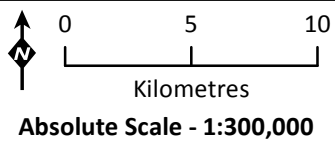
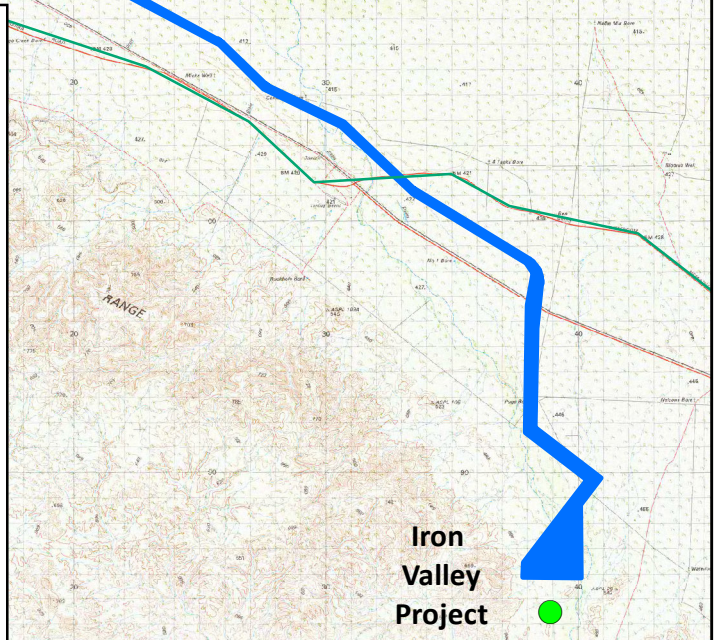


Legend

- Great Northern Hwy
- Major Roads
- Iron Valley Project
- BOTS Proposal Area

Priority Flora Records in BOTS Proposal Area

- *Goodenia omearana* ms. - Priority 1
- *Heliotropium muticum* - Priority 1
- *Tephrosia rosea* var. *venulosa* MS - Priority 1
- *Paspalidium rryiglume* - Priority 2
- ▲ *Abutilon trudgenii* ms. - Priority 3
- ▲ *Bulbostylis burbidgeae* - Priority 3
- ▲ *Goodenia nuda* - Priority 3
- ▲ *Gymnanthera cunninghamii* - Priority 3
- ▲ *Hibiscus brachysiphonius* - Priority 3
- ▲ *Sida* sp. Wittenoom (W.R. Barker 1962) - Priority 3
- ▲ *Thamesa* sp. Hammersley Station (M.E. Trudgen 11,431) - Priority 3



**Priority Flora Records
in BOTS Proposal Area
southern section**

Figure: 10
Project ID: 1651

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

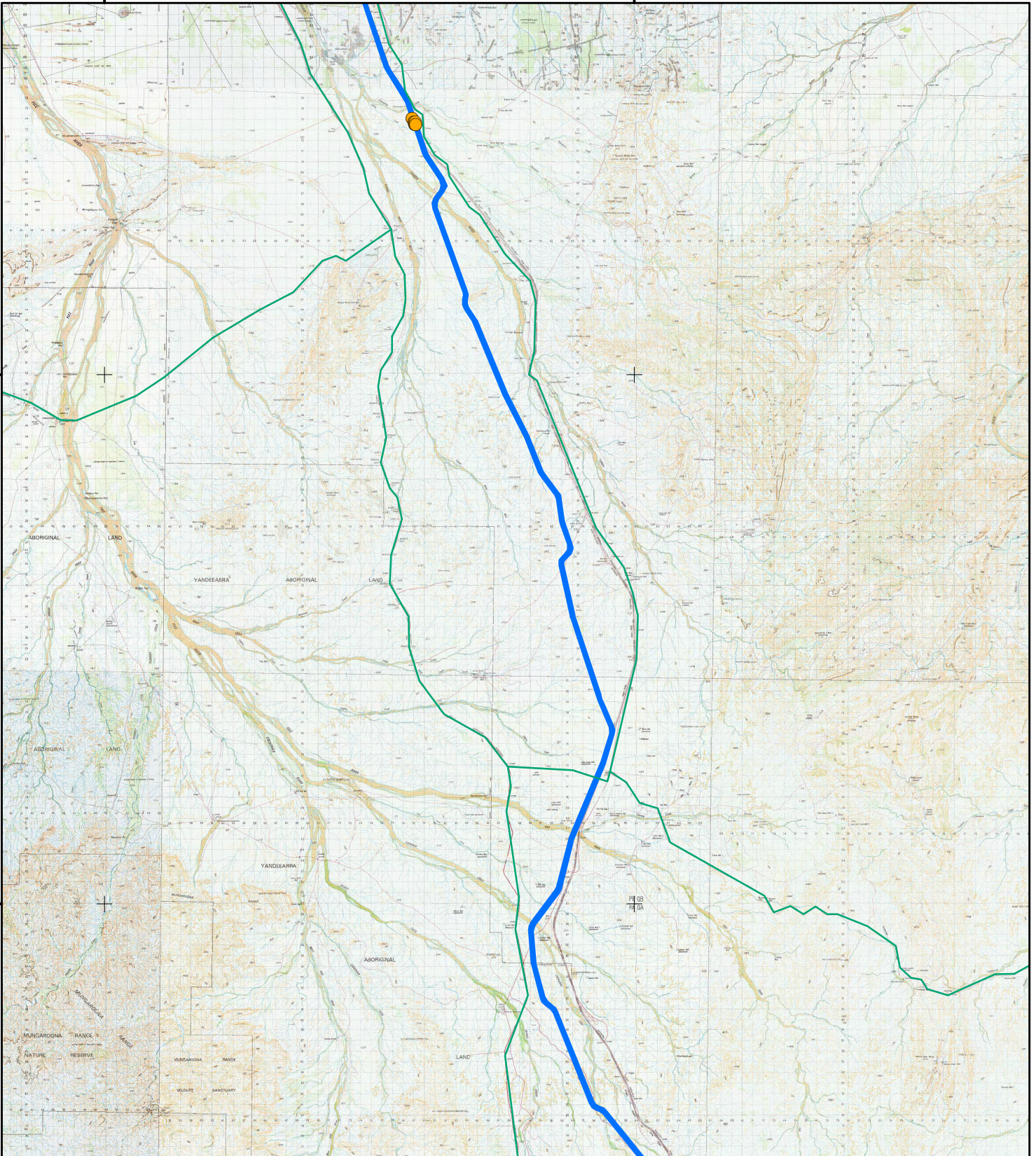
Drawn: BH
Date: 13/112015

650000

700000


7650000

7600000



Legend

- █ BOTS Proposal Area
- Major Roads
- *Heliotropium muticum* - Priority 1
- *Paspalidium rryiglume* - Priority 2
- ▲ *Abutilon trudgenii* ms. - Priority 3
- ▲ *Hibiscus brachysiphonius* - Priority 3
- ▲ *Themsa* sp. Hamersley Station (M.E. Trudgen 11,431) - Priority 3

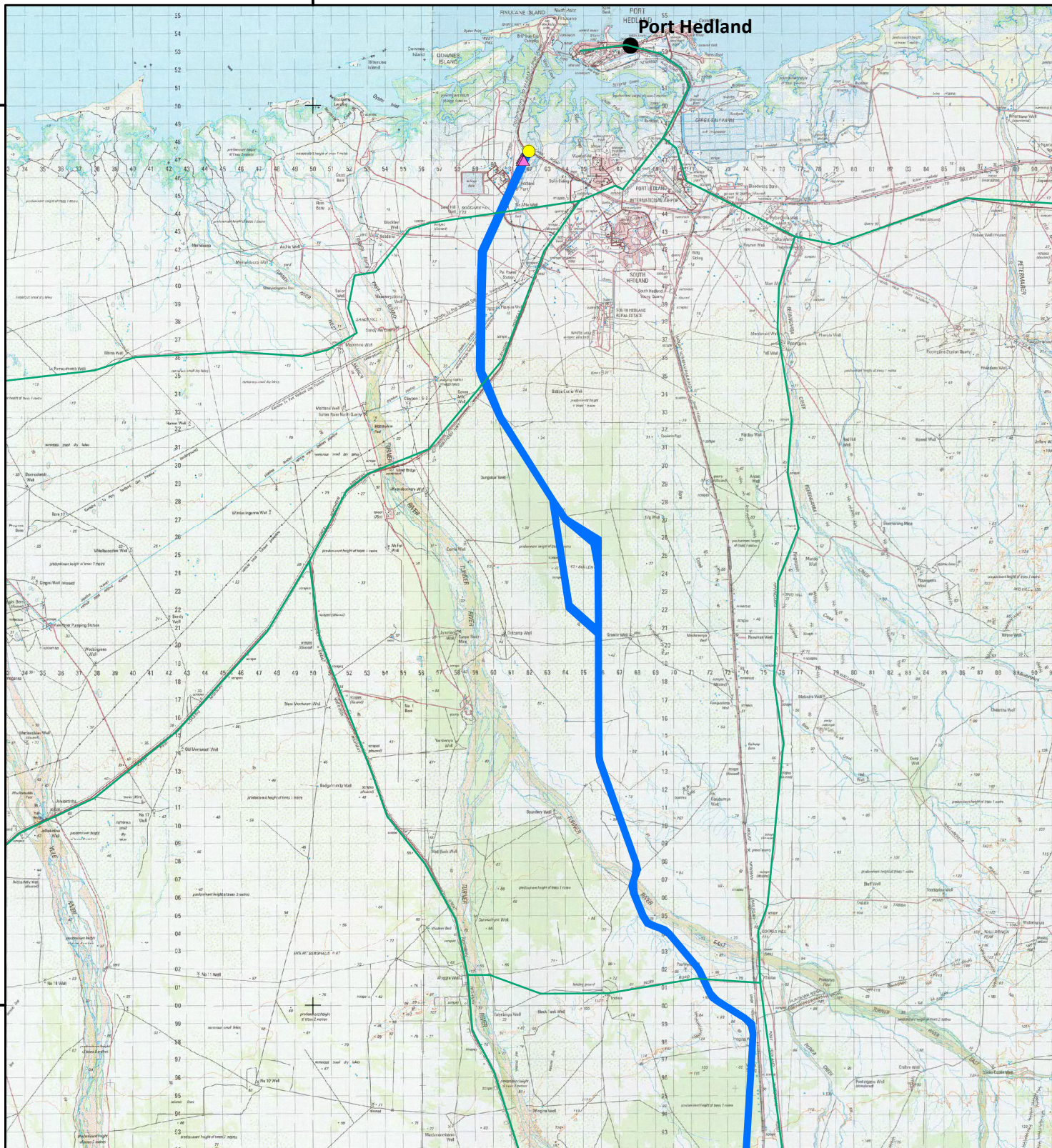

0
9
18
 Kilometres
Absolute Scale - 1:500,000



**Priority Flora Records
in BOTS Proposal Area
central section**

Figure: 11
Project ID: 1651
Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: BH
Date: 13/11/2015
A4



Legend

● Major Towns

— Major Roads

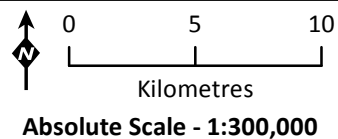
■ BOTS Proposal Area

Species

● *Tephrosia rosea* var. *venulosa* MS - Priority 1

▲ *Bulbostylis burbidgeae* - Priority 3

▲ *Goodenia nuda* - Priority 3

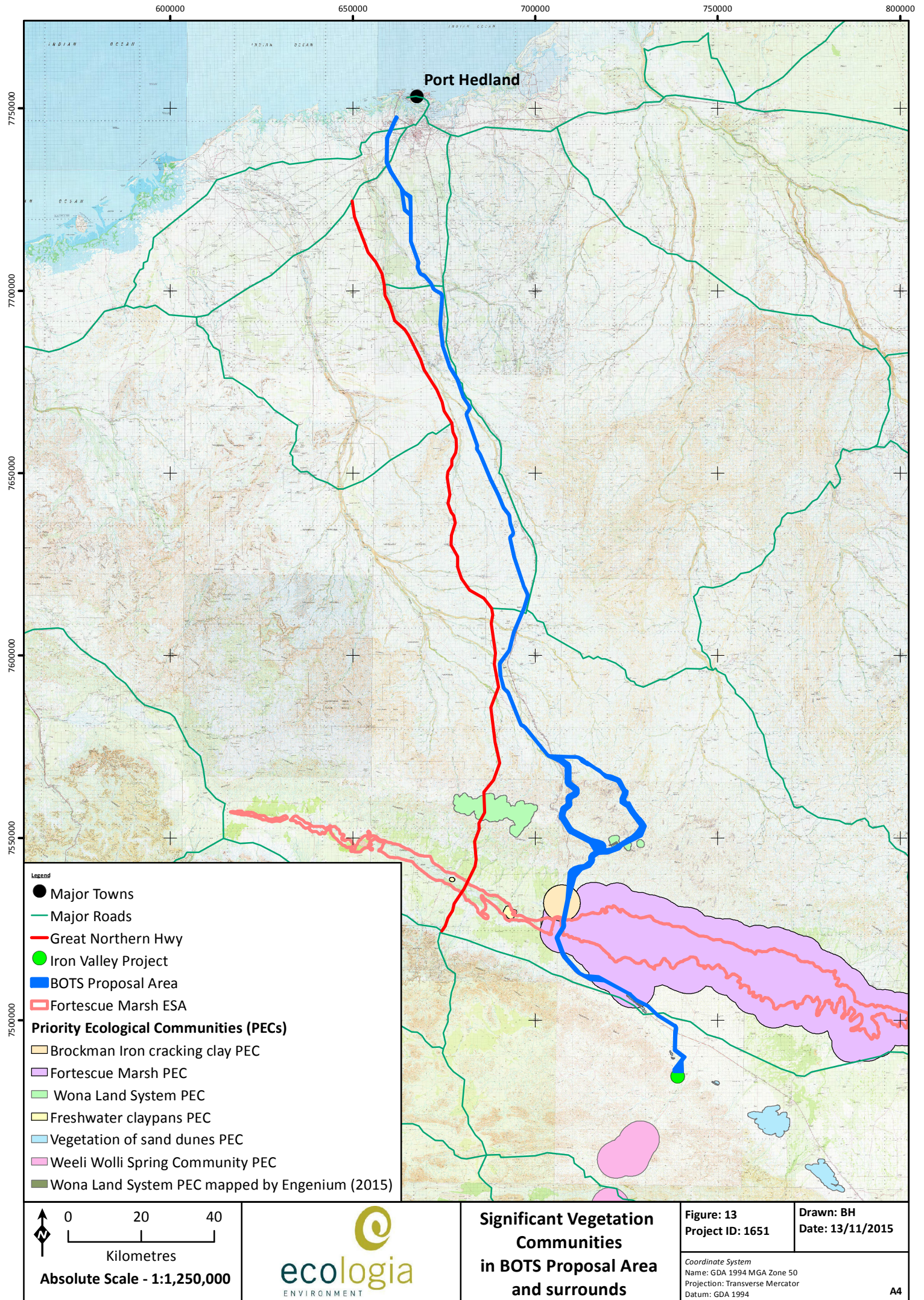


**Priority Flora Records
in BOTS Proposal Area
northern section**

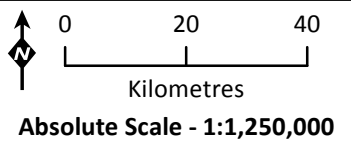
Figure: 12
Project ID: 1651

Drawn: BH
Date: 13/11/2015

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994



- Legend**
- Major Towns
 - Major Roads
 - Great Northern Hwy
 - Iron Valley Project
 - BOTS Proposal Area
 - Fortescue Marsh ESA
 - Priority Ecological Communities (PECs)**
 - Brockman Iron cracking clay PEC
 - Fortescue Marsh PEC
 - Wona Land System PEC
 - Freshwater claypans PEC
 - Vegetation of sand dunes PEC
 - Weeli Wolli Spring Community PEC
 - Wona Land System PEC mapped by Engenium (2015)



Significant Vegetation Communities in BOTS Proposal Area and surrounds

Figure: 13
Project ID: 1651

Drawn: BH
Date: 13/11/2015

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

TABLE 8: PECS RECORDED WITHIN VICINITY OF PROPOSAL AREA FROM DESKTOP SEARCHES

Conservation Status	Community	Presence within the Proposal Area
Priority 1 PEC	Brockman Iron cracking clay communities of the Hamersley Range	Yes
Priority 1 PEC	Fortescue Marsh (Marsh Land System)	Yes
Priority 1 PEC	Four plant assemblages of the Wona Land System	Yes
Priority 1 PEC	Freshwater claypans downstream of the Fortescue Marsh – Goodiadarrie Hills on Mulga Downs Station	No
Priority 3(iii) PEC	Vegetation of sand dunes of the Hamersley Range/Fortescue Valley	No
Priority 1 PEC	Weeli Wolli Spring Community	No

Survey Results

Based on the results of the flora and vegetation surveys conducted by Engenium (May 2015) reviewed for this Proposal (refer to **Table 4**), no TECs are recorded within the Proposal Area. Three PECs were identified as occurring within the Proposal Area:

- Fortescue Marsh (Marsh Land System) PEC P1
- Brockman Iron cracking clay communities of the Hamersley Range PEC P1
- Four plant assemblages of the Wona Land System PEC P1.

On the basis of the mapping of PECs by DPAW, it appears that both the Fortescue Marsh PEC and Brockman Iron cracking clay communities of the Hamersley Range PEC do intersect with portions of the Proposal Area (**Figure 13**).

Based on the available mapping by DPAW, the Proposal Area intersects less than 1% of the total mapped extent of the Fortescue Marsh PEC (1,463ha) and approximately 7% of the Brockman Iron cracking clay communities of the Hamersley Range PEC (543ha). However, assuming a proposed 60 m disturbance footprint along the length of the Proposal Area, the actual disturbance to these PECs will be significantly less, with a maximum of approximately 201 ha within the Fortescue Marsh (Marsh Land System) PEC and 58 ha within the Brockman Iron cracking clay communities of the Hamersley Range PEC, representing less than 1% of the total mapped extent of each PEC (**Table 10**). Additionally, as the Proposal Area’s alignment through the Fortescue Marsh (Marsh Land System) PEC coincides with BHPIO’s Newman rail corridor, any additional disturbance will be minimal.

During the 2012 Brockman survey conducted by *ecologia* (2012a), four vegetation units associated with cracking clay were recorded that are likely to represent the four plant assemblages of the Wona Land System PEC. A portion of these vegetation units are located within the Proposal Area. The vegetation units are described in **Table 9** and locations are shown on **Figure 13**.

The Proposal Area intersects approximately 58ha (<1%) of the Wona Land System PEC. Based on the proposed 60 m disturbance footprint, only 10.8ha of the Wona Land System PEC is likely to be impacted, representing less than 1% of its total mapped extent of the PEC (**Table 10**).

TABLE 9: VEGETATION UNITS REPRESENTING THE PEC - FOUR PLANT ASSEMBLAGES OF THE WONA LAND SYSTEM WITHIN THE PROPOSAL AREA

Unit	Description	Associated Species
c1	Mixed herbland over mixed isolated clumps of tussock grasses.	<i>Centipeda thespidioides</i> <i>Cleome viscosa</i> <i>Euphorbia boophthona</i> <i>Tephrosia clementii</i> <i>Sida fibulifera</i> <i>Boerhavia repleta</i> <i>Aristida inaequiglumis</i> <i>Eriachne mucronata</i>
c2	Mixed herbland over <i>Paraneurachne muelleri</i> , <i>Aristida inaequiglumis</i> tussock grassland.	<i>Centipeda thespidioides</i> <i>Heliotropium crispatum</i> <i>Cleome viscosa</i> <i>Desmodium sp.</i>
c3	Mixed herbland over mixed isolated clumps of tussock grasses.	<i>Senna glaucifolia</i> <i>Eriachne sp.</i>
c4	+/- <i>Acacia aneura</i> tall open woodland over mixed herbland over * <i>Cenchrus ciliaris</i> dominated tussock grassland.	<i>Centipeda thespidioides</i> <i>Heliotropium crispatum</i> <i>Cleome viscosa</i> <i>Evolvulus alsinoides</i> <i>Acacia tumida</i> var. <i>pilbarensis</i> <i>Senna artemisioides</i> subsp. <i>helmsii</i> <i>Senna glutinosa</i> <i>Corymbia hamersleyana</i>

TABLE 10: ESTIMATED DISTURBANCE CALCULATIONS FOR PECS LOCATED WITHIN THE PROPOSAL AREA

PEC	Total Area of PEC Mapped by DPAW (ha)	Area of PEC within the Proposal Area (ha/% of total)	Area of proposed disturbance to PEC by Proposal* (ha/% of total)
Fortescue Marsh (Marsh Land System) PEC (P1)	243,277	1,463 (<1%)	201 (<1%)
Brockman Iron cracking clay communities of the Hamersley Range PEC (P1)	7,856	543 (6.9%)	58 (<1%)
Four plant assemblages of the Wona Land System PEC (P1)	15,172	58 (<1%)	10.8 (<0.1%)
TOTAL AREA	266,305	2,064 (<1%)	308 (0.1%)

* Based on an average 60m wide disturbance associated with the rail footprint for length of the Proposal Area

In addition to the PECs, four groundwater dependent vegetation communities were recorded from within the Proposal Area during the Engenium survey (2015). These communities are described below in **Table 11**. It should be noted that these communities were only mapped within their designated study areas for the biological survey conducted, and are likely to occur beyond the Proposal Area.

TABLE 11: GROUNDWATER DEPENDENT VEGETATION COMMUNITIES RECORDED WITHIN THE PROPOSAL AREA

Community ID	Description	Total Area Mapped (ha)
GDE1	<i>Eucalyptus camaldulensis</i> and <i>Eucalyptus victrix</i> sparse mid woodland, over <i>Melaleuca argentea</i> sparse low woodland, over <i>Melaleuca linophylla</i> sparse tall shrubland, over <i>Triodia epactia</i> open hummock grassland and <i>Cyprus vaginatus</i> sparse sedgeland.	1.42
GDE2	<i>Eucalyptus victrix</i> and <i>Melaleuca argentea</i> sparse low woodland, over <i>Melaleuca linophylla</i> , <i>Acacia trachycarpa</i> and <i>Acacia pyrifolia</i> subsp. <i>pyrifolia</i> open tall shrubland, over <i>Triodia epactia</i> hummock grassland.	3.78
GDE3	<i>Melaleuca argentea</i> open low woodland, over <i>Acacia trachycarpa</i> and <i>Acacia tumida</i> subsp. <i>pilbarensis</i> sparse tall shrubland, over <i>Acacia acradenia</i> sparse mid shrubland, over <i>Triodia epactia</i> hummock grassland.	0.71
GDE4	<i>Eucalyptus camaldulensis</i> and <i>Eucalyptus victrix</i> mid woodland, over <i>Atalaya hemiglauc</i> a and <i>Acacia coriacea</i> sparse low woodland, over <i>Acacia trachycarpa</i> and <i>Melaleuca linophylla</i> sparse tall shrubland, over <i>Triodia epactia</i> sparse hummock grassland and/or <i>Cenchrus ciliaris</i> tussock grassland.	114.87

5.2.3. TERRESTRIAL FAUNA

A total of nine terrestrial fauna surveys have been conducted over the Proposal area, both by other Proponents and MRL (**Table 4**).

Desktop Assessment

Searches of the DPAW and DotE databases (Engenium 2015 and Astron 2015) were conducted for the Proposal Area to identify potential fauna species of conservation significance likely to occur in the Proposal area. This included a search of the following databases:

- DPAW Threatened and Priority Fauna Database
- DotE Protected Matters Search Tool (40 km radius from a line defined by coordinates -20.322, 118.621 and -22.693, 119.939 (GDA94).

The database searches identified a total of 60 conservation significant taxa that have been previously recorded within the vicinity of the Proposal Area, including ten Threatened species. The Northern Quoll (*Dasyurus hallucatus*) was the only Threatened species recorded from within the Proposal area, with a total of seven records listed.

Three Priority 4 (P4) listed species have been recorded from the Proposal area taxa, including the Brush-tailed Mulgara (*Dasyercus blythi*), Ghost Bat (*Macroderma gigas*) and the Western Pebble-mound Mouse (*Pseudomys chapmani*).

A further two species are listed as Migratory under both the EP Act and EPBC Act; Rainbow Bee-eater (*Merops ornatus*) and White-bellied Sea-Eagle (*Haliaeetus leucogaster*) were also Proposal area.

Table 12 outlines all the fauna species of conservation significance identified within desktop searches and their presence within the Proposal Area. Locations of desktop records for all Threatened and Priority species are shown on **Figure 14** and **Figure 15** and migratory species are shown on **Figure 16** and **Figure 17**.

TABLE 12: CONSERVATION SIGNIFICANT FAUNA RECORDS WITHIN THE VICINITY OF THE PROPOSAL AREA FROM DESKTOP SEARCHES

Common Name	Species	Conservation status			Desktop record in the Proposal Area
		EPBC Act	WC Act	DPaW	
Reptiles					
Airlie Island Skink	<i>Ctenotus angusticeps</i>	VU	S1	VU	No
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	VU	S1	VU	No
Woma	<i>Aspidites ramsayi</i>		S4	Other	No
Black-lined Ctenotus	<i>Ctenotus nigrilineatus</i>			P1	No
Gane's Blind Snake	<i>Ramphotyphlops ganei</i>			P1	No
Lake Disappointment Ground Gecko	<i>Diplodactylus fulleri</i>			P2	No
Spotted Ctenotus, Spotted Skink	<i>Ctenotus uber subsp. johnstonei</i>			P2	No
Southern Death Adder	<i>Acanthophis antarcticus</i>			P3	No
Mammals					
Greater Bilby	<i>Macrotis lagotis</i>	VU	S1	VU	No
Crest-tailed Mulgara	<i>Dasyercus cristicauda</i>	VU	S1	VU	No
Northern Quoll	<i>Dasyurus hallucatus</i>	EN	S1	EN	YES
Pilbara Leaf-nosed Bat	<i>Rhinonicteris aurantia</i> (Pilbara form)	VU	S1	VU	No
Little North-western Mastiff Bat	<i>Mormopterus loriae cobourgiana</i>			P1	No
Spectacled Hare-wallaby	<i>Lagorchestes conspicillatus leichardti</i>			P3	No
Brush-tailed Mulgara	<i>Dasyercus blythi</i>			P4	YES
Ghost Bat	<i>Macroderma gigas</i>			P4	YES
Short-tailed Mouse	<i>Leggadina lakedownensis</i>			P4	No
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>			P4	YES
Birds					
Peregrine Falcon	<i>Falco peregrinus</i>		S4	Other	No
Asian Dowitcher	<i>Limnodromus semiarmatus</i>	M	S3	IA	No
Bar-tailed Godwit	<i>Limosa lapponica</i>	M	S1/S3	VU	No
Caspian Tern	<i>Hydroprogne caspia</i>	M	S3	IA	No
Cattle Egret	<i>Ardea ibis</i>	M	S3	IA	No
Common Greenshank	<i>Tringa nebularia</i>	M	S3	IA	No
Common Sandpiper	<i>Actitis hypoleucos</i>	M	S3	IA	No
Common Tern	<i>Sterna hirundo</i>	M	S3	IA	No
Eastern Great Egret	<i>Ardea modesta</i>	M	S3	IA	No
Eastern Reef Egret	<i>Egretta sacra</i>	M	S3	IA	No
Fork-tailed Swift	<i>Apus pacificus</i>	M	S3	IA	No
Greater Sand Plover	<i>Charadrius leschenaultii</i>	M	S1/S3	VU	No
Grey Plover	<i>Pluvialis squatarola</i>	M	S3	IA	No
Lesser Frigatebird	<i>Fregata ariel</i>	M	S3	IA	No
Little Curlew	<i>Numenius minutus</i>	M	S3	IA	No
Long-toed Stint	<i>Calidris subminuta</i>	M	S3	IA	No
Marsh Sandpiper	<i>Tringa stagnatilis</i>	M	S3	IA	No
Oriental Pratincole	<i>Glareola maldivarum</i>	M	S3	IA	No

Common Name	Species	Conservation status			Desktop record
Pacific Golden Plover	<i>Pluvialis fulva</i>	M	S3	IA	No
Pin-tailed Snipe	<i>Gallinago stenura</i>	M	S3	IA	No
Rainbow Bee-eater	<i>Merops ornatus</i>	M	S3	IA	YES
Red Knot	<i>Calidris canutus</i>	M	S1/S3	VU	No
Red-necked Stint	<i>Calidris ruficollis</i>	M	S3	IA	No
Ruddy Turnstone	<i>Arenaria interpres</i>	M	S3	IA	No
Ruff	<i>Philomachus pugnax</i>	M	S3	IA	No
Sanderling	<i>Calidris alba</i>	M	S3	IA	No
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	M	S3	IA	No
Terek Sandpiper	<i>Xenus cinereus</i>	M	S3	IA	No
Whimbrel	<i>Numenius phaeopus</i>	M	S3	IA	No
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	M	S3	IA	YES
White-winged Black Tern	<i>Chlidonias leucopterus</i>	M	S3	IA	No
Wilson's Storm Petrel	<i>Oceanites oceanicus</i>	M	S3	IA	No
Wood Sandpiper	<i>Tringa glareola</i>	M	S3	IA	No
Yellow Wagtail	<i>Motacilla flava subsp. similima</i>	M	S3	IA	No

Survey Results

Based on the results of the available spatial data from the Engenium (2015) survey and previous vertebrate fauna surveys reviewed for this Proposal (refer to **Table 4**) along with the results of database searches (**Table 12**), only one Threatened fauna has been recorded within the Proposal Area (**Table 13**). Locations of all Threatened and Priority fauna records are shown on **Figure 18** and **Figure 19** and migratory species are shown on **Figure 20** and **Figure 21**.

The Northern Quoll (*Dasyurus hallucatus*) was recorded on three occasions during the Engenium survey (May 2015) from the one location within the Proposal Area. Locations of all Northern Quoll records within the Proposal Area are shown on **Figure 22**.

Four P4 fauna taxa including the Brush-tailed Mulgara (*Dasycercus blythi*), Western Pebble-mound Mouse (*Pseudomys chapmani*), Ghost Bat (*Macroderma gigas*) and the Australian Bustard (*Ardeotis australis*) have been recorded within the Proposal Area.

Two species listed as Migratory were recorded within the Proposal Area, the Rainbow Bee-eater (*Merops ornatus*), from seven locations, and the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) from one location.

Locations of all conservation significant species recorded within the Proposal Area are shown on **Figure 22** and **Figure 23**.

TABLE 13: FAUNA SPECIES OF CONSERVATION SIGNIFICANCE RECORDED WITHIN THE PROPOSAL AREA (FROM ENGENIUM (2015) AND PREVIOUS SURVEYS)

Common Name	Species	Conservation Status			No. of Records within the Proposal Area
		EPBC Act	WC Act	DPaW	
Mammals					
Northern Quoll	<i>Dasyurus hallucatus</i>	EN	S1	EN	10
Brush-tailed Mulgara	<i>Dasyercus blythi</i>			P4	20
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>			P4	15
Ghost Bat	<i>Macroderma gigas</i>			P4	1
Birds					
Australian Bustard	<i>Ardeotis australis</i>			P4	5
Rainbow Bee-eater	<i>Merops ornatus</i>	M	S3	IA	7
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	M	S3	IA	1
TOTAL					59

Significant Fauna Habitats

The following potentially significant fauna habitats were identified within the vicinity of the Proposal Area:

- The Fortescue Marsh is listed an Environmentally Sensitive Area (ESA) and Nationally Significant Wetland, this may provide a significant habitat for local fauna and Migratory species;
- Linear sand dunes habitats adjacent to Weeli Wolli Creek (located at southern end of the Proposal Area);
- Cracking clay habitat units associated with the Chichester Range (located in the southern half of the Proposal Area, north of the Fortescue Marsh ESA);
- Granite rockpiles scattered on the Abydos plain (located centrally within the Proposal Area); and
- Major drainage systems located along the length of the Proposal Area (Biota 2004b).