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Abydos Project - Terrestrial Flora and Fauna Gap Analysis and Risk Assessment

Introduction

Atlas Iron Pty Ltd (Atlas) is seeking approval for five borrow pits, herein referred to as the 'Study Area', required to construct and maintain a haul road between a satellite mine and existing processing facility at the Abydos Iron Ore Project. The Study Area is located in the Pilbara region of Western Australia (WA), approximately 100 kilometres (km) southeast of Port Hedland, along the Marble Bar Road (Figure 1). The five proposed borrow pits comprising the Study Area are mapped in Figure 2 and summarised below:

- Northeast borrow pit North - 12.90ha;
- Northeast borrow pit South - 10.69ha;
- Middle borrow pit - 5.85ha;
- Southwest borrow pit North - 5.17ha; and
- Southwest borrow pit South - 6.11ha.

Baseline environmental surveys completed for the Abydos Project in 2012 combined with more recent surveys undertaken for the Miralga Creek Project in 2019 intersect the Study Area. However, due to the dated nature of the 2012 surveys the Department of Mines, Industry Regulation and Safety (DMIRS) have advised Atlas to undertake a review of the combined survey database, and determine any risks to flora, vegetation and fauna associated with construction of the proposed borrow pits.

Reviewer

The technical review and impact assessment has been completed by Dr Darren Brearley, Director and Principal Botanist with Onshore Environmental Consultants Pty Ltd (Onshore). Darren holds Bachelor of Science degrees in Botany (University of Western Australia) and Environmental Biology (1st Honours Curtin University of Technology), along with a PhD from Curtin University of Technology. Between 1997 and 2000 he was employed as Research Fellow on a three year Minerals and Energy Research Institute of Western Australia (MERIWA) funded project that investigated development of completion criteria for arid and semi-arid mine sites in Western Australia. Darren started Onshore in February 2001 after working closely with a number of greenfield exploration companies in the late 1990's, and continues to operate the business as Director and Principal Botanist. Darren is a respected botanist with 27 years' experience working extensively throughout all bioregions in Western Australia, predominantly within the mining sector. His work has included biological surveys (flora, vegetation and vertebrate fauna), native rehabilitation planning and monitoring, developing completion criteria, vegetation mapping, management plans, impact assessments and environmental approvals. He has undertaken more than 275 baseline flora and fauna surveys, is well

published in respected journals, and frequently provides technical advice on environmental approvals and site operations.

Darren's experience in the Pilbara includes biological survey work for a range of mining companies including BHP Billiton, Rio Tinto, Chevron, Woodside and Iron Ore Holdings. In 2014 Darren completed the consolidation of previous vegetation mapping across BHP's entire Pilbara tenure into one regional Geographic Information System (GIS) database that provided consistency in methods and nomenclature as part of their Strategic Environmental Review. A total of 162 baseline flora and vegetation surveys were reviewed with vegetation mapping consolidated into 218 vegetation associations classified under 53 broad floristic formations and 15 landform types.

Baseline Surveys

The following baseline surveys conducted as part of the Abydos and Miralga Creek Projects intersect with the Study Area:

- Miralga Creek Iron Ore Project Detailed Flora and Vegetation Survey. Prepared for Atlas Iron (Woodman Environmental, 2019);
- Abydos East Project Camp and Haul Road Corridor Flora and Vegetation Studies (Woodman Environmental 2012);
- Miralga Creek Project: Level 2 Vertebrate Fauna and Short-range Endemic Invertebrate Fauna Assessment (Biologic, 2020a);
- Abydos East Link Road Terrestrial Fauna Impact Assessment (Outback Ecology 2012);
- Miralga Creek Ghost Bat Review - March 2020 (Bat Call WA, 2020);
- Miralga Creek: Subterranean Fauna Assessment (Biologic, 2020d);
- Miralga Creek Project: Conservation Significant Vertebrate Fauna Impact Assessment (Biologic, 2020b); and
- Miralga Creek Project: Short-Range Endemic Invertebrate Fauna Impact Assessment (Biologic, 2020c).

A review of the baseline surveys was undertaken to identify any limitations that should be considered when interpreting results and undertaking any impact assessment. For the Miralga Creek flora and vegetation survey (Woodman Environmental, 2019) the following limitations were identified:

- The survey extent intersects the three northeast and central proposed borrow pits, but does not extend to cover the two southwest proposed borrow pits;
- One of the 12 vegetation types (VTs) mapped was sampled by two quadrats, which is less than the minimum number of three recommended by the EPAs technical guidelines (EPA 2016a);
- Vegetation types were determined on the basis of multivariate statical analysis (presence/absence of taxa within quadrats) and excluding any structural data (height and cover classes). This has effectively resulted in the description of floristic community types, rather than vegetation types, and makes interpretation of vegetation mapping problematic; and
- Ground truthing and targeted searches were restricted nearby to access tracks and quadrat locations and traverses (refer Figure 6 in Woodman Environmental, 2019).

There is a large proportion of the Miralga Creek survey area that was not covered on foot, including the current Study Area.

For the Abydos East Project Camp and Haul Road Corridor (Woodman Environmental 2012) the following limitations were identified:

- The survey area only intercepted approximately 50% of the two proposed borrow pits situated to the southwest of the Study Area;
- A Level 1 flora and vegetation survey was undertaken by Woodman Environmental (2012). This is equivalent to a Basic flora and vegetation survey level, as defined by the EPA (2016a), and incorporated a two-day reconnaissance field survey. There were a total of 24 detailed sample sites incorporated into the field survey, although only dominant vascular plants were recorded resulting in a relatively low total flora count (62 species); and
- Vegetation mapping was aligned with vegetation alliance descriptions taken from Mattiske (2007), which itself was a review of previous vegetation mapping from flora and vegetation survey work completed for the Panorama Project by Trudgen, Morgan and Griffin (2002) and Trudgen (2006, 2007a, 2007b).

The Miralga Creek Level 2 vertebrate fauna and SRE fauna assessment (Biologic 2020a) was fully compliant with relevant EPA technical guidelines (EPA 2016b, 2016c). The following limitation was identified:

- The survey area intercepted the three northeast and middle borrow pits, but did not cover the two borrow pits in the southwest of the Study Area.

For the Abydos East Link Road terrestrial fauna impact assessment (Outback Ecology 2012) the following limitations were identified:

- The assessment was completed as a desktop study that did not involve a field reconnaissance survey or any other ground-truthing component; and
- Fauna habitat mapping was generated using data from four previous vertebrate fauna surveys completed within the area (Bamford 2009, Outback Ecology 2011a, 2011b, 2012b), and the occurrence of conservation significant fauna inferred from habitat type and specific habitat features.

Vegetation

The northeast and middle borrow pits occur within the Miralga Creek Study Area surveyed by Woodman Environmental (2019), with the southwest borrow pits covered by an earlier flora and vegetation survey of the Abydos East Project Camp and Haul Road Corridor (Woodman Environmental 2012).

A combination of floristic analysis and manual dissection defined 12 VTs within the Miralga Creek Study Area (Woodman 2019). Three of the 12 VTs were represented within the boundary of the northeast and middle borrow pits (VTs 7, 10 and 12). None of the VTs were considered to represent any Threatened Ecological Community (TEC) protected under the Biodiversity Conservation Act 2016 (BC Act), or as listed under the EPBC Act. Furthermore, none of the VTs were considered to represent any DBCA-classified Priority Ecological Community (PEC) (Woodman Environmental, 2019). In addition, no TECs or PECs occur within, or have previously been recorded within 100 km of, the Study Area (Biologic, 2020a). Four VTs

(VT 2, 6, 9 and 11) were determined to be potentially locally significant because they were locally uncommon (present in less than 1% of the Study Area) and/or restricted within the Study Area, and/ or were known to provide habitat for significant flora. These four VTs may also be regionally significant given their uncommon and/or restricted distribution regionally or in the absence of regional distribution data:

- VT 2: occurs in shallow gorge/creek areas and provides habitat for significant flora taxa
- VT 6: is mapped on a claypan, which is a limited habitat and supports significant flora taxa, it also has limited representation in the Study Area
- VT 9: has an unknown regional extent and has limited representation in the Study Area
- VT 11: has an unknown regional extent and has limited representation in the Study Area.

None of the above four VTs were represented within the boundary of the three northeast and middle borrow pits borrow pits.

The two proposed borrow pits situated to the southwest are partially covered by an earlier flora and vegetation survey of the Abydos East Project Camp and Haul Road Corridor (Woodman Environmental 2012). Whilst approximately 50% of the two proposed borrow pit has been vegetation mapped, the unmapped portion of the borrow pits extends over the same landform and is inferred to support the same vegetation types. A total of eight Vegetation Alliances (VAs) were mapped within the Abydos East Project Camp and Haul Road Corridor (Woodman Environmental 2012). Two of the eight VAs were represented within the boundary of the two proposed borrow pits located in the southwest:

- Vegetation Alliance 6a - *Corymbia hamersleyana* scattered low trees to low open woodland over tall shrubs to open shrubland of *Acacia* spp. and *Grevillea wickhamii* over hummock grasslands on creek banks, flood banks and distributing fans. This vegetation alliance was extensively mapped over the haul road corridor and camp areas; and
- Vegetation Alliance 12a - *Acacia inaequilatera* scattered tall shrubs to high open shrubland over *Triodia brizoides* hummock grasslands on ridge slopes and low hills. This vegetation alliance was mapped over a majority of the haul road corridor.

VAs 6a and 12a were not aligned with any Commonwealth or State listed TECs or State listed PECs, were well represented within the area surveyed, occurred on landforms that were common and widespread, and were not considered to be locally significant.

The proposed clearing will not impact any vegetation determined to be conservation significant or support any unique or restricted values.

Vegetation Significance

Regional vegetation mapping of the Pilbara completed by Beard (1975) was utilised to assess the representation of vegetation defined to overlap the five proposed borrow pits. One Beard vegetation association was represented within the study area (Table 1). In terms of representation, the Western Australian Government is committed to the National Objectives Targets for Biodiversity Conservation which includes a target that prevents clearance of ecological communities with an extent below 30% of that present at pre-European settlement (Department of Natural Resources and Environment 2002, EPA 2000).

When considering representation at the state level, the sole Beard vegetation association represented within the study area currently has 99.5% of the pre-European extent remaining at the State level (Table 1, Government of Western Australia 2018). The Study Area is located within the Pilbara bioregion, specifically within the Chichester subregion. When considering the representation of vegetation at the IBRA regional level and IBRA system level, >99.5% of the pre-European extent remains for the vegetation association represented (Table 1). The Study Area falls entirely within the Shire of East Pilbara. At this local level 99.1% of the pre-European extent remains for the vegetation association represented (Table 10).

Vegetation within the Study Area is therefore determined to be well represented at all levels (state-wide, bioregional [IBRA region and IBRA sub-region] and local).

In terms of reservation, there is a benchmark for a minimum of 15% of each Beard vegetation association to be protected in Class I-IV reserves (Commonwealth of Australia 2012). For the sole vegetation association represented within the Study Area, 10.3% of the current extent occurs within Class I-IV reserves at the State level, noting that 11.6% is within DBCA managed lands (Table 1). While the reservation status for Vegetation Association 82 (Beard 1975) is under the recommended target, this is determined to be of least concern for biodiversity conservation given the very high proportion of the Pre-European extent remaining intact (99.5%).

Table 1 Pre-European extent of vegetation represented on the basis of identified datasets (Government of Western Australia 2018).

Vegetation System / Association	Pre-European Extent (ha)	Current Extent (ha)	% Pre-European Extent Remaining	Current Extent in Class I-IV Reserves (ha)	% Current Extent in Class I-IV Reserves	Current Extent DBCA Managed Lands (ha)	% Current Extent DBCA Managed Lands
State-wide							
82 Hummock grasslands, low tree steppe; snappy gum over Triodia wiseana	2,565,901.28	2,553,206.19	99.51	262,983.27	10.30	295,377.96	11.57
Beard Vegetation System							
82.2 (Chichester Plateau))	27,520.62	27,520.62	100.00				
IBRA Region							
82 - Pilbara (PIL)	2,563,583.23	2,550,888.14	99.50	262,983.27	10.26	295,377.96	11.58
IBRA Sub-Region							
82 - Chichester (PIL01)	360,666.90	360,322.69	99.90				
Local Government – Shire of East Pilbara							
82	927,709.76	919,072.17	99.07			4,637.34	0.50

Flora

A total of 380 discrete vascular flora taxa including 135 annual taxa (36%) and 245 perennial taxa (64%) was recorded from the Miralga Creek survey area (Woodman Environmental, 2019). The total flora included the following eight conservation significant flora:

- *Corchorus* sp. Yarrie (J. Bull & D. Roberts CAL 01.05) (P1 (3 records);
- *Eragrostis crateriformis* (P3) (17 records);
- *Euphorbia clementii* (P3) (29 records);
- *Euphorbia inappendiculata* var. *inappendiculata* (P2) (3 records);
- *Goodenia nuda* (P4) (1 record);
- *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3) (2 records);
- *Triodia basitricha* (P3) (31 records); and
- *Triodia chichesterensis* (P3) (1 record).

In addition, there were two potentially undescribed flora, *Abutilon* aff. *hannii* (1 record) and *Polymeria* sp. (2 records), and six range extensions; *Cyperus microcephalus* subsp. *saxicola* (2 records), *Desmodium campylocaulon* (2 records), *Dodonaea petiolaris* (3 records), *Fimbristylis nuda* (2 records), *Ophioglossum lusitanicum* (1 record) and *Scleria rugosa* (2 records).

For the Abydos East Project Camp and Haul Road Corridor, 62 vascular flora taxa were recorded including two conservation significant flora; *Eriachne* aff. *festucacea*[1] and *Euphorbia clementii* (P3) (Woodman Environmental 2012).

There were no Threatened Flora taxa listed under the EPBC Act or BC Act recorded from either survey area (Woodman Environmental 2012, 2019).

There are no previous records for significant flora taxa from within the boundary of the Study Area. However, it is noted that previous survey work has not specifically targeted the five proposed borrow pits. Based on suitability of habitats and vegetation types intersecting the Study Area, it is determined to be *possible* that three Priority 3 flora taxa and one Priority 4 taxon may occur within the proposed footprint of these areas; *Eragrostis crateriformis* (P3), *Euphorbia clementii* (P3), *Triodia chichesterensis* (P3), *Goodenia nuda* (P4). The remaining conservation significant flora are associated with vegetation and landforms that are not represented within the Study Area. The potential impact on the wider population for each of the four Priority flora species resulting from the proposed disturbance activities is determined to be *low*.

Fauna Habitat

Six broad fauna habitat types were identified within the 7,834 ha Miralga Creek survey area (Biologic 2020):

- Low Stony Hills (Low Significance to Vertebrate Fauna);
- Stony Plain (Low Significance to Vertebrate Fauna);
- Sandy Plain (Moderate Significance to Vertebrate Fauna);
- Major Drainage (High Significance to Vertebrate Fauna);

[1] Not conservation significant

- Hillcrest / Hillslope (High Significance to Vertebrate Fauna); and
- Gorge / Gully (High Significance to Vertebrate Fauna).

The most common habitats were determined to be of least conservation significance to vertebrate fauna, and none of the habitat types were unique to the region. The northeast and middle borrow pits intersected the 'stony plain' habitat type, with the southwest borrow pits inferred to occur on the same habitat. The 'stony plain' habitat comprised areas with vegetation dominated by *Triodia* hummock grasses of various life stages and scattered patches of various small to medium shrub species on gravelly clay loam substrates. The habitat was determined to be common and widespread within the area surveyed and more broadly across the Pilbara region, and species of conservation significance were not dependent on the habitat at the broad-scale. The vertebrate fauna significance was therefore rated as low.

There were five fauna habitat types recorded within the Abydos East Link Road survey area (Outback Ecology 2012):

- Spinifex Stony Plain;
- Spinifex Sandplain;
- Stony Rise;
- Major Drainage Line; and
- Ironstone Ridge.

All five proposed borrow pits occur within the 'spinifex stony plain' fauna habitat. This was described as 'stony plains supporting extensive *Triodia* hummock grasslands with scattered shrubs. Plains may be flat to slightly undulating.' It was the most widespread of the five fauna habitats mapped, covering 46% of the 9,544 ha area surveyed.

None of the ten Commonwealth (EPBC Act) and State (BC Act) protected fauna species identified during desktop searches and the literature review as possibly, likely, very likely or confirmed to occur within the survey area were associated with the 'spinifex stony plain' fauna habitat.

Of the 15 Priority fauna species, as listed by DBCA, four were associated with the 'spinifex stony plain' fauna habitat:

- Western Pebble-mound Mouse *(Pseudomys chapmani)* - active mounds were recorded at multiple locations within the 'spinifex stony plain' habitat;
- Spectacled Hare-wallaby *(Lagorchestes conspicillatus leichardti)* - there were two observations made within the 'spinifex stony plain' habitat;
- Australian Bustard *(Ardeotis australis)* - observed within multiple habitat types including 'spinifex stony plain' habitat; and
- Bush Stone-curlew *(Burhinus grallarius)* - one record within the 'spinifex stony plain' habitat.

The 'spinifex stony plain' habitat can offer large, mature hummocks of spinifex which are important to the Spectacled Hare-wallaby and the Australian Bustard, as well as an abundance of small, evenly sized stones utilised by the Western Pebble-mound mouse to construct mounds. Each of these species has been recorded in this habitat type during previous surveys, as has the Bush Stone-curlew.

The ‘spinifex stony plain’ habitat was determined to be widespread (45.9% of the survey area) and is well represented and well connected in the broader landscape. The broad nature of the habitat provides confidence that it is unlikely to be significantly impacted by the proposed borrow pit development.

Vertebrate Fauna

A total of 154 vertebrate fauna species comprising 24 native and four introduced mammal species, 84 bird species, 39 reptile species, and three amphibian species were recorded during the baseline vertebrate fauna survey for the Miralga Creek Project (Biologic, 2020a). This number of species is comparable with other surveys of equivalent scope and size in the vicinity (Biologic, 2020a). No unusual or unexpected fauna species were recorded during the survey, and all species had been recorded in the area by at least two previous surveys considered in the literature review.

Significant Vertebrate Fauna

Seven vertebrate species listed as conservation significant were recorded during the field survey for the Miralga Creek Project (Biologic, 2020a):

- Northern Quoll (89 records from 15 sites) - identified in gorge/ gully, major drainage line, low stony hills, hillcrest/ hillslope and sand plain habitat types. Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur;
- Pilbara Leaf-nosed Bat (35 records from 14 sites) - requires caves and/or mine shafts for roosting, and data from current survey effort suggest that none of the caves recorded within the Study Area are likely to represent a roosting cave. Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur;
- Ghost Bat (11 records from six sites) - associated with deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines. Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur;
- Northern Brushtail Possum (two records from one site) - suitable habitat for the species is present within all major drainage habitat within the Study Area, in addition to suitable rocky habitat being present within gorge/gully habitat. Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur;
- Grey Falcon (four records from one site) - within the Study Area, all records of Grey Falcon were recorded within or in close proximity to major drainage habitat. Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur;
- Peregrine Falcon (two records from two sites) - hillcrest/ hillslope may provide potential breeding areas; the habitat types sand plain, major drainage and stony plain provide foraging habitat (Biologic, 2020a). Not recorded from the ‘stony plains’ habitat where the five proposed borrow pits occur; and
- Western Pebble-mound Mouse (15 records from 15 sites) - common from the ‘stony plain’ habitat where small pebbles used to construct mounds are plentiful. Populations are widespread throughout the ranges of the Pilbara (Anstee 1996).

Based on field survey outcomes from the Miralga Creek fauna survey, the Western Pebble-mound Mouse is likely to be the only conservation significant vertebrate fauna species present within the Study Area. Given the widespread distribution of the Western Pebble-mound Mouse in the Pilbara, combined with the common representation of the ‘stony plains’ habitat, any impact resulting from clearing for the proposed borrow pits is likely to *low.*

Short Range Endemic (SRE) Fauna

A desktop study undertaken by Biologic (2020b) identified a total of 668 invertebrate records that belonged to taxonomic groups that are prone to short-range endemism within a 40 km radius of the Study Area. Of these, four records are regarded as Confirmed SRE:

- Two millipedes (*Antichiropus apricus* and *Antichiropus forcipatus*);
- One pseudoscorpion (*Faella tealei*); and
- One gastropod (Camaenidae Gen. nov. cf. `Z` n. sp.).

Six invertebrate fauna habitats were mapped by Biologic (2020a):

- Low Stony Hills (Low Significance to Invertebrate Fauna);
- Stony Plain (Low Significance to Invertebrate Fauna);
- Sandy Plain (Low-Moderate Significance to Invertebrate Fauna);
- Major Drainage (Moderate Significance to Invertebrate Fauna);
- Hillcrest / Hillslope (Moderate-High Significance to Invertebrate Fauna); and
- Gorge / Gully (High Significance to Invertebrate Fauna).

A total of 184 invertebrate fauna specimens were collected within the Study Area (Biologic, 2020b). No Confirmed SRE taxa were recorded during the field survey (Biologic, 2020b). However, 18 Potential SRE taxa were recorded, typically associated with the 'gorge/ gully' habitat type which has the highest value to SRE species. The five proposed borrow pits all intersected the 'stony plain' SRE habitat type, which was determined to be of low conservation significance for invertebrate fauna.

Summary

The historical biological survey effort for the Abydos Project and adjacent projects can be considered high, with a variety of baseline terrestrial flora and fauna surveys occurring over an extended period (2002 and 2019). For the current Study Area, the three proposed borrow pits in the northeast and central sectors have been covered by recent surveys addressing flora and vegetation, vertebrate fauna and SRE. The two proposed borrow pits in the southwest were surveyed prior to 2012, noting that vegetation mapping covered approximately half of each borrow pit in this sector of the Study Area. However, all five proposed borrow pits occur on similar landforms and fauna habitat types, and support similar vegetation.

Vegetation within the Study Area was determined to be well represented at all levels (state-wide, bioregional [IBRA region and IBRA sub-region] and local) on the basis of broadscale mapping completed by Beard (1975). Similarly, fine-scale vegetation type mapping confirmed that vegetation of the Study Area was well represented within the area surveyed, occurred on landforms that were common and widespread, and was not considered to be locally significant. Furthermore, vegetation types were not aligned with any Commonwealth or State listed TECs or State listed PECs.

There were no previous records for significant flora taxa from within the boundary of the Study Area, and there were no Threatened Flora taxa listed under the EPBC Act or BC Act recorded from the wider areas surveyed. Based on suitability of habitats and vegetation types intersecting the Study Area, it was determined to be *possible* that up to three Priority 3 flora taxa and one Priority 4 taxon may occur within the Study Area; *Eragrostis crateriformis* (P3), *Euphorbia clementii* (P3), *Triodia chichesterensis* (P3), *Goodenia nuda* (P4). The potential impact on the wider population for

each of these Priority flora species resulting from the proposed disturbance activities was determined to be low.

The Study Area intersected one vertebrate fauna habitat type, 'stony plain'. This habitat was determined to be common and widespread within the area surveyed and more broadly across the Pilbara region, and species of conservation significance were not dependent on the habitat at the broad-scale. The vertebrate fauna significance was therefore rated as low.

Vertebrate fauna diversity was comparable with other surveys of equivalent scope and size in the vicinity of the Abydos Project, and there were no unusual or unexpected fauna species recorded during the baseline surveys.

Based on field survey outcomes, one conservation significant fauna species is likely to occur within the Study Area, the Western Pebble-mound Mouse (Priority 4). Given the widespread distribution of the Western Pebble-mound Mouse in the Pilbara, combined with the common representation of the 'stony plains' habitat, any impact resulting from clearing for the proposed borrow pits is likely to *low.*

There were no Confirmed SRE taxa were recorded during the field survey, and the 18 Potential SRE taxa were typically associated with the 'gorge/ gully' habitat type which has the highest value to SRE species. The Study Area intersected the 'stony plain' SRE habitat type, which was determined to be of low conservation significance for invertebrate fauna.

Yours sincerely

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