortality associated with trench entrapment/vehicle strike. As a result it is considered unlikely that the project will adversely affect habitat critical to the survival of the species.

Species	Status	Significant impact criteria	Likelihood	Comments
		Disrupt the breeding cycle of a population	Possible	There is limited information available regarding the reproduction of the Sandhill Dunnart in the wild. It is estimated that breeding occurs from September to January (Churchill 2001), however captive studies suggest mating can begin from July. Impacts to optimal Sandhill Dunnart habitat will be minimised wherever possible. In addition, there will be fauna specialists on hand for trench rescue, identification and relocations. Pre-clearance surveys will be undertaken along the construction ROW prior to construction to look for evidence of breeding activity. It is therefore possible that the project will disrupt the breeding cycle of a population as little is known about breeding ecology of the species.
		Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Although Sandhill Dunnart habitat will be disturbed, the disturbance will be small scale, temporary and short-term. In addition, optimal and potential habitat is widespread throughout the surrounding area. As such, the project is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
		Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	Management measures such as vehicle hygiene, waste management and effective reinstatement will be implemented to minimise risk of the introduction of invasive species across the pipeline corridor. For more details see Section 5.3. The project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered species' habitat.
		Introduce disease that may cause the species to decline	Unlikely	There are no known diseases in the area. Management measures such as vehicle and machinery hygiene will be implemented to minimise risk of the introduction of any disease along the pipeline corridor. Further details regarding hygiene management can be found in section 5.3. The project is unlikely to introduce disease that may cause the species to decline.
		Interfere with the recovery of the species	Unlikely	EGP corridor disturbance is temporary and short term (construction ~10 months). The entire corridor will be rehabilitated excluding a single 4WD access track and small above ground facilities. In addition suitable habitat is found in the areas surrounding the pipeline corridor. The project is unlikely to interfere with the recovery of the species.

Species	Status	Significant impact criteria	Likelihood	Comments
Malleefowl	Vul	Lead to a long-term decrease in the size of an important population of a species	Unlikely	Nineteen mounds and evidence of individuals (scats and feathers) were recorded in proximity to the pipeline corridor. Suitable habitat for the Malleefowl was recorded within the pipeline corridor. The mounds have been plotted and will be completely avoided by the proposed alignment. Avoidance buffers (50 m) will also be placed around the mounds and will be clearly demarcated as 'no go zones'. In addition, upon finalisation of the alignment, and prior to construction, a walk through will be carried out with fauna and/or flora specialists to further identify any avoidance areas and where the construction ROW can be further reduced to minimise impact. As no mounds have been recorded within the construction ROW, and due to the widespread nature of suitable habitat, the project is considered unlikely to lead to a long-term decrease in the size of a population.
		Reduce the area of occupancy of an important population	Possible	The majority of records for the Malleefowl come from areas surrounding the pipeline corridor, and although suitable habitat was recorded within the pipeline corridor no mounds were recorded within the construction ROW. The area of occupancy appears to be within a 10 km radius, approximately 600 m from the pipeline corridor. Despite this, the species is likely to use the pipeline corridor for foraging and/or dispersal. It is therefore possible that the project will reduce the area of occupancy of a population. However, this impact will be small-scale, temporary and short-term. Areas of suitable Malleefowl habitat have been avoided where practicable, and areas of suitable habitat exist in areas outside that to be disturbed in the wider surrounding area. Any impacts associated with reducing the area of occupancy are therefore expected to be low and not significant.
		Fragment an existing population into two or more populations	Unlikely	Records of this species have been located in the wider area surrounding the proposed EGP. Due to this, and the small width of the pipeline corridor (30 m) the proposed action is unlikely to fragment any existing populations of Malleefowl.
		Adversely affect habitat critical to the survival of a species	Likely	Habitat for the species was recorded within the areas to be disturbed. These habitats potentially represent habitat critical to the survival of the Malleefowl as defined in the National Recovery Plan for Malleefowl (Benshemesh 2007), as they may be necessary for activities such as foraging, breeding, or nesting (DoE 2014a). Approximately 24.2 ha of Malleefowl habitat will be disturbed for excavation of the pipeline. Therefore it is considered likely that the project will adversely affect habitat critical to the survival of the species. However, this impact is not anticipated to be significant due to the availability of suitable habitat in the wider surrounding area, the temporary nature of the disturbance to suitable habitat, and due to the avoidance of the known Malleefowl mounds in the surrounding area outside the pipeline corridor. In addition, pre-clearance surveys will be undertaken along the pipeline ROW to identify any further Malleefowl mounds not previously recorded.

Species	Status	Significant impact criteria	Likelihood	Comments
		Disrupt the breeding cycle of an important population	Unlikely	Malleefowl are generally monogamous and take on lifelong breeding partners. The species tend to be sedentary and nest in the same roost year after year; meaning if there are no mounds in the corridor now it is unlikely there will be a disruption to the current Malleefowl population in the area. However, eggs are laid between September and January, which will coincide with the later stages of construction. Information regarding the species breeding patterns will be included in inductions and current known mounds will be demarcated as 'no go zones'. All known mounds occur outside the area to be disturbed and so it is considered unlikely that the project will disrupt the breeding cycle of a population.
		Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The proposed EGP corridor disturbance is temporary and short term. Although habitat will be lost during construction, the corridor will be fully rehabilitated (excluding a single 4WD track and small above ground facilities) such that it is unlikely to cause a species decline. In addition, Malleefowl habitat is found throughout the wider areas surrounding the pipeline corridor. The project is therefore unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
		Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Management measures such as vehicle hygiene, waste management and effective reinstatement will be implemented to minimise risk of the introduction of invasive species across the pipeline corridor. The project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the vulnerable species' habitat.
		Introduce disease that may cause the species to decline	Unlikely	There are no known diseases in the area. Management measures such as vehicle and machinery hygiene will be implemented to minimise risk of the introduction of any disease along the pipeline corridor. The project is unlikely to introduce disease that may cause the species to decline.
		Interfere with the recovery of the species	Unlikely	EGP corridor disturbance is temporary and short term (construction ~9months). The entire corridor will be rehabilitated excluding a single 4WD access track and small (< 1 ha) above ground facilities. In addition, Malleefowl habitat is found in the wider areas surrounding the pipeline corridor. The project is unlikely to interfere with the recovery of the species.
Princess Parrot	Vul	Lead to a long-term decrease in the size of an important population of a species	Unlikely	The Princess Parrot has been recorded in the Queen Victoria Spring and Neale Junction Nature Reserves which are both located over 100 km from the Pipeline corridor. Although large areas of suitable habitat (Marble Gum woodland) are present within Section 2 of the Pipeline corridor, the species is only considered to be an occasional visitor. The species was not recorded during recent surveys. This, in addition with the high mobility of the species, and the small, temporary disturbance of the Project means it is unlikely that the Project would lead to the long-term decrease in the size of an important population.

Species	Status	Significant impact criteria	Likelihood	Comments
		Reduce the area of occupancy of an important population	Unlikely	Although large areas of suitable habitat were recorded along Section 2 of the Pipeline corridor, the species was not recorded during the survey and is considered (at best) to be an occasional visitor. This, coupled with the small and temporary nature of the disturbance, means that the Project is unlikely to reduce the area of occupancy of an important population.
		Fragment an existing population into two or more populations	Unlikely	No existing populations have been recorded within the pipeline corridor. Although large areas of suitable habitat exist along Section 2 of the Pipeline corridor, the species was not recorded during the survey and is considered (at best) to be an occasional visitor. This, coupled with the small and temporary nature of the disturbance means that the Project is unlikely to fragment an existing population into two or more populations.
		Adversely affect habitat critical to the survival of a species	Unlikely	Habitat critical to the survival of the Princess Parrot has not been explicitly defined by DoE. However, suitable habitat has been recorded in large areas within Section 2 of the Pipeline corridor (Marble Gum woodland). Impacts to Marble Gum Woodland will be largely temporary with 81% of the pipeline footprint being rehabilitated post construction. There will be a loss of habitat, but this will be temporary. Large, mature Marble Gum trees will be avoided where practicable, and pre-clearance surveys will target large trees to search for breeding activity. In addition, the Marble Gum Woodland habitat extends beyond the area to be disturbed and species records are known from areas outside the pipeline corridor. In addition, the species is highly mobile and nomadic in nature and is therefore not restricted to the pipeline corridor. The project is considered unlikely to adversely affect habitat critical to the survival of the species.
		Disrupt the breeding cycle of an important population	Unlikely	The species is considered to be an occasional visitor that may breed during optimal conditions. Breeding usually occurs around a point location, for example one nesting tree which is defended by the species (DoE 2014d) and so any surveys prior to construction would likely pick up any breeding activity. The Princess Parrot is said to breed from September to January but it is also possible that breeding may occur at any time of the year following rainfall (DoE 2014d). The species has not been recorded in the pipeline corridor to date, although suitable breeding habitat does occur along Section 2 of the pipeline corridor. It is considered unlikely that the project would disrupt the breeding cycle of an important population as no important populations have been recorded within the pipeline corridor and the species is considered to be an occasional visitor (at best). Although breeding may potentially occur during optimal conditions, Marble Gum habitat extends beyond the areas to be impacted. In addition, pre-clearance surveys will identify any potential breeding activity in the area and in the event that breeding activity is identified, fauna will be re-located to nearby, suitable habitat (refer to Section 5.3).

Species	Status	Significant impact criteria	Likelihood	Comments
		Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Although large areas of suitable habitat were recorded along Section 2 of the Pipeline corridor, the species was not recorded during the survey and is considered (at best) to be an occasional visitor. This, coupled with the small and temporary nature of the disturbance, means that the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
		Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Management measures such as vehicle hygiene, waste management and effective reinstatement will be implemented to minimise risk of the introduction of invasive species across the pipeline corridor. The project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the vulnerable species' habitat.
		Introduce disease that may cause the species to decline	Unlikely	There are no known diseases in the area. Management measures such as vehicle and machinery hygiene will be implemented to minimise risk of the introduction of any disease along the pipeline corridor. The project is unlikely to introduce disease that may cause the species to decline.
		Interfere with the recovery of the species	Unlikely	EGP corridor disturbance is temporary and short term (construction ~9months). The entire corridor will be rehabilitated excluding a single 4WD access track and small (< 1 ha) above ground facilities. In addition habitat is found in the wider areas surrounding the proposed corridor. The project is unlikely to interfere with the recovery of the species.
Great Desert Skink	Vul	Lead to a long-term decrease in the size of an important population of a species	Unlikely	The Great Desert Skink has not been recorded within the pipeline corridor and the closest records are approximately 40 km away. Although suitable habitat exists along Section 2 of the pipeline corridor, suitable habitat is also available throughout the wider surrounding locality. Also, due to the small and temporary nature of the disturbance it is unlikely that the Project would: • Lead to the long-term decrease in the size of an important population (if present) • Reduce the area of occupancy of an important population (if present) • Fragment an existing population into two or more populations (if present).
		Reduce the area of occupancy of an important population	Unlikely	
		Fragment an existing population into two or more populations	Unlikely	
		Adversely affect habitat critical to the survival of a species	Unlikely	Habitat critical to the survival of the Great Desert Skink cannot be defined due to inadequacies with distribution data (McAlpin 2001). However, Great Desert Skinks occupy a variety of habitat types within the western deserts region and the area of potentially suitable habitat within the region is considered to be tens of thousands of square kilometres (McAlpin 2001). This coupled with the small and temporary nature of the disturbance means that it is unlikely that the Project would adversely affect habitat critical to the survival of a species.

Species	Status	Significant impact criteria	Likelihood	Comments
		Disrupt the breeding cycle of an important population	Unlikely	The breeding season of the Great Desert Skink occurs in spring and summer, between September to October with young born in December (DoE 2014o). This will coincide with construction activities along Section 2 of the pipeline corridor where habitat for the Great Desert Skin occurs. However, the species has not been recorded in the region since the 1960's and the closest record is over 40 km away. Suitable habitat for the species extends beyond the areas to be disturbed and as such it is considered unlikely that the project would disrupt the breeding cycle of an important population (if present). Management measures will be implemented to reduce mortality associated with trench entrapment and vehicle strike, and are outlined in Section 5.2.9 and Section 5.3.
		Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The Great Desert Skinks occupy a variety of habitat types within the western deserts region and the area of potentially suitable habitat within the region is tens of thousands of square kilometres (McAlpin 2001). This, coupled with the small and temporary nature of the disturbance of the Project, means that the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
		Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Management measures such as vehicle hygiene, waste management and effective reinstatement will be implemented to minimise risk of the introduction of invasive species across the pipeline corridor. The project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the vulnerable species' habitat.
		Introduce disease that may cause the species to decline	Unlikely	There are no known diseases in the area. Management measures such as vehicle and machinery hygiene will be implemented to minimise risk of the introduction of any disease along the pipeline corridor. The project is unlikely to introduce disease that may cause the species to decline.
		Interfere with the recovery of the species	Unlikely	EGP corridor disturbance is temporary and short term (construction ~9months). The entire corridor will be rehabilitated excluding a single 4WD access track and small (< 1 ha) above ground facilities. In addition habitat is found in the wider areas surrounding the proposed corridor. The project is unlikely to interfere with the recovery of the species.

Table 19: Assessment of significant impact criteria for Migratory birds

Species	Significant impact criteria	Likelihood	Comments
Rainbow Bee-eater Fork-tailed Swift Other EPBC Migratory Waterbirds: • Eastern Great Egret	Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	Unlikely	No critical habitat for any migratory species has been identified within the pipeline corridor (KFC 2014a, b). No important habitat for the Rainbow Bee-eater occurs within the pipeline corridor, and the Fork-tailed Swift is an aerial species that does not rely on terrestrial habitats. Important habitat for migratory waterbirds occurs at the Salt Lake systems and Samphire habitats associated with Lake Carey and Hope Campbell Lake. Neither of these habitats occur within the pipeline ROW but do occur within the 100 m pipeline corridor. Habitat will not be modified, destroyed or isolated but may be subject to indirect impacts such as altered fire regimes. Management measures will be implemented to minimise any indirect impacts associated with the construction of the pipeline and include management for fire, introduction or spread of weeds (refer to Section 5.3). Once management measures have been implemented, the project is considered as unlikely to result in substantial modification of habitat for migratory species.
• Oriental Plover • Common Greenshank • Wood Sandpiper • Red-necked • Sharp-tailed Sandpiper • Curlew Sandpiper	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	Unlikely	No important habitat for the Rainbow Bee-eater occurs within the pipeline corridor, and the Fork-tailed Swift is an aerial species that does not rely on terrestrial habitats. Important habitat for migratory waterbirds occurs at the Salt Lake systems associated with Lake Carey and Hope Campbell Lake. Neither of these habitats occur within the construction ROW but do occur within the 100 m pipeline corridor. Habitat will not be modified, destroyed or isolated but may be subject to indirect impacts related to habitat degradation associated with the introduction or spread of invasive species. Management measures will be implemented to minimise any indirect impacts associated with the construction of the pipeline and include management for the introduction or spread of weeds and feral animals (refer to Section 5.3). No introduced flora were recorded within Section 2 of the pipeline corridor and so additional management measures will be implemented to ensure introduced flora from Section 1 of the proposed pipeline are not introduced into Section 2 of the proposed pipeline (Refer to Section 5.2.9 and Section 5.3). Once management measures have been implemented, the project is considered as unlikely to result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.
• Common Sandpiper	Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	Unlikely	No important habitat for the Rainbow Bee-eater occurs within the pipeline corridor and the species is widespread across the region and surrounding local area. The Fork-tailed Swift is an aerial species that does not rely on terrestrial habitats. Important habitat for migratory waterbirds occurs at the Salt Lake systems and Samphire habitats associated with Lake Carey and Hope Campbell Lake. Neither of these habitats occur within the pipeline ROW but do occur within the 100 m pipeline

Species	Significant impact criteria	Likelihood	Comments
			corridor. Although a number of EPBC listed Migratory waterbirds are considered as likely to occur within the pipeline corridor, they are considered to be rare visitors associated with the irregular flooding of the salt lake habitats. None of these species are restricted to the pipeline corridor and all species are highly mobile and nomadic in nature. Management measures will be implemented to minimize disturbance to migratory species and their habitat (refer to Section 5.2.9 and Section 5.3). Once management measures have been implemented, the project is considered unlikely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

7 ENVIRONMENTAL MANAGEMENT FRAMEWORK

7.1 Environmental management system

APA will ensure environmental management is implemented in accordance with their ISO14001 accredited integrated Health, Safety and Environmental Management System (APA HSE Management System; WA business only), which comprises the following elements:

- A corporate policy stating APA's commitment to responsible environmental management;
- Clearly stated objectives consistent with this commitment;
- Clearly defined roles and responsibilities for personnel to indicate their obligations regarding environmental management;
- Appropriate induction and training of personnel;
- Monitoring and auditing programs to assess compliance with procedures and the achievement of objectives;
- A system of reporting for recording data and notification of relevant personnel; and
- Ongoing consultation to seek input from and inform all parties of relevant issues.

The primary management document used during implementation of the project will be the Construction Environment Plan (CEP), prepared in accordance with the Pipelines Act. Additionally, APA has a comprehensive database of procedures, forms and other guidance materials pertaining to environmental management, and project specific documentation can also be developed as required.

7.2 Roles and responsibilities

Consistent with the APA Group Health, Safety and Environment Policy (July 2012), all employees and contractors have responsibilities with regard to health, safety and environment matters. APA will ensure the management actions outlined previously in this document (Table 16, Section 5.3) are implemented.

7.3 Inductions and training

All personnel working on-site (including visitors) will be required to undertake an induction to ensure that:

- Personnel have an awareness of key environmental values;
- Personnel are aware of environmental requirements relevant to their roles and responsibilities;
- Personnel understand all forms of demarcation (i.e. no go zones);
- Personnel understand how to report any environmental incidents; and
- Compliance is maintained with the CEP.

Training will also be provided, as required, for specific tasks (e.g. spill clean-up).

7.4 Incident reporting and management

The APA Hazard and Incident Reporting System forms part of the APA integrated HSE Management System and caters for the reporting, recording and follow up of all safety and environmental hazards and incidents. Personnel who observe, or are involved in a hazard or incident must complete a written form describing the situation. All incidents must be reported within 24 hrs of occurrence or knowing of the occurrence.

Completed hazard and incident forms are sent to APA administrative personnel for entry into the APA hazard and incident database. Notification is then sent to the relevant Team Leader or Manager (who has thus far been verbally informed) for follow up and/or investigation if required. Reportable incidents are compiled for monthly regulatory reporting.

7.5 Monitoring and reporting

Monitoring of compliance with the CEP will be undertaken through a number of methods and at different stages throughout the Project. Compliance checking against the CEP will include:

- Weekly housekeeping inspections of construction areas (this will involve completion of an environmental checklist form); and
- Regular internal audits to assess compliance and performance against objectives detailed within the CEP.

APA will maintain an appropriate and auditable record system in accordance with the EMS, and conduct environmental reporting in accordance with the conditions of all approval instruments.

8 SUMMARY

This document has been prepared to support the Referrals being submitted under Section 38 of the EP Act and the Commonwealth EPBC Act. This document provides:

- A description of the project;
- A brief summary of the physical, biological and social environment;
- An evaluation of the potential impacts to environmental factors and Matters of NES; and
- An outline of the management measures that will be implemented to minimise any potential impacts to environmental values.

Based on the environmental impact assessment presented in this document, the environmental impacts of the project and anticipated environmental outcomes are summarised as follows:

- Flora and vegetation:
  - Five Priority species will be impacted. However, all species occur in areas outside that to be disturbed. Impacts are expected to be minimal.
  - All of the vegetation groups recorded in areas to be disturbed are widespread in the local region, and none are restricted to the pipeline corridor. Impacts to broad vegetation groups are expected to be low.
  - Approximately 10 % of the potential PEC areas will be impacted. However, these areas extend beyond the pipeline licence area and therefore impacts are expected to be low.
  - Management measures will be implemented for indirect impacts associated with altered fire regimes and the introduction and spread of weeds. Indirect impacts to flora and vegetation are expected to be low.
- Terrestrial fauna:
  - Approximately 915 ha of terrestrial fauna habitat will be cleared during excavation. Approximately 81% of these areas will be rehabilitated following construction. Impacts to general fauna habitats and terrestrial fauna are expected to be low.
  - Eight conservation significant species representing MNES will potentially be impacted by the Project. Management measures will be implemented to:
    - Minimise impacts to threatened species habitat
    - Minimise impacts associated with mortality due to trench entrapment and/or vehicle strike
    - Minimise indirect impacts associated with altered fire regimes and introduction and spread of exotic pests.
  - The Marsupial Mole and Sandhill Dunnart will be most impacted by the Project. However, once management measures have been implemented, impacts are expected to be low. Impacts to other MNES are low.
- Terrestrial environmental quality:
  - Impacts to terrestrial environmental quality may arise from excavation, contaminated sites, opening up of country, waste, hazardous fuels and fire.
  - Once management measures have been implemented there will be no decrease in the terrestrial environmental quality of the area surrounding the Project. Any impacts are expected to be low.
- Hydrological processes and inland waters environmental quality:
  - There are no significant watercourses, Ramsar wetland sites, wetlands of national significance or perennial waterways within the pipeline corridor
  - Two Salt Lake Systems occur either within, or in proximity to, the pipeline licence area: Lake Carey and Hope Campbell Lake
  - Management measures will be implemented to minimise impacts to hydrological processes and inland waters environmental quality from physical disturbance, alterations to surface water flow regimes, ground water dewatering (if required) and use, deterioration in surface water and groundwater quality and waste water.
  - Impacts to hydrological processes and inland waters environmental quality are expected to be low.

APA will implement a range of avoidance, mitigation and management measures to appropriately manage the project and any potential environmental impacts, in accordance with their HSE Management System. A CEP will be prepared based on the management actions outlined in this Supporting Document, which will guide implementation of the project.

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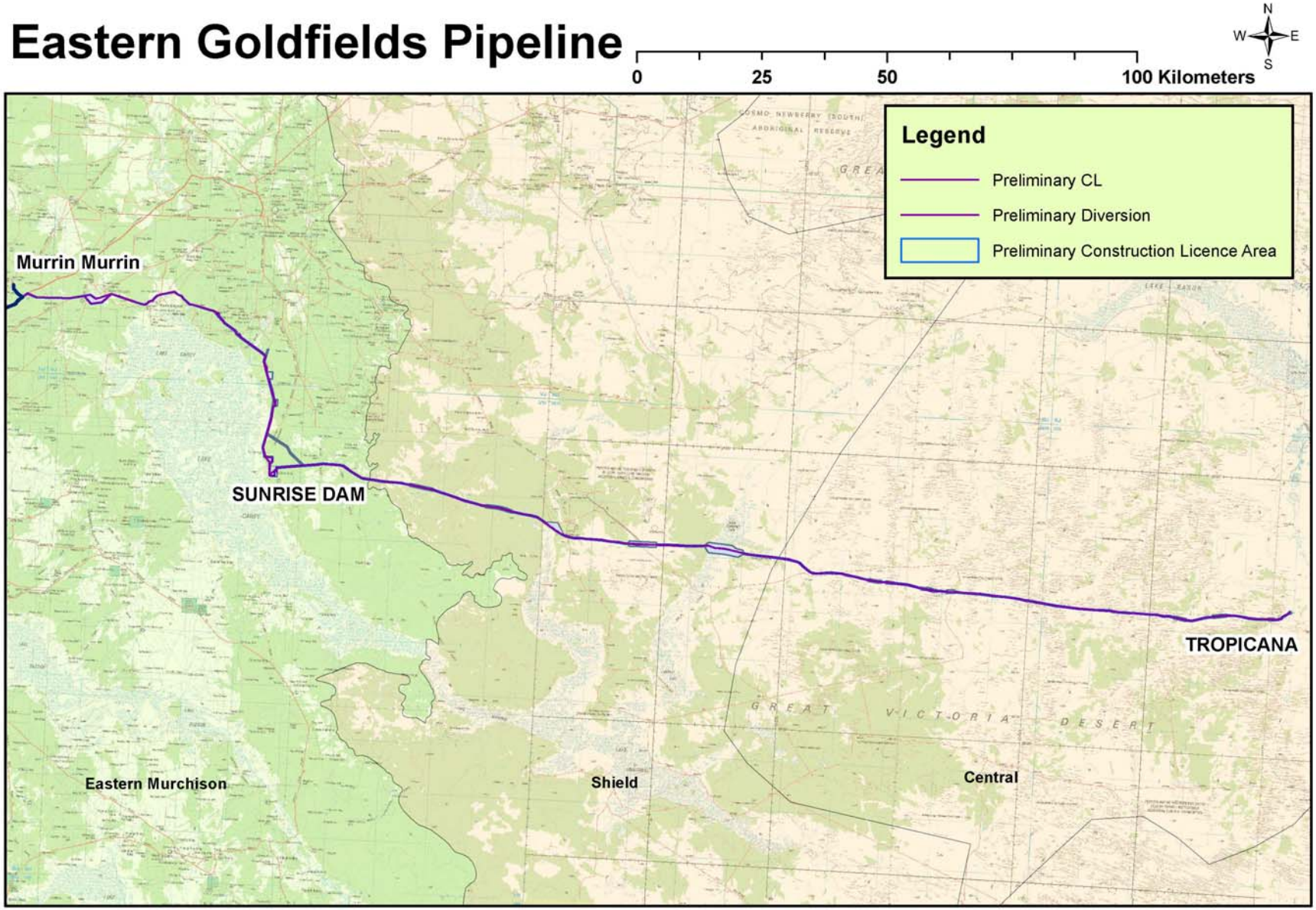
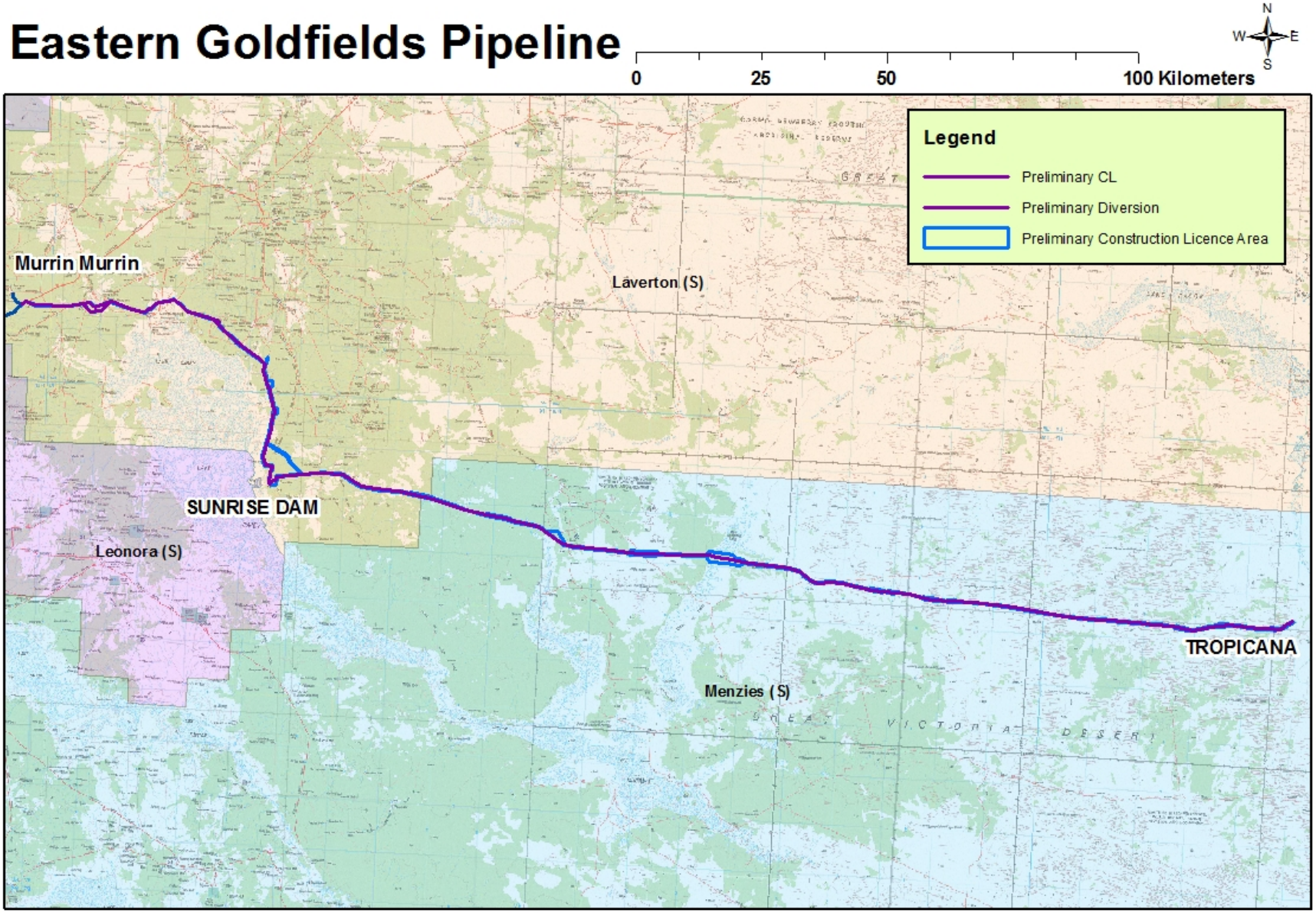
Waru Consulting (2014b) Archaeological survey of an infrastructure corridor between Sunrise Dam Gold Mine & Tropicana Gold Mine, Great Victoria Desert. Unpublished report for AngloGold.

Appendix A MAPBOOK FIGURES


Eastern Goldfields Pipeline
N
W
E
S
0
25
50
100 Kilometers
Legend
Preliminary CL
Preliminary Diversion
Preliminary Construction Licence Area
Murrin Murrin
SUNRISE DAM
TROPICANA
GREAT VICTORIA DESERT
Eastern Murchison
Shield
Central


Eastern Goldfields Pipeline
N
W
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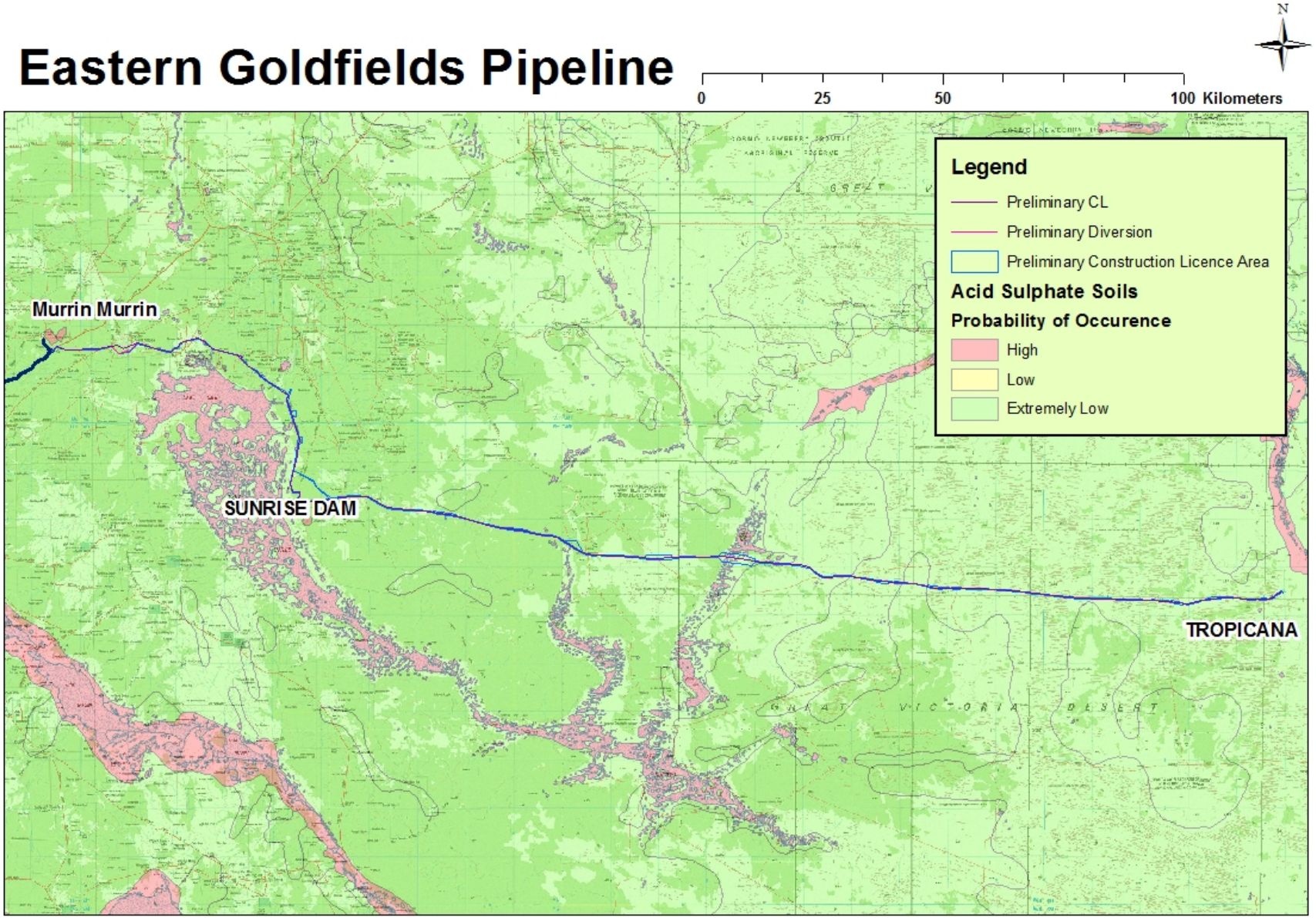
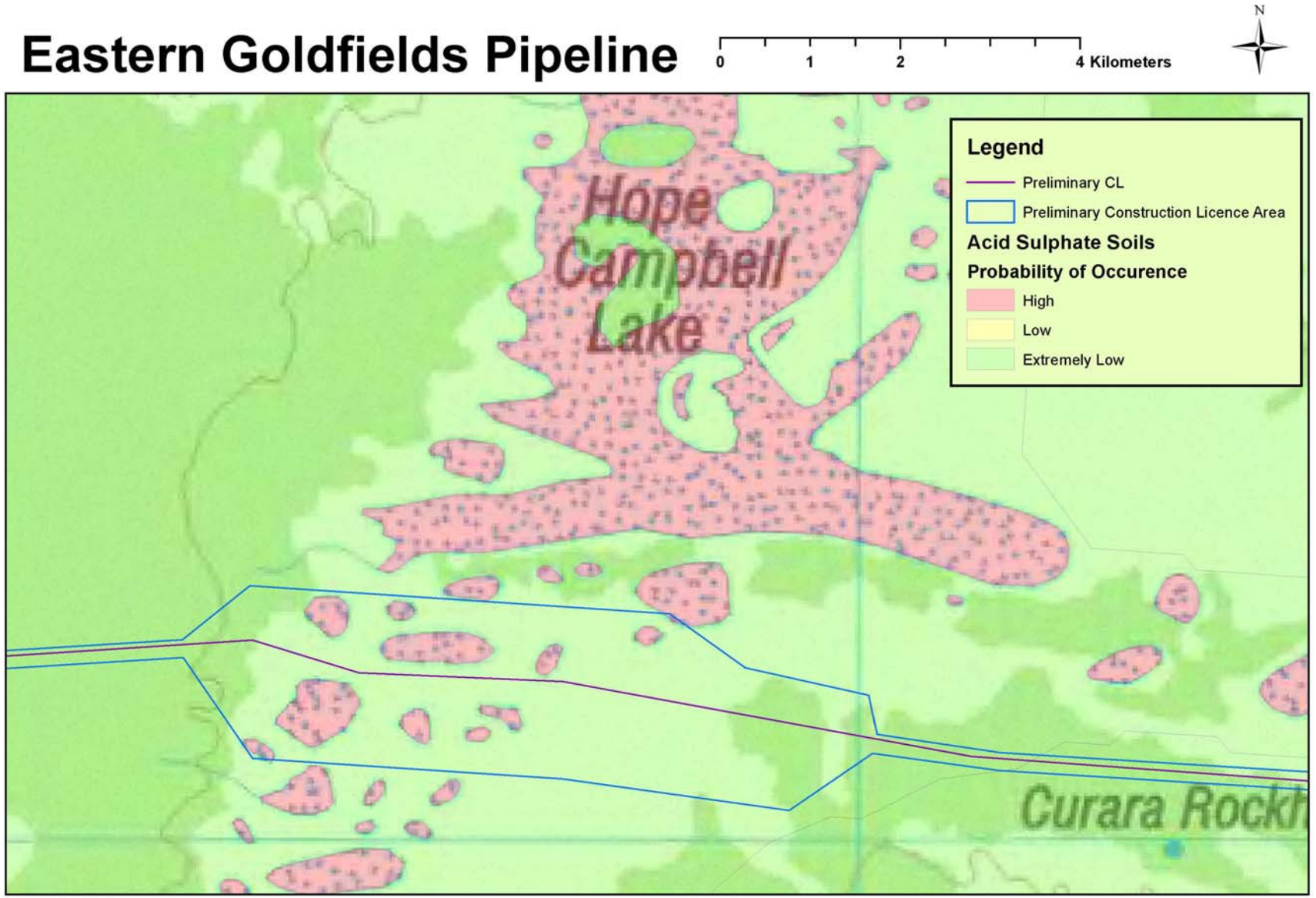
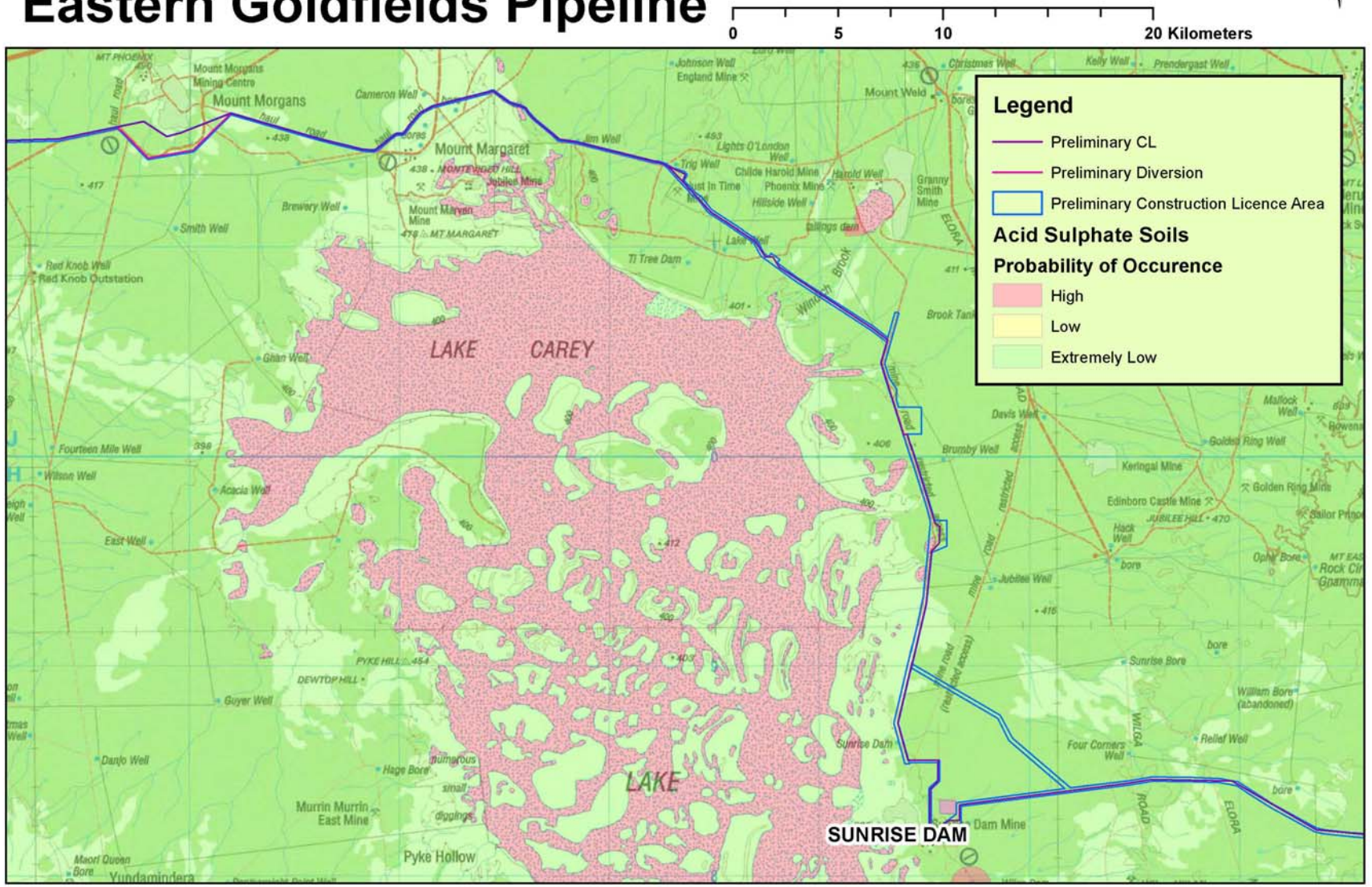
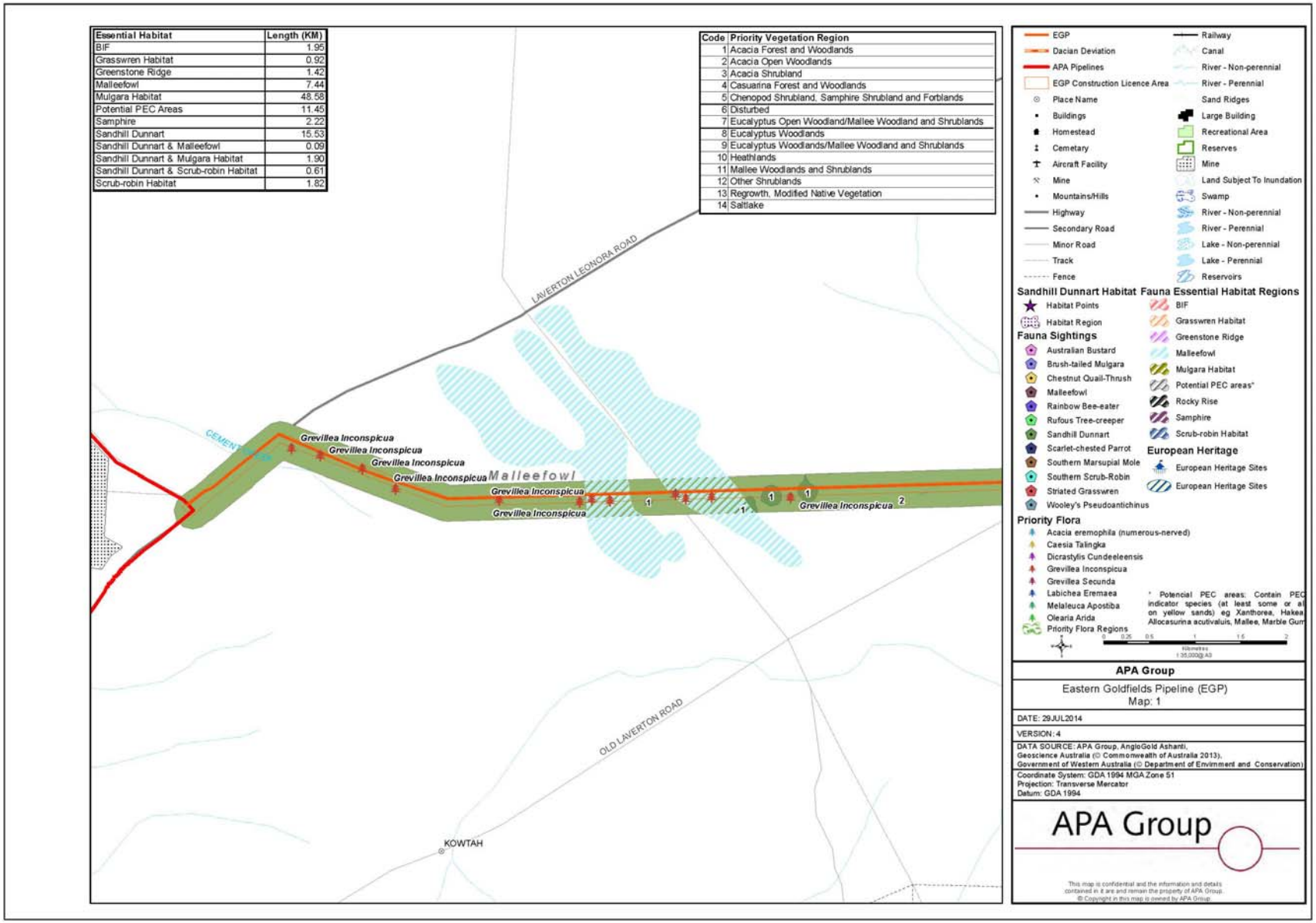
S
0
25
50
100 Kilometers
Legend
Preliminary CL
Preliminary Diversion
Preliminary Construction Licence Area
Murrin Murrin
Laverton (S)
SUNRISE DAM
Leonora (S)
TROPICANA
Menzies (S)
GREAT VICTORIA DESERT


Eastern Goldfields Pipeline
N
0
25
50
100 Kilometers
Legend
Preliminary CL
Preliminary Diversion
Preliminary Construction Licence Area
Acid Sulphate Soils
Probability of Occurence
High
Low
Extremely Low
Murrin Murrin
SUNRISE DAM
TROPICANA
GREAT VICTORIA DESERT


Eastern Goldfields Pipeline
0
1
2
4 Kilometers
N
Legend
Preliminary CL
Preliminary Construction Licence Area
Acid Sulphate Soils
Probability of Occurence
High
Low
Extremely Low
Hope
Campbell
Lake
Curara Rockh

Eastern Goldfields Pipeline




Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
LAVERTON LEONORA ROAD
CEMENT LINE
Grevillea Inconspicua
Malleefowl
OLD LAVERTON ROAD
KOWTAH
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potential PEC areas: Contain PEC indicator species (at least some or a on yellow sands) eg Xanthorea, Hakea Allocasurina acutivaluis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 1
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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Projection: Transverse Mercator
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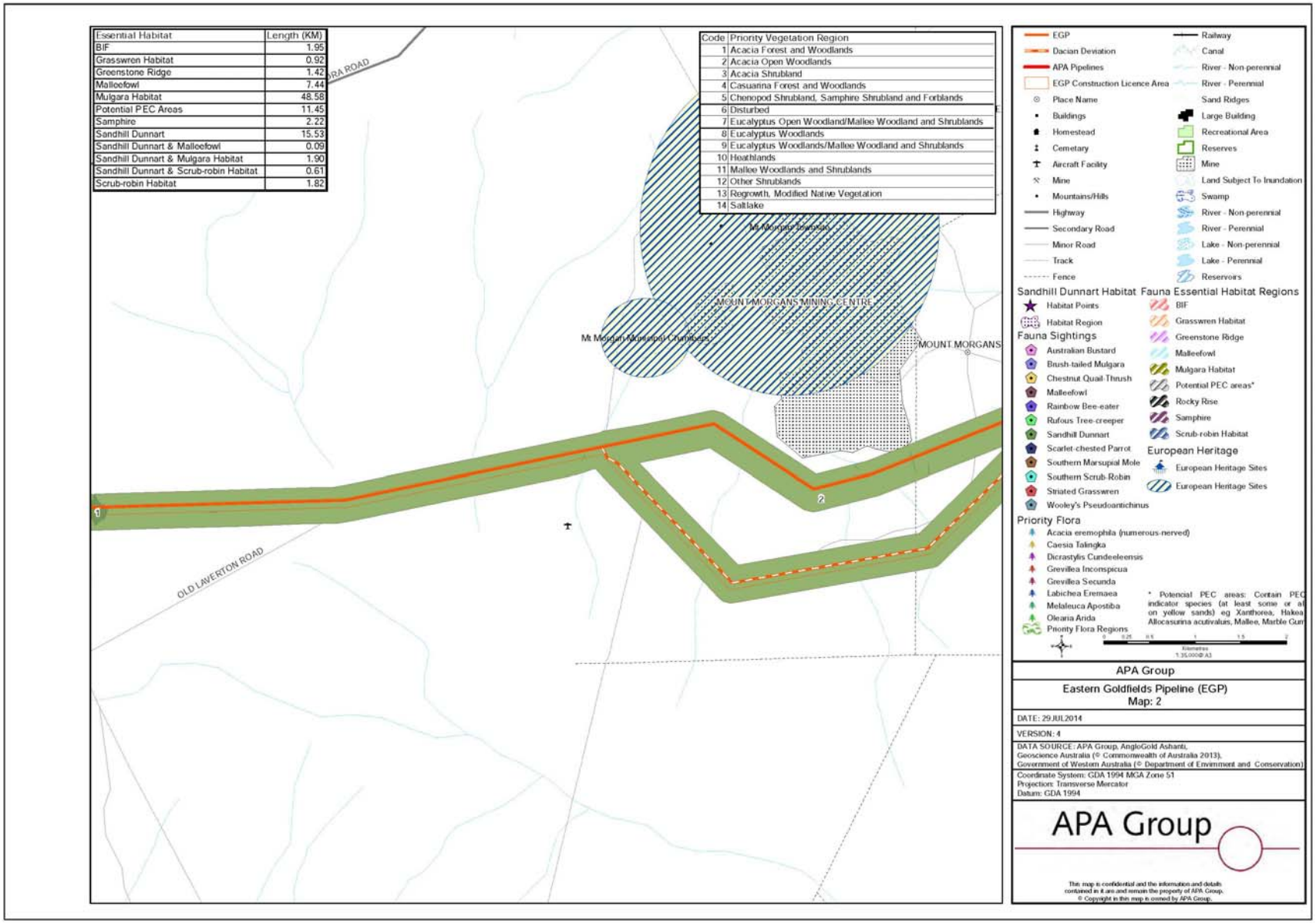
APA Group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10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Mt Morgan Deposit
MOUNT MORGANS MINING CENTRE
Mt Morgan Municipal Cemetery
MOUNT MORGANS
OLD LAVERTON ROAD
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
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Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
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River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
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Habitat Region
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Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
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European Heritage
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Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
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* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 2
DATE: 29JUL2014
VERSION: 4
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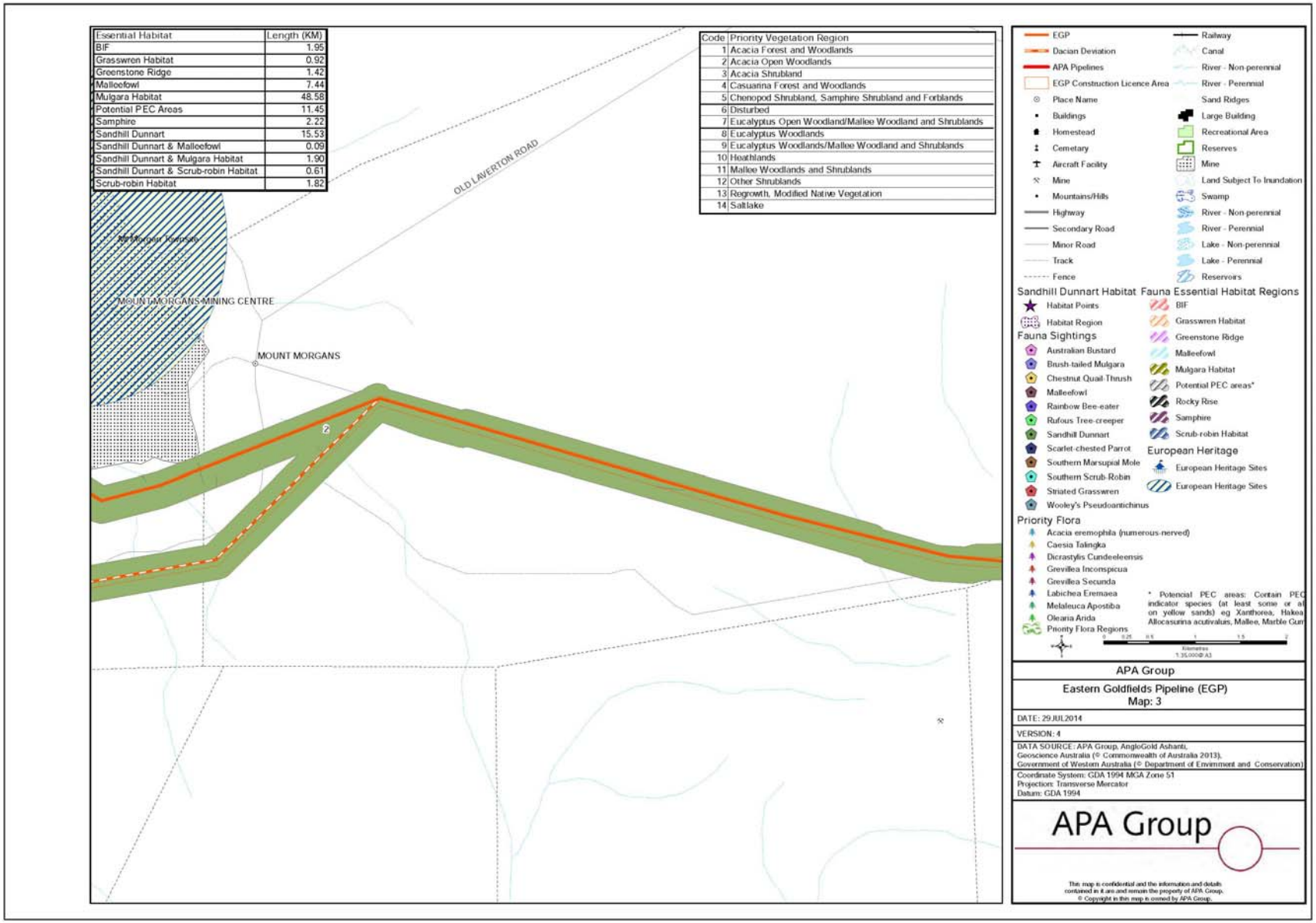
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Fauna Essential Habitat Regions
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Kilometres
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APA Group
Eastern Goldfields Pipeline (EGP)
Map: 3
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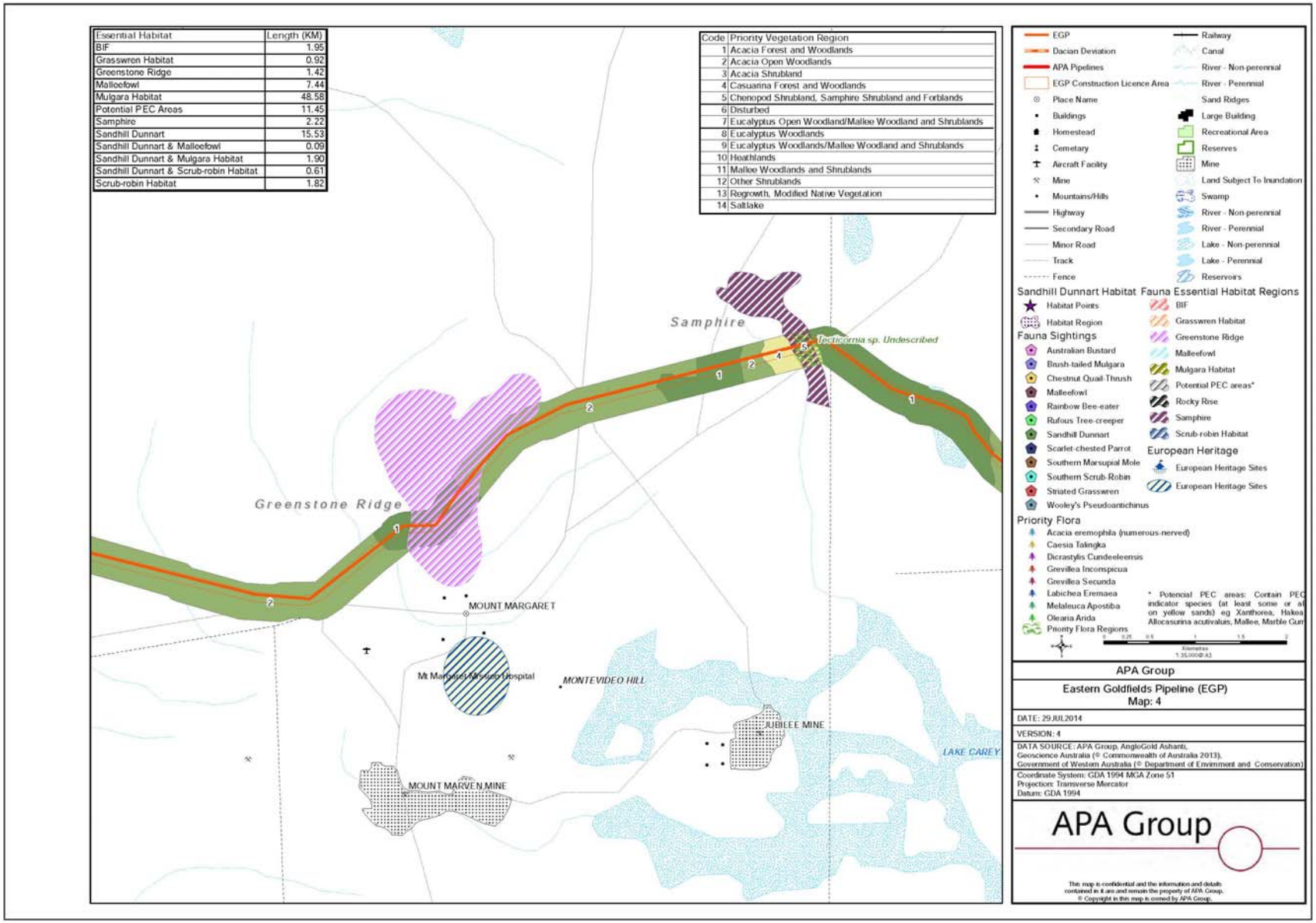
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Samphire
Tecticornia sp. Undescribed
Greenstone Ridge
MOUNT MARGARET
Mt Margaret Mission Hospital
MONTEVIDEO HILL
JUBILEE MINE
LAKE CAREY
MOUNT MARVEN MINE
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
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Cemetary
Aircraft Facility
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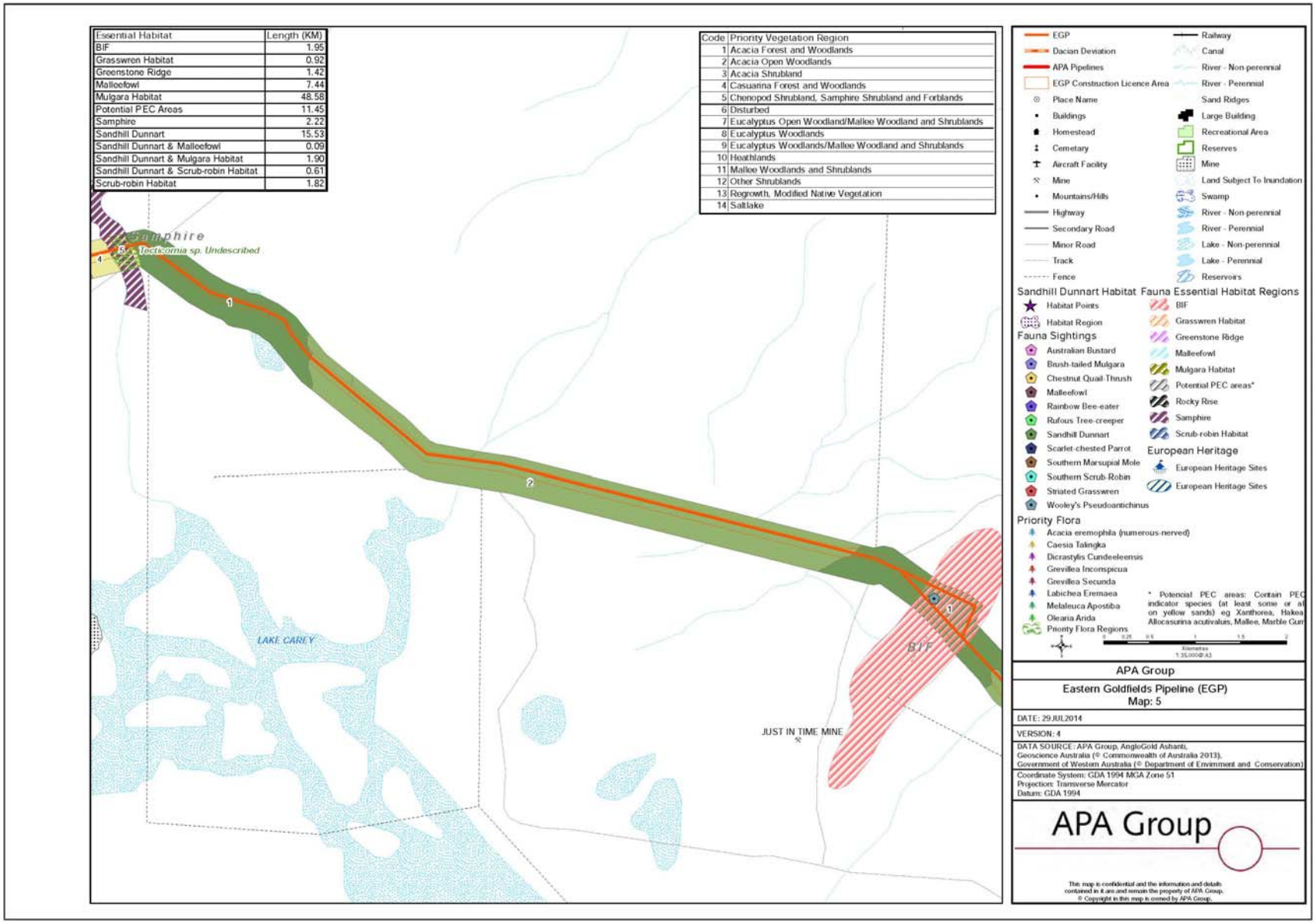
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LAKE CAREY
JUST IN TIME MINE
BIF
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
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Cemetary
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Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
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Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
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Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
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Southern Scrub-Robin
Striated Grasswren
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Samphire
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Eastern Goldfields Pipeline (EGP)
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DATE: 29JUL2014
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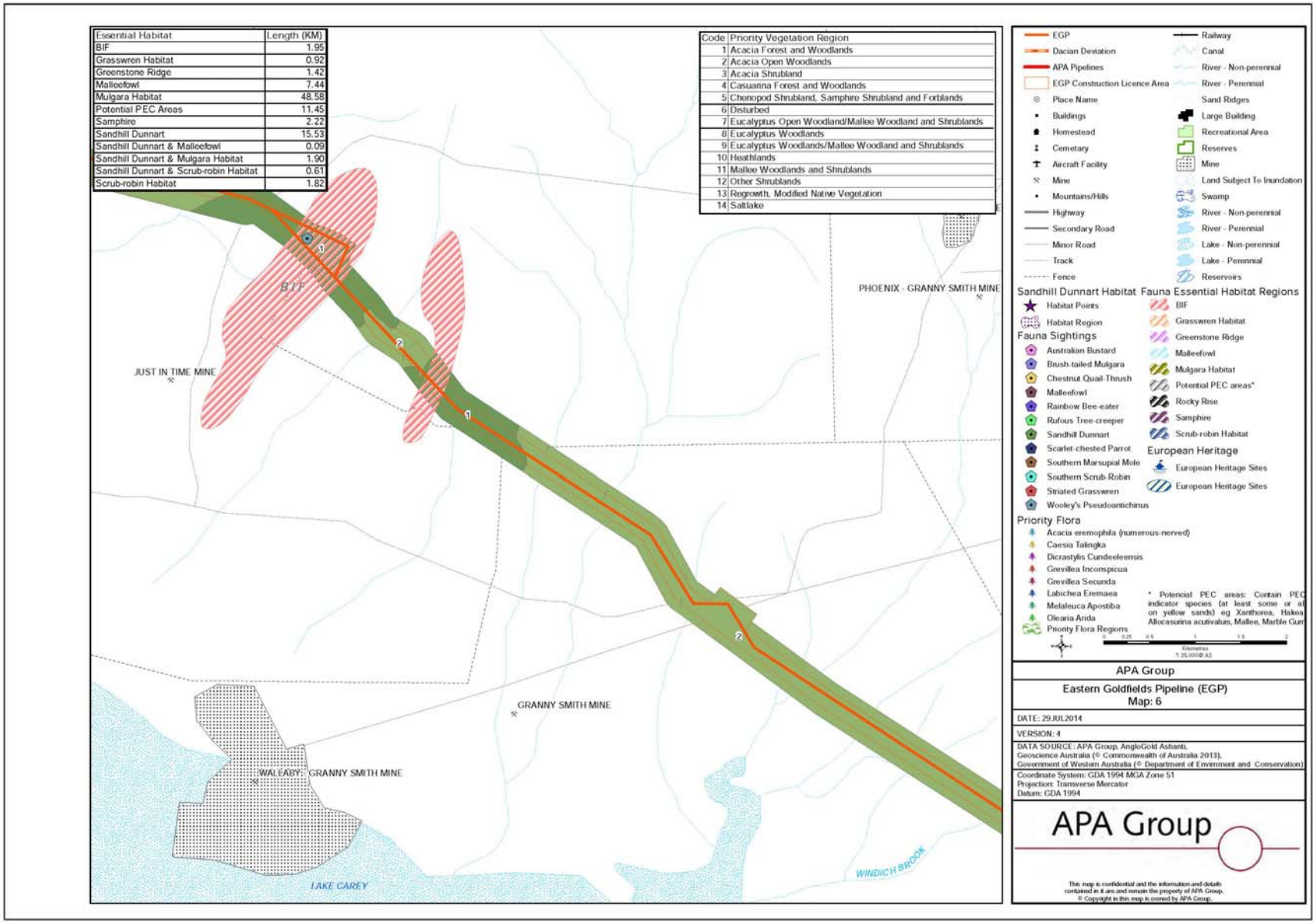
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JUST IN TIME MINE
GRANNY SMITH MINE
WALLABY - GRANNY SMITH MINE
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Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 6
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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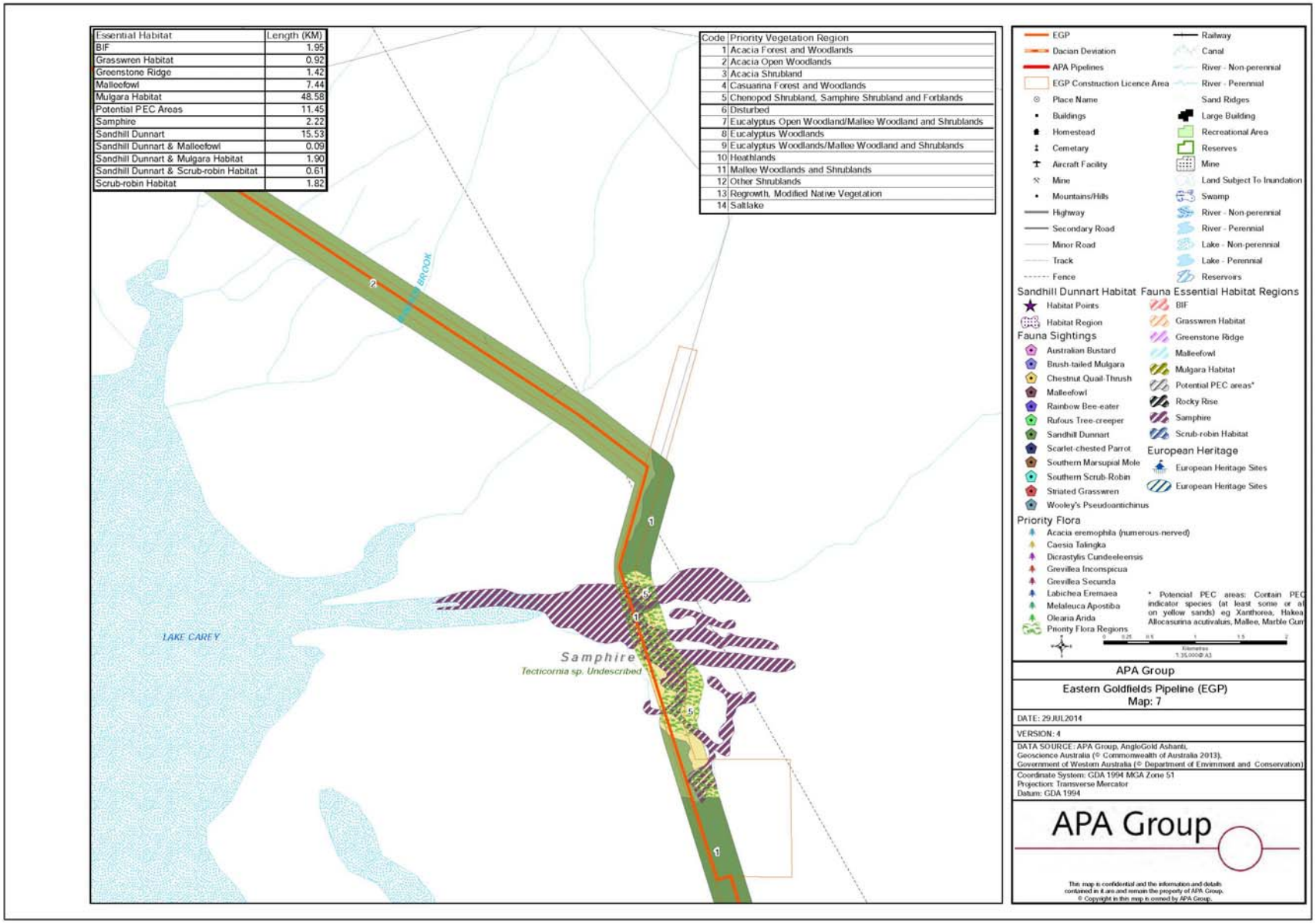
Essential Habitat | Length (KM)
BIF 1.95
Grasswren Habitat 0.92
Greenstone Ridge 1.42
Malleefowl 7.44
Mulgara Habitat 48.58
Potential PEC Areas 11.45
Samphire 2.22
Sandhill Dunnart 15.53
Sandhill Dunnart & Malleefowl 0.09
Sandhill Dunnart & Mulgara Habitat 1.90
Sandhill Dunnart & Scrub-robin Habitat 0.61
Scrub-robin Habitat 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
LAKE CAREY
Samphire
Tecticornia sp. Undescribed
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 7
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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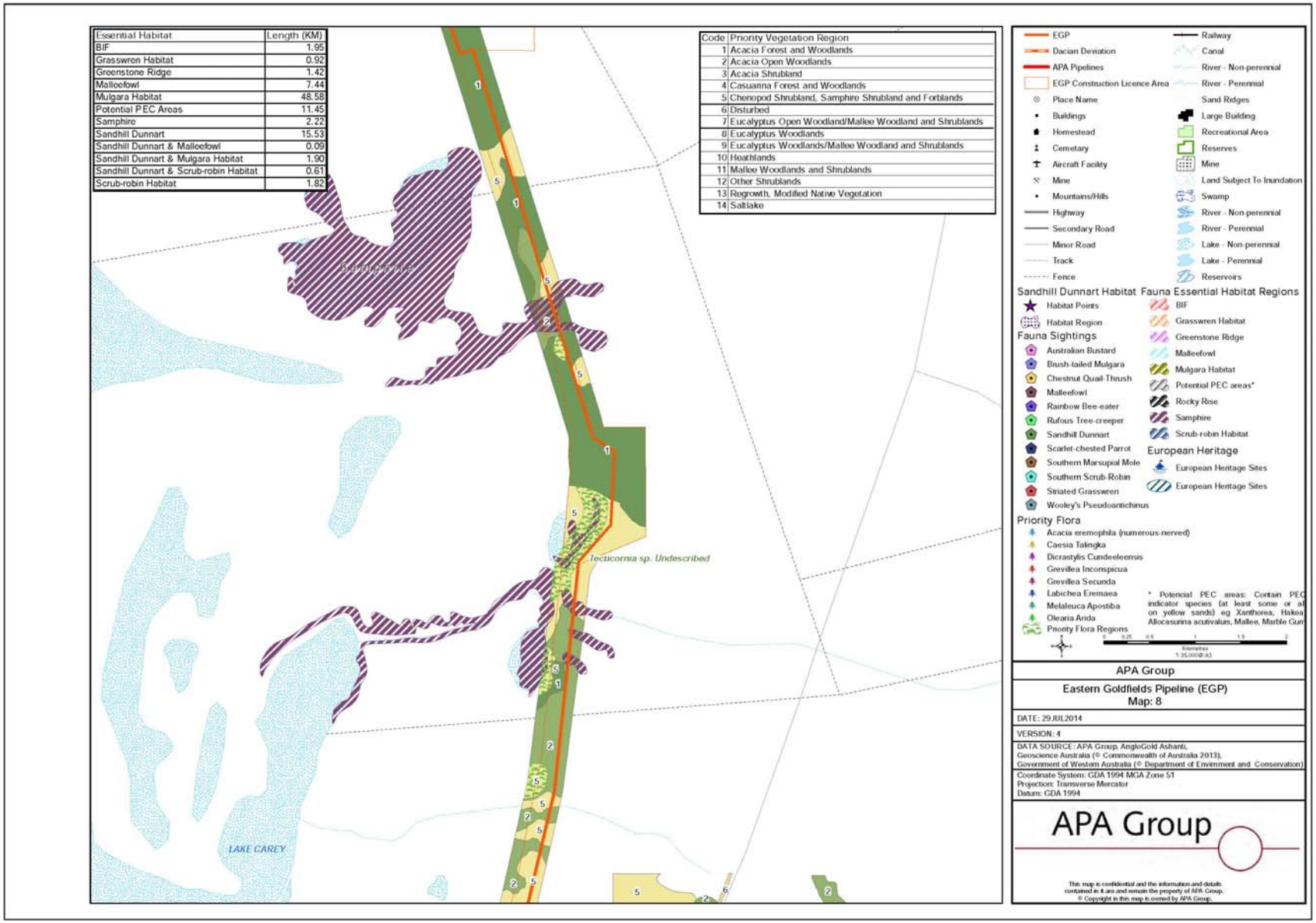
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Tecticornia sp. Undescribed
LAKE CAREY
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 8
DATE: 29JUL2014
VERSION: 4
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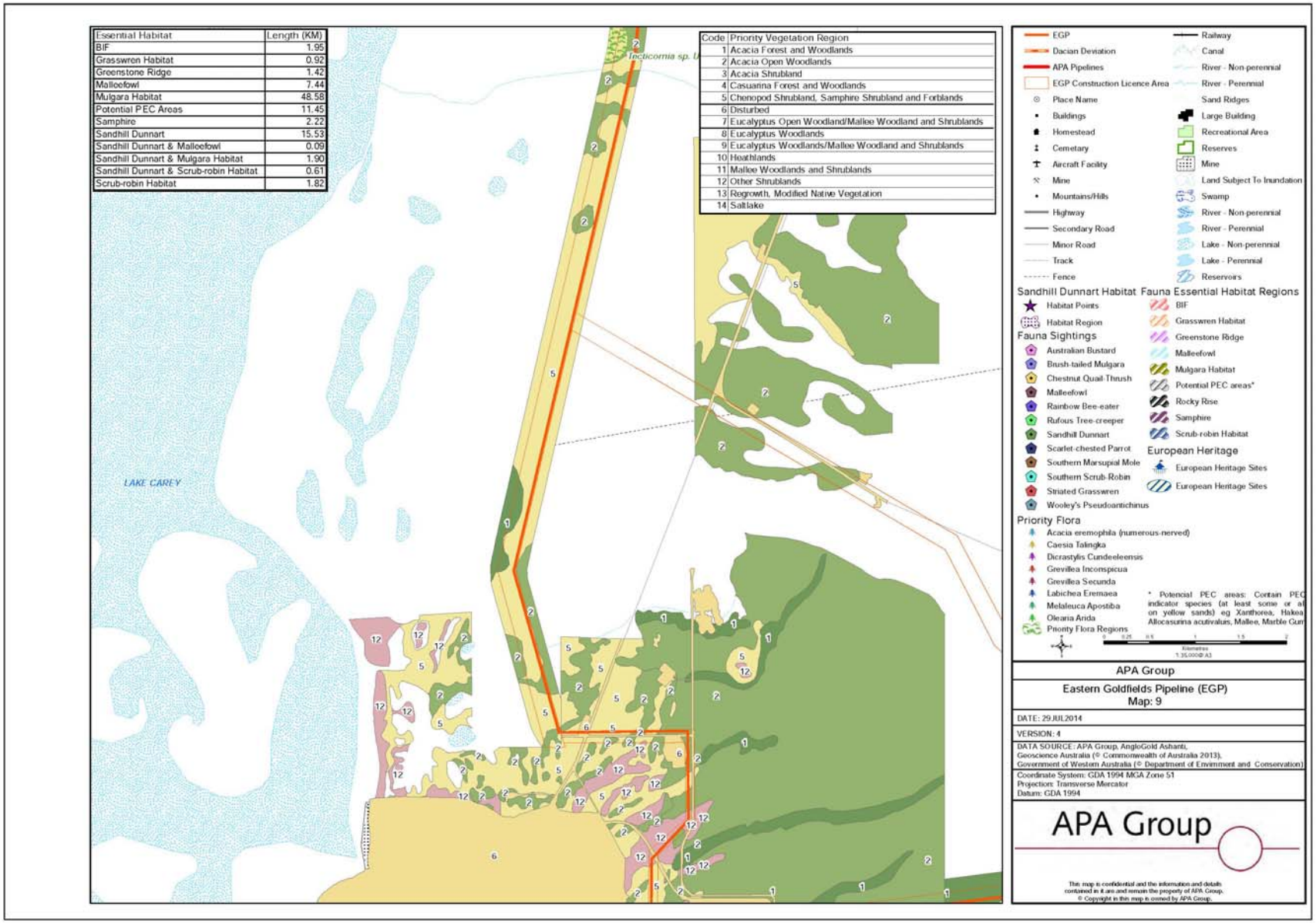
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
LAKE CAREY
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 9
DATE: 29JUL2014
VERSION: 4
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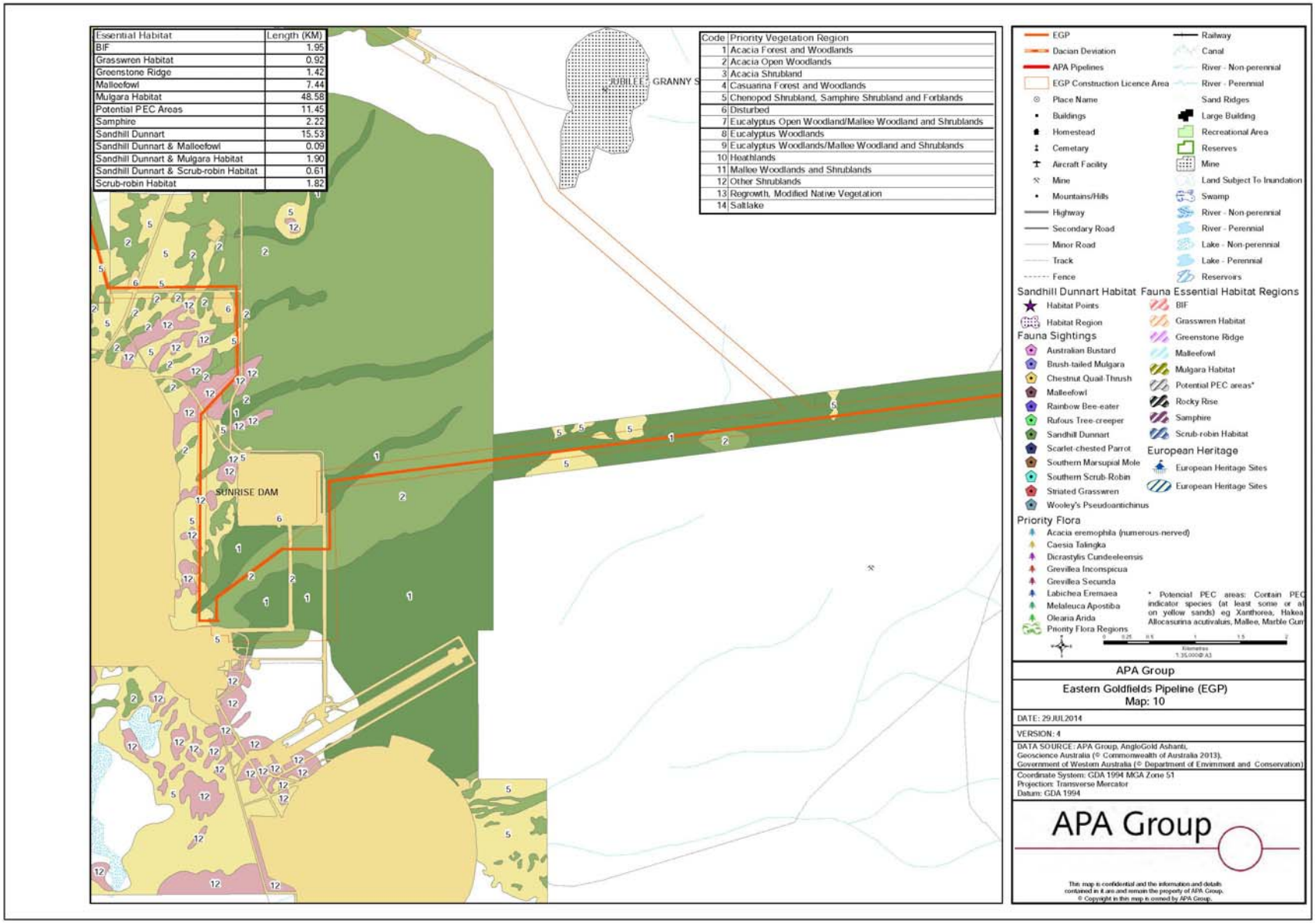
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
JUBILEE
GRANNY S
SUNRISE DAM
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 10
DATE: 29JUL2014
VERSION: 4
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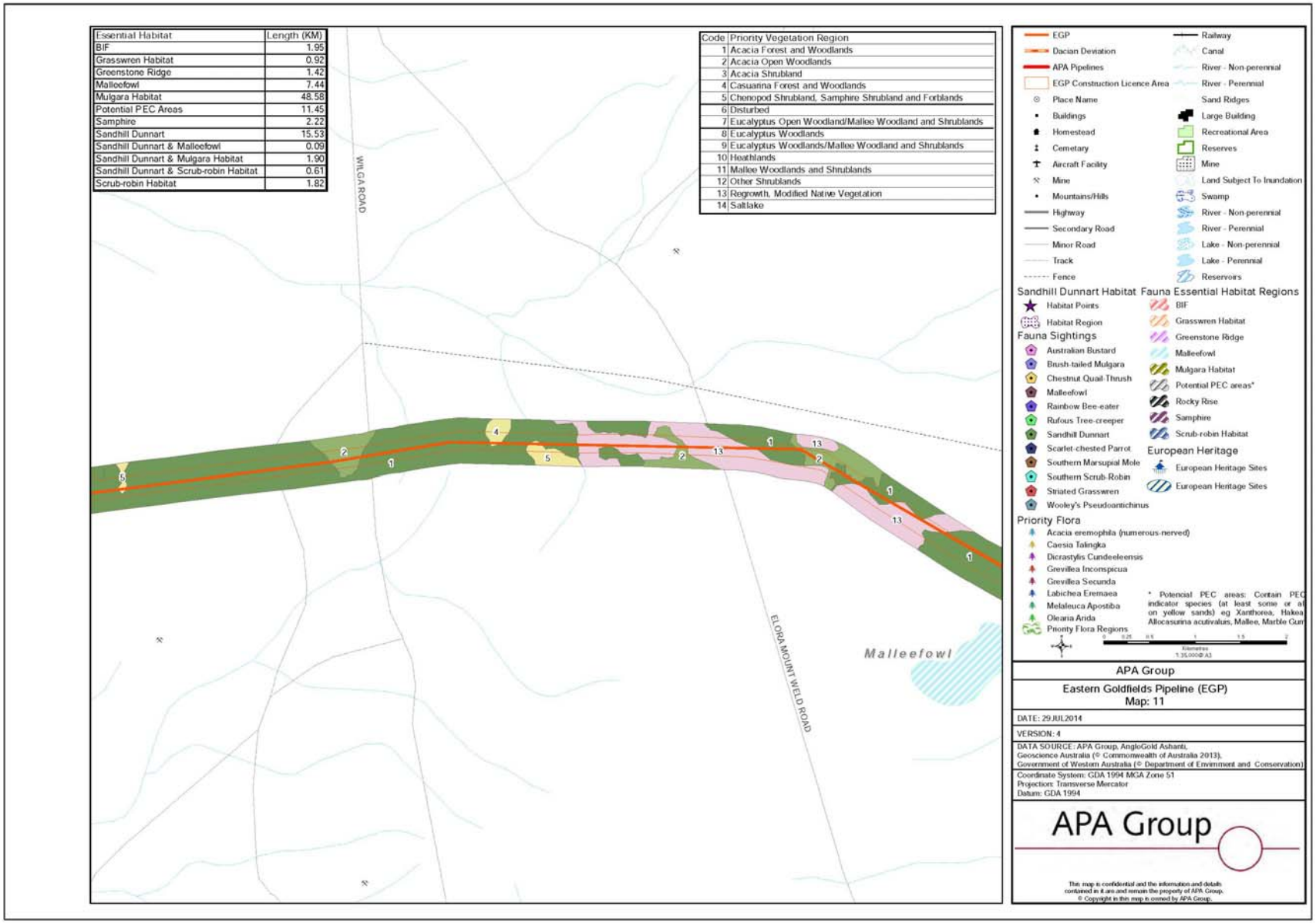
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
WILGA ROAD
ELORA MOUNT WELD ROAD
Malleefowl
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 11
DATE: 29JUL2014
VERSION: 4
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Datum: GDA 1994
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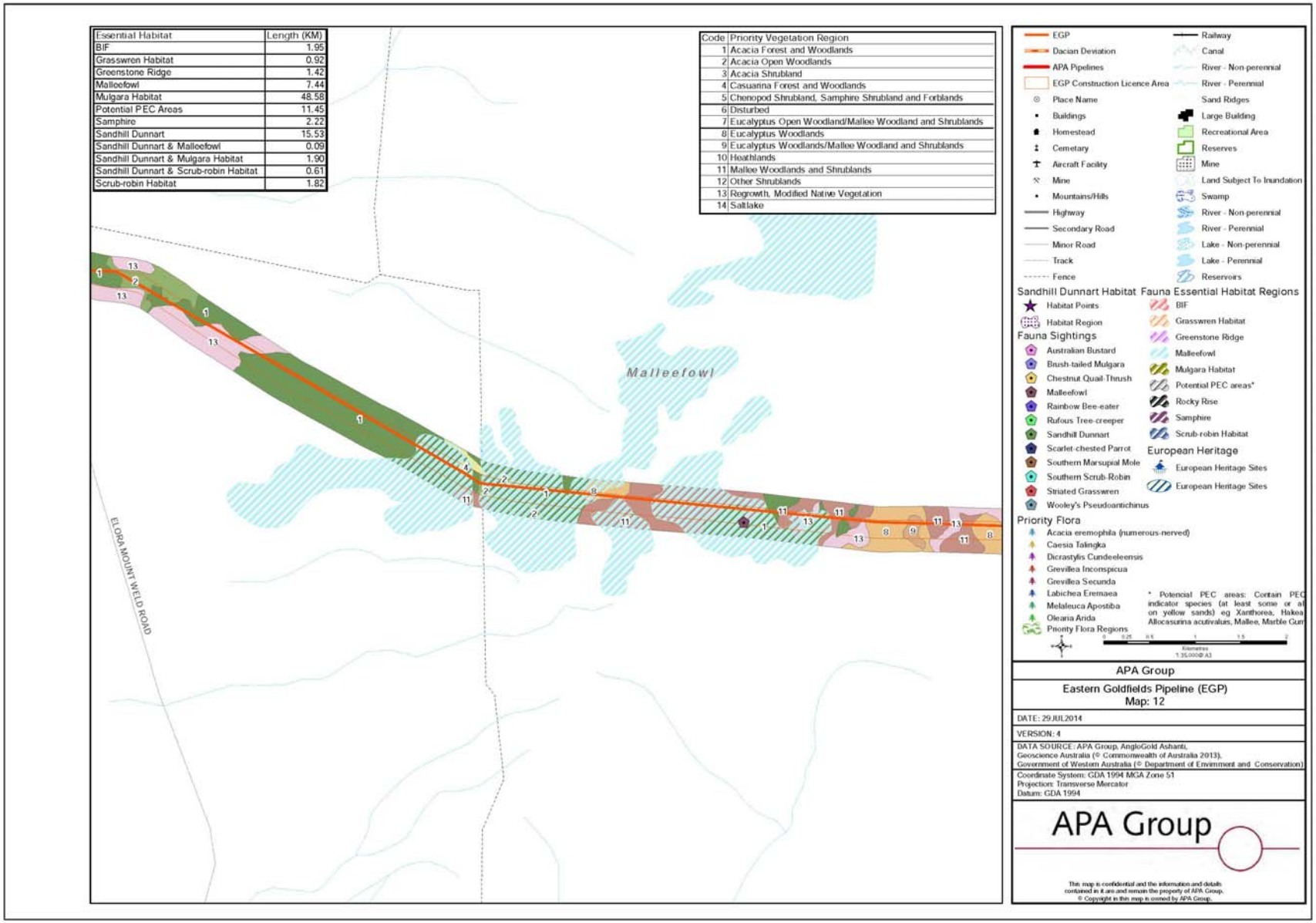
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Malleefowl
ELORA MOUNT WELD ROAD
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 12
DATE: 29JUL2014
VERSION: 4
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Datum: GDA 1994
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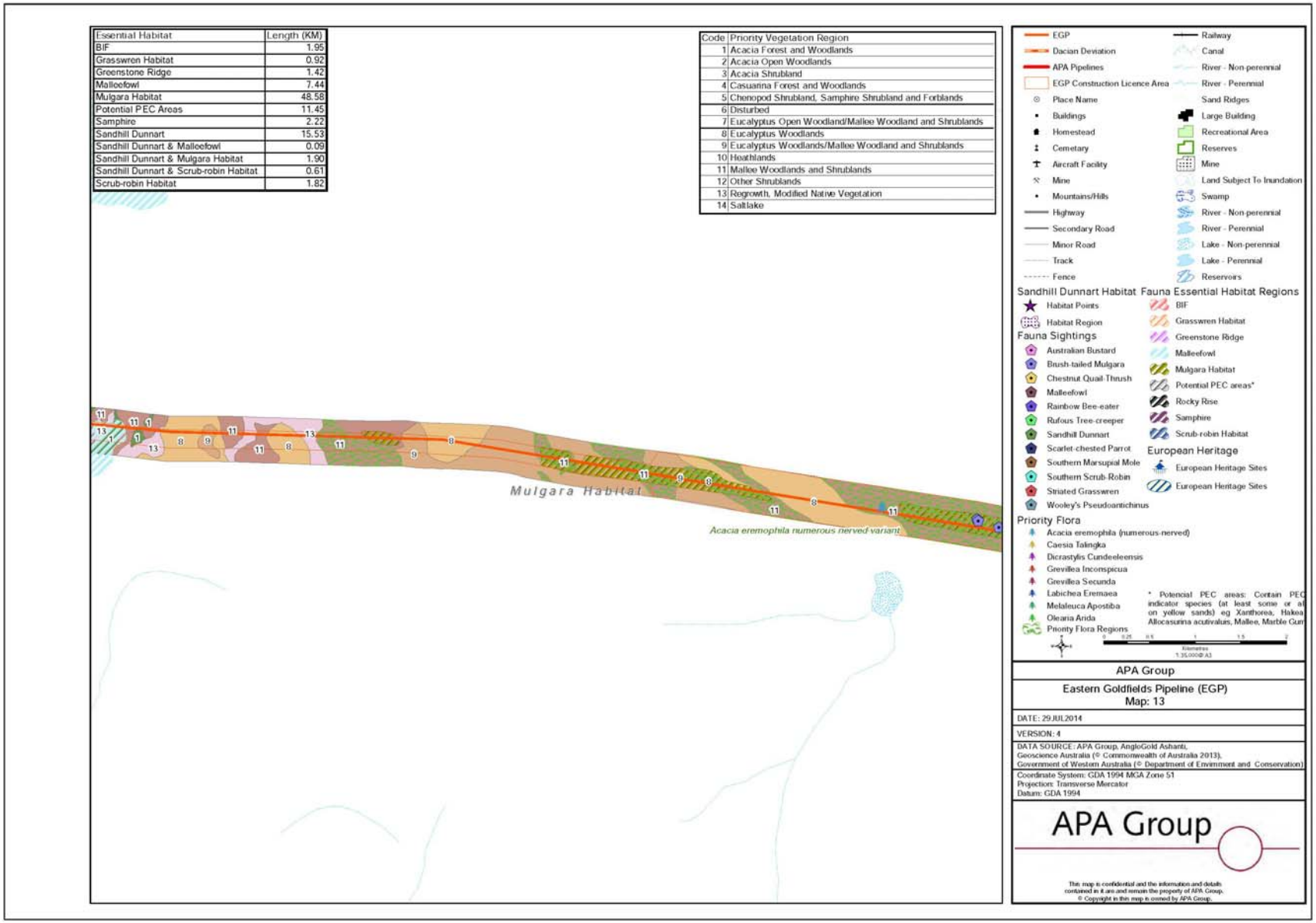
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
Acacia eremophila numerous nerved variant
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
Kilometres
1:35,000@ A3
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 13
DATE: 29JUL2014
VERSION: 4
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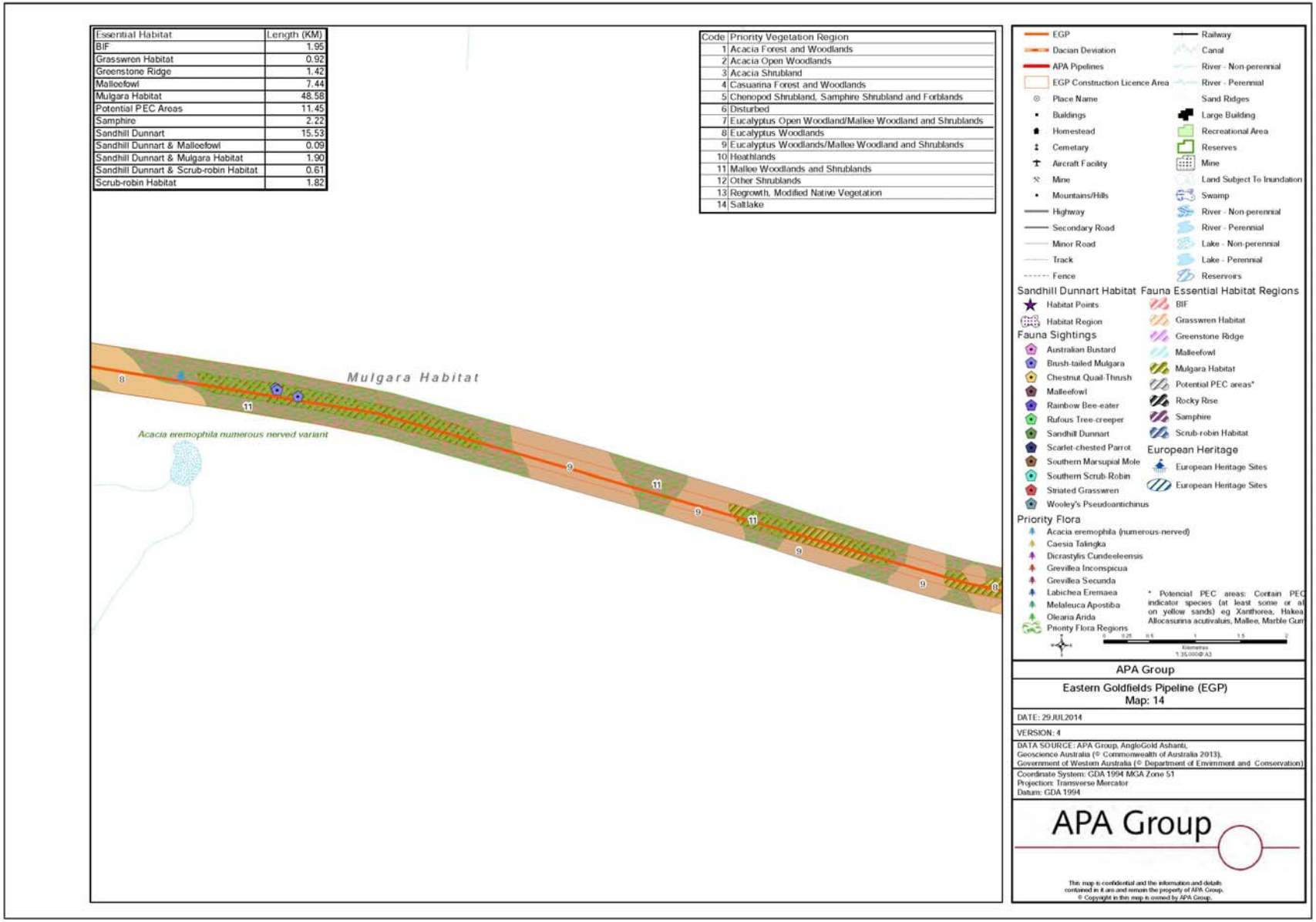

Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
2	Acacia Open Woodlands
3	Acacia Shrubland
4	Casuarina Forest and Woodlands
5	Chenopod Shrubland, Samphire Shrubland and Forblands
6	Disturbed
7	Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8	Eucalyptus Woodlands
9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum

Kilometres
1:35,000@ A3

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Eastern Goldfields Pipeline (EGP)
Map: 14

DATE: 29JUL2014

VERSION: 4

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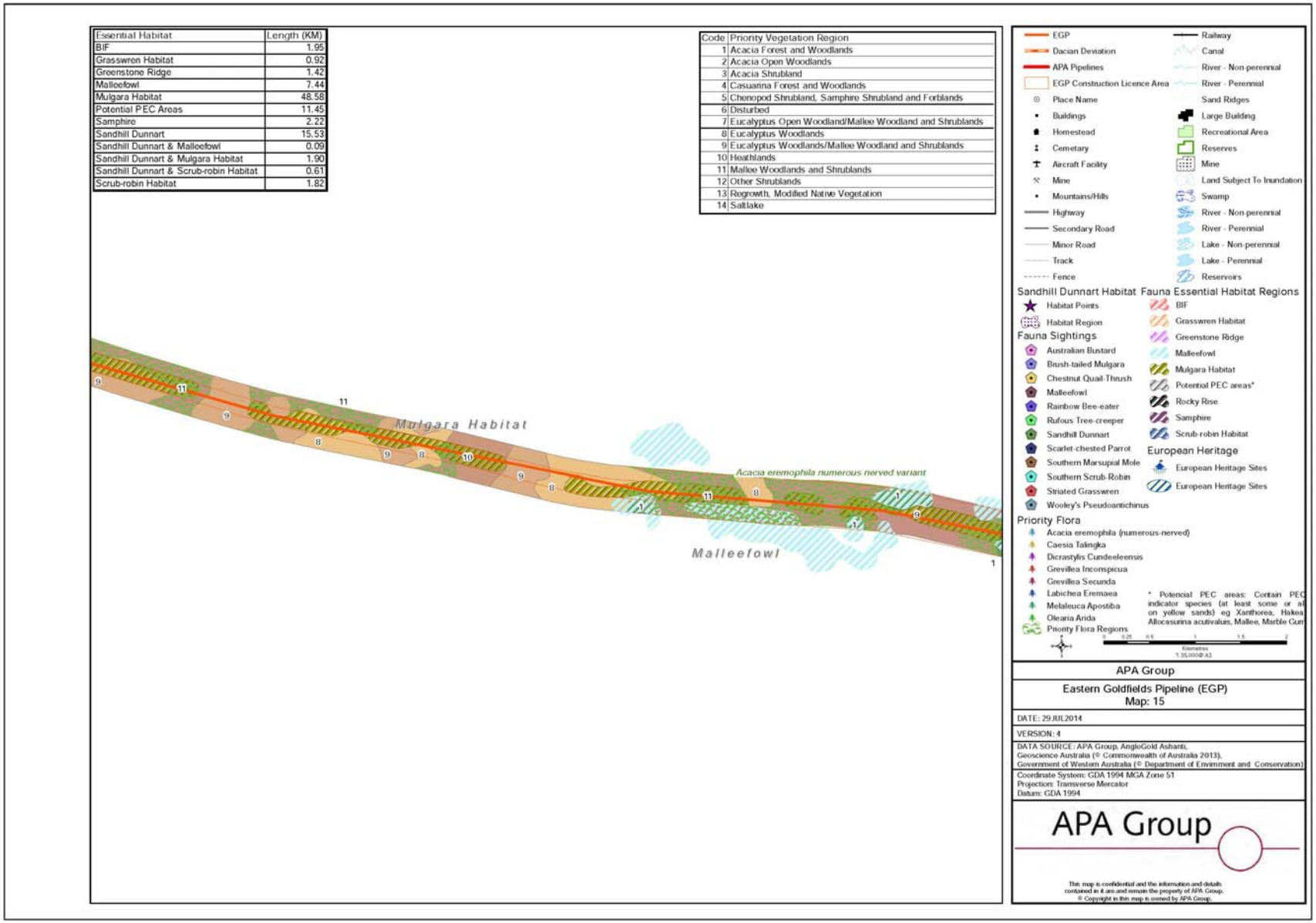
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
Acacia eremophila numerous nerved variant
Malleefowl
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
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Eastern Goldfields Pipeline (EGP)
Map: 15
DATE: 29JUL2014
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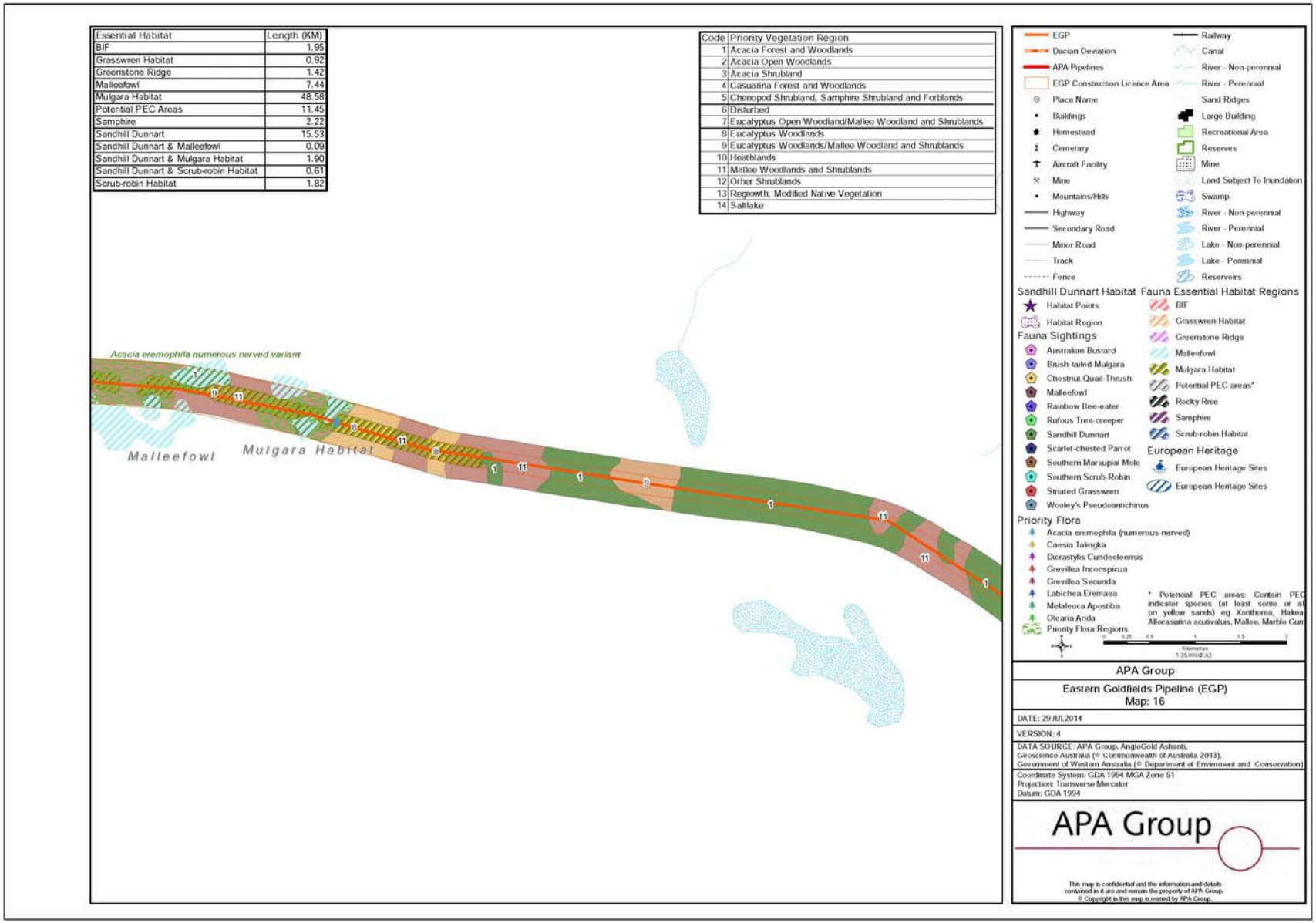
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Acacia eremophila numerous nerved variant
Malleefowl
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
Kilometres
1:35,000@ A3
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Eastern Goldfields Pipeline (EGP)
Map: 16
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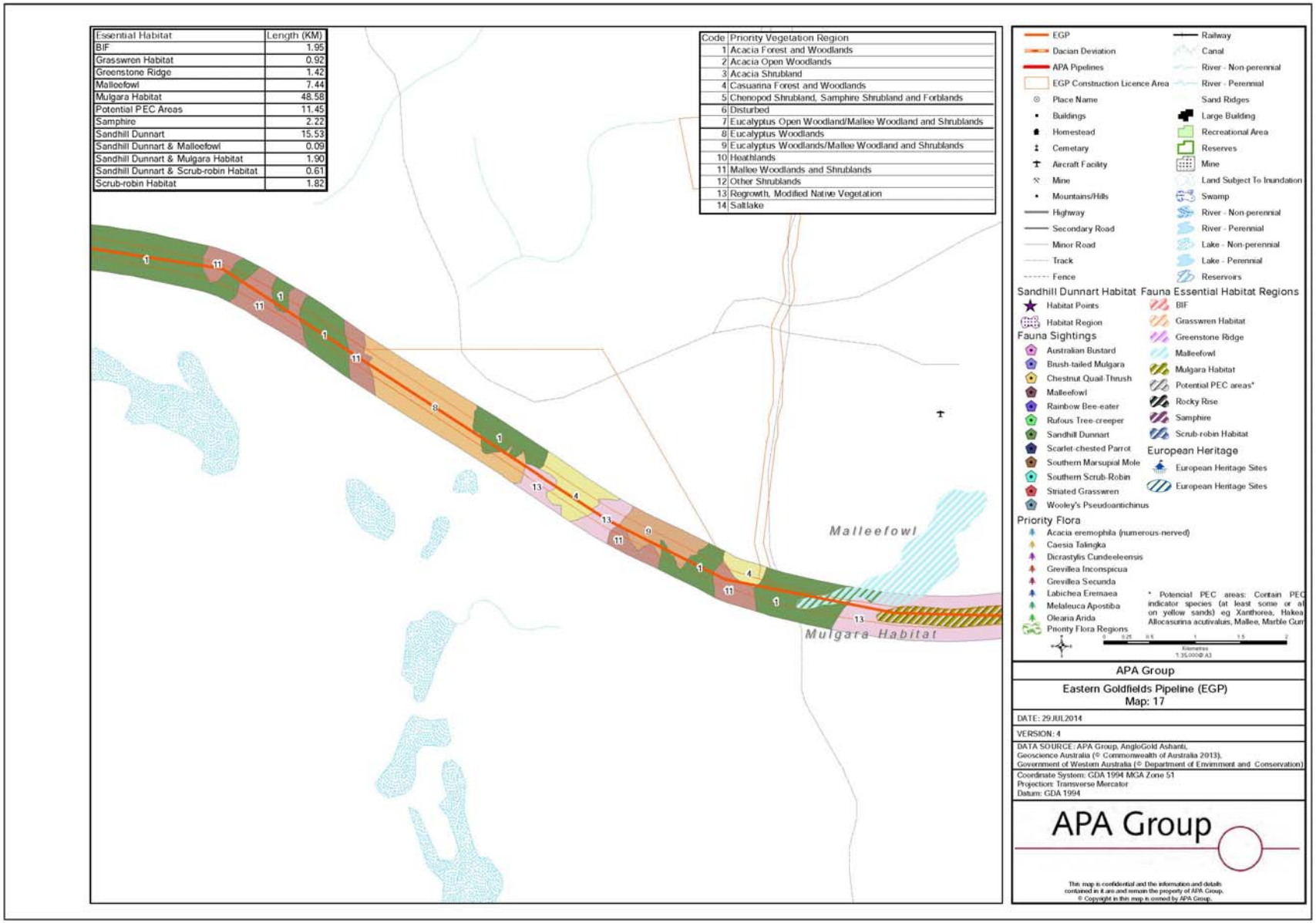
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Malleefowl
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
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Eastern Goldfields Pipeline (EGP)
Map: 17
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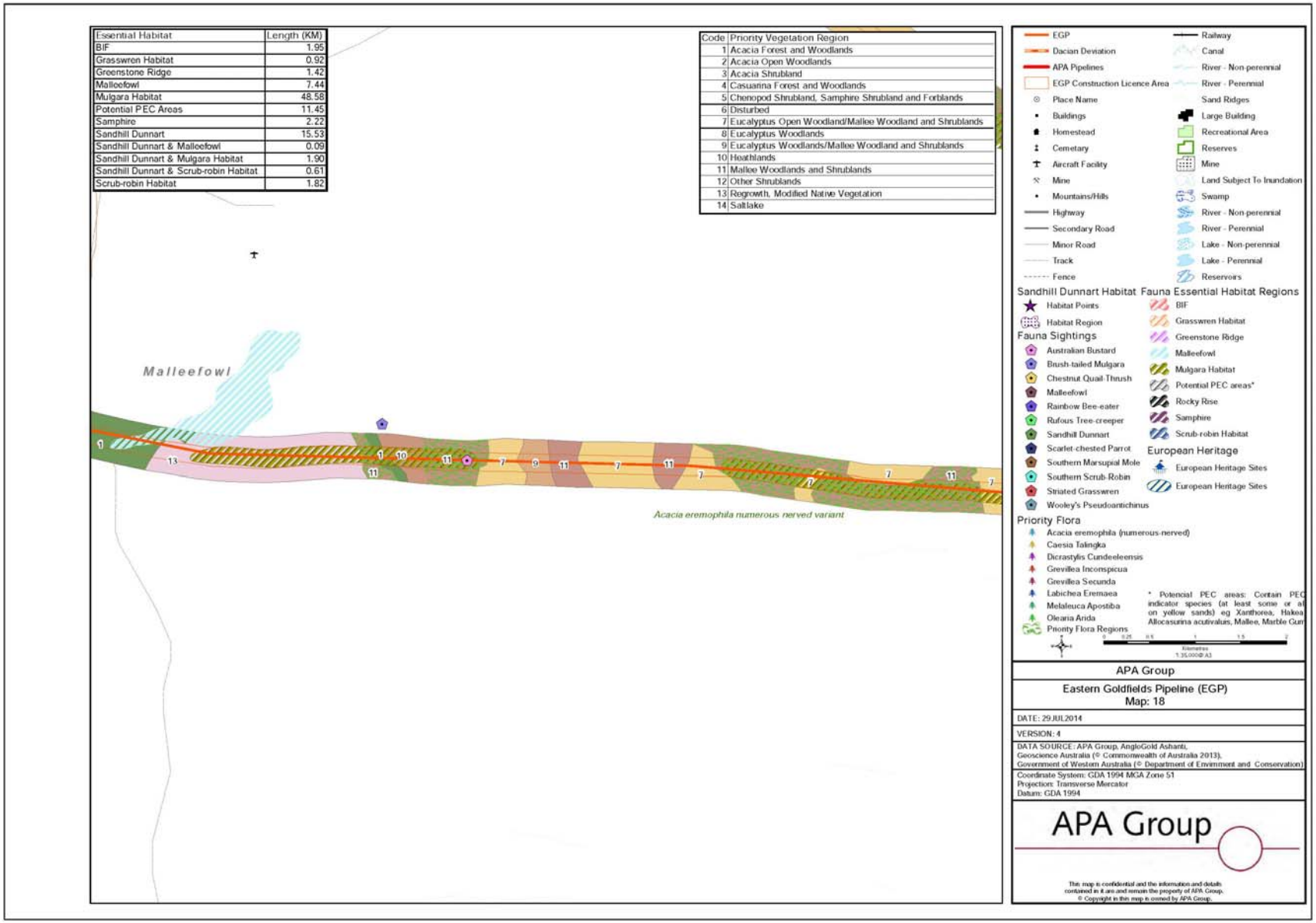
Essential Habitat | Length (KM)
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Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
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Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
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9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Malleefowl
Acacia eremophila numerous nerved variant
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
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Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
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Eastern Goldfields Pipeline (EGP)
Map: 18
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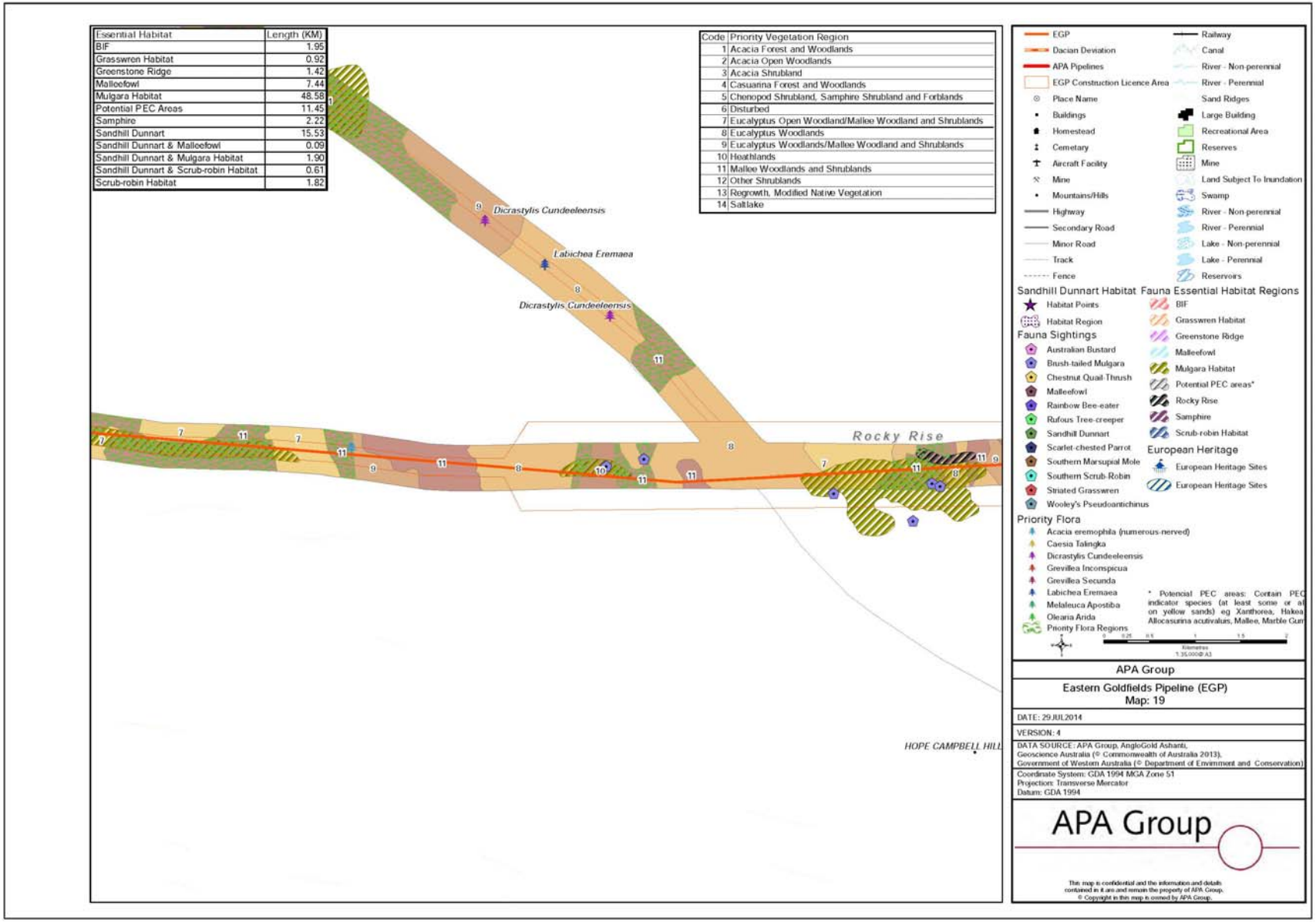
Essential Habitat | Length (KM)
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Mulgara Habitat | 48.58
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Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
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9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Dicrastylis Cundeeleensis
Labichea Eremaea
Dicrastylis Cundeeleensis
Rocky Rise
HOPE CAMPBELL HILL
EGP
Dacian Deviation
APA Pipelines
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Recreational Area
Reserves
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Swamp
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River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
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Eastern Goldfields Pipeline (EGP)
Map: 19
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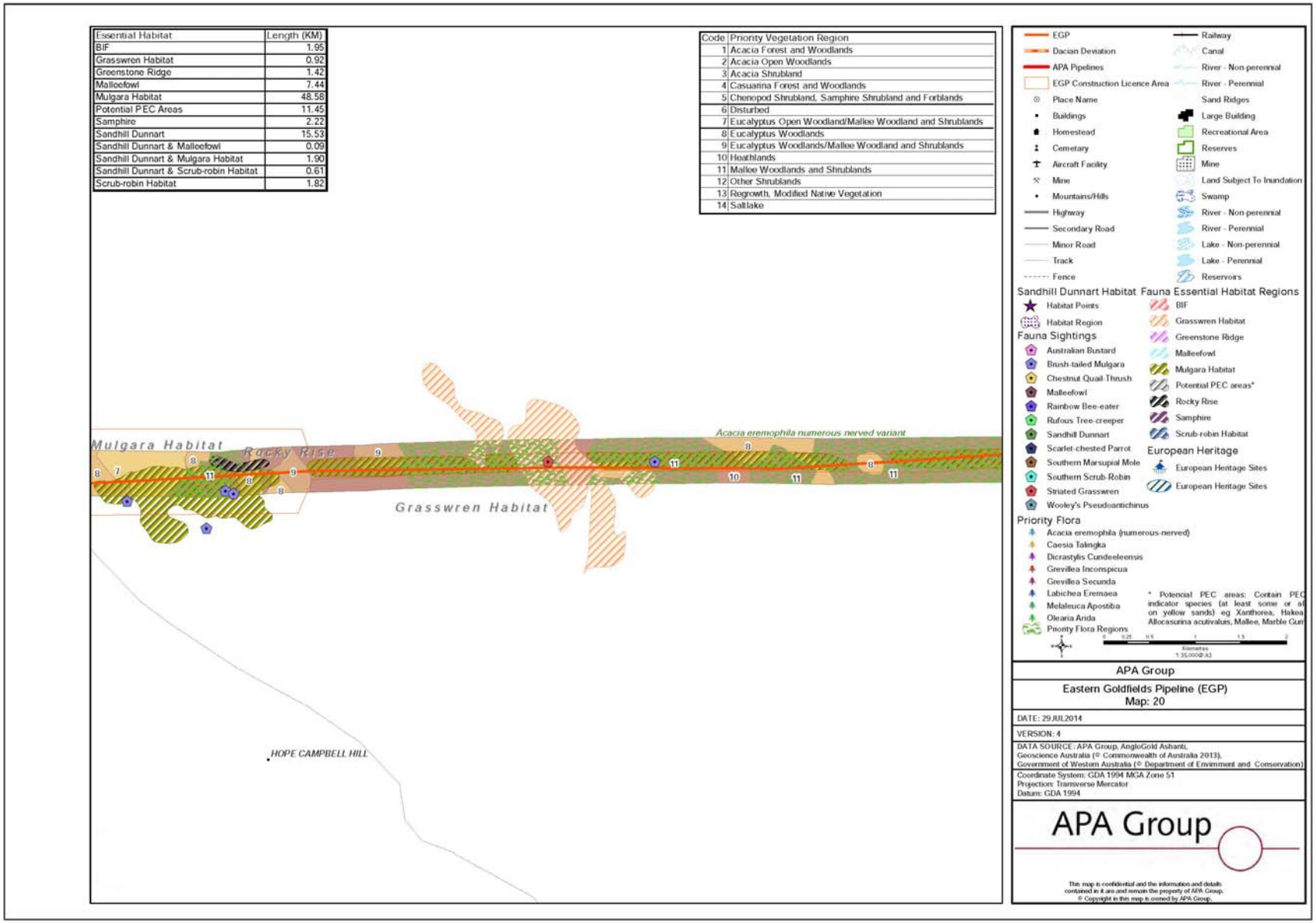
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Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
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9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
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14 | Saltlake
Mulgara Habitat
Rocky Rise
Acacia eremophila numerous nerved variant
Grasswren Habitat
HOPE CAMPBELL HILL
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
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Aircraft Facility
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Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
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Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
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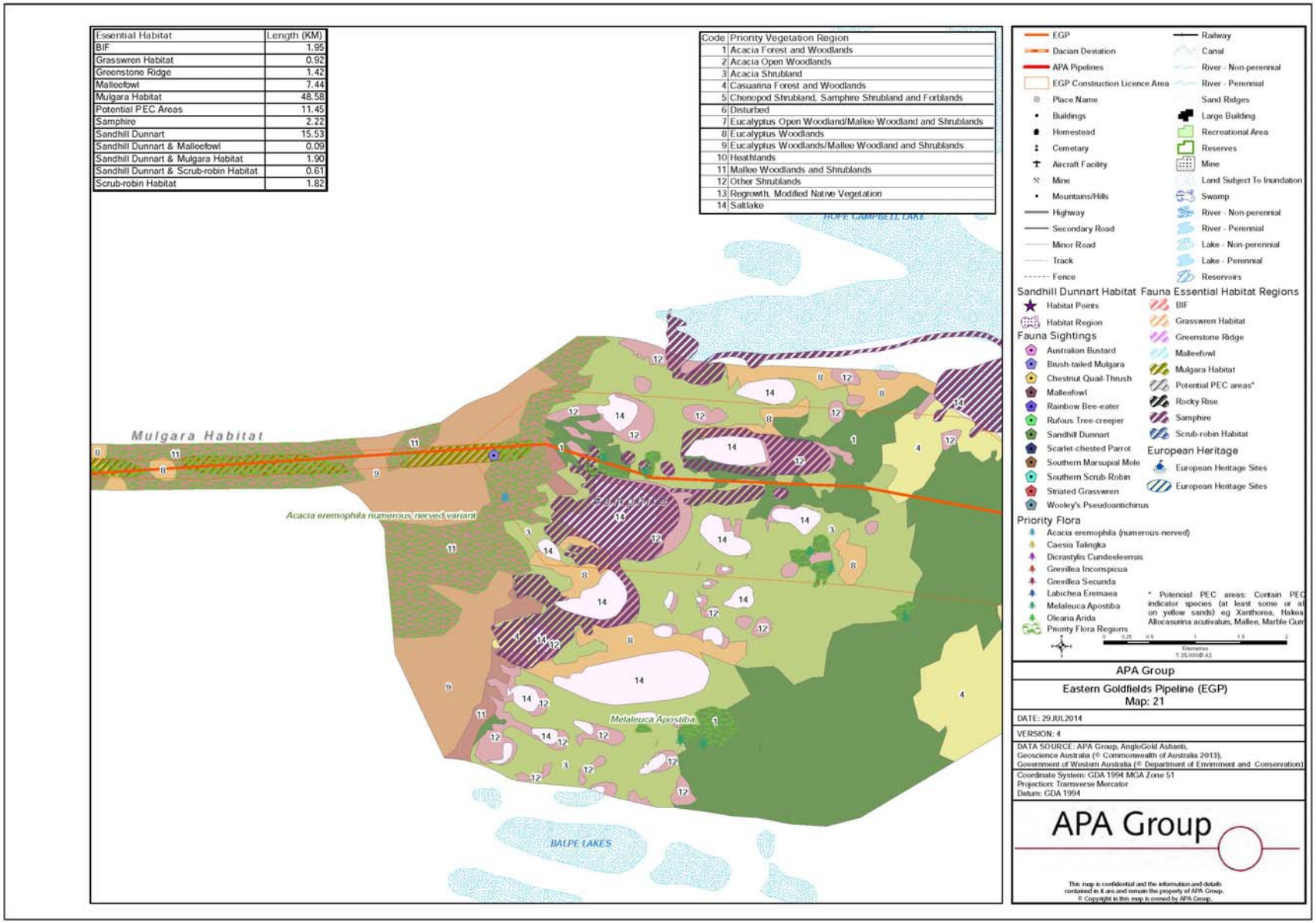
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
HOPE CAMPBELL LAKE
Mulgara Habitat
Acacia eremophila numerous nerved variant
Melaleuca Apostiba
BALPE LAKES
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 21
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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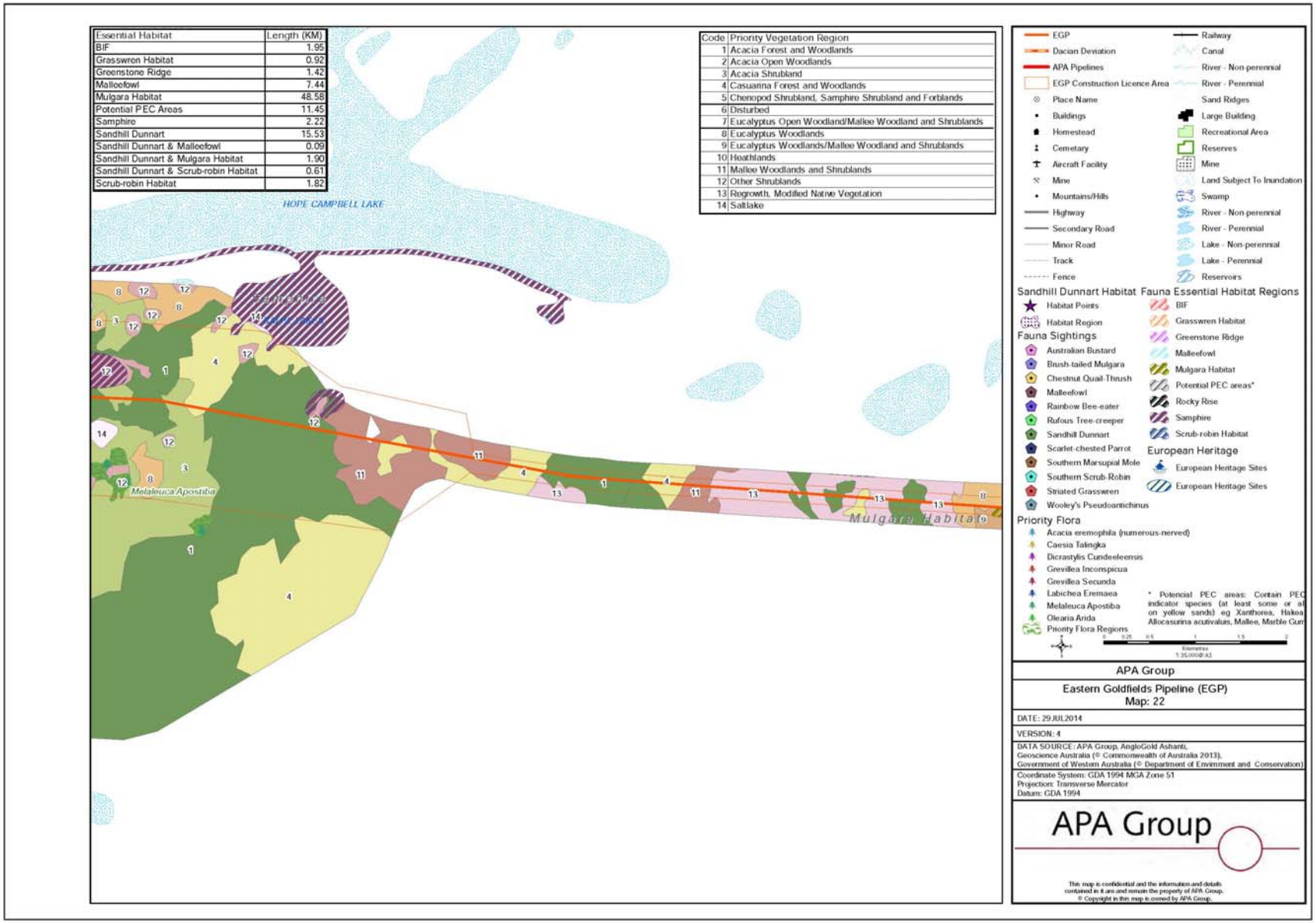
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
HOPE CAMPBELL LAKE
Melaleuca Apostiba
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
Kilometres
1:35,000@ A3
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 22
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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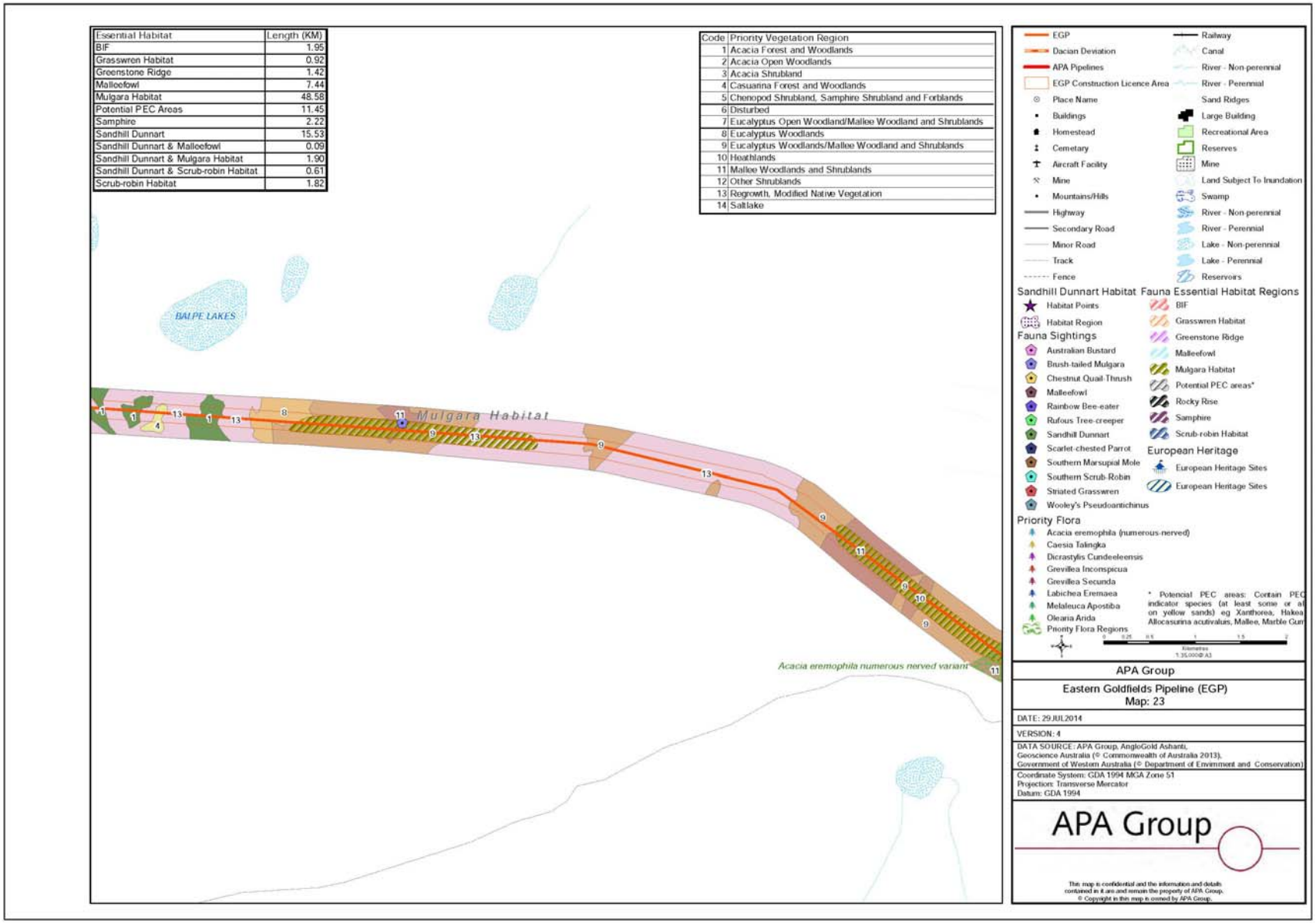
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
BALPE LAKES
Mulgara Habitat
Acacia eremophila numerous nerved variant
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 23
DATE: 29JUL2014
VERSION: 4
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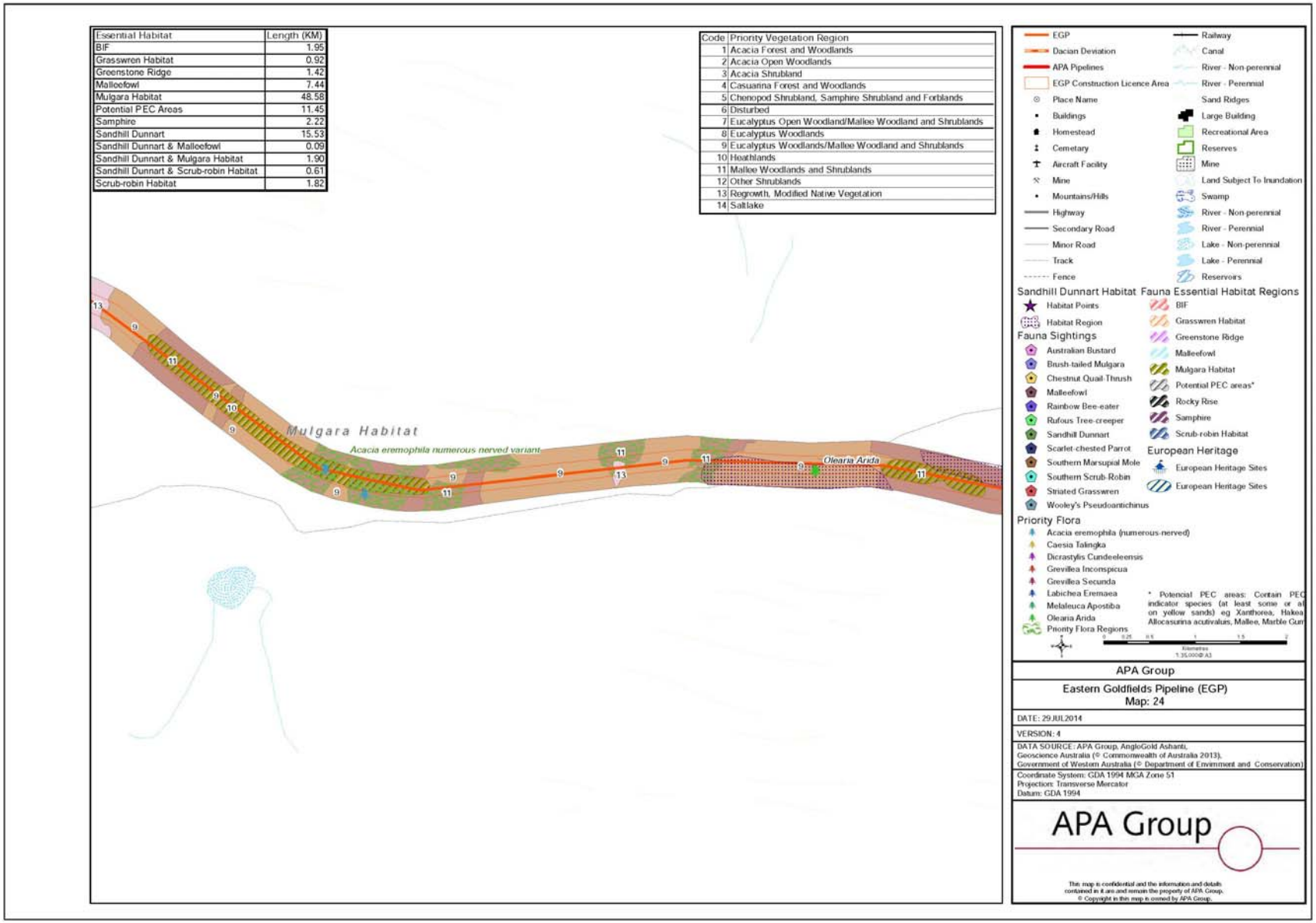
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
Acacia eremophila numerous nerved variant
Olearia Arida
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 24
DATE: 29JUL2014
VERSION: 4
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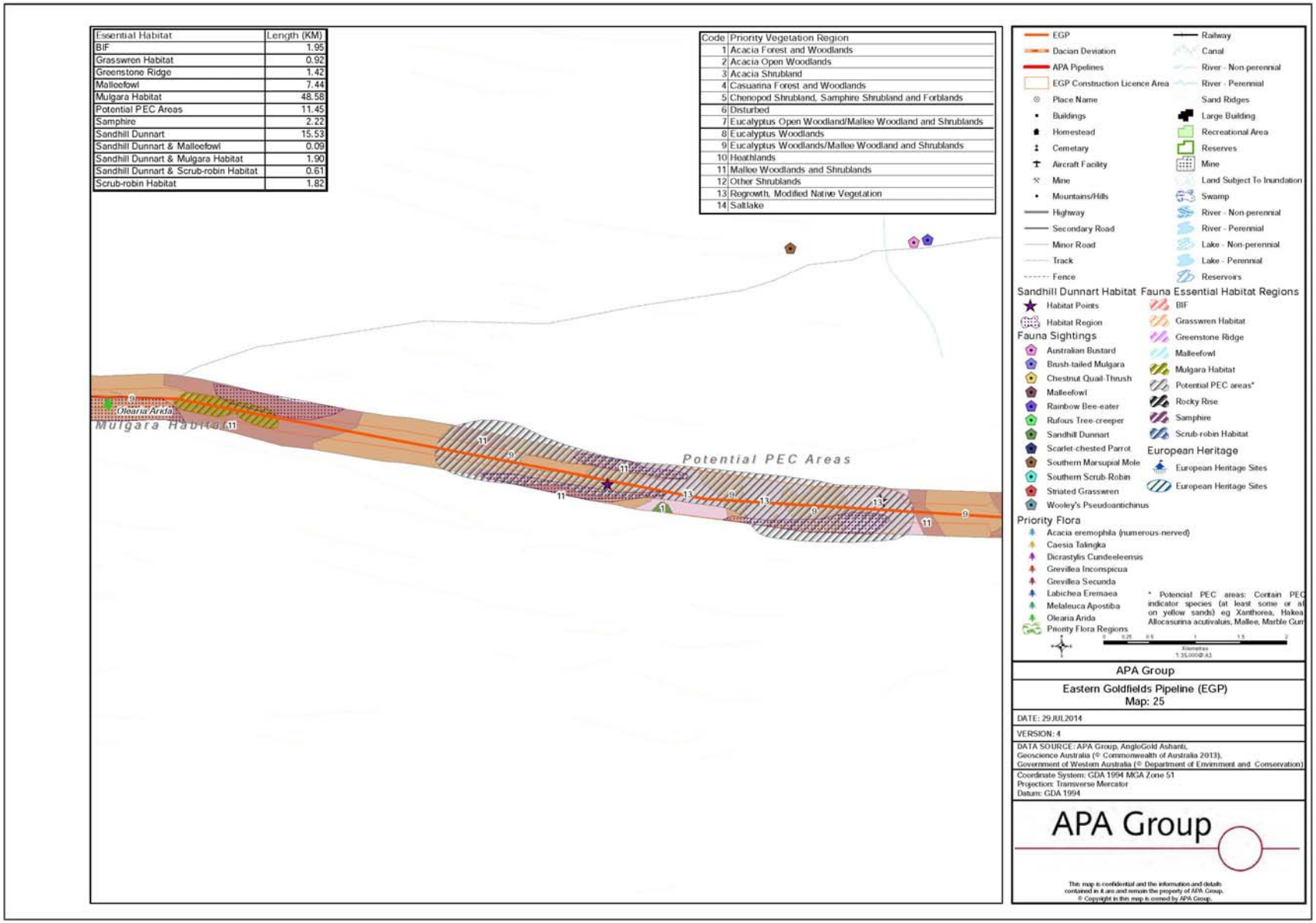
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Olearia Arida
Mulgara Habitat
Potential PEC Areas
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
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Eastern Goldfields Pipeline (EGP)
Map: 25
DATE: 29JUL2014
VERSION: 4
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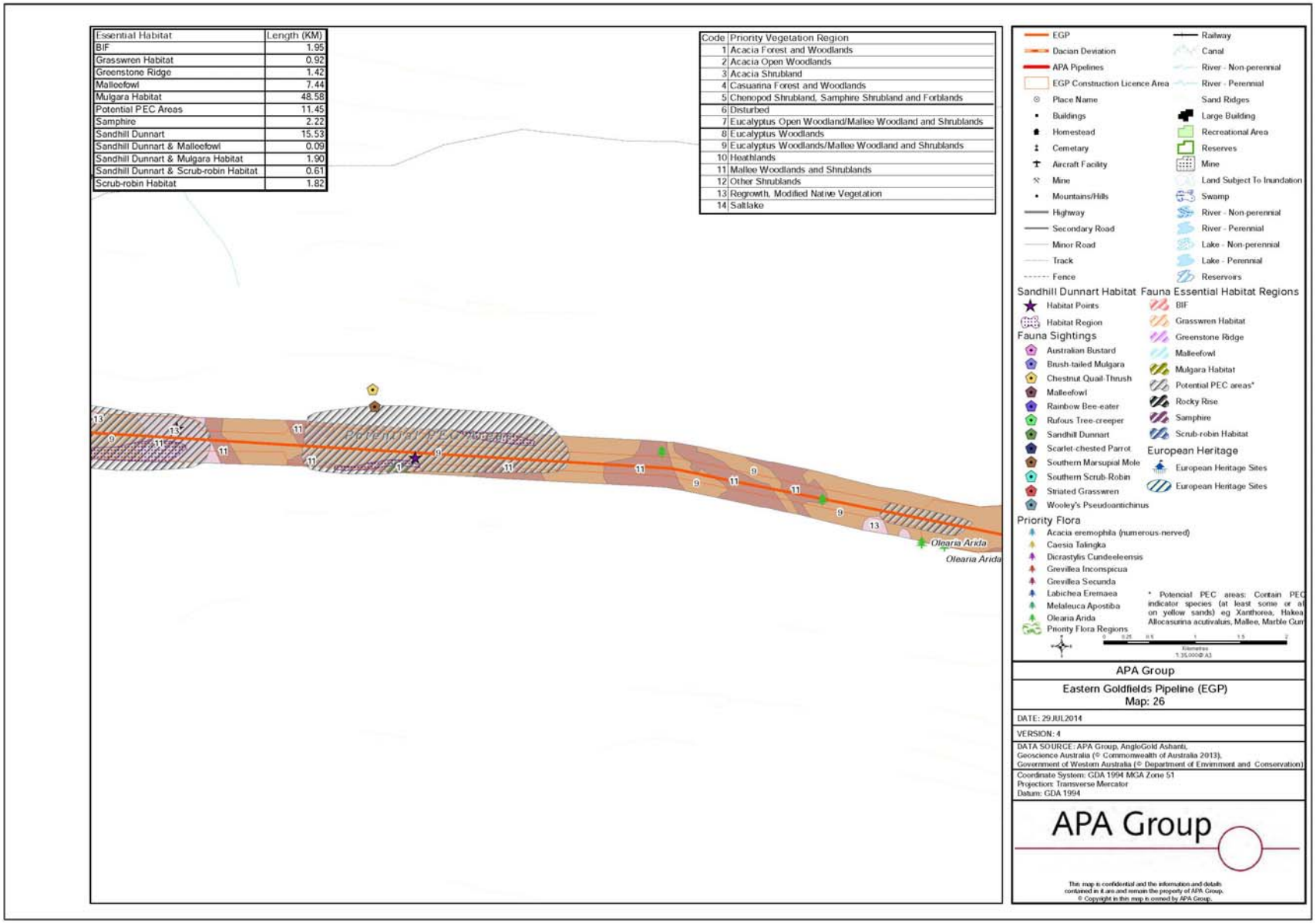
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Potential PEC Areas
Olearia Arida
Olearia Arida
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 26
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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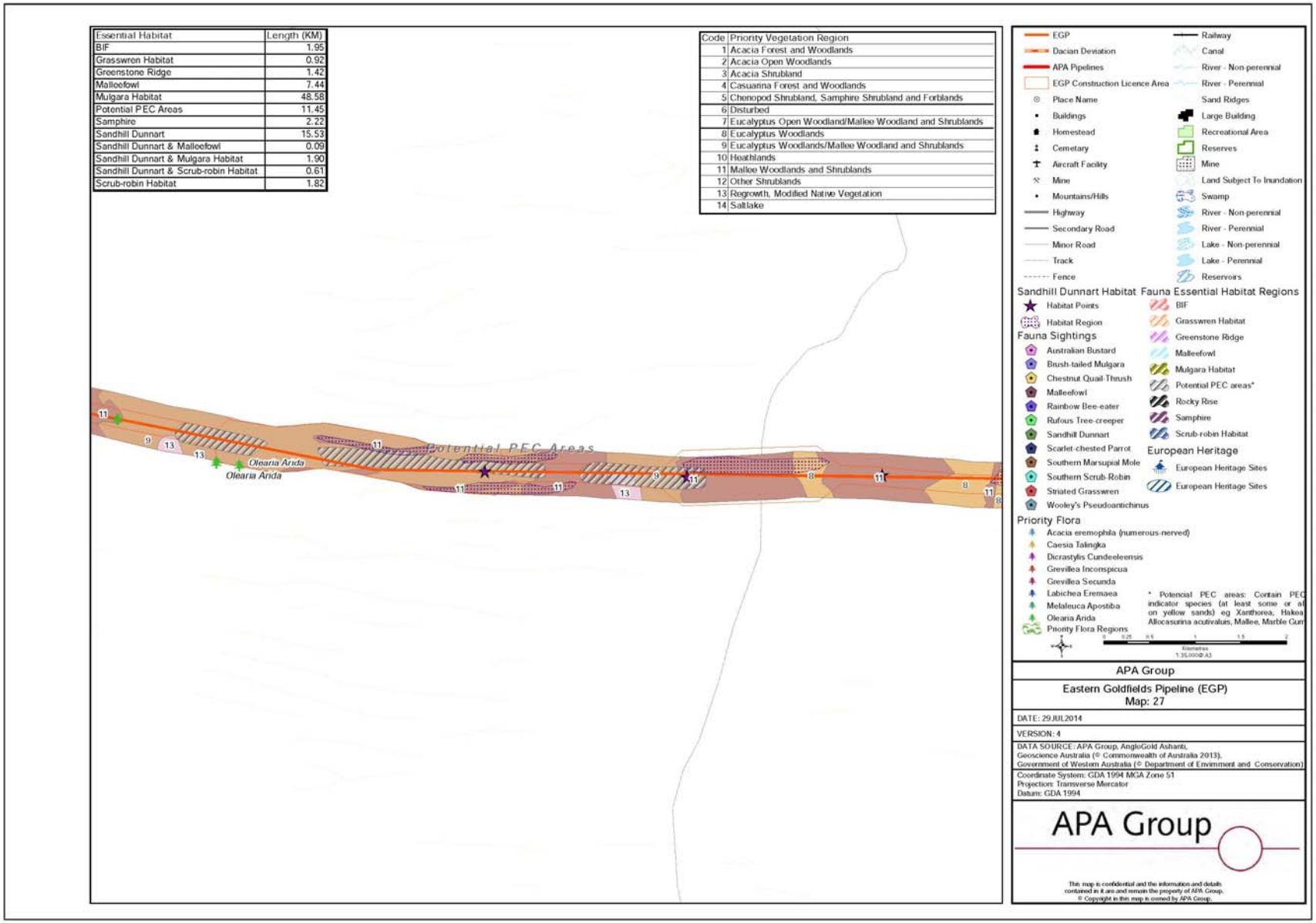
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Potential PEC Areas
Olearia Arida
Olearia Arida
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 27
DATE: 29JUL2014
VERSION: 4
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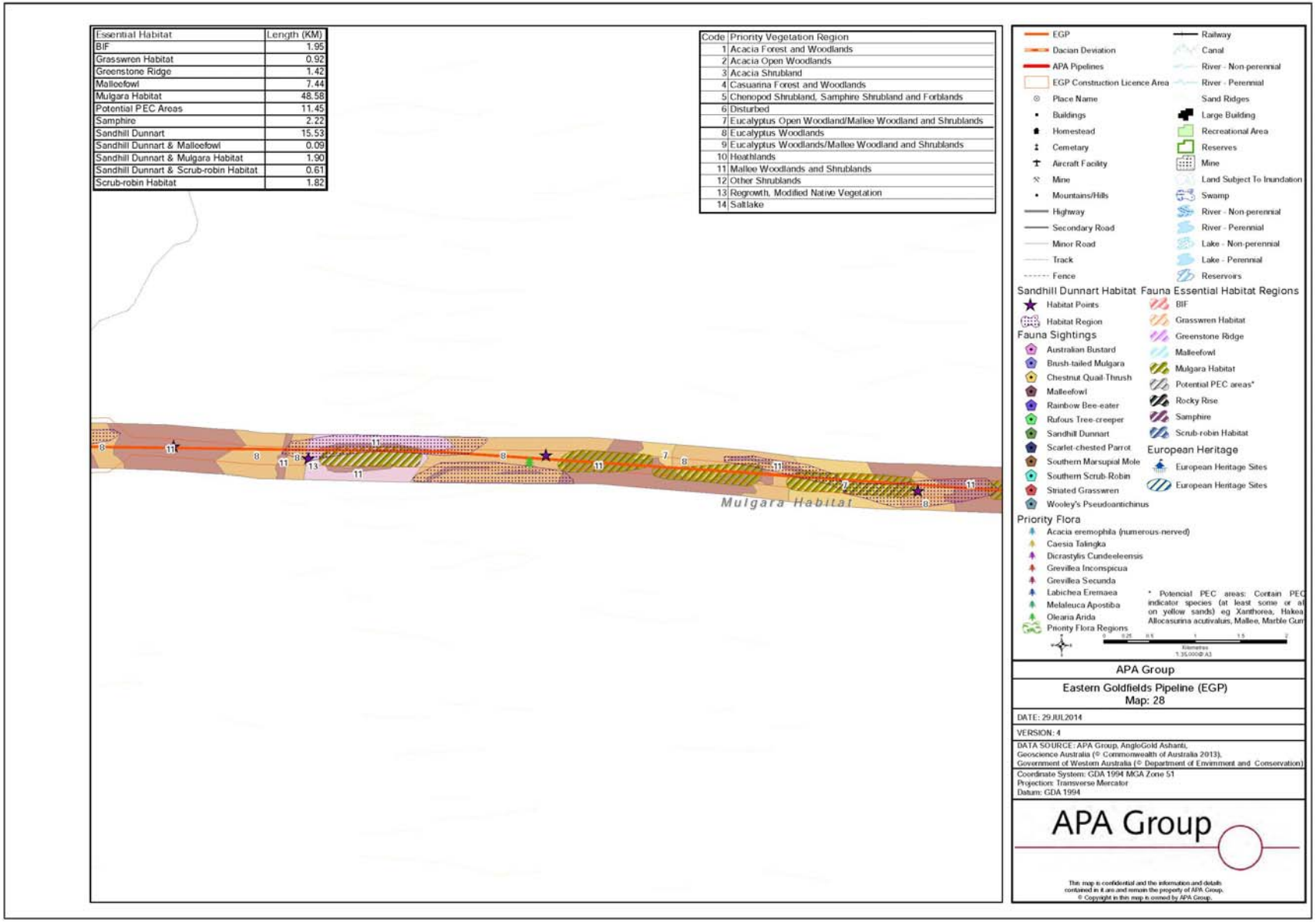
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 28
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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Datum: GDA 1994
APA Group
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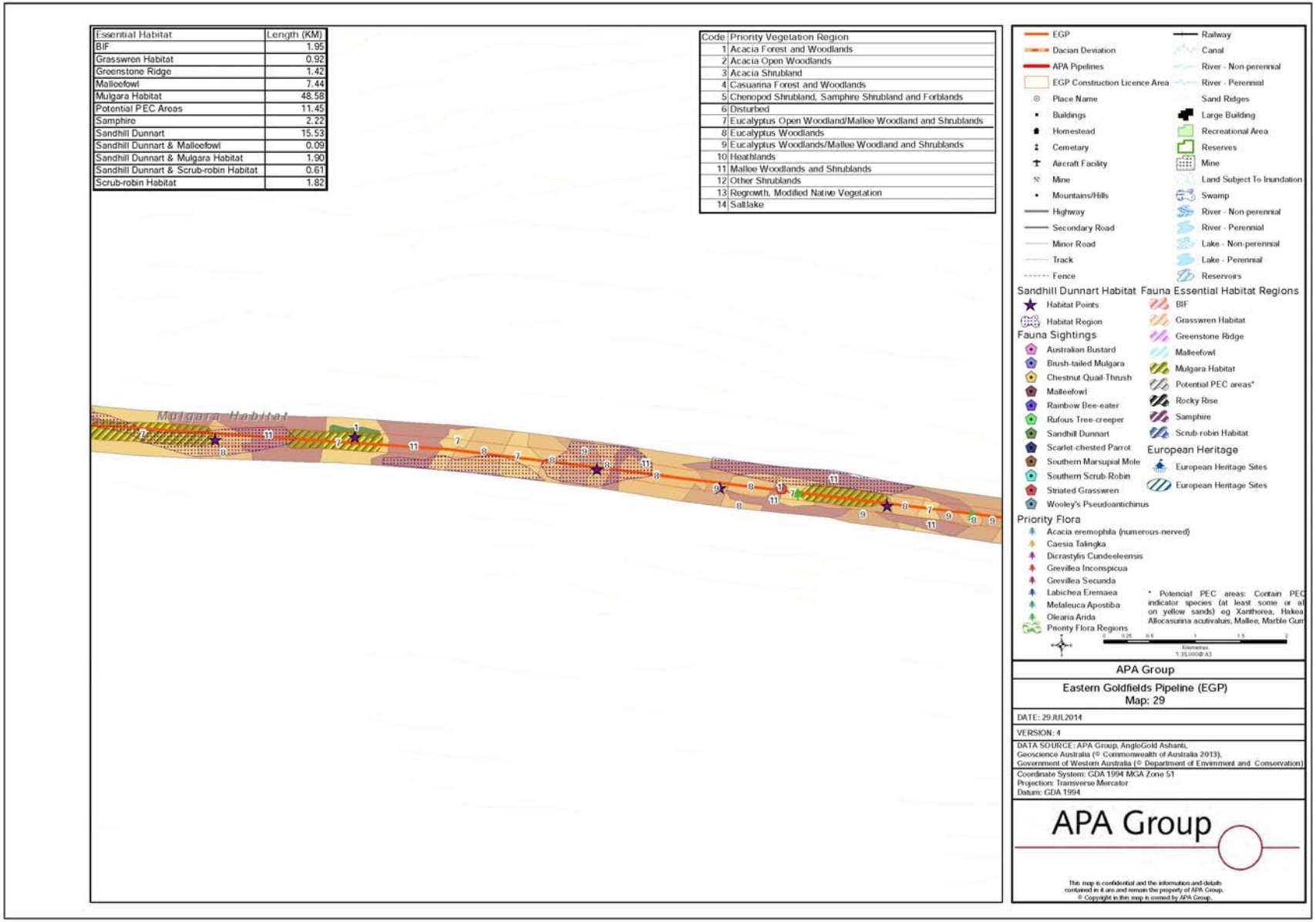
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat Fauna Essential Habitat Regions
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 29
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
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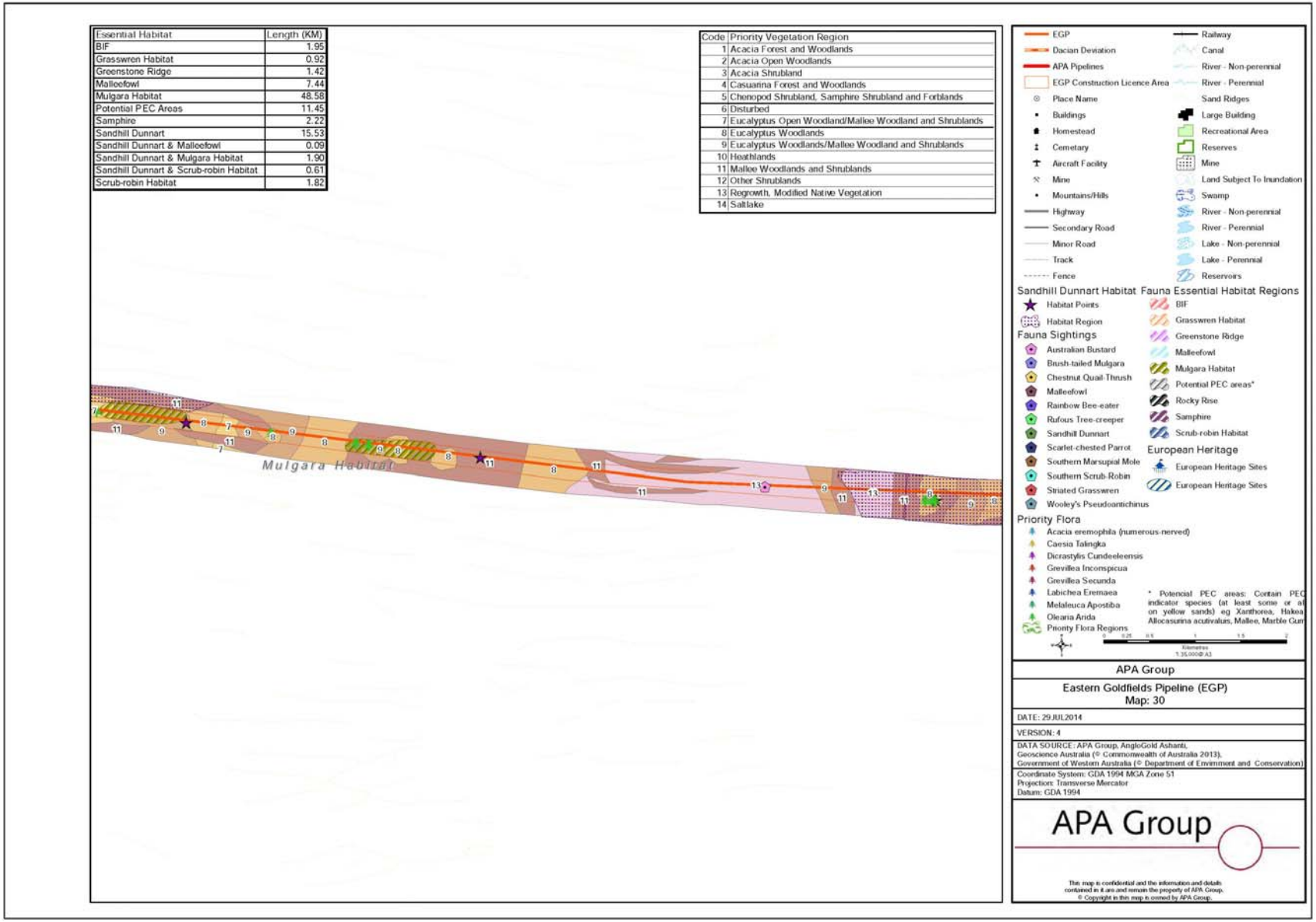
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
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Samphire | 2.22
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Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 30
DATE: 29JUL2014
VERSION: 4
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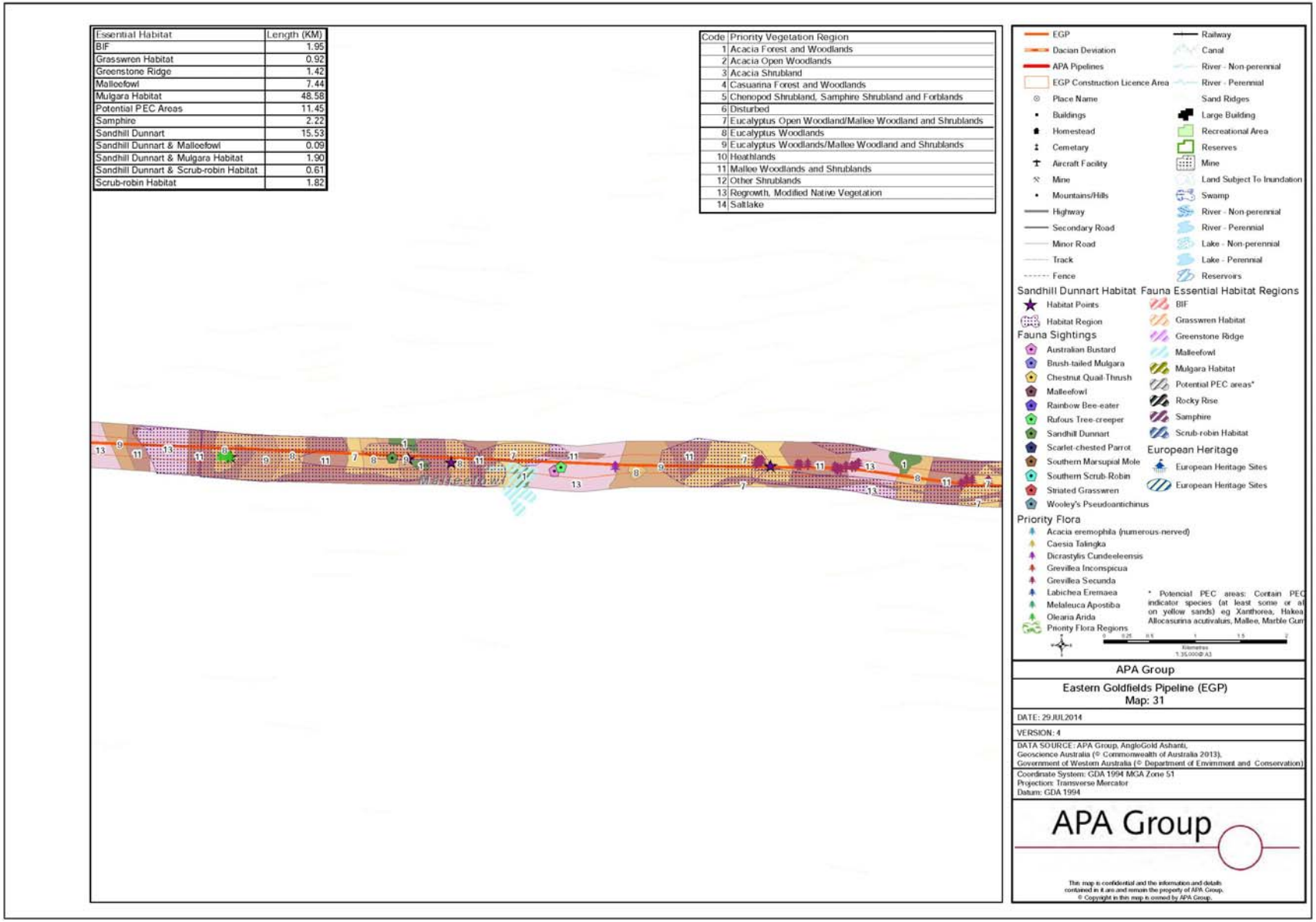
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalus, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 31
DATE: 29JUL2014
VERSION: 4
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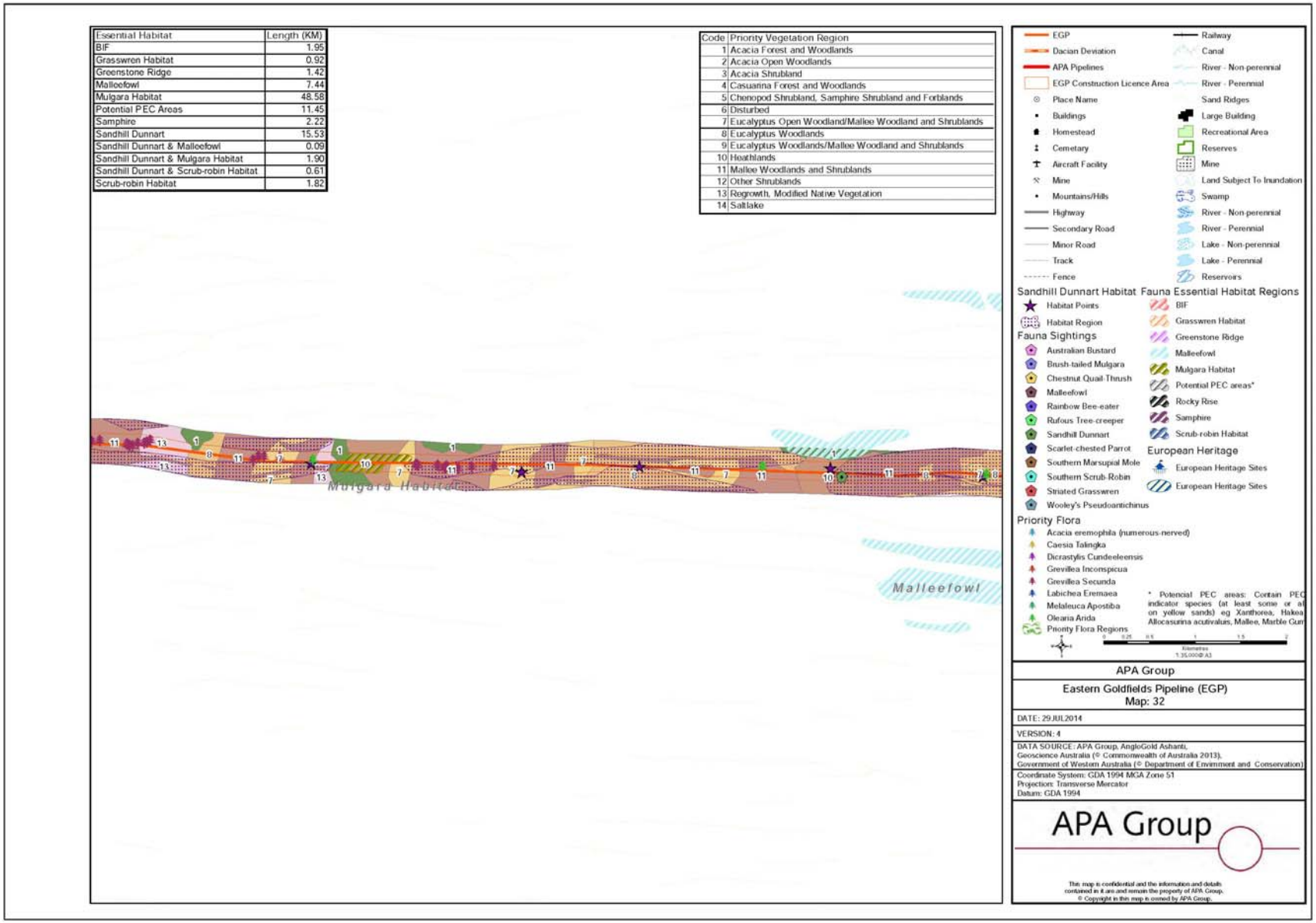
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 Acacia Forest and Woodlands
2 Acacia Open Woodlands
3 Acacia Shrubland
4 Casuarina Forest and Woodlands
5 Chenopod Shrubland, Samphire Shrubland and Forblands
6 Disturbed
7 Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 Eucalyptus Woodlands
9 Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 Heathlands
11 Mallee Woodlands and Shrublands
12 Other Shrublands
13 Regrowth, Modified Native Vegetation
14 Saltlake
Mulgara Habitat
Malleefowl
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 32
DATE: 29JUL2014
VERSION: 4
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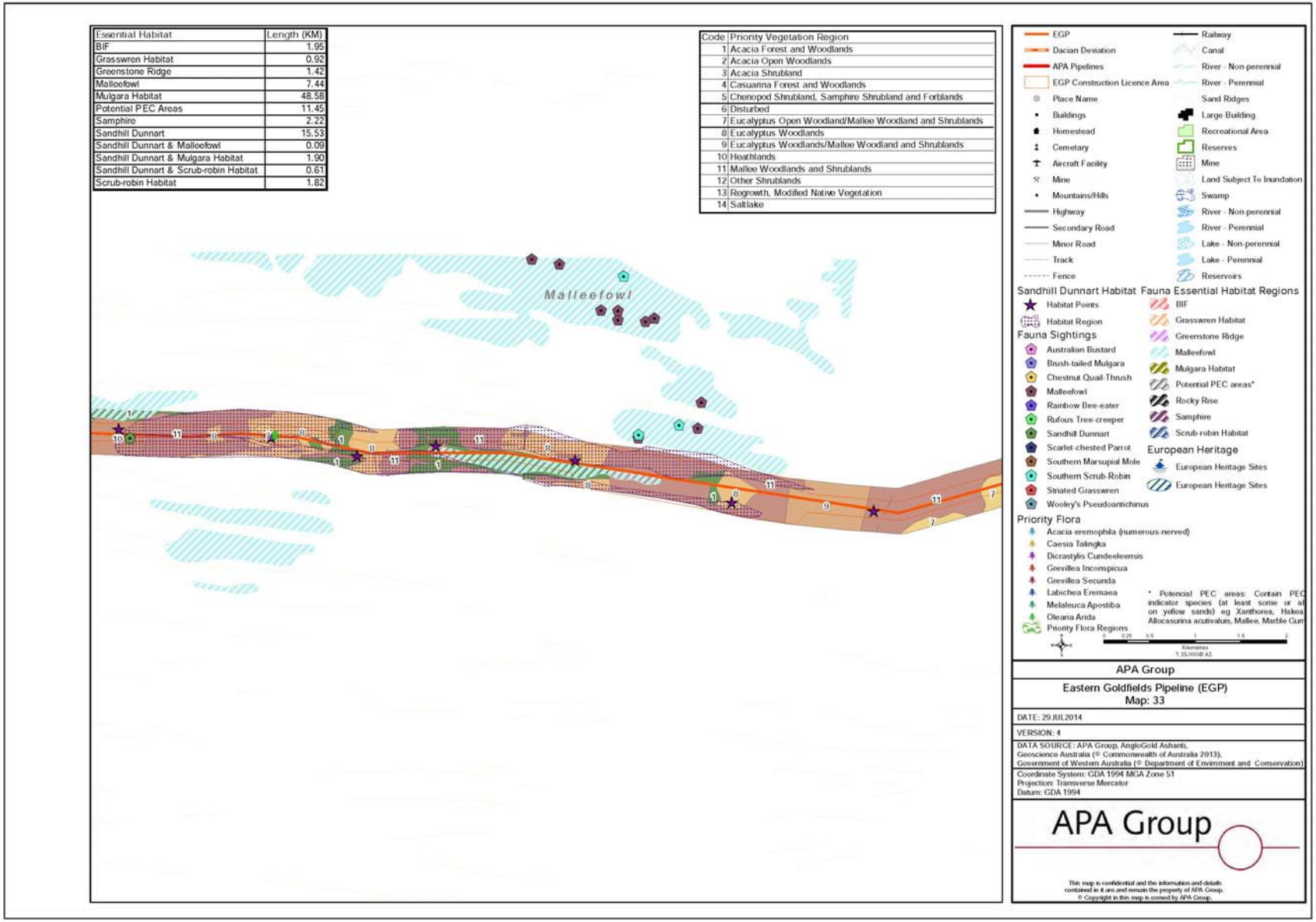
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
Greenstone Ridge | 1.42
Malleefowl | 7.44
Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Malleefowl
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
Kilometres
1:35,000@ A3
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 33
DATE: 29JUL2014
VERSION: 4
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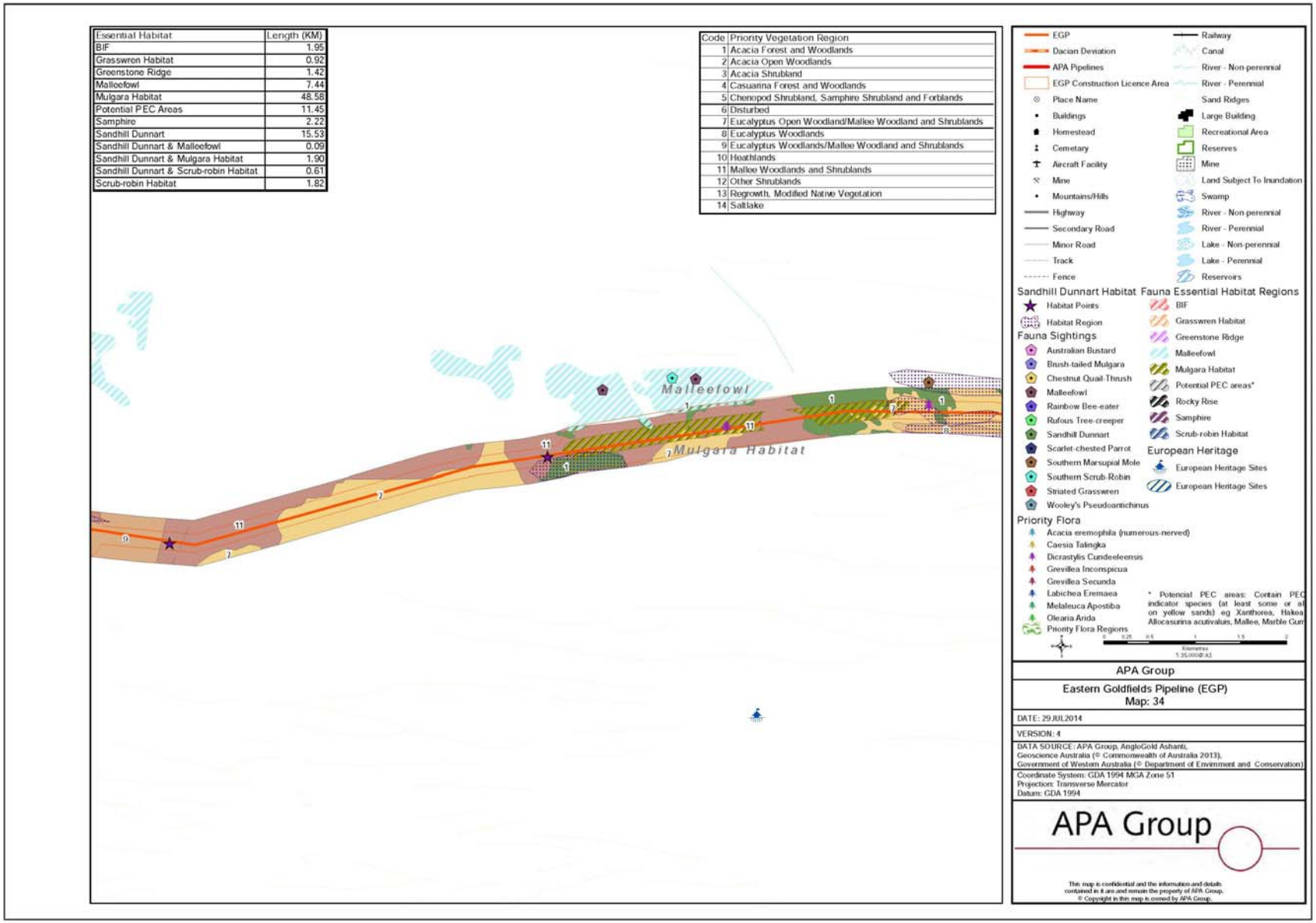
Essential Habitat | Length (KM)
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Mulgara Habitat | 48.58
Potential PEC Areas | 11.45
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Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Malleefowl
Mulgara Habitat
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
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Highway
Secondary Road
Minor Road
Track
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Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
* Potencial PEC areas: Contain PEC indicator species (at least some or all on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 34
DATE: 29JUL2014
VERSION: 4
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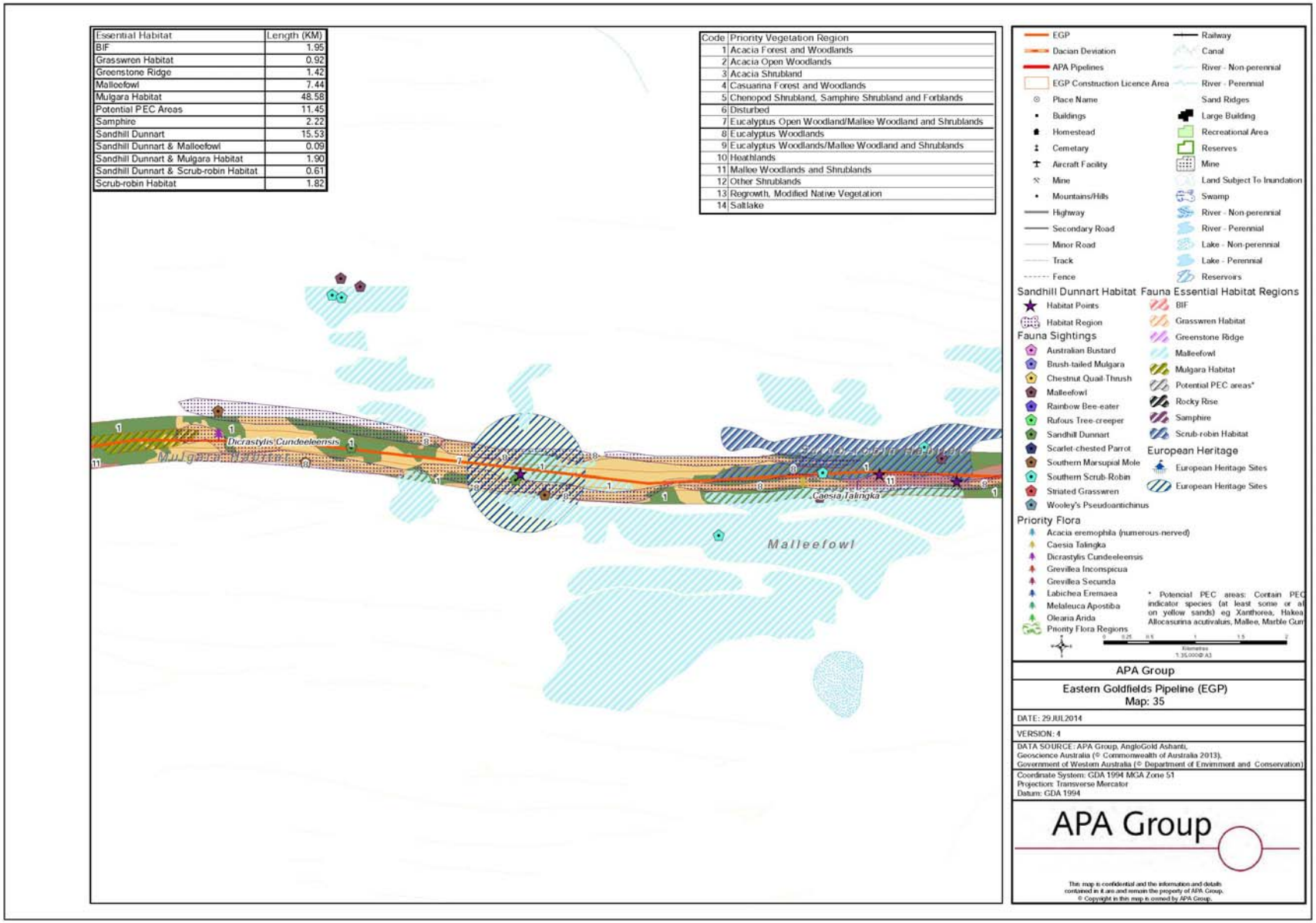
Essential Habitat | Length (KM)
BIF | 1.95
Grasswren Habitat | 0.92
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Malleefowl | 7.44
Mulgara Habitat | 48.58
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Samphire | 2.22
Sandhill Dunnart | 15.53
Sandhill Dunnart & Malleefowl | 0.09
Sandhill Dunnart & Mulgara Habitat | 1.90
Sandhill Dunnart & Scrub-robin Habitat | 0.61
Scrub-robin Habitat | 1.82
Code | Priority Vegetation Region
1 | Acacia Forest and Woodlands
2 | Acacia Open Woodlands
3 | Acacia Shrubland
4 | Casuarina Forest and Woodlands
5 | Chenopod Shrubland, Samphire Shrubland and Forblands
6 | Disturbed
7 | Eucalyptus Open Woodland/Mallee Woodland and Shrublands
8 | Eucalyptus Woodlands
9 | Eucalyptus Woodlands/Mallee Woodland and Shrublands
10 | Heathlands
11 | Mallee Woodlands and Shrublands
12 | Other Shrublands
13 | Regrowth, Modified Native Vegetation
14 | Saltlake
Dicrastylis Cundeeleensis
Caesia Talingka
Malleefowl
EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs
Sandhill Dunnart Habitat
Habitat Points
Habitat Region
Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus
Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat
European Heritage
European Heritage Sites
European Heritage Sites
Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions
* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum
APA Group
Eastern Goldfields Pipeline (EGP)
Map: 35
DATE: 29JUL2014
VERSION: 4
DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)
Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994
APA Group
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Essential Habitat	Length (KM)
BIF	1.95
Grasswren Habitat	0.92
Greenstone Ridge	1.42
Malleefowl	7.44
Mulgara Habitat	48.58
Potential PEC Areas	11.45
Samphire	2.22
Sandhill Dunnart	15.53
Sandhill Dunnart & Malleefowl	0.09
Sandhill Dunnart & Mulgara Habitat	1.90
Sandhill Dunnart & Scrub-robin Habitat	0.61
Scrub-robin Habitat	1.82

Code	Priority Vegetation Region
1	Acacia Forest and Woodlands
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3	Acacia Shrubland
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9	Eucalyptus Woodlands/Mallee Woodland and Shrublands
10	Heathlands
11	Mallee Woodlands and Shrublands
12	Other Shrublands
13	Regrowth, Modified Native Vegetation
14	Saltlake

EGP
Dacian Deviation
APA Pipelines
EGP Construction Licence Area
Place Name
Buildings
Homestead
Cemetary
Aircraft Facility
Mine
Mountains/Hills
Highway
Secondary Road
Minor Road
Track
Fence
Railway
Canal
River - Non-perennial
River - Perennial
Sand Ridges
Large Building
Recreational Area
Reserves
Mine
Land Subject To Inundation
Swamp
River - Non-perennial
River - Perennial
Lake - Non-perennial
Lake - Perennial
Reservoirs

Sandhill Dunnart Habitat
Habitat Points
Habitat Region

Fauna Sightings
Australian Bustard
Brush-tailed Mulgara
Chestnut Quail-Thrush
Malleefowl
Rainbow Bee-eater
Rufous Tree-creeper
Sandhill Dunnart
Scarlet-chested Parrot
Southern Marsupial Mole
Southern Scrub-Robin
Striated Grasswren
Wooley's Pseudoantichinus

Fauna Essential Habitat Regions
BIF
Grasswren Habitat
Greenstone Ridge
Malleefowl
Mulgara Habitat
Potential PEC areas*
Rocky Rise
Samphire
Scrub-robin Habitat

European Heritage
European Heritage Sites
European Heritage Sites

Priority Flora
Acacia eremophila (numerous-nerved)
Caesia Talingka
Dicrastylis Cundeeleensis
Grevillea Inconspicua
Grevillea Secunda
Labichea Eremaea
Melaleuca Apostiba
Olearia Arida
Priority Flora Regions

* Potencial PEC areas: Contain PEC indicator species (at least some or al on yellow sands) eg Xanthorea, Hakea Allocasurina acutivalvis, Mallee, Marble Gum

Kilometres
1:35,000@ A3

APA Group

Eastern Goldfields Pipeline (EGP)
Map: 36

DATE: 29JUL2014

VERSION: 4

DATA SOURCE: APA Group, AngloGold Ashanti, Geoscience Australia (© Commonwealth of Australia 2013), Government of Western Australia (© Department of Environment and Conservation)

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

APA Group

Appendix B MINING LEASES AND TENURE

Mining Lease	Exploration Licence	Prospecting Licence	Miscellaneous Licence
M 3800389	E 3801652	P 3803669	L 3800048
M 3800396	E 3802301	P 3803796	L 3800144
M 3800397	E 3802784	P 3803797	L 3800209
M 3800440	E 3802795	P 3804125	L 3800223
M 3800525	E 3802822	P 3904682	L 3900031
M 3800532	E 3802873	P 3905134	L 3900058
M 3800533	E 3802888	P 3905135	L 3900059
M 3800548	E 3802893	P 3905284	L 3900120
M 3800595	E 3802942	P 3905358	L 3900121
M 3800726	E 3900950	P 3905469	L 3900136
M 3800848	E 3901284		L 3900163
M 3800849	E 3901306		L 3900204
M 3900018	E 3901310		L 3800105
M 3900217	E 3901614		L 3900225
M 3900248	E 3901744		L 3900226
M 3900250	E 3901748		L 3900227
M 3900261	E 3901748		L 3900228
M 3900273	E 3901771		L 3900229
M 3900282	E 3901780		
M 3900301	E 3901796		
M 3900348	E 3901797		
M 3900359	E 3901801		
M 3900366	E 3901802		
M 3900395			
M 3900403			
M 3900423			
M 3900441			
M 3900501			
M 3900504			
M 3900737			
M 3900745			
M 3900868			
M 3900979			
M 3900980			
M 3901014			
M 3901015			
M 3901018			
M 3901088			
M 3901092			

Appendix C BROAD NVIS VEGETATION GROUPS

Landform	Vegetation Group
Breakaway	Casuarina Forests and Woodlands
	Mallee Woodlands and Shrublands
Clay-loam Plains	Acacia Forests and Woodlands
	Acacia Open Woodlands
	Casuarina Forests and Woodlands
	Chenopod shrublands, samphire shrublands and forblands
	Eucalypt Woodlands
	Mallee Woodlands and Shrublands
	Regrowth, modified native vegetation
Closed Depression	Acacia Forests and Woodlands
	Acacia Shrublands
	Other Shrublands
Dunes	Eucalypt Woodlands
	Mallee Woodlands and Shrublands
	Other Shrublands
Interdune Swales and Sandplain	Acacia Forests and Woodlands
	Eucalypt Open Woodlands/Mallee Woodland and Shrublands
	Eucalyptus Woodlands
	Heathlands
	Mallee Woodlands and Shrublands
	Regrowth, modified native vegetation
Rocky Hillslope	Acacia Forests and Woodlands
	Casuarina Forests and Woodlands