
Chapter 3: Existing Environment

May 2016

3 EXISTING ENVIRONMENT

3.1 Studies and Investigations

A Level One flora and vegetation assessment of the GGPP was undertaken by Botanica Consulting in November 2015 (Botanica 2015), whilst the Level One fauna assessment was completed in January 2016 (Botanica & Harewood 2016). Additionally numerous other fauna and flora studies have been completed for Gold Road's other projects in the area (Gruyere Gold Project and Central Bore Project) which overlap the GGPP alignment. These studies support the findings of the GGPP surveys.

Relevant baseline surveys undertaken and completed to-date are shown in Table 3-1.

Table 3-1: Summary of Baseline Surveys Undertaken for and Associated with the GGPP

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
Flora	Level 1 Flora and vegetation survey - Proposed Gas Pipeline Routes (Spring)	GGPP	Botanica Consulting	2015	<ul style="list-style-type: none"> Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>Two minor constraints were noted during the survey:</p> <ul style="list-style-type: none"> High quality ortho aerial imagery was not available for mapping. Vegetation was in various stages of fire regrowth.
	Level 1 flora and vegetation survey - Proposed Haul Road (Autumn).	Central Bore	Botanica Consulting	2011	<ul style="list-style-type: none"> Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>The only limitation to this survey was that fieldwork was not completed during the EPA's recommended time period. It was noted however that above average rainfall had occurred in the months prior to the survey and as such many plants were in flower.</p>

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 2 flora and vegetation survey (Spring).	Central Bore	Botanica Consulting	2011	<ul style="list-style-type: none"> • Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002).
	Level 2 flora and vegetation survey (Autumn).	Central Bore	Botanica Consulting	2012	<ul style="list-style-type: none"> • Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002).

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 1 flora and vegetation survey (Autumn).	Gruyere	Botanica Consulting	2014	<ul style="list-style-type: none"> • Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>There were two minor limitations to the survey these were:</p> <ul style="list-style-type: none"> • Timing of survey, weather and season - above average rainfall had been received before the survey; however the survey was conducted outside of optimal flowering period for the majority of species. • Survey intensity – Additional survey work may be required during optimal flowering periods.
	Level 2 flora and vegetation survey (Spring).	Gruyere	Botanica Consulting	2014	<ul style="list-style-type: none"> • Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>The only limitation to this survey was the fact that rainfall for the winter months preceding the survey were below average. This was considered a minor limitation.</p>

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 2 flora and vegetation survey (Autumn).	Gruyere	Botanica Consulting	2015	<ul style="list-style-type: none"> Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>The only limitation to this survey was relating to PATN data analysis due to BC staff only having basic statistical training. This was considered a minor limitation. The potential limitation was addressed by a peer review by an experienced statistician.</p>
	Level 1 flora and vegetation survey (Autumn)	Gruyere Borefields	Botanica Consulting	2015	<ul style="list-style-type: none"> Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b). Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). <p>There were two minor limitations to the survey these were:</p> <ul style="list-style-type: none"> Mapping reliability – high quality ortho aerial images were unobtainable, however aeriels used were considered sufficient. Area disturbance – vegetation was in various stages of fire regrowth.

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
Fauna	Fauna Assessment (Level 1) White Cliffs Yamarna Road Gas Pipeline Route (Spring)	GGPP	Greg Harewood/ Botanica Consulting	2015	<ul style="list-style-type: none"> • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia (EPA 2009). • Guidance Statement No. 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Assessment in Western Australia (EPA 2003). • Guidance Statement No 54a: Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia (EPA 2007). • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (EPA 2010).
	Level 1 vertebrate fauna survey (Autumn).	Central Bore	Greg Harewood/ Botanica Consulting	2011	<ul style="list-style-type: none"> • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (EPA 2010).

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 2 vertebrate fauna survey (Spring 2011, Autumn 2012).	Central Bore	Keith Lindbeck & Associates	2011	<ul style="list-style-type: none"> • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia. (EPA 2009). • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (EPA 2010). <p>The single limitation noted during this survey was the inability to access and dig pit traps into the granite areas.</p>

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 1 vertebrate fauna survey (Autumn).	Gruyere	Greg Harewood/ Botanica Consulting	2014	<ul style="list-style-type: none"> • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia (EPA 2009). • Guidance Statement No. 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Assessment in Western Australia (EPA 2003). • Guidance Statement No 54a: Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia (EPA 2007). • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (EPA 2010). <p>Limitations for this survey included:</p> <ul style="list-style-type: none"> • No seasonal sampling being undertaken. • Some fauna species have been reported to potentially occur in the survey

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
	Level 2 vertebrate fauna survey (Spring).	Gruyere	Rapallo Environmental	2014	<ul style="list-style-type: none"> • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia (EPA 2009). • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessments (EPA 2010). <p>Two limitations were noted during this survey, they are:</p> <ul style="list-style-type: none"> • Proportion of fauna identified/recorded – Lower than anticipated numbers of species from common taxonomic groups were recorded. • Timing – hot, dry conditions may have contributed to lower than anticipated faunal abundance although survey timing did conform to EPA (2010) recommendations.

Aspect	Survey	Project	Undertaken By	Year Undertaken	Applicable Policy and Limitations
Short Range Endemics	Level 2 SRE Survey (Spring).	Gruyere	Greg Harewood	2015	<ul style="list-style-type: none"> • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia (EPA 2009). • Guidance Statement No. 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Assessment in Western Australia (EPA 2003) • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b) • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002) • Environmental Assessment Guideline12: Consideration of Subterranean Fauna in Environmental Impact Assessment in Western Australia (EPA 2013a).

3.2 Regional Setting

The GGPP lies within the Austin Botanical District and Helms 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). 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 GGPP located within the Great Victoria Desert bioregion and the Murchison bioregion of Western Australia. These bioregions are further divided into subregions, the Great Victoria Desert bioregion is divided into four subregions, Shield, Central, Maralinga and Kintore. The Murchison bioregion is divided into two subregions; Eastern Murchison and Western Murchison (Barton & Cowan, 2001; Barton & Cowan, 2001a).

The White Cliffs Road survey area is located within the Shield (GVD1) and Central (GVD2) of the Great Victoria Desert bioregion and the Eastern Murchison (MUR1) of the Murchison bioregion (Botanica 2015).

3.3 Climate

The GVD is characterised by an arid climate, with hot summers and cool winters. Summer maximum temperatures average about 35°C, while winter minimum temperatures are around 5°C. Rainfall is related both to locally generated thunderstorms and to dissipating tropical cyclones tracking south-east. Thunderstorm activity tends to be greatest between October and December when cool airflows from the south wedges beneath humid north-westerly winds. Remnant cyclonic activity is greatest between January and May, reflecting the tropical wet season in the north of the state.

Yamarna operated as a weather station from 1967 to 1998; the nearest presently operating weather station is currently located at Laverton (Station No. 12305) 160 km to the west. Gold Road has installed and operated a private weather station at the Yamarna exploration camp since December 2014.

Average annual rainfall in the Yamarna region is 200 to 230 mm. The two mechanisms of rainfall generation in opposing seasons lead to a more evenly distributed annual rainfall distribution than in most of the state. Rainfall is highest in the remnant cyclone season. While relatively evenly distributed, rainfall is very infrequent with only about 30 rain days per year. Most of the annual rainfall is received in one or two significant events and many years have close to zero rainfall. Monthly evaporation data is available from the Bureau of Meteorology (BoM) for Yamarna and is shown in Figure 3-1.

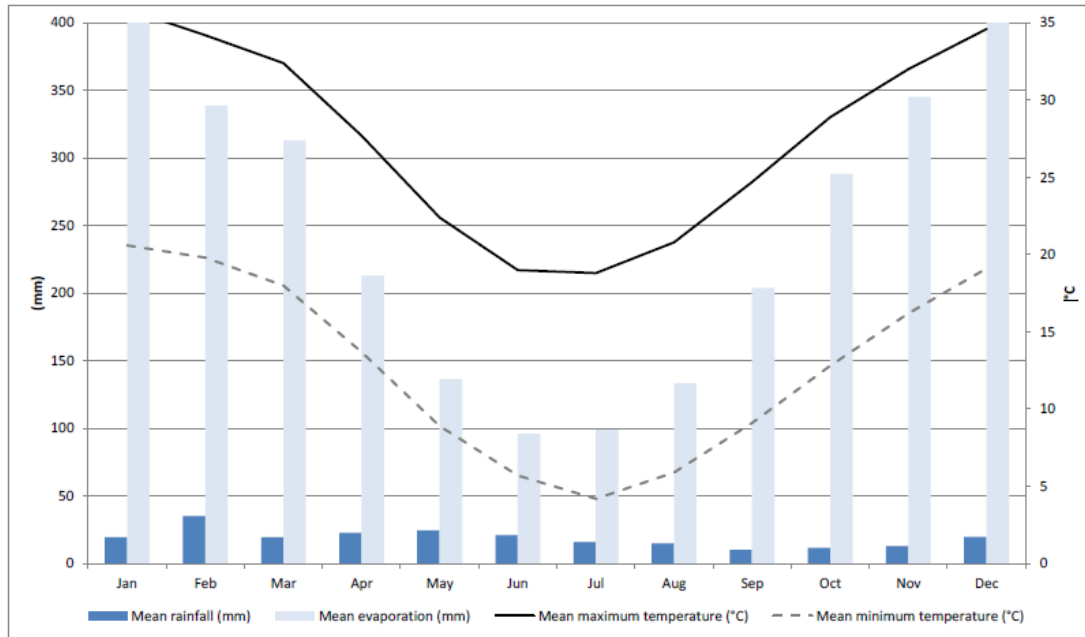


Figure 3-1: Monthly mean rainfall, evaporation and temperature data for Yamarna (19767 – 98) (BoM 2016)

3.4 Geology

(a) Regional

The Yamarna and Dorothy Hills greenstone belt forms part of the eastern-most geological province (Yamarna Terrane) of the Yilgarn Craton of Western Australia. The Yamarna and Dorothy Hills greenstone belts are aligned in a north-north westerly orientation adjacent to the 500 km long Yamarna shear zone, which is considered the western boundary of the Yamarna Terrane from the Burtville Terrane to the west. The Yamarna Belt felsic volcanic rocks have been dated as approximately 2,683 million years old (Archean) and is in faulted contact with plutonic igneous rocks of similar age, including quartz diorites, granites and quartz migmatites (Gold Road 2013). The Yamarna shear zone is host to significant gold mineralisation (Gold Road 2013). It is partially covered by Permian age glacial sediments of the Paterson Formation and cover is thicker at the southern portion of the Yamarna Belt. The Yamarna Belt is historically underexplored and highly prospective for gold mineralisation as well as other metals. Geologically similar to the prolific Kalgoorlie Gold Belt, the Yamarna Belt has a significant resource of gold.

3.5 Landform and Soils

The landscape of the Murchison bioregion comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains. It is dominated by the Archaean (over 2500 million years ago) granite greenstone terrain of the Yilgarn Craton. 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). 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 bioregion forms the southern part of the anti-clockwise whorl of dune fields of Australia. The dominating landforms are dunes and swales. There are local occurrences of playa lakes, associated lee-sided mounds and rocky prominences

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 (Botanica 2015). 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 Officer 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 (Botanica 2015).

The western end of the Shield subregion is underlain by the Yilgarn Craton. Here 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. The sandplains occur with patches of sand dunes running east-west and areas of moderate relief without-cropping and silcrete capped mesas and plateaus (breakaways). The subregion contains a major paleo channel 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 sand dunes running east-west, with occasional outcropping (breakaways) and quartzite hills provide minor relief (Barton & Cowan, 2001).

The GGPP is located within the Leemans Sandplain Zone 274 and Salinaland Plains Zone 279 of the Murchison Province 27 and the North-western Great Victoria Desert Zone 122 of the Gunbarrel Province 12. These zones are further divided into systems, which are displayed in Table 3-2 and Figure 3-2 (DAFWA 2014).

Table 3-2: Soil Landscape Systems within the White Cliffs Road survey area

Land System	Mapping Unit	Description
AB47	AB 47	Plains and dunes - longitudinal and ring dunes with interdune corridors and plain; occasional salt pans
Ararak System	Ar	Broad plains with mantles of ironstone gravel supporting mulga shrublands with wanderrie grasses.
Brooking System	Br	Prominent ridges of banded iron formation supporting mulga shrublands and occasional minor halophytic communities.
Bullimore System	Bu	Gently undulating sandplain with occasional linear dunes and stripped surfaces supporting spinifex grasslands with mallees and acacia shrubs.
BY7	BY7	Scarpland - low lateritic breakaway on granites and gneisses
Carnegie System	Ca	Salt lakes with fringing saline alluvial plains, kopi dunes and sandy banks, supporting halophytic shrublands and acacia tall shrublands.
Cyclops System	Cy	Saline alluvial plains with numerous drainage foci and sandy banks, supporting halophytic shrublands.
Gransal System	Gr	Stony plains and low rises based on granite supporting mainly halophytic low shrublands.
Gundockerta System	Gu	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.
Jundee System	Ju	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.
Laverton System	Lv	Greenstone hills and ridges with acacia shrublands.
Leonora System	Le	Low greenstone hills and stony plains supporting mixed chenopod shrublands.
Mileura System	279Mi	Saline and non-saline calcreted river plains with flood plains and calcrete platforms supporting variable tall shrublands, mixed halophytic shrublands and shrubby grasslands.
Mindura System	Mn	Low hills, ridges and outcrops of granite, gneiss and quartz above convex, quartz-strewn interfluves and lower plains supporting sparse acacia shrublands becoming denser in drainage floors.
Monk System	Mk	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.
My99	My99	Plains with extensive gravel pavements and small tracts of longitudinal dunes
Nubev System	Nu	Gently undulating stony plains, minor limonitic low rises and drainage floors supporting mulga and halophytic shrublands.
Sherwood System	Sh	Breakaways, kaolinised foot slopes and extensive gently sloping plains on granite supporting mulga shrublands and minor halophytic shrublands.
Tiger System	Tg	Gravelly hardpan plains and sandy banks with mulga shrublands and wanderrie grasses.

Land System	Mapping Unit	Description
Violet System	Vi	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.
Waguin System	Wg	Sandplains and stripped granite or laterite surfaces with low fringing breakaways and lower plains; supports bowgada and mulga shrublands with wanderrie grasses and minor halophytic shrublands.
Windarra System	Wn	Gently undulating stony plains and low rises with quartz mantles on granite, supporting acacia-eremophila shrublands.
Wyarri System	Wy	Granite domes, hills and tor fields with gritty-surfaced fringing plains supporting mulga and granite wattle shrublands

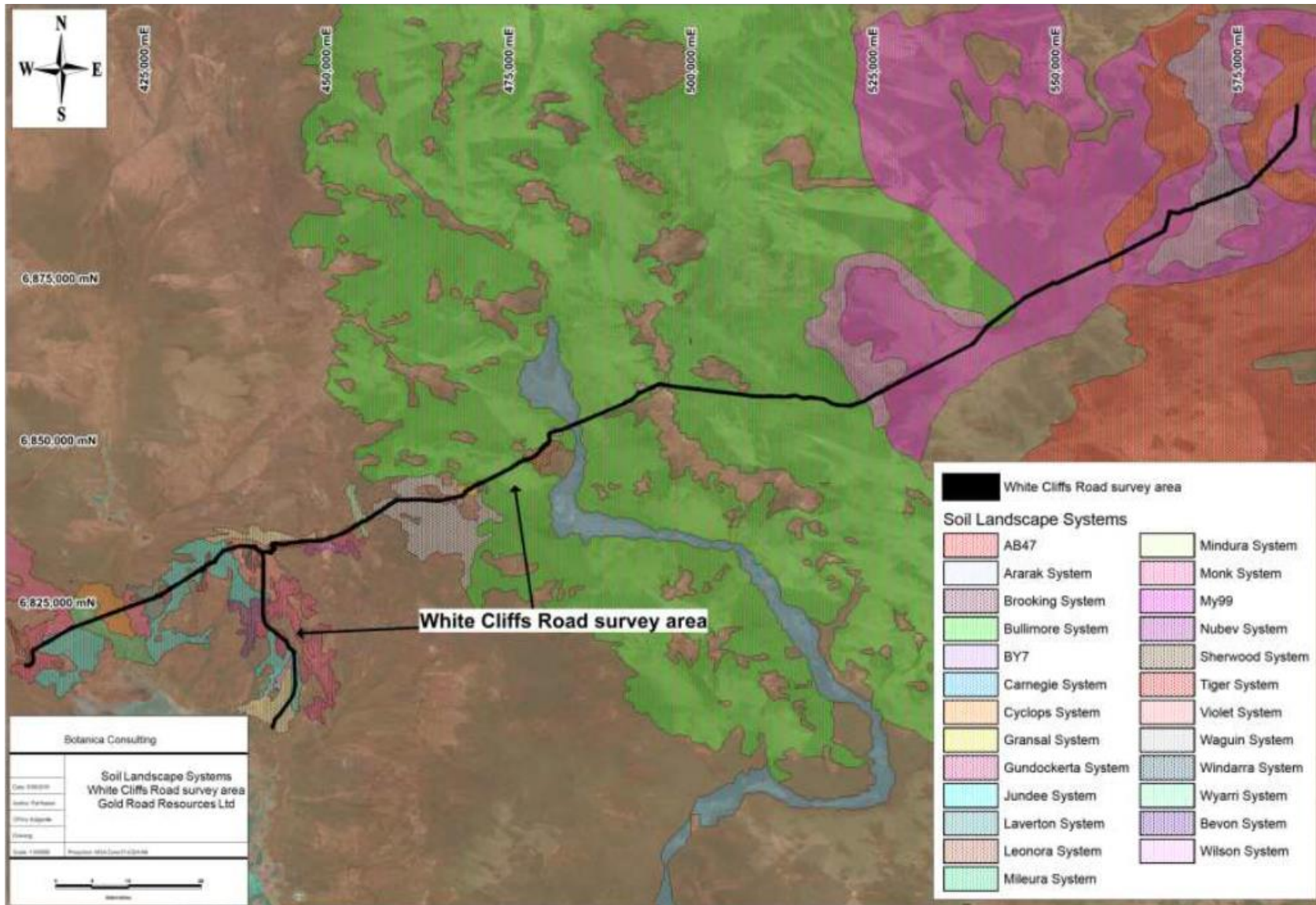


Figure 3-2: Map of Soil Landscape Systems within the White Cliffs Road survey area.

3.6 Hydrogeology

Detailed studies of the hydrogeology of the region along the GGPP alignment have not been undertaken. Hydrogeology is well understood and has been extensively studied at the Gruyere end of the alignment with modelling studies completed for both the Gruyere and Central Bore projects. This particular region contains hard rock and palaeochannel aquifer systems generally occurring within the weathered profile (saprolite and saprock) and fractured bedrock. The weathered profile and underlying fractured bedrock can form moderately permeable aquifers, and locally may be highly productive. They are characterised by secondary porosity and permeability through the break-down of the primary rock material. A significant resource of groundwater is stored within the weathered profile, although the unit is not necessarily permeable. In contrast, the fractured rock aquifer contains a very small portion of groundwater relative to its volume, but can have zones of high permeability.

Salinity of the groundwater along the GGPP alignment is expected to be high (5-17 mS/cm) based on samples collected to date from aquifers at Yamarna. The groundwater is also generally pH neutral (7.5-7.8 pH).

3.7 Surface Hydrology

The hydrology and flood characteristics along the GGPP alignment have not been assessed in great detail. There are no defined rivers along the alignments, and only three named ephemeral watercourses are mapped between Laverton and Gruyere (Skull Creek, Hagen Creek and Swincer Creek). It is expected that several other unnamed creeks would occur along the alignment on the regional scale, but are dry throughout the year except during periods of rain activity from seasonal thunderstorms and occasional cyclone remnants.

Based on the high evaporation rates (>3,030 mm annual evaporation) and the porous nature of soils in the region, surface water drains or evaporates quickly.

3.8 Flora and Vegetation

Botanica Consulting were commissioned by Gold Road to undertake a Level 1 flora and vegetation survey of two possible routes of the GGPP (Appendix 1). This referral only presents the findings of the preferred White Cliffs Road survey alignment. The White Cliffs Road survey area comprises of two sections; 211 km section (40 m wide) following the existing road reserve along White Cliffs Road and a 30 km section (100 m wide) extending south from Laverton on the Mount Weld Road to the Granny Smith Mine. The White Cliffs Road survey area covered a total area of approximately 1,255 ha.

The survey area was not located within any Environmentally Sensitive Areas or within any DPaW managed land; however did interested two Schedule 1 Areas as per the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These were:

- Centred on the abandoned Mt Morgan Mine and a section of the Old Laverton Road extending south west of Mt Morgan.
- Centred on the Laverton town site (Appendix 1).

As development of the project will require >10 ha of clearing and will involve clearing within a Schedule 1 Area a clearing permit will be required for the GGPP.

A summary of the findings for the survey is provided in Table 3-3.

Table 3-3: Summary of the findings for the vegetation and flora survey

Environmental Aspect	White Cliffs Road Survey Area (Gruyere to Laverton to Granny Smith)
Vegetation Communities and plant species	Fifty-four vegetation communities. Eight different landform types and seven NVIS major vegetation groups. Total 54 Families, 133 Genera and 314 Taxa.
Taxa Vegetation Condition	Ranged from good (fire, exploration, grazing, vehicle access, introduced species) to very good (fire, camel grazing). Majority Good. Vegetation in various stages of fire regrowth (5 to 10+ years).
Threatened Flora Taxa	No
Priority Flora taxa	<i>Olearia arida</i> (P4)
Introduced Flora Taxa	<i>Acetosa vesicaria</i> (Ruby Dock), <i>Cenchrus ciliaris</i> (Buffel Grass), <i>Centaurea melitensis</i> (Maltese Cockspur), <i>Cucumis myriocarpus</i> (Paddy Melon), <i>Lysimachia arvensis</i> (Pimpernel), <i>Nicotiana glauca</i> (Tree Tobacco), <i>Salvia verbenaca</i> (Wild Sage), <i>Schinus molle</i> (Peppercorn Tree), <i>Sonchus oleraceus</i> (Common Sow thistle) and <i>Tamarix aphylla</i> (Athel Tree).
Threatened Ecological Communities	No
Priority Ecological Communities	No
Environmentally Sensitive Areas	No
Schedule 1 Areas	2
DPaW Managed Land	No

A total of 54 vegetation communities were identified within the survey area. The communities comprised of eight different landform types and seven NVIS major vegetation groups. These communities were represented by a total of 54 Families, 133 Genera and 314 Taxa as listed in Appendix 1. The identified vegetation communities and a breakdown of their size as a percentage of the overall footprint are listed in Table 3-4. A map of the vegetation communities present within the survey area can be found as Appendix two of the Botanica report (Botanica 2015).

Table 3-4: Summary of vegetation communities and area within the White Cliffs Road survey area

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)
Breakaway	Casuarina Forests and Woodlands/ Acacia Shrublands	Low woodland of <i>Casuarina pauper</i> / <i>Acacia incurvaneura</i> over low scrub of <i>A. quadrimarginea</i> / <i>Dodonaea viscosa</i> and low heath of <i>Frankenia georgei</i> / <i>Prostanthera wilkieana</i> on breakaway	B-CFW/AF W1	10	0.9
Clay-Loam Plain	Acacia Forests and Woodlands	Low woodland of <i>Acacia aptaneura</i> over low scrub <i>Hakea preissii</i> / <i>A. colletioides</i> / <i>Atriplex bunburyana</i> and dwarf scrub <i>Maireana pyramidata</i> on clay-loam plain	CLP-AFW1	10	0.9
		Low forest of <i>Acacia incurvaneura</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Eremophila latrobei</i> subsp. <i>glabra</i> / <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> / <i>Eremophila jucunda</i> and dwarf scrub of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> on clay-loam plain	CLP-AFW2	40	3.5
		Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over open low scrub of <i>Eremophila margarethae</i> and open low grass of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-AFW4	10	30.9
	Acacia Open Woodlands	Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over heath of <i>Eremophila latrobei</i> subsp. <i>filiformis</i> / <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> and low grass of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-AOW1	50	4.4
		Open low woodland of <i>Acacia incurvaneura</i> / <i>Hakea preissii</i> over low scrub <i>Eremophila pantonii</i> / <i>Maireana pyramidata</i> / <i>Maireana sedifolia</i> / <i>Maireana glomerifolia</i> and dwarf scrub <i>Maireana triptera</i> on clay-loam plain	CLP-AOW2	45	4.0
		Open low woodland of <i>Acacia aptaneura</i> over low scrub of <i>Eremophila pantonii</i> , <i>Atriplex bunburyana</i> , <i>Cratystylis subspinescens</i> and <i>Maireana pyramidata</i> on clay-loam plain	CLP-AOW3	1	0.1
		Open low woodland of <i>Acacia ayersiana</i> / <i>A. caesaneura</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>A. tetragonophylla</i> / <i>Eremophila</i> spp. and dwarf scrub of <i>Maireana triptera</i> / <i>Solanum lasiophyllum</i> / <i>Ptilotus obovatus</i> and open low grass of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-AOW4	140	12.4
		Mallee Woodlands and Shrublands/ Acacia Forests and Woodlands	Open tree mallee of <i>Eucalyptus lucasii</i> / Low woodland of <i>Acacia incurvaneura</i> / <i>A. caesaneura</i> over heath of <i>Eremophila latrobei</i> subsp. <i>filiformis</i> and very open low grass of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-MWS/AF W1	8

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)
		Open tree mallee of <i>Eucalyptus youngiana</i> / Forest of <i>Acacia incurvaneura</i> / <i>A. mulganeura</i> over heath of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and dense low grass of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-MWS/AF W2	6	0.5
Drainage Depression	Acacia Open Woodlands	Open low woodland of <i>Acacia incurvaneura</i> over dwarf scrub of <i>Maireana pyramidata</i> / Low heath of <i>Frankenia georgei</i> and <i>Sclerolaena densiflora</i> in drainage depression	DD-AOW1	20	1.8
		Open low woodland of <i>Acacia caesaneura</i> / <i>A. macraneura</i> / <i>A. ayersiana</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Eremophila forrestii</i> subsp. <i>forrestii</i> / <i>Eremophila margarethae</i> / <i>Maireana triptera</i> and open low grass of <i>Eragrostis laniflora</i> in drainage depression	DD-AOW2	20	1.8
		Open low woodland of <i>Acacia aptaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>A. craspedocarpa</i> / <i>A. tetragonophylla</i> / <i>Eremophila margarethae</i> / <i>Atriplex bunburyana</i> and dwarf scrub of <i>Cratystylis subspinescens</i> in drainage depression	DD-AOW3	2	0.2
	Mallee Woodlands and Shrublands/ Acacia Forests and Woodlands	Very open tree mallee of <i>Eucalyptus lucasii</i> / Low forest of <i>Acacia burkittii</i> / <i>A. incurvaneura</i> / <i>A. caesaneura</i> over low scrub of <i>Eremophila latrobei</i> subsp. <i>latrobei</i> / <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> and dwarf scrub of <i>Eremophila gilesii</i> / <i>Ptilotus obovatus</i> in drainage depression	DD-MWS/AF W1	2	0.2
Quartz/Rocky Plain	Acacia Forests and Woodlands	Low woodland of <i>Acacia aptaneura</i> / <i>A. caesaneura</i> over heath of <i>Scaevola spinescens</i> / <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> / <i>Senna artemisioides</i> subsp. <i>helmsii</i> and low heath of <i>Ptilotus obovatus</i> / <i>Maireana triptera</i> on quartz/rocky plain	QRP-AFW1	80	7.1
		Low woodland of <i>Acacia incurvaneura</i> over heath of <i>Eremophila latrobei</i> subsp. <i>latrobei</i> and low heath of <i>Eremophila exilifolia</i> on quartz/rocky plain	QRP-AFW2	5	0.4
		Low woodland of <i>Acacia aptaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>Eremophila abietina</i> subsp. <i>ciliata</i> / <i>Senna artemisioides</i> subsp. <i>helmsii</i> and dwarf scrub of <i>Ptilotus obovatus</i> on quartz/rocky plain	QRP-AFW3	20	1.8

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)
		Low woodland of <i>Acacia aptaneura</i> / <i>A. caesaneura</i> over scrub of <i>A. burkittii</i> / <i>Senna artemisioides</i> subsp. <i>filifolia</i> and low scrub of <i>Ptilotus obovatus</i> / mid-dense hummock grass of <i>Triodia irritans</i> on quartz/rocky plain	QRP-AFW4	10	0.9
		Low woodland of <i>Acacia burkittii</i> over low scrub of <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> and mid-dense hummock grass of <i>Triodia irritans</i> on quartz/rocky plain	QRP-AFW5	1	0.1
		Open low woodland of <i>Acacia caesaneura</i> / open scrub of <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> over low scrub of <i>A. burkittii</i> / <i>Dodonaea lobulata</i> and dwarf scrub of <i>Ptilotus obovatus</i> on quartz/rocky plain	QRP-AFW6	5	0.4
		Low forest of <i>Acacia caesaneura</i> / <i>A. quadrimarginea</i> over low scrub of <i>Senna artemisioides</i> subsp. <i>helmsii</i> / <i>A. tetragonophylla</i> / <i>A. burkittii</i> / <i>Eremophila margarethae</i> / <i>Ptilotus obovatus</i> / <i>Solanum lasiophyllum</i> and dwarf scrub of <i>Maireana triptera</i> on quartz/rocky plain	QRP-AFW7	65	5.7
		Low woodland of <i>Acacia aptaneura</i> / <i>A. caesaneura</i> / <i>A. incurvaneura</i> over open low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Senna artemisioides</i> subsp. <i>filifolia</i> and dwarf scrub of <i>Ptilotus obovatus</i> / open low grass of <i>Eragrostis eriopoda</i> on quartz/rocky plain	QRP-AFW10	20	1.8
	Acacia Open Woodlands	Open low woodland of <i>Acacia caesaneura</i> over low scrub of <i>Eremophila pantonii</i> / <i>Ptilotus obovatus</i> and dwarf scrub of <i>Maireana triptera</i> on quartz/rocky plain	QRP-AOW1	16	1.4
	Casuarina Forests and Woodlands	Low woodland of <i>Casuarina pauper</i> over heath of <i>Eremophila scoparia</i> / <i>Senna artemisioides</i> subsp. <i>x artemisioides</i> and low heath of <i>Ptilotus obovatus</i> / <i>Maireana triptera</i> on quartz/rocky plain	QRP-CFW1	5	0.4
	Eucalypt Woodlands	Open low woodland of <i>Eucalyptus gypsophila</i> over low scrub of <i>Eremophila scoparia</i> and dwarf scrub of <i>Ptilotus obovatus</i> on quartz/rocky plain	QRP-EW1	1	0.1
	Malle Woodlands and Shrublands	Open shrub mallee of <i>Eucalyptus trichopoda</i> over open low scrub of <i>Eremophila pantonii</i> and dwarf scrub of <i>Tecticornia disarticulata</i> on quartz/rocky plain	QRP-MWS1	2	0.2

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)
Rocky Hillslope	Acacia Forests and Woodlands	Open low woodland of <i>Acacia quadrimarginea</i> over heath of <i>Eremophila abietina</i> subsp. <i>ciliata</i> and dwarf scrub of <i>Ptilotus obovatus</i> on rocky hillslope	RH-AFW1	1	0.1
		Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>Scaevola spinescens</i> / <i>Senna cardiosperma</i> and dwarf scrub of <i>Ptilotus obovatus</i> / <i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925) on rocky hillslope	RH-AFW2	35	3.1
		Low Forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Dodonaea rigida</i> / <i>Senna</i> spp. and dwarf scrub of <i>Ptilotus obovatus</i> on Banded Ironstone Hill	RH-AFW3	35	3.1
Sandplain	Acacia Forests and Woodlands	Low forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-AFW1	5	0.4
		Low forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over low scrub of mixed shrubs and dwarf scrub of <i>Eremophila gilesii</i> / mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-AFW2	5	0.4
		Forest of <i>Acacia aptaneura</i> / <i>A. caesaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> and dense tall grass of <i>Eragrostis eriopoda</i> in sandplain.	S-AFW3	15	1.3
		Forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-AFW4	30	2.7
		Low woodland of <i>Acacia aptaneura</i> / <i>A. caesaneura</i> / <i>A. incurvaneura</i> over open low scrub of <i>A. mulganeura</i> / <i>Eremophila latrobei</i> subsp. <i>latrobei</i> and dense hummock grass of <i>Triodia irritans</i> in sandplain	S-AFW5	15	1.3
		Low woodland of <i>Acacia aptaneura</i> / <i>A. incurvaneura</i> over heath of <i>Cratystylis subspinescens</i> and dwarf scrub of <i>Frankenia setosa</i> / mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-AFW6	15	1.3
		Forest of <i>Acacia caesaneura</i> over scrub of <i>A. ramulosa</i> var. <i>ramulosa</i> / <i>Senna artemisioides</i> subsp. <i>filifolia</i> and low heath of <i>Ptilotus obovatus</i> in sandplain	S-AFW7	5	0.4

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)
		Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over low scrub of <i>Atriplex bunburyana</i> , <i>Scaevola spinescens</i> , <i>Acacia tetragonophylla</i> , <i>Hakea kippistiana</i> and low grass of <i>Aristida contorta</i> in sandplain	S-AFW8	1	0.1
	Eucalypt Woodlands	Low woodland of <i>Eucalyptus gongylocarpa</i> over heath of <i>Acacia abrupta</i> / <i>A. ligulata</i> and dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-EW1	34	3.0
	Eucalypt Woodlands/Mallee Woodlands and Shrublands	Low woodland of <i>Eucalyptus gongylocarpa</i> over shrub mallee of <i>E. youngiana</i> and mid-dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-EW/MW S1	112	9.9
	Mallee Woodlands and Shrublands/ Acacia Forests and Woodlands	Open tree mallee of <i>Eucalyptus trivalva</i> / Low woodland of <i>Acacia craspedocarpa</i> over open low scrub of <i>A. desertorum</i> var. <i>desertorum</i> / <i>A. ligulata</i> and mid-dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-MWS/AF W1	10	0.9
		Very open tree mallee of <i>Eucalyptus youngiana</i> / Open low woodland of <i>Acacia caesaneura</i> over low scrub of <i>A. ligulata</i> and hummock grass of <i>Triodia basedowii</i> in sandplain	S-MWS/AF W2	6	0.5
	Mallee Woodlands and Shrublands	Open tree mallee of <i>Eucalyptus youngiana</i> / <i>E. trivalva</i> over heath of <i>Acacia abrupta</i> and dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-MWS1	26	2.3
		Open tree mallee of <i>Eucalyptus concinna</i> / <i>E. youngiana</i> over heath of <i>Acacia desertorum</i> var. <i>desertorum</i> / <i>A. grasbyi</i> and low heath of <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> / mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS2	82	7.3
		Open tree mallee of <i>Eucalyptus concinna</i> over low scrub of <i>Eremophila latrobei</i> subsp. <i>filiformis</i> and mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS3	7	0.6
		Open tree mallee of <i>Eucalyptus glomerosa</i> / <i>E. youngiana</i> over low scrub of <i>Acacia ligulata</i> and dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS4	2	0.2
		Open tree mallee of <i>Eucalyptus youngiana</i> over heath of <i>Acacia desertorum</i> var. <i>desertorum</i> / <i>A. grasbyi</i> and low heath of <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> / mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS5	2	0.2

Landform	NVIS Vegetation Group	Vegetation Community	Code	Area (ha)	Area (%)	
		Open tree mallee of <i>Eucalyptus youngiana</i> over low scrub of <i>Acacia desertorum</i> var. <i>desertorum</i> and mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS6	12	1.1	
		Tree mallee of <i>Eucalyptus youngiana</i> over low scrub of <i>Acacia ligulata</i> and dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-MWS7	7	0.6	
		Open tree mallee of <i>Eucalyptus trivalva</i> over low scrub of <i>Acacia pachyacra</i> / <i>Senna artemisioides</i> subsp. <i>filifolia</i> and mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-MWS19	5	0.4	
	Regrowth, modified native vegetation	Regrowth open low scrub of <i>Acacia abrupta</i> over dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-RMNV1	7	0.6	
		Regrowth open tree mallee of <i>Eucalyptus youngiana</i> over low scrub of <i>Acacia desertorum</i> var. <i>desertorum</i> / <i>A. grasbyi</i> and low heath of <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> /mid-dense hummock grass of <i>Triodia irritans</i> in sandplain	S-RMNV2	18	1.6	
		Regrowth low woodland of <i>Eucalyptus gongylocarpa</i> over shrub mallee of <i>E. youngiana</i> and mid-dense hummock grass of <i>Triodia basedowii</i> in sandplain	S-RMNV3	19	1.7	
		Regrowth open tree mallee of <i>Eucalyptus trivalva</i> over very open shrub mallee of <i>E. youngiana</i> and low heath of <i>Alyogyne pinoniana</i> / <i>Sida calyxhymenia</i> in sandplain	S-RMNV4	25	2.2	
	Sand Dune	Eucalypt Woodlands/Mallee Woodlands and Shrublands	Open low woodland of <i>Eucalyptus gongylocarpa</i> over open shrub mallee of <i>E. youngiana</i> and mid-dense hummock grass of <i>Triodia basedowii</i> on sand dune	SD-EW/MW S1	1	0.1
	Total				1131	100

(a) Conservation Significant Species

Flora of conservation significance identified in the desktop assessment as potentially occurring within the survey area were targeted during the field assessment. No Threatened Flora taxa pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950* or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were identified along the alignment. Two Priority Flora taxa were recorded *Thryptomene nealensis* (P3) and *Olearia arida* (P4) within the survey area. Although the DPaW database identifies *Calytrix warburtonensis* (P2), this species was not located within the survey area, but some 60 m to the north of the GGPP survey area (Botanica 2015). *Figure 3-3* illustrates the locations of the identified Priority Flora.

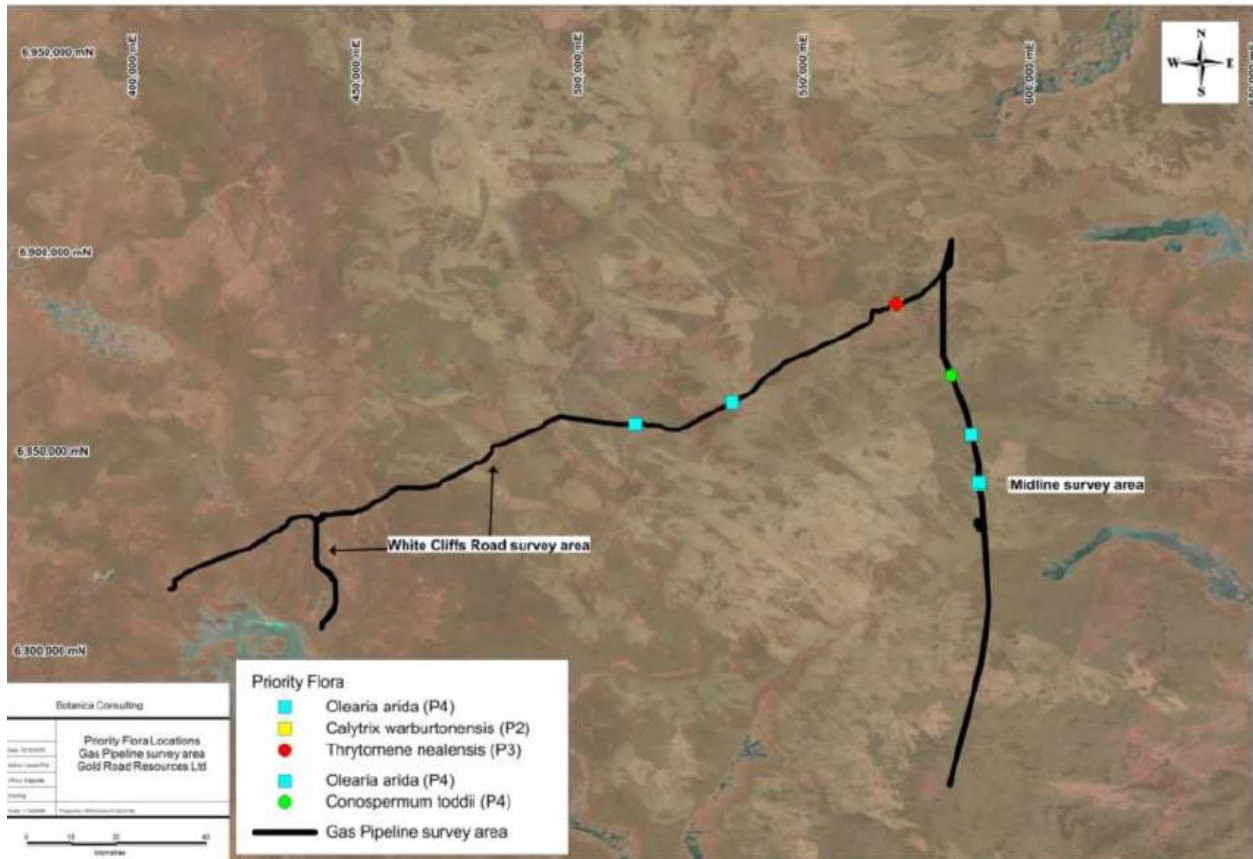


Figure 3-3: Priority Flora locations recorded by Botanica Consulting in relation to the Gas Pipeline survey area

Thryptomene nealensis (P3)

This taxon is described as a shrub that can grow to 0.3 m high. It produces pink flowers, and it is found on lateritic breakaways (WAHERB, 2015). One location of this taxon was identified during an earlier survey approximately 60 m north of the White Cliffs Road (GGPP) survey area. The location of this taxon has been previously formally lodged with DPaW. Location details of this taxon are provided in Appendix 1. *Thryptomene nealensis* was recorded within the Low woodland of *Casuarina pauper*/*Acacia incurvaneura* over low scrub of *A. quadrimarginea*/*Dodonaea viscosa* and low heath of *Frankenia georgei*/*Prostanthera wilkieana* on breakaway vegetation community.

Olearia arida (P4)

Olearia arida is described as an erect shrub, which grows up to 0.4 m high. It produces white flowers from July to September. It occurs on red or yellow sand on undulating low rises (WAHERB, 2015). *Olearia arida* was identified within three vegetation communities within the GGPP survey area:

- Low woodland of *Eucalyptus gongylocarpa* over heath of *Acacia abrupta*/*A. ligulata* and dense hummock grass of *Triodia basedowii* in sandplain
- Open tree mallee of *Eucalyptus trivalva*/ low woodland of *Acacia craspedocarpa* over open low scrub of *A. desertorum*/*A. ligulata* and mid-dense hummock grass of *Triodia basedowii* in sandplain
- Regrowth Low woodland of *Eucalyptus gongylocarpa* over shrub mallee of *E. youngiana* and mid-dense hummock grass of *Triodia basedowii* in sandplain.

Three locations were recorded in the White Cliffs Road survey. None of these locations were listed on the DPaW database; however this taxon was listed by DPaW as occurring within a 50 km radius of the survey area. A specimen of this plant and location details have been provided to DPaW to update their database. GPS locations are provided in Appendix [1](#).

(b) Threatened and Priority Ecological Communities

No Threatened Ecological Communities pursuant to Commonwealth and State legislation or Priority Ecological Communities as listed by DPaW were recorded within the GGPP.

(c) Weeds

An environmental weed is an introduced species that establishes itself into a natural ecosystem and modifies natural processes (usually adversely) and results in the decline of the communities they invade.

As listed in Table 3-3, a number of introduced taxon were identified within the GGPP survey area. Only one of these species, *Tamarix aphylla* (Athel Tree) is listed as a Declared Plant under Section 22 of the *Biosecurity and Agriculture Management Act 2007*.

3.9 Terrestrial Fauna and Habitat

A Level 1 fauna desktop and reconnaissance field survey of the GGPP area was undertaken by Greg Harewood (consultant zoologist) in the Spring of 2015 for Botanica (Botanica 2016). The survey area extended from the Gruyere Gold Project and followed the White Cliffs Road for a distance of 157 km to Laverton, at which point two route options were investigated. The first extends to the south for around 29 km, following the Mount Weld Road, whilst the second option heads further west a distance of about 38 km. Both options will join the existing EGP. The survey area covered approximately 1,255 ha.

A list of expected vertebrate fauna species likely to occur in the survey area was compiled from information obtained during the desktop survey. The list includes 29 mammals (including eight bat species), 103 bird, 107 reptile and 9 frog species that have previously been recorded in the general area, some of which have the potential to occur in or utilise at times, the GGPP survey area.

A total of 48 native fauna species were recorded over the combined two day survey period. This included 4 reptiles, 40 birds and 4 mammals. Observations of three introduced species using the survey area were also gathered (Appendix [2](#)).

(a) Habitat

Seven broad scale terrestrial fauna habitats within the GGPP survey area were identified based on landforms identified by Botanica (2015) with further often subtle subdivisions possible using vegetation structure. This information was supplemented with observations made during the survey. The extent of the identified broad scale fauna habitats within the survey area are shown in Figures 3a to 3i of Appendix 2 with a summary description of each given in *Table 3-5*

Table 3-5: Main terrestrial fauna habitats within the GGPP

No.	Fauna Habitat Name	Fauna Habitat Description	Area (ha)	Area (%)
1	Breakaways	<ul style="list-style-type: none"> Casuarina forests and Woodlands/Acacia Shrublands. 	8.0	~0.7
2	Clay-Loam Plains	<ul style="list-style-type: none"> Acacia Forests and Woodlands Acacia Open Woodlands Acacia Open Woodlands Mallee Woodlands Shrublands/Acacia Forests and Woodlands. 	341.0	~27.88
3	Drainage Depressions	<ul style="list-style-type: none"> Acacia Open Woodlands Mallee Woodlands Shrublands/Acacia Forests and Woodlands. 	49.0	~4.0
4	Quartz/Rocky Plains	<ul style="list-style-type: none"> Acacia Forests and Woodlands Acacia Open Woodlands, Casuarina Forests and Woodlands Eucalypt Woodlands Mallee Woodlands and Shrublands. 	324.0	~26.4
5	Rocky Hill Slopes	<ul style="list-style-type: none"> Acacia Forests and Woodlands. 	72.0	~5.9
6	Sandplains	<ul style="list-style-type: none"> Acacia Forests and Woodlands, Eucalypt Woodlands, Eucalyptus Woodlands/Mallee Woodlands and Shrubland, Mallee Woodlands and Shrublands/Acacia Forests and Woodlands, Mallee Woodlands and Shrublands or Regrowth, modified native vegetation 	460.0	~37.6
7	Sand Dunes	<ul style="list-style-type: none"> Eucalypt Woodlands/Mallee Woodlands and Shrublands 	1.0	~0.1

(b) Species of Conservation Significance

A review of the EPBC Act threatened fauna list, DPAW's Threatened Fauna Database and Priority List, unpublished reports and scientific publications by Botanica and Harewood (2016) identified 27 specially protected, migratory or priority fauna species as having been previously recorded or as being potentially present in the general vicinity of the GGPP survey area. Of these, only eight species of conservation significance are considered to have the potential to occur in the GGPP area. These eight species are detailed in Table 3-6 and discussed below. Of these five are birds, two are mammals and one is a reptile.

Table 3-6: Conservation Significant Species at the Gruyere Gold Pipeline Project

Species	Common Name	Conservation Status			Likelihood to occur in the GGPP area	Reason for Likelihood
		EPBC Act	WC Act	DPaW Priority		
<i>Emilio's margaretae</i>	Buff-snouted Blind Snake	-	-	P2	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Leipoa ocellata</i>	Malleefowl	VU	S3	-	Possible transient individuals only.	<ul style="list-style-type: none"> Foraging habitat
<i>Falco peregrinus</i>	Peregrine Falcon	-	S4	-	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Polytelis alexandrae</i>	Princess Parrot	VU	-	P4	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Merops ornatus</i>	Rainbow Bee-eater	Mg	S5	-	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Amytornis striatus</i>	Striated Grasswren (sand plain)	-	-	P4	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Dasyercus blythi</i>	Brush-tailed Mulgara	-	-	P4	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	-	-	P4	Possible	<ul style="list-style-type: none"> Breeding habitat Foraging habitat

- Buff-snouted Blind Snake *Anilius margaretae* – P2 (DPaW Priority Species)

The Buff-snouted blind snake (*Ramphotyphlops margaretae*) is listed by DPaW as a Priority 2. It is about 30 cm in length, non-venomous, burrowing worm-like snake that feeds mostly on the larvae and pupae of ants and termites (Botanica & Harewood 2016).

This species was not found in the GGPP survey area, however given the presence of suitable habitat (i.e., sand dunes and sand plains), the Buff-snouted snake could possibly be found along the pipeline route. While there are limited records for this species, it appears to have a wide distribution across the GVD. The lack of records could be attributed to the areas remoteness and the secretive habits of blind snakes.

- Malleefowl *Leipoa ocellata* – S3 (WC Act), Vulnerable (EPBC Act)

In Western Australia, the Malleefowl (*Leipoa ocellata*) is listed under the WC Act as Schedule 1: Fauna that is rare or likely to be extinct (Government of Western Australia 2014). Nationally, the species is listed under the EPBC Act as Vulnerable (Department of the Environment 2013). The Malleefowl belongs to an ancient family called *Megapodiidae* whose members build mounds for nesting (Marchant & Higgins 1993). The Malleefowl is found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or Acacia species. A sandy substrate and abundance of leaf litter are required for mound construction and heat regulation (Johnstone & Storr 1998). Clearance for agriculture has eliminated and fragmented much of the Malleefowl habitat, resulting in localised extinctions and fragmented populations.

A Level 1 survey undertaken by Botanica in 2016 found no evidence of this species. Habitat for breeding (i.e., nest mound construction) appeared unsuitable or at best marginal along the entire pipeline route primarily due to the generally sparse nature of the vegetation and/or a lack of leaf litter.

- Peregrine Falcon *Falco peregrinus* – S7 (WC Act)

The Peregrine Falcon (*Falco peregrinus*) is listed under the WC Act as Schedule 4 - Other Specially Protected Fauna. The species experienced a large population decline as a result of herbicide and pesticide use in the 1950's to the 1970's, which caused major reductions in breeding success. However, since the banning of such chemicals the species population has stabilised and expanded. In Western Australia, populations are stable in areas with granite outcrops and cliffs (Johnstone & Storr 1998). This species is uncommon throughout its range, preferring areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. In the absence of such habitats, the species is known to nest in trees using the nests of species from the family *Corvidae* and occasionally hollows for nesting (Marchant & Higgins 1993).

Previously recorded at Tropicana, the Peregrine Falcon was not observed during the survey (Botanica & Harewood 2016). The species potentially utilises some sections of the survey area as part of a much larger home range for foraging purposes only and would only be represented by a very small number of individuals for limited periods.

- Princess Parrot *Polytelis alexandrae* – Vulnerable (EPBC Act), P4 (DPaW Priority Species)

The Princess Parrot (*Polytelis alexandrae*) is listed by DPaW as Priority 4 and as Vulnerable under the EPBC Act. It is a slim, medium-sized parrot that grows to 40 to 45 cm in length (Higgins 1999). It is a colourful bird with a distinctive flight profile and flight movements and a harsh far-ranging call (Johnstone & Storr 1998). The Princess Parrot occurs in lightly wooded country of open mallee over spinifex or open marble gum (*Eucalyptus gongylocarpa*) woodland (Johnstone & Storr 1998). It is confined to arid regions of Western Australia, the Northern Territory and South Australia (Barrett et al. 2003, Johnstone & Storr 1998). In Western Australia it occurs in a broad band from the Great Sandy Desert in the north, across the Gibson and Tanami Desert to the Great Victoria Desert in the south (Johnstone & Storr 1998, Higgins 1999). The species is rare and highly nomadic, occurs over a very large area in remote or rarely visited regions and its movements are largely unknown (Higgins 1999). These habits make it difficult to determine its exact range or decide whether there has been a change in its population size and/or range. Historical records paint a picture of large range fluctuations over the decades but they do show a decline in the frequency of records from the periphery of its distribution since 1950 which might indicate a decline in range (Garnett & Crowley 2000).

Although not observed during the survey of the GGPP, this species may frequent the area at times. Given it is highly nomadic, its frequency of occurrence would be very low and generally temporary. Areas containing *Eucalyptus gongylocarpa* woodland are of most significance as they have the potential to contain larger trees with hollows that may represent potential breeding habitat.

- Rainbow Bee-eater *Merops ornatus* – Migratory (EPBC Act), S5 (WC Act)

The Rainbow Bee-eater is listed under the WC Act as Schedule 3 – Migratory birds protected under an international agreement. It is protected under Japan-Australia Migratory Bird Agreement (JAMBA). Under the EPBC Act the species is listed as Migratory. The Rainbow Bee-eater prefers open or lightly timbered areas, often near water. This species has been recorded in dry open sclerophyll forest, open woodlands and shrublands, including mallee, spinifex tussock grassland with scattered trees, chenopod shrubland with scattered trees and riparian or littoral assemblages. It is often seen around disturbed areas such as quarries, road cuttings and mines where exposed bare soil provides suitable breeding sites (Marchant and Higgins 1993). The Rainbow Bee-eater is a migratory bird and will move north from the southern areas of Australia during winter (Johnstone & Storr 1998).

This species is likely to use the survey area on occasions, though it would not be specifically attracted to the site. Some potential breeding habitat was noted in sections of the survey area where ground conditions were suitable, however population levels would not be significant. The Bee-eater was not observed during the survey (Botanica 2016).

- Striated Grasswren (sand plain) *Amytornis striatus striatus* - P4 (DPaW Priority Species).

The Striated Grasswren is listed by DPaW as Priority 4. The reason for listing is that the race has suffered loss and fragmentation of habitat as a result of clearing during the last century. This has resulted in reduced population size and the population being scattered in isolated remnants, making them more vulnerable to extinction. The Striated Grasswren is a small bird that spends most of its time on the ground hunting insects. It lives in small family groups in areas of mallee over spinifex (*Triodia* sp.) and it is exceptionally well camouflaged with its presence often detected only on calls. Striated Grasswren

have been shown to recolonise burnt areas after six or seven years and the habitat remains suitable up to around 40 years after fire (Rapallo 2015).

Although not observed during the field survey, this species was recorded at several locations along the Tropicana to Sunrise Dam pipeline route (Botanica & Harewood 2016). It is therefore possible that the Grasswren could occur in suitable habitat within the pipeline route, mainly in the central/eastern sections.

- Brush-tailed Mulgara *Dasyercus blythi* - P4 (DPaW Priority Species)

The Brush-tailed Mulgara (*Dasyercus blythi*) is listed by DPaW as Priority 4. The Brush-tailed Mulgara has a widespread, but patchy occurrence in sandy regions of arid central Australia (Menkhorst & Knight 2011). It occurs in a range of vegetation types including spinifex grassland on plains, sand ridges and mulga shrubland on loamy sand. The principal habitat is mature hummock grasslands of spinifex, especially *Triodia basedowii* and *T. pungens* where it lives in burrows that it digs on the flats between low sand dunes (Van Dyck & Strahan 2008).

Botanica found no evidence of the presence of the Brush-tailed Mulgara during the field survey, however portions of the GGPP area falls within the known range of the species and contains suitable habitat on the spinifex-covered sand plains and sand ridges. This indicates it is possible that the species occurs in the Gruyere Gold Project area, although in low numbers.

- Long-tailed Dunnart *Sminthopsis longicaudata* – P4 (DPaW Priority Species)

The Long-tailed Dunnart is classified as Priority 4 under the *WC Act*. This species lives in arid rocky areas and has been recorded from flat topped hills, plateaus, granite outcrops and rocky scree slopes. In the winter, the Long-tailed Dunnart feeds entirely on arthropods and under cold conditions this species may utilise torpor as a strategy to conserve energy (Van Dyck and Strahan 2008).

This species was recorded during the “Granny Deeps” fauna survey in 2011 (Terrestrial Ecosystems 2011) which lies in close proximity to the pipeline route near Laverton. It may therefore occur in suitable habitat, most likely in western sections of the pipeline route.

(c) Introduced Species

Three species of introduced mammals were recorded within the GGPP. These were the Dromedary Camel (*Camelus dromedaries*), Cattle (*Bos taurus*), and the European Rabbit (*Oryctolagus cuniculus*).

(d) Short Range Endemics

Previous invertebrate surveys undertaken within the Yamarna area indicate that potential SREs occur in the habitats present in some areas through which the proposed GGPP will pass. Based on available information it can be concluded that SRE invertebrates if present are unlikely to be significantly impacted on by installation and operation of a gas pipeline along the proposed route.

(e) Subterranean Fauna

Subterranean invertebrate fauna (stygo fauna and troglo fauna) have not been considered as part of this referral as no subsurface impacts are considered likely.

3.10 Social Environment

(a) Social Setting

The GGPP is located in the north-eastern Goldfields region of Western Australia. This area contains Unallocated Crown Land, reserves, pastoral and exploration leases and is used for grazing, tourism, exploration and mining.

The GGPP is located within the Shire of Laverton and the nearest permanent town is Laverton. The GGPP alignment approaches Laverton from the south, but by-passes the town to the east before heading south-west along White Cliffs Road. There are small retail shops in Laverton to support the local population in addition to tourists passing through the town. The only other community is Cosmo Newberry which is located approximately 80 km north-west of GGPPs end-point at the Gruyere Gold Project.

There are no existing facilities along the GGPP alignment. Gold Road has an exploration camp located within the Yamarna pastoral lease through which the end of the GGPP is aligned. This consists of an accommodation and messing arrangement that can cater for up to 30 exploration personnel, an office, a core yard, a storage/laydown area and a number of portable equipment items.

(b) Mining History

Excluding the existing disturbance created by the road formation within the road reserve, there are few other disturbances within the corridor. The road reserve crosses some mining operations closer to Laverton, for which the road formation is re-directed. A section of the pipeline will cross directly through M38/318 currently held by Focus Minerals (Laverton) Pty Ltd which has the Barnicoat Gold Plant and its associated infrastructure constructed on it. Additionally the pipeline may cross M38/595 and M38/512 held by Dacian Gold Limited and Aqua Alluvial Pty Ltd respectively.

(c) Pastoral

The GGPP alignment crosses two pastoral leases, both between Laverton and the end point at Gruyere Gold Project. These are the White Cliffs pastoral station and Yamarna pastoral station. The intention is to construct the gas pipeline within the road reserve that crosses these pastoral stations. The White Cliffs Road reserve effectively extinguishes these areas of the pastoral leases.

(d) Native Title

Only one Native Title claim exists along the GGPP alignment (Native Title Claim WC2008/005 registered on 6 August 2009). A Mining Agreement was signed on 3 May 2016 with the Yilka Claimant Group for the Gruyere Gold Project and all associated infrastructure (including the GGPP that crosses their claim area). The Mining Agreement provides for input into environmental management and monitoring, employment and contracting opportunities and cultural awareness programmes as well as payments based on production. Central Desert Native Title Services (CDNTS) are the legal representatives for the Claimant Group.

(e) Heritage

In order to determine the presence of items or sites of State, National or Aboriginal heritage, a search of the Heritage Council's State Heritage Register and the Department of Aboriginal Affairs' (DAA) register of

heritage places using the Heritage Inquiry System was undertaken for the projects development envelope. No registered Aboriginal heritage sites are located within the development envelope. Registered Heritage sites occurring within the wider area, but outside of the project footprint are:

- Registered Site 206 Mt Weld Rockhole 03 – Artefacts scatter and manmade structure.
- Registered Site 17247 Durang Gnamma Rockhole – Artefacts scatter and historical items.
- Registered Site 17248 Gnamma Rockhole (White Cliffs/Yamama Road) – Historical.

A search of the *EPBC Act* Protected Matters Database Search was undertaken to determine the presence of any Registers of the National Estate (RNE) listed under the Australian Heritage Council Act 2003 within the development envelope. The Protected Matters Database Search identified no RNEs.

3.11 Fire Regimes

Fires in this region are likely due to lightning strikes and will usually burn until they naturally extinguish. Fire has historically occurred in the project area, affecting both fauna and flora habitats and communities. Fire is a common occurrence though out the GVD and is listed as one of the existing disturbances in the area along with exploration activities and stock grazing.

In 2008 and 2012, two fires were prevalent in an area located approximately 122 km south-east of the GGPP (Botanica 2015).

3.12 Air Quality and Noise

The GGPP will pass around 2 km to the south of the town of Laverton. Laverton is a historic mining town that is resilient to works such as will occur with the construction of the GGPP. In addition and due to the distance from the town, the receptors of potential air quality and noise issues associated with the GGPP will only be the employees and anyone working within the immediate vicinity of the GGPP alignment. Due to the transient nature of pipeline construction, air and noise impacts will be limited to a short period of time.

Placement of the temporary Gruyere Gas Pipeline Project camp and work locations have taken into consideration the predominant wind directions and topography of the area to minimise any risk of potential air quality and noise impacts.

Chapter 4: Identification Of Environmental Factors

May 2016

4 Identification of Environmental Factors and Assessment of Potential Impacts

Based on a preliminary assessment, the following is a summary of the key environmental factors identified as being relevant to the proposal:

- Flora and vegetation.
- Terrestrial fauna.

Secondary factors that are considered less likely to be impacted by the Gruyere Gas Pipeline Project include:

- Terrestrial environmental quality.
- Inland waters environmental quality.
- Hydrological processes.

Other factors considered clearly unlikely to be impacted by the Gruyere Gas Pipeline Project include:

- Closure and rehabilitation.
- Landform.
- Air quality and atmospheric gases.
- Amenity.
- Human health.
- Heritage
- Offsets.
- Subterranean fauna.
- Coastal Processes.
- Benthic Communities and Habitat.

Information regarding each of the environmental factors including a description of the potential environmental impact and preliminary management and mitigation actions is contained in Table 4-1.

Table 4-2 summarises the reasoning behind the assessment of the environmental factors for the GGPP, whilst Figure 4-1: *Assessment of Likelihood of Significant Impact by Factor*

illustrates the likely significance of each of the environmental factors considering inherent and residual risk after management and mitigation measures have been applied. From this it can be seen that the residual risk for each factor is considered below the point where formal assessment under the *EP Act* is warranted.

Table 4-1: Assessment of Likely Impact on Environmental Factors by the Gruyere Gas Pipeline Project

Receiving Environment	Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
Land			
Landforms			
<i>To maintain the variety, integrity, ecological functions and environmental values of landforms and soils.</i>			
<p>The pipeline route occurs across 8 landform types:</p> <ul style="list-style-type: none"> • Sand dunes. • Sandplains. • Rocky hills slopes. • Quartz/Rocky Plain. • Closed Depression. • Drainage Depression. • Quartz-Loam Plain. • Breakaway. 	<ul style="list-style-type: none"> • Short term changes to landform as a result of construction of the Gas Pipeline and associated infrastructure. • Impacts on landform are only for the life of the GGPP (approximately 10-15 years). • Increased erosion within and adjacent to disturbed areas. • Changes to land natural levels due to borrow pits and dune crossings. 	<ul style="list-style-type: none"> • Environmental Assessment Guideline for Environmental Principles, Factors and Objectives, (EAG 8). (EPA 2015). • Guidance on the EPA Landforms Factor. Environmental Protection Bulletin Number 23 (EPA 2015). • Land Administration Act 1997 • Land Drainage Act 1925 • Soil and Land Conservation Act 1945. 	<ul style="list-style-type: none"> • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for the operations. • Vehicle movements will be confined to designated areas through the identification of access tracks prior to construction. • Equipment will be confined to designated construction areas. • Excavations will be profiled and rehabilitated as soon as practical, to minimise soil erosion and loss of soil water holding and infiltration capacity. • Vegetation and topsoil will be stripped and stockpiled for later use in rehabilitation activities. • Reinstatement of natural landform contours in areas affected by construction (returning land surface to natural levels) to assist with stabilisation. • Borrow pits, if required, will be rehabilitated with slopes battered to a 1:3 slope to reduce water erosion and ponding and blend with the surrounding environment. • Consultation will be undertaken with stakeholders regarding the future use of Gruyere Gas Pipeline Project access track and associated infrastructure.

Receiving Environment	Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
Flora and Vegetation			
<i>To maintain representation, diversity, viability and ecological function at the species, population and community level.</i>			
<p>No TEC or PECs.</p> <p>Total permanent clearing to be about 133 h.</p> <p>A total of 41 Vegetation communities in seven vegetation formations were noted within the Survey Area.</p> <p><i>Olearia arida</i> (P4) and <i>Thryptomene nealensis</i> (P3) recorded within the GGPP.</p>	<ul style="list-style-type: none"> • Localised loss of vegetation from clearing. • Fragmentation of land. • Spread of existing weed species and introduction of new weed species due to increased vehicle movement • Vegetation damage due to increased fire risk. • Alteration to vegetation communities resulting from changed drainage patterns. • Reduction in vegetation condition due to dust emissions. 	<ul style="list-style-type: none"> • Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004a) • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems. Guidance for the Assessment of Environmental Factors (EPA 2006). • <i>Wildlife Conservation Act 1950</i> • <i>Environmental Protection Act 1986</i> (Part V – clearing of native vegetation). • <i>Environment Protection Biodiversity Conservation Act 1999.</i> 	<ul style="list-style-type: none"> • The area of permanent land clearing will be minimised through careful project design. • The Construction RoW width will be managed to minimise vegetation clearing. • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for the project. • Topsoil will be stripped and stockpiled within the RoW for later use in rehabilitation. • Cleared vegetation will be stockpiled within the RoW. • Disturbed areas will be progressively rehabilitated following completion of construction. • Heavily compacted areas will be ripped to increase the probability of rehabilitation success. • Vegetation and topsoil will re-spread over rehabilitation areas to assist in stabilisation and revegetation. • Vehicle and equipment hygiene procedures will be implemented to minimise entry and spread of weeds and soil borne diseases. • Firefighting equipment will be available during construction and personnel trained in fire response. • Dust control measures will be implemented during construction. • Topsoil will be stored near the area from which it was collected. • Where required, appropriate clean on entry procedures will be applied. • A weed monitoring programme will be implemented following construction.

Receiving Environment	Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions	
Terrestrial Fauna				
<i>To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i>				
<p>Clearing of habitat types.</p> <p>Fauna mortality resulting from construction activities.</p> <p>Modification of surface and subsurface flow.</p> <p>Fauna mortality due to vehicle strikes.</p> <p>Increased feral animal populations.</p>	<p>The pipeline route occurs across 7 broad scale terrestrial fauna habitats based on landform types:</p> <ul style="list-style-type: none"> • Sand dunes. • Sandplains. • Rocky hills slopes. • Quartz/Rocky Plain. • Drainage Depression. • Clay-Loam Plains. • Breakaway. <p>Baseline studies have identified up to 248 native terrestrial vertebrate fauna species that may occur within the general area, including 29 mammals, 103 birds, 107 reptiles and 9 amphibian species.</p>	<ul style="list-style-type: none"> • Reduction in connectivity of fauna habitat. • Increased risk of fauna mortality from vehicle strikes during construction and operations. • Increased risk of fauna mortality from exposure to elements from entrapment within trench and excavation areas. • Death of fauna due to drowning in trenches during rain events. 	<ul style="list-style-type: none"> • Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA 2004b). • Guidance Statement No. 20: Sampling of Short Range Endemic Vertebrate Fauna for Environmental Impact in Western Australia (EPA 2009). • Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010). • <i>Wildlife Conservation Act 1950.</i> • <i>Environmental Protection Act 1986.</i> • <i>Environment Protection Biodiversity Conservation Act 1999.</i> 	<ul style="list-style-type: none"> • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for operations. • Disturbed areas will be rehabilitated as soon as practicable to facilitate fauna habitat restoration. • Traffic will be kept to designated tracks. • Speed limits will be applied during construction and operation of the pipeline to minimise the risk of fauna fatality or injury by moving vehicles. • Open trench not to exceed a length capable of being inspected and cleared by fauna clearing persons within timeframes stipulated by regulatory authorities. • During pipeline construction, fauna will be removed from open trench on a daily basis. Open trench sections will be inspected no later than 3 hours after sunrise (2.5 hours if daily temperatures are expected to exceed 35°C) and not more than half an hour prior to the backfilling of trenches. Records will be kept of animals removed from the trenches. • Fauna handling will be undertaken by appropriately qualified and experienced personnel. • Appropriate ramps will be installed at intervals of no more than 1,200m in the open trench to minimise fauna entrapment. • Appropriate fauna refuges (including floatation refuges where appropriate) to minimise fauna entrapment will be implemented to allow fauna to escape. • The site induction programme for the construction workforce will provide information on local fauna including their appearance and habitats. • Welded pipe strings will be capped to minimise fauna entry.

Receiving Environment	Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
Terrestrial Environmental Quality			
<i>To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.</i>			
<p>Clearing of vegetation and stripping topsoil.</p> <p>Contamination of surface or groundwater.</p>	<p>There are several soil types within the region of the GGPP being alluvial soils and sands (shallow, sandy and infertile); underlying the soils in low areas is a red-brown siliceous hard pan and red sands, lithosols, calcareous red earth soil, duplex soil and clays.</p>	<p>Contamination of soils through spillage of chemicals, hydrocarbons, hydrotesting water or saline water.</p> <p>Reduce quality and structure of soils and terrain, and maintain soil stability/integrity.</p>	<ul style="list-style-type: none"> • Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems. Guidance for the Assessment of Environmental Factors (EPA 2006). • <i>Contaminated Sites Act 2003</i> • National Environment Protection (Assessment of Site Contamination Measures) 1999. <ul style="list-style-type: none"> • Temporary soil erosion berms, drains, sediment barriers and settlement basins will be installed and maintained near water courses to preserve surface water quality. • Sediment and erosion controls will apply across identified surface water flow areas during pipeline construction. • Fuels, lubricants and chemicals will be stored and handled within containment facilities, such as bunded areas or spill trays, designed to prevent the release of spilt substances. • Refuelling of vehicles along the ROW will take place with a drip tray underneath to prevent spills. • All storage and handling equipment will be maintained in good condition. • No servicing or maintenance of vehicles will be undertaken within the construction Row, these activities will be undertaken off-site in appropriately equipped areas. • When surface water is present, diversion berms or drains shall be installed to divert water away from the construction area. • Landforms and natural levels to be reinstated during rehabilitation. • Spill kits will be located at strategic locations throughout the GGPP during construction and in vehicles. Employees will be trained in their use. •
Subterranean Fauna			
<i>To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i>			
	<p>The GGPP is not expected to impact upon stygofauna or troglofauna or their associated habitat.</p>	<ul style="list-style-type: none"> • Nil 	<ul style="list-style-type: none"> • Environmental Assessment Guideline 12 'Consideration of Subterranean Fauna in Environmental Impact Assessment in Western Australia' (EPA 2013a). • Draft Guidance Statement 54a 'Sampling Methods for Survey Considerations for Subterranean Fauna in Western Australia' (EPA 2007). <ul style="list-style-type: none"> • Landforms and natural levels to be reinstated during rehabilitation.

Receiving Environment		Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
			<ul style="list-style-type: none"> • <i>Wildlife Conservation Act 1950.</i> 	
Hydrological Processes				
<i>To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.</i>				
<p>Interception of surface water flows across the project area.</p> <p>Interception of surface water flows across the waterways.</p>	<p>There are no defined rivers along the alignments, and only three named ephemeral watercourses are mapped between Laverton and Gruyere:</p> <ul style="list-style-type: none"> • Skull Creek. • Hagen Creek. • Swincer Creek. <p>It is anticipated that several other unnamed ephemeral watercourses could occur along the alignment.</p> <p>Groundwater and surface water flow systems in the area are complex, variable and linked.</p>	<ul style="list-style-type: none"> • Altered waterbody flows and routes. • Localised reduction in surface water volumes. • Flooding of the excavation areas and associated infrastructure. • Death to fauna due to flooding of excavations • Ponding of water in infrastructure areas. • Contamination of water through uncontrolled discharge and water disposal. • Contamination of water through spills. 	<ul style="list-style-type: none"> • Position Statement 4 – Environmental Protection of Wetlands (EPA 2004c) • Department of Water (DoW). 2013. Western Australia Water in Mining Guideline. Water licensing delivery report series. Report No. 12. Perth, Western Australia. • <i>Environmental Protection Act 1986</i> (Part V – Works Approvals and Licensing). • <i>Rights in Irrigation and Water Act 1914.</i> 	<ul style="list-style-type: none"> • GGPP selected route has considered locations of ephemeral drainages and minimised disturbance of these. • GGPP design has incorporated surface water diversion measures to minimise risk of flooding or ponding of project infrastructure. • GGPP design has considered flood levels and made adequate provision to minimise risk of flooding affecting trench and project infrastructure. • Culverts or floodways will be installed where necessary to prevent blockage of ephemeral drainages. • Fuels, lubricants and chemicals will be stored and handled within containment facilities, such as bunded areas or spill trays, designed to prevent the release of spilt substances. • All watercourse areas will be marked on construction maps and flagged in the field as no refuelling areas. • Vehicular intrusion into the riparian zone and along stream banks shall be limited through fencing or flagging, and/or signage. • Disposal of trench and/or hydrotest water r shall be undertaken in a manner that shall avoid soil erosion, through the use of flow diffusers and energy dissipaters. • Water discharged on completion of hydro-testing will be of suitable quality for release to land.
Inland Waters Environmental Quality				
<i>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</i>				
Interception of surface water	Surface water flows generally to	<ul style="list-style-type: none"> • Contamination of underlying groundwater due to chemical spills. 	<ul style="list-style-type: none"> • Position Statement 4 – Environmental Protection of Wetlands (EPA 2004c). 	<ul style="list-style-type: none"> • GGPP design has considered locations of ephemeral drainages and minimised disturbance of these.

Receiving Environment		Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
flows across waterways.	the west. Several inland waters occur along the alignment of the GGPP with three named ephemeral watercourses (Skull Creek, Hagen Creek and Swincer Creek) and several other unnamed creeks.	<ul style="list-style-type: none"> Contaminated of ephemeral drainage lines from saline water or hydrocarbon spills. Increased sediment entering ephemeral watercourses during construction. 	<ul style="list-style-type: none"> Rights In Irrigation and Water Act 1914 	<ul style="list-style-type: none"> GGPP design has considered flood levels and made adequate provision to minimise risk of flooding affecting trench and Project infrastructure. Culverts or floodways will be installed where necessary to prevent blockage of ephemeral drainages. Water used for hydro-testing shall be disposed into the evaporation pond. Fuels, lubricants and chemicals will be stored and handled within containment facilities, such as bunded areas or leak trays, designed to prevent the release of spilt substances. All watercourse areas would be marked on construction maps and flagged in the field as no refuelling areas. Vehicular intrusion into the riparian zone and along stream banks shall be limited through fencing or flagging, and/or signage. Disposal of trench and/or hydrotest water shall be undertaken in a manner that shall avoid soil erosion, through the use of flow diffusers and energy dissipaters. The GGPP access road will be properly formed and compacted with appropriate drainage.
Air Quality				
<i>To maintain air quality for the protection of the environment and human health and amenity.</i>				
Construction activities. Transportation.	The nearest sensitive receptors to the GGPP is the town of Laverton. The Cosmo-Newberry settlement 80 km north-west is the only other near receptors to the project.	<p>Decrease in air quality from dust from land clearing and vehicle movement during construction.</p> <p>Decrease in air quality from emissions generated from engine exhaust emissions from construction equipment.</p>	<p>A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and Other Related Activities (DEC. 2011).</p> <p>Environmental Protection Bulletin No .24: Greenhouse Gas Emissions and Consideration of Projected Climate Change Impacts in the EIA Process (EPA 2015).</p> <p>National Environmental Protection (Ambient Air Quality) Measure (2003).</p>	<ul style="list-style-type: none"> Vehicle traffic will be confined to defined roads and tracks. Dust suppression measures will be implemented as necessary. Disturbed areas will be rehabilitated as they become available.

Receiving Environment	Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
Heritage <i>To ensure that historical and cultural associations are not adversely affected.</i>			
Aboriginal and historical heritage sites and values	<p>No known European heritage sites are within the GGPP development envelope.</p> <p>Four Aboriginal heritage sites have been identified near, but not within the development envelope for the GGPP.</p>	<p>Disruption of access to sites of cultural significance.</p> <p>Direct disturbance of Aboriginal heritage sites/artefacts.</p> <p>Disturbance and damage to new Aboriginal heritage sites/artefacts uncovered or identified during construction.</p>	<ul style="list-style-type: none"> Aboriginal Heritage Act (1972). Guidance Statement No. 41: Assessment of Aboriginal Heritage (EPA. 2004). <ul style="list-style-type: none"> GGPP design has considered the results of an ethnographic survey. Archeological surveys will occur before construction commences. GGPP inductions will include information on heritage aspects of the project area. Cultural heritage monitors will be engaged prior to clear and grade activities to ensure heritage sites are identified prior to land disturbance. In the event that site earthworks uncover potential Indigenous heritage material, construction work will stop in the immediate vicinity until all parties have been consulted and agreement has been reached on appropriate management of the artefacts.
Amenity <i>To ensure that impacts to amenity are reduced as low as reasonably practicable.</i>			
Land value	<p>The GGPP is for the most part remote and will not often be visited by people besides the traditional owners.</p> <p>The project will only be temporary with only a small access track</p>	<p>Disruption to traditional use of the land.</p> <p>Visual scar on the landscape if rehabilitation of disturbed areas is ineffective.</p>	<ul style="list-style-type: none"> A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and Other Related Activities (DEC. 2011). Health Act (1911).

Receiving Environment		Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
	remaining post construction.			
Human Health				
<i>To ensure that human health is not adversely affected.</i>				
Dust. Noise. Chemicals and contaminated waters.	The nearest sensitive receptors to the GGPP is the town of Laverton. The Sunrise Dam and Cosmo-Newberry Group 80 km north-west are the only other near receptors to the project.	To ensure that human health is not adversely affected. The GGPP area is for the most part remote and is not visited by people other than Traditional Owners. Potential impacts on health of employees relevant to the EP Act include: <ul style="list-style-type: none"> Noise. Air quality (particulates). Chemical exposure. 	<i>Environmental Protection Act 1986</i> (Part V – Works Approvals and Licensing).	<ul style="list-style-type: none"> Compliance with occupational hygiene requirements for noise, dust and chemicals in operational areas.
Offsets				
<i>To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.</i>				
Land clearing	No critical or high value environment assets as defined by the EPA will be affected by the GGPP	Nil	<ul style="list-style-type: none"> Environmental Protection Bulletin No. 1: Environmental Offsets (EPA. 2014). WA Environmental Offsets Guidelines. Perth, Western Australia. (Government of Western Australia 2014). WA Environmental Offsets Policy. Perth, Western Australia (Government of Western Australia 2011). 	Offsets are not anticipated to be required. GGPP design has considered critical and high value environmental assets and avoided direct or indirect impact on them.
Rehabilitation and Closure				
<i>To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State.</i>				
Construction ROW.	Rehabilitated land.	<ul style="list-style-type: none"> Wind and water erosion of disturbed areas. Off-site discharge of potential 	<ul style="list-style-type: none"> Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems. Guidance for the Assessment of Environmental Factors (EPA 2006). Assessment and Management of Contaminated Sites 	<ul style="list-style-type: none"> Disturbed areas will be rehabilitated on completion of construction i.e within 6 months of disturbance occurring. Monitoring will be implemented once areas are rehabilitated to ensure progression towards completion

Receiving Environment		Potential Impacts of Gruyere Gas Pipeline Project	Guidance and Policy	Preliminary Mitigation and Management Actions
Temporary Accommodation Camp if required.		<p>pollutants from un-rehabilitated land.</p> <ul style="list-style-type: none"> • Ineffective establishment of vegetation and habitat. • Disruption to or poor re-establishment of local drainage paths. 	(DER 2014).	<p>criteria.</p> <ul style="list-style-type: none"> • Fences and gates disturbed during construction will be repaired or replaced as per agreements with the relevant land owner. • Public roads and tracks used during construction shall be returned to their pre-construction state, or to a condition agreed to with the owner. • Decommissioning of above ground infrastructure and rehabilitation of disturbed areas will be integrated into the Gruyere Gold Project Mine Closure Plan.

Table 4-2: Summary of Assessment of Environmental Factors

Environmental Factor	Significance	Justification
Benthic Communities and Habitat	No	Not aquatic, not coastal.
Coastal Processes	No	Not aquatic, not coastal.
Flora and Vegetation	Yes	<p>Depending on whether either Option A or B is selected for the pipeline route, between 585 to 605 ha of vegetation will be required to be cleared for construction of the pipeline. The majority of this land disturbance will be short term (< 6 months) as disturbed areas are rehabilitated on completion of pipeline construction. Total permanent clearing is estimated to be 133 ha.</p> <p>No species or communities of conservation significance will be affected. Communities to be impacted are well represented on a regional basis. Vegetation within the selected routes has been affected by fire and current land use (pastoral and road reserves) and this has affected its current condition.</p>
Landforms	No	The pipeline route has been selected to avoid significant landforms. The pipeline will be buried to prevent significant changes in landform. Changes in landform associated with construction of borrow pits will be minor in nature.
Subterranean Fauna	No	No significant subsurface impacts are considered likely to occur.
Terrestrial Environmental Quality	No	Localised short term disturbance that will not cause significant disruption to pastoral station activities. Construction activities will be undertaken in a manner that minimises risk of land and soil contamination. Rapid rehabilitation of the majority of land disturbed during construction of the pipeline will ensure any impacts on terrestrial environmental quality are short term in nature.

Environmental Factor	Significance	Justification
Terrestrial Fauna	Yes	<p>Depending on whether either Option A or B is selected for the pipeline route, between 585 to 605 ha of vegetation will be required to be cleared for construction of the pipeline. The majority of this land disturbance will be short term (< 6 months) as disturbed areas are rehabilitated on completion of pipeline construction. Total permanent clearing is estimated to be 133 ha.</p> <p>No conservation significant fauna species or critical habitats will be affected. Disturbance to habitat will be short term due to rapid rehabilitation of disturbed areas after completion of pipeline construction.</p> <p>Implementation of standard fauna management practices for pipeline construction will ensure impacts on fauna will be minimised.</p>
Hydrological Processes	No	<p>The pipeline will be buried to prevent impacts to surface water flow patterns and volumes. The depth of burial will not impact on groundwater systems. Water required during construction will be sourced from existing licenced bores.</p>
Inland Waters Environmental Quality	No	<p>Watercourses in the GGPP area are limited in extent and ephemeral in nature. Impacts on water quality would be limited to the construction period which is short (<6 months). Standard construction management practices including erosion and sediment control, hydrocarbon and chemical storage will ensure impacts to water quality are prevented.</p>
Air Quality and Atmospheric Gases	No	<p>Impacts on air quality would be limited to the construction period (<6 months) and are related to dust emissions during earth moving and emissions from construction equipment. Such emissions will be transient and diffuse in nature. Application of dust control measures during construction will minimise potential impacts. There are no sensitive receptors for the majority of the pipeline route, with the town on Laverton being the closest receptor some 2 km from the pipeline.</p>
Amenity	No	<p>The pipeline will be buried and will have limited permanent surface infrastructure. There are no sensitive receptors given the remoteness of the Gruyere Gas Pipeline Project area.</p>

Environmental Factor	Significance	Justification
Heritage	No	The pipeline route has been selected to avoid heritage sites. Use of standard heritage monitoring practices and ongoing consultation with Traditional Owners during construction will minimise potential adverse impacts.
Human Health	No	<p>The nearest community is the town of Laverton located 2 km away. Potential health impacts would primarily be limited to the construction period (<6 months) and relate to dust and noise emissions. Given the separation distance and remoteness of the majority of the pipeline route, health impacts are considered unlikely.</p> <p>The pipeline will be signposted in accordance with applicable regulatory requirements to ensure the risks of interaction with the high pressure pipeline are minimised.</p>
Offsets	No	No critical or high value environment assets will be affected by construction or operation of the Gruyere Gas Pipeline Project. Offsets are not anticipated to be required.
Rehabilitation and Decommissioning	No	Rehabilitation of the majority (80%) of the land disturbance related to construction of the pipeline will be completed within 6 months of the disturbance occurring. Rapid re-use of stockpiled topsoil and vegetation will increase the likelihood of revegetation success in the short term. Above ground infrastructure associated with operation for the pipeline will be removed as part of the overall Gruyere Gold Project decommissioning and closure process.

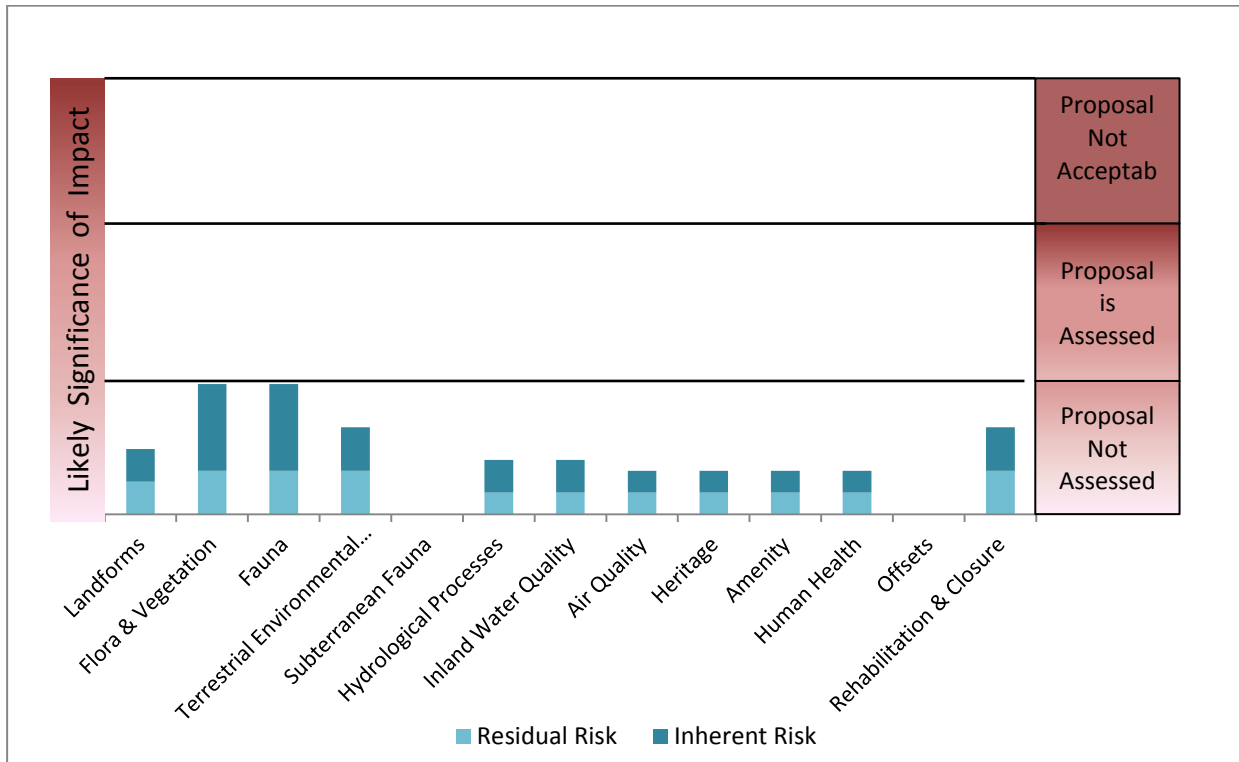


Figure 4-1: Assessment of Likelihood of Significant Impact by Factor

Chapter 5: Stakeholder Consultation

May 2016

5 STAKEHOLDER CONSULTATION

5.1 Stakeholder Identification

Gold Road continues to work towards the development and establishment of economically, environmentally and socially responsible practises throughout its business activities. This applies to the GGPP. A comprehensive consultation programme was commenced upon the discovery of the Central Bore deposit in 2009 and has since been expanded following the 2014 discovery of the Gruyere deposit and Gold Road's decision to develop it. The programme has been further expanded to include consultation with regards to the development of the GGPP. The programme was designed to ensure all relevant stakeholders were identified and effectively consulted in order to address potential stakeholder concerns or requirements with regards to the GGPP. Table 5-1 lists the stakeholders identified for the Gruyere Gas Pipeline Project.

Table 5-1: Key Stakeholders for the Gruyere Gas Pipeline Project

Stakeholder Sector	Organisation	Interest
State Government Departments and Agencies	Office of the Environmental Protection Authority (OEPA).	<ul style="list-style-type: none"> • Administers <i>EP Act</i>. • Part IV (<i>EP Act</i>) Environmental Impact Assessments.
	Department of Aboriginal Affairs (DAA).	<ul style="list-style-type: none"> • Indigenous and Native Title requirements. • Heritage, cultural, ethnographic and archaeological sites.
	Department of Mines and Petroleum (DMP).	<ul style="list-style-type: none"> • <i>Petroleum Pipelines Act</i>. • Petroleum Pipelines (Environment) Regulations. • Petroleum Pipelines (management of Safety of Pipeline Operations) Regulations. • Petroleum Pipelines (Occupational Safety and Health) Regulations. • Petroleum Pipeline Regulations. • Rehabilitation standards. • Safety in resource sector.
	Department of Environment Regulation (DER).	<ul style="list-style-type: none"> • Administers Part V (EP act), Industry Regulation and Licensing. • Contaminated Sites Act 2003.
	Department of Parks and Wildlife (DPaW).	<ul style="list-style-type: none"> • Administers <i>Wildlife Conservation Act 1950 (WC Act)</i>. • Flora, fauna and habitat conservation. • Baseline surveys and licences to take flora and fauna.

Stakeholder Sector	Organisation	Interest
	Department of Fire and Emergency Services (DFES).	<ul style="list-style-type: none"> • Fire breaks. • Provision of emergency services
	Pastoral Lands Board (PLB).	<ul style="list-style-type: none"> • Pastoral leases, stations.
	Main Roads Western Australia (MRWA).	<ul style="list-style-type: none"> • Use of public roads.
Local Government Authorities	Shire of Laverton (SoL).	<ul style="list-style-type: none"> • Use of public roads and infrastructure.
Indigenous Groups	<ul style="list-style-type: none"> • Native Title Claimant Group. • Central Desert Native Title Services (CDNTS). • Cosmo Newberry Aboriginal Corporation. 	<ul style="list-style-type: none"> • Access to and use of Traditional Owner land. • Cultural heritage values. • Native Title rights.
Underlying Land/Tenement Owners	<ul style="list-style-type: none"> • Focus Minerals (Laverton Pty Ltd • Redfeather Holdings Pty Ltd • Eastern Goldfields Mining Company • GSM Mining Company Pty Ltd • Northern Drilling Pty Ltd • Phosphate Australia Ltd • Ellen Resources Pty Ltd • Duketon Mining Ltd • AngloGold Ashanti Australia Ltd • Desert Ventures Pty Ltd • Resource Assets Pty Ltd • Gelnmurrin Pty Ltd • Murrin Murrin Holdings Pty Ltd • Central Australia Rare Earths Pty Ltd • Mt Weld Mining Pty Ltd • Aqua Alluvial Pty Ltd • Dacian Gold Limited 	<ul style="list-style-type: none"> • Land access approvals for baseline surveys and installation of linear infrastructure.

Stakeholder Sector	Organisation	Interest
Environmental Interest Groups	<ul style="list-style-type: none"> • Wildlife Society of Western Australia. • Conservation Council of Western Australia (CCWA). • Goldfields Naturalist Club. • Great Victoria Desert (GVD) Biodiversity Trust. 	<ul style="list-style-type: none"> • Potential interest in baseline surveys.

5.2 Consultation

Stakeholder management and consultation has been adopted by Gold Road throughout all aspects of its projects and business. The objective of Gold Roads consultation programme has been to enable individuals, groups and agencies with an interest in the proposed project to have access to up-to-date, relevant information regarding the projects, as well as providing a means for stakeholders to raise issues and concerns, and Gold Road with the means to respond to these.

Gold Road has carried out extensive direct consultation with neighbours, pastoralists, representatives of interested parties and regulatory agencies in the past several years during the design and development of its Gruyere Gold Project. This has included consultation with regards to support infrastructure, such as the GGPP. Presentations and information sessions were held to provide stakeholders with an overview of the project as well as information on potential impacts and how they will be managed. These sessions also provided a mechanism for participant feedback.

Details of consultation outcomes with stakeholders listed in Table 14 are provided in the Stakeholder Consultation Register in Appendix 3 . Gold Road will continue to genuinely engage with relevant stakeholders on matters associated with the GGPP to ensure stakeholder concerns are addressed and that potential impacts will be managed through implementation of best practice environmental management measures.

Chapter 6: EPA Principles

May 2016

6 EPA PRINCIPLES

The EPA has identified a set of principles for environmental management. Gold Road has considered these initially in the GGPP Pre-feasibility study (PFS) report. Further consideration of the EPA principles will be considered during the Gruyere Feasibility Study (FS) in 2016 when Gold Road’s environmental design standards will be incorporated and implemented in the engineering specifications for the GGPP. Details of how these have currently been considered in early GGPP design are provided in Table 6-1.

Table 6-1: Gruyere Gas Pipeline Project – Principles of Environmental Management

Principle	Application
<p>Precautionary Principle</p> <p>Where there are threats of serious irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • An assessment of the risk-weighted consequence of various options. 	<p>Gold Road will utilise baseline environmental investigations to identify potential impacts and assess the environmental risk of the GGPPs implementation on these aspects.</p> <p>Environmental risks will be considered when finalising options for key GGPP design choices.</p> <p>Gold Road commits to develop and implement measures to avoid serious or irreversible damage to the environment.</p>
<p>Intergenerational Equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>	<p>Gold Road commits to managing those environmental factors within its control such that future adverse impacts are minimised and that, wherever possible, the quality of the environment is maintained or enhanced.</p> <p>Long-term land management proposals are being discussed between Gold Road and the Native Title Claimant Group who are charged as the custodians of their Country to preserve and enhance environmental and cultural values of the region so that the land can be protected for future generations.</p> <p>Rehabilitation of the pipeline will be undertaken progressively as construction is completed with only an access track remaining for operational inspection and maintenance activities.</p>

Principle	Application
<p>Conservation of Biological Diversity and Ecological Integrity</p> <p>Conservation of biological diversity and ecological integration should be a fundamental consideration</p>	<p>The GGPP route has been design as far as practical to take into account and reduce any direct impacts it may have on conservation significant fauna and flora and thus maintain the biological diversity in the area.</p> <p>Biological studies undertaken as part of collation of baseline information for the project have greatly assisted the scientific community in understanding the biological diversity of this area.</p> <p>Gold Road undertakes to fully assess the effects of its operations, both direct and indirect, on the biological environment and to implement measures to protect remaining biodiversity. This assessment will be documented in the environmental approval submissions provided to regulatory authorities.</p>
<p>Improved Valuation, Pricing and Incentive Mechanisms</p> <ul style="list-style-type: none"> • Environmental factors should be included in the valuation of assets and services. • The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. • The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. • Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which benefit and/or minimise costs to develop their own solutions and responses to environmental problems. 	<p>Gold Road is committed to implementing proven, practical and economically viable technologies where practical and possible.</p> <p>Costs and environmental impact associated with power generation and energy use options were considered as part of the Scoping Study and then refined as part of the PFS. Diesel compared to natural gas or LNG/CNG was evaluated considering environmental life cycle analysis, environmental footprints, market drivers, taxation and economic advantages.</p> <p>Costs associated with GGPP operations as well as rehabilitation have been considered as part of the PFS and will be further refined as part of the DFS engineering designs.</p> <p>Gold Road recognises that project costs include mitigation, management and closure actions.</p>

Principle	Application
<p>Waste Minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p> <p>Wastes should be managed in accordance with the following order of preference:</p> <ul style="list-style-type: none"> • Avoidance. • Re-use. • Recycling. • Recovery. • Treatment. • Containment. • Disposal. 	<p>Waste minimisation principles have been considered in GGPP design. This includes:</p> <ul style="list-style-type: none"> • Re-use of topsoil and cleared vegetation in rehabilitation of areas during operations and post-mining. • Ensuring any discharge of water to the environment does not contain any contaminants and meets industry guidelines and best practise. • Disposal of putrescible wastes in either a purpose built onsite landfill or at an appropriate registered facility. • Reduce landfill by reusing and recycling materials where possible. • Minimising packaging wastes associated with consumable by importing in bulk and requiring return of packaging to suppliers where possible.

Chapter 7: Project Environmental Assessment Requirements

May 2016

7 PROJECT ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The GGPP is located in a remote greenfield location partially within a pastoral lease and as such there was a limited amount of environmental data available for the region prior to Gold Road's presence. Baseline environmental studies undertaken by Gold Road thus far have significantly contributed to the scientific knowledge of the area and have given Gold Road a well-developed understanding of the GGPP area, the surrounding environmental aspects and potential impacts.

Gold Road has engaged key stakeholders of the area since 2009 with regards to its exploration activities and potential mining projects and since 2015 with regards to the development of the GGPP. Gold Road intends to continue the stakeholder consultation programme as further environmental and engineering investigations are initiated and GGPP design details are refined.

Gold Road considers there are no significant environmental issues associated with the GGPP. This is primarily due to:

- Design of the pipeline route to avoid conservation significant flora, vegetation, fauna, ecological communities, heritage sites and surface water features.
- The short term nature of the construction period in any single area and rapid rehabilitation of disturbance related to burying of the pipeline.
- Small footprint of the remaining above ground infrastructure required for operation of the gas pipeline (about 133 ha).
- Location of the majority of the pipeline (75%) within an existing road reserve (White Cliffs Road) which has already been subject to disturbance.

Gold Road believe environmental issues associated with the GGPP can be managed effectively within the following regulatory frameworks:

- **Native Vegetation Clearing Permit:** This is a well-documented assessment process with opportunity for public comment. Impacts of land clearing can be adequately assessed by DMP using this process.
- **Mining Proposal:** This is a well-documented assessment process managed by DMP Environmental Officers. DMP Officers have a strong technical understanding of the potential impacts of gas pipelines and associated activities and what are appropriate management measures to safeguard the environment. Requirements for lodgement of an annual Mining Rehabilitation Fund fee will assist in minimising environmental liabilities to the State in the case of unplanned closure. A Mine Closure Plan (including supporting infrastructure) will be developed in accordance with EPA and DMP guidelines, incorporating progressive rehabilitation, closure monitoring and maintenance.
- **Environment Plan:** This is a management document which is designed to demonstrate that all environmental risks and impacts associated with a petroleum activity are reduced to as low as reasonably practicable, and at all times carried out in a manner consistent with the principles of ecologically sustainable development.

Chapter 8: Conclusion

May 2016

8 CONCLUSION

The Gruyere Gas Pipeline Project area is located in a remote greenfield area historically used for pastoral activities and mineral exploration. The pipeline will largely be located adjacent to White Cliffs Road in an existing road reserve which has been subject to prior land disturbance.

Limited baseline environmental information was available prior to Gold Road engaging specialists to conduct baseline studies. The information obtained from these studies has contributed to the scientific understanding of the area as well as allowing Gold Road to select a pipeline route that prevents and minimises adverse environmental impacts.

Gold Road has engaged key stakeholders of the GGPP since 2015; additionally stakeholder consultation has occurred since 2009 with regards to the Gold Road Central Bore and Gruyere Gold Project. Gold Road will continue the stakeholder consultation programme and effectively engage with key stakeholders throughout the life of the GGPP.

Gold Road believes that potential adverse environmental impacts associated with construction and operation of the GGPP are limited due to well thought-out environmental and engineering project designs. Any adverse impacts are able to be effectively managed using standard gas pipeline industry construction and operational practices. Key aspects that have potential to be impacted through land disturbance associated with construction of the pipeline have been identified to be (Table 4-1):

- Flora and vegetation.
- Terrestrial fauna.

After application of best practice management and mitigation measures, Gold Road believes the EPA objectives for these two key environmental factors can be met (Figure 4-1: *Assessment of Likelihood of Significant Impact by Factor*

).

Gold Road does not believe that formal assessment of the GGPP under Part IV of the *EP Act* is required. Gold Road believes that environmental impacts can be adequately assessed and implementation monitored through provisions of the *Petroleum Pipelines Act* and associated legislation and regulations.

Chapter 9: References

May 2016

9 REFERENCES

- APA Group (APA). 2014. *Eastern Goldfields Pipeline Project – General Supporting Documentation for Applications*.
- APA Group (APA). 2015. *Gold Road Resources Limited - Connection to The Eastern Goldfields Pipeline*. An unpublished report prepared for Gold Road Resources.
- Australian Pipeline Industry Association (APIA). 2013. *Code of Environmental Practice*.
- Australian Standard (AS) 2885.1. 2012. *Pipelines - Gas and Liquid Petroleum - Design and Construction*.
- Australian Standard (AS) 2885.2. 2012a. *Pipelines-Gas and Liquid Petroleum-Welding*.
- Australian Standard (AS) 2885.5. 2012b. *Pipelines - Gas and Liquid Petroleum - Field Pressure Testing*.
- Barrett, G. 2003. *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Hawthorn East, Vic.
- Barton, B. and Cowan, M. 2001. Great Victoria Desert 1 (GVD1 – Great Victoria Desert Shield subregion). In a Biodiversity Audit of Western Australia's 53 Biogeographic Subregions 2002.
- Barton B and Cowan M. 2001a. *Great Victoria Desert 1 (GVD2 - Great Victoria Desert Central Subregion)*. A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions 2002, Government of Western Australia.
- Beard, J.S. 1990. *Plant Life of Western Australia*, Kangaroo Press Pty Ltd, NSW.
- Botanica Consulting (Botanica). 2015. *Level one Flora and Vegetation Survey Proposed Gas Pipeline Routes*. Report prepared for Gold Road Resources Limited, November 2015.
- Botanica Consulting (Botanica) and Harewood, G. 2016. *Fauna Assessment (Level 1) White Cliffs Yamarna Road Gas Pipeline Route*. Report prepared for Gold Road Resources Limited, January 2016.
- Cowan. 2001. *A Biodiversity Audit of Western Australia's 53 Biogeographical Region in 2001- MUR1 (Eastern Murchison Subregion)*, Department of Conservation and Land Management.
- Curry, PJ, Payne, AL, Leighton, KA, Hennig, P & Blood, and DA. 1994. *An Inventory and Condition Survey of the Murchison River Catchment and Surrounds, Western Australia, Department of Agriculture, Western Australia, Technical Bulletin No. 84*.
- Department of Agriculture and Food WA (DAFWA). 2014. *Soil Landscape System of Western Australia, Department of Agriculture and Food Western Australia*.
- Department of the Environment (DoE). 2013a. *Species Profile and Threats Database*. <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Department of Environment and Conservation. (DEC). 2011. *A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.*

Department of Water (DoW). 2012. *Water Quality Protection Note No. 13. Dewatering of Soils at Construction Sites.*

Department of Water (DoW). 2013. *Western Australian Water in Mining Guideline.*

Environmental Protection Authority (EPA). 2002. *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3.*

Environmental Protection Authority (EPA). 2003. *Environmental Protection Authority Guidance for the Assessment of Environmental Factors, Statement No 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Assessment in Western Australia.*

Environmental Protection Authority (EPA). 2004a. *Environmental Protection Authority Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986), Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No 51.*

Environmental Protection Authority (EPA). 2004b. *Guidance for the Assessment of Environmental Factors in accordance with the Environmental Protection Act 1986 Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56.*

Environmental Protection Authority (EPA). 2004c. *Environmental Protection of Wetlands, Position Statement No. 4.*

Environmental Protection Authority (EPA). 2006. *Guidance for the Assessment of Environmental Factors, Statement No. 6, Rehabilitation of Terrestrial Ecosystems.*

Environmental Protection Authority (EPA). 2007. *Guidance for the Assessment of Environmental Factors, Statement No. 54a: Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia.*

Environmental Protection Authority (EPA). 2009. *Guidance for the Assessment of Environmental Factors, Statement No.20: Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia'.*

Environmental Protection Authority (EPA). 2010. *Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.* Technical report of the Environmental Protection Authority and the Department of Environment and Conservation.

Environmental Protection Authority (EPA). 2012. *EAG 1: Environmental Assessment Guideline for Defining the Key Characteristics of a Proposal Environmental Protection Act 1986.*

Environmental Protection Authority (EPA). 2013. *EAG 6: Environmental Assessment Guideline for Timelines for Environmental Impact Assessment of Proposals.*

- Environmental Protection Authority (EPA). 2013a. *Environmental Assessment Guideline 12 Consideration of Subterranean Fauna in Environmental Impact Assessment in Western Australia*.
- Environmental Protection Authority (EPA). 2015. *EAG 8: Environmental Assessment Guideline for Environmental Principles, Factors and Objectives*.
- Environmental Protection Authority (EPA). 2015a. *EAG 9: Environmental Assessment Guideline for Application of a Significance Framework in the Environmental Impact Assessment Process*.
- Environmental Protection Authority (EPA). 2015b. *EAG 16: Environmental Assessment Guideline for Referral of a Proposal under s38 of the Environmental Protection Act 1986*.
- Garnett, S. & Crowley, G.M. 2000. *The Action Plan for Australian Birds 2000*. Environment Australia, Canberra.
- Gold Road Resources Limited (Gold Road). 2013. *Mining Proposal for Mining Lease M38/1255 Central Bore (Volume 1 Draft)*. Report Prepared for Gold Road Resources Limited by Mining Solutions.
- Government of Western Australia (2014). *Wildlife Conservation Act 1950*. Wildlife Conservation (Specially Protected Fauna) Notice 2014. Government Gazette, WA. 3 November 2015.
- Higgins, P.J. (de). 1999. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 4. Parrot to Dollarbird*. Oxford University Press, Melbourne.
- Johnstone, R.E. & Storr, G.M. 1998. *Handbook of Western Australian Birds. Volume I: Non-Passerines (Emu to Dollarbird)*. Western Australian Museum, Perth, W.A.
- KD.1 Pty Ltd (KD.1). 2015. *Yamarna Gas Pipeline Project Route Selection Assessment*. Report prepared for Gold Road Resources Limited, 30 October 2015.
- Marchant, S. & Higgins, P.J. (eds). 1993. *Handbook of Australian, New Zealand & Antarctic Birds. Volume 2. Raptors to Lapwings*. Oxford University Press, Melbourne.
- Menkhorst, P. & Knight, F. 2011. *A Field Guide to the Mammals of Australia*. Third Edition. Oxford University Press.
- Rapallo Group (Rapallo). 2015. *Level two Vertebrate Fauna Survey of the Gruyere Project Area Rev E*. Unpublished report prepared for Gold Road Resources Limited.
- State of Western Australia. 2012. *Petroleum Pipelines (Environment) Regulations*.
- Terrestrial Ecosystems. 2011. *Level two Fauna Risk Assessment for the Granny Deeps Project Area*. Unpublished report. February 2011.
- Van Dyck, S. & Strahan, R. 2008. *The Mammals of Australia*. New Holland Publishers, Sydney.
- Western Australia Herbarium (WAHERB). 2015. *Florabase – Information on the Western Australian Flora*, Department of Parks and Wildlife. <https://florabase.dpaw.wa.gov.au>. Accessed 06/10/2015.

APPENDICES

APPENDIX 1: LEVEL one FLORA AND VEGETTION SURVEY PROPOSED GAS PIPELINE ROUTES (BOTANICA 2015)

APPENDIX 2: FAUNA ASSESSMENT WHITE CLIFFS YAMARNA ROAD GAS PIPELINE ROUTE (BOTANICA 2016)

APPENDIX 3: STAKEHOLDER CONSULTATION REGISTER