14 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

14.1 Introduction

Actions relating to the Wandoan Coal Project including the Glebe Weir raising and pipeline (the Glebe Option) were referred to the Commonwealth Minister responsible for the administration of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 17 June 2008 in accordance with section 68 of that Act.

On 21 July, 2008, the Minister's delegate determined that the Glebe Option constituted a 'controlled action' under section 75 of the EPBC Act, due to the likely impacts on the following matters of national environmental significance (MNES):

- Listed threatened species and ecological communities (sections 18 and 18A); and
- Listed migratory species (sections 20 and 20A).

Thus, before the Federal Minister for the EPBC Act makes a decision under Part 9 of the EPBC Act, whether to approve the Glebe Option as a controlled action, the Minister must consider all adverse and beneficial impacts that the Glebe Option will have on the above MNES.

This chapter refers only to the Glebe Option (Volume 4 of the Project EIS).

14.2 Methodology

14.3 Description of the proposed action

The action is fully described in Chapter 5. In summary, it is the raising of the existing Glebe Weir (Plate 14-1) through modifications of the weir crest and abutments that will allow a fabridam (a rubber inflatable dam) to be fitted. This will raise the full supply level (FSL) of the weir by 2.36 m from the current 10.6 m. The stored water is currently maintained entirely within the banks of the Dawson River and short lengths of a number of tributaries. Water will be extracted from the weir via a pump station to be constructed on the right bank and then transported to the Wandoan Coal Project by buried pipe. The pipeline will be located within the Nathan Rd reserve for 72 km of its 83 km length. Other than the additional water being extracted for the Wandoan Coal Project, the weir will continue to operate as it currently does in terms of supplying water to the downstream Dawson Valley Water Supply Scheme. No water will be provided for any new purpose other than the Wandoan Coal Project.

Plate 14-1. Existing Glebe Weir

Raising of the weir FSL will cause the stored water to spill over the banks of a number of tributaries (Figure 14-1). The extent of spill will be contained by earth levees. On the north side (left bank) adjoining Boggomoss Ck and Boggomoss Area No. 1 (Section 14.4), the levee will be approximately 1km long and 1.2 m high.

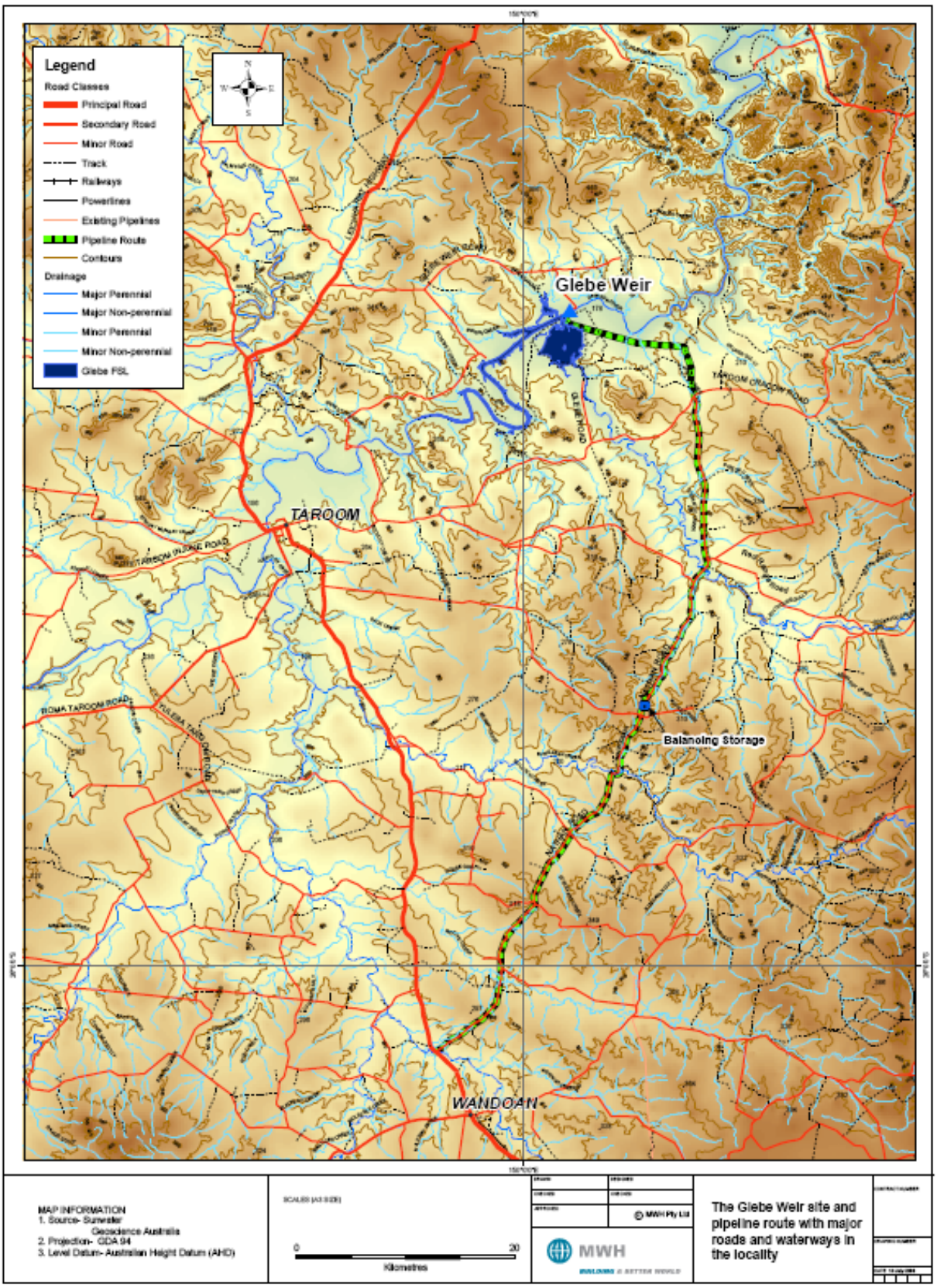

Figure 14-1. Glebe Option proposed inundation area and pipeline route.

Other key features of the development are:

- the inundation area of the weir will increase from 593 ha to 1792 ha, with the majority of the increase due to overtopping of the banks adjacent Cockatoo Ck and Boggomoss Ck;
- the weir development will require 690.14 ha of native vegetation to be cleared or inundated;
- a fishway and multi-level offtake will be fitted if the proposed Nathan Dam does not proceed (the current weir has neither facility);
- the pipeline requires a 30 m wide cleared construction easement, reducing to 16 m for maintenance purposes;
- the pipeline will be buried for its entire length, including at creek crossings such that the only above ground structures are the balancing storage at the high point in the route, air vents and purge valves; and
- the pipeline component will require the clearing the 15.5 ha of native vegetation.

14.4 Relevant Matters of National Environmental Significance

14.4.1 Listed Threatened Ecological Communities

Database searches undertaken as part of the terrestrial ecology assessment (Chapter 12) indicate that four Threatened Ecological Communities are known to occur within the area, as follows:

- Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South);
- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; and
- the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin.

All of these communities currently have a management status of Endangered under the EPBC Act.

Recent seasonal ground survey has confirmed the presence of all but Bluegrass within the Glebe Option impact area.

A description of the occurrence of each of these confirmed Threatened Ecological Communities within the Study Area is provided below. As no vegetation communities analogous to the 'Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South)' community were recorded within the Study Area (Table 12-3), this Threatened Ecological Community is not considered relevant to the Glebe Option.

14.4.1.1 Brigalow (*Acacia harpophylla* dominant and co-dominant)

Brigalow dominated vegetation communities analogous to the EPBC-listed community that were recorded from the Study Area during recent ground survey are listed and described in terms of the analogous Regional Ecosystem (RE) in Table 14-1 and shown in relation to the inundation area and pipeline route for the Glebe Option on Figure 14-2.

Table 14-1. Brigalow dominated vegetation communities analogous to the EPBC-listed community that were recorded from the Study Area during recent ground survey.

RE	Community Description	Location Description
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Various locations adjacent to and within inundation area and northern-most section of pipeline route
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	Single location adjacent to middle section of pipeline route
11.9.5	*Acacia harpophylla* ± *Casuarina cristata* open forest on fine-grained sedimentary rocks	Various locations adjacent to and within inundation area and along pipeline route

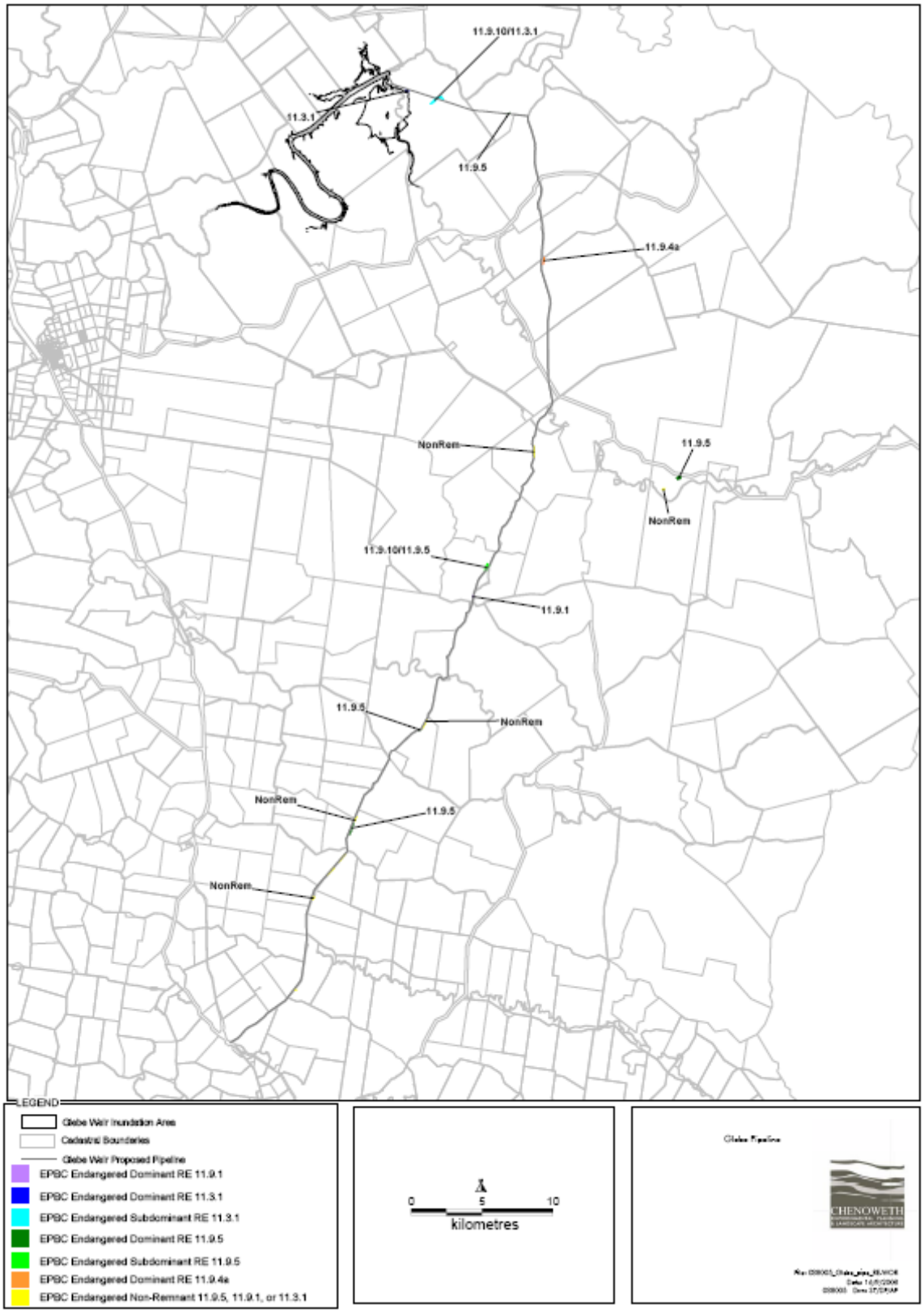

Figure 14-2. Regional Ecosystem Mapping

14.4.1.2 Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

Semi-evergreen vine thickets are a form of dry, seasonal subtropical rainforest occurring throughout the Brigalow Belt bioregion, often referred to as 'vine scrub'. They are typified by a floristically diverse species composition, including a mixture of evergreen, semi-evergreen and deciduous emergent vegetation, and variable canopy height and density, and lack species typical of wet, tropical rainforest such as tree ferns, palms and vascular epiphytes. They are also often characterised by the presence of Bottle Trees and vines (EPA 2008b).

The only occurrence of this Threatened Ecological Community within the Study Area was a single area analogous to RE 11.9.4a (Semi-evergreen vine thicket on fine grained sedimentary rocks) recorded adjacent to (but not within) the northern section of the pipeline route (Figure 14-2).

14.4.1.3 The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

This community is found in numerous locations in Queensland, New South Wales and South Australia (Figure 14-3) and represents moist groundwater dependent habitats which are important refugia for flora and fauna species.

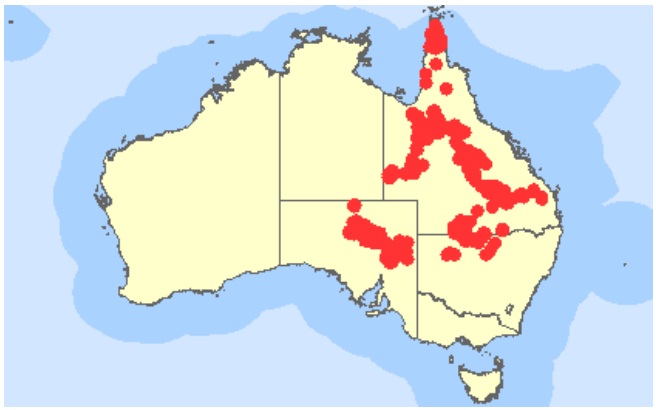

Figure 14-3. Distribution of "communities of Native vegetation species dependent on natural discharge of groundwater from the Great Artesian Basin" throughout Australia

(Source: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=26&status=Endangered).

These mound springs are locally known in the Study Area as 'boggomoss' communities. A boggomoss is a small peat bog that is formed by water from underlying aquifers of the Great Artesian Basin being pushed to the surface through mound springs (Clarke and Spier-Ashcroft 2003). Boggomosses are dynamic in that the outlets of the boggomosses close over from time to time and new outlets appear (DNR, 1996).

Figure 14-4 shows the location of boggomosses within, or in close proximity to, the inundation area, including those recently recorded during ground survey and those previously recorded on the EPA's Queensland Springs Database. It also shows Boggomoss Area No.1, an area listed on the Register of the National Estate. Also clear is the existing centre pivot irrigation and the proposed levee. No boggomosses occur along the pipeline route.

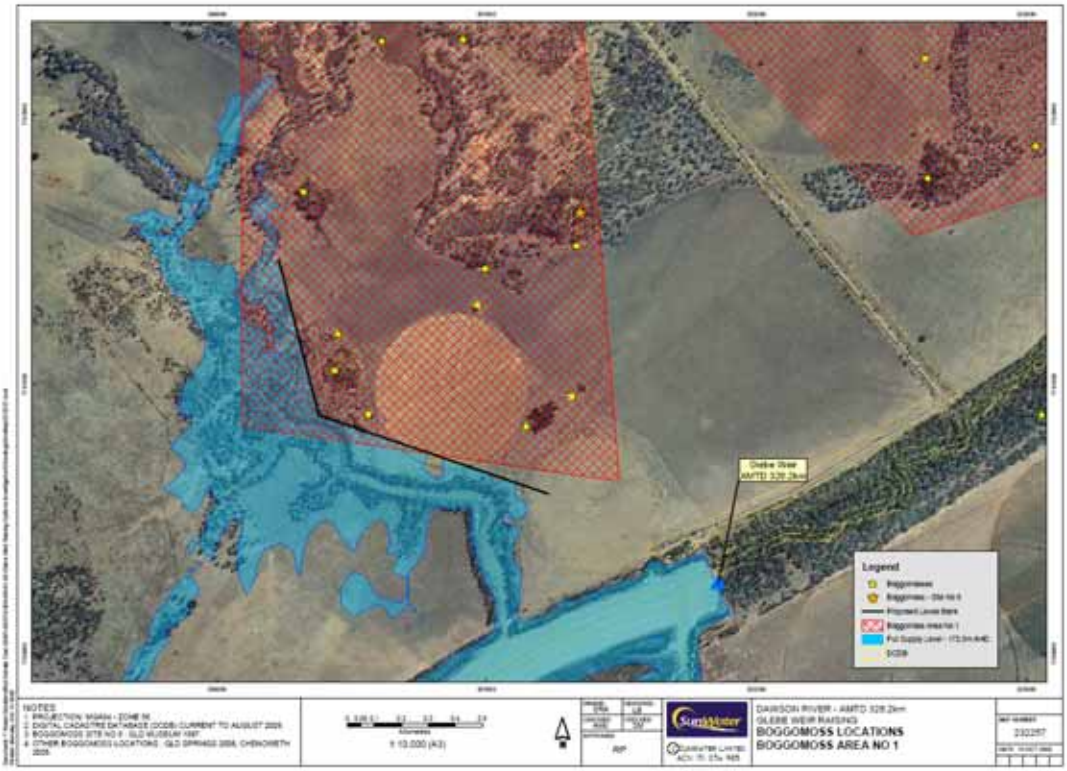

Figure 14-4. Boggomoss locations and Boggomoss Area no.1

14.4.2 Listed Threatened Species

14.4.2.1 Flora

Based on database searches and previous investigations, six flora species listed under the provisions of the EPBC Act may potentially occur within the vicinity of the Study Area, as follows:

- *Arthraxon hispidus* (Hairy Joint-grass) – Vulnerable;
- *Cadellia pentastylis* (Ooline) – Vulnerable;
- *Commersonia* sp. (Cadarga - G.P. Guymer 1642*)* – Vulnerable;
- *Dichanthium queenslandicum* (King Blue-grass) – Vulnerable;
- *Digitaria porrecta* (Finger Panic Grass) – Endangered, and
- *Eriocaulon carsonii (*Salt Pipewort, Button Grass) – Endangered.

Ground survey confirmed the presence of Hairy Joint grass and Salt Pipewort beyond the Glebe Option impact area. The likelihood of occurrence of each species within the area of impact is assessed in Table 14-2.

Table 14-2. Likelihood of occurrence of significant flora species within the impact area based on ground-truthing

Genus Species	Common Name	EPBC Act Status	Likelihood of Occurrence
Arthraxon hispidus	Hairy Joint-grass	Vulnerable	**Possible**. Species recorded in RE11.3.27b, outside of inundation area and pipeline route.
Cadellia pentastylis	Ooline	Vulnerable	**Possible**. General habitat represented by REs 11.9.4 and 11.9.5.
Commersonia sp. Cadarga (G.P.Guymer 1642)		Vulnerable	**Unlikely**. Potential habitat not represented.
Dichanthium queenslandicum	King Blue-grass	Vulnerable	**Unlikely**. Potential habitat not represented.
Digitaria porrecta	Finger Panic Grass	Endangered	**Unlikely**. Potential habitat not represented.
Eriocaulon carsonii	Salt Pipewort, Button Grass	Endangered	**Possible**. Species recorded in RE11.3.25 specifically associated with Boggomosses on Sandy Creek.

14.4.2.2 Terrestrial Fauna

Based on database searches and previous investigations, a number of terrestrial fauna species listed as threatened under the provisions of the EPBC Act have been previously recorded or potentially occur within the vicinity of the Study Area. These are listed in Table 14-3, along with an assessment of their likelihood of occurrence in the impact area following recent ground survey.

Table 14-3. EPBC-listed threatened terrestrial fauna species known or potentially occurring within the impact area

Genus Species	Common Name	EPBC Act Status	Likelihood of Occurrence
Adclarkia dawsonensis	Boggomoss Snail	Critically Endangered	**Unlikely** One population of the Boggomoss Snail is currently known from a 44.5 ha patch of riparian habitat at the Isla-Delusion Road crossing of the Dawson River, which is approximately 30 km downstream of Glebe Weir. Another population is located in a 0.5 ha patch of boggomoss habitat (Boggomoss no.8 Figure 13-4) over 1km north and east of the weir and the proposed levee on Boggomoss Creek. The species has also recently been found at two other boggomoss sites very near to Boggomoss no.8 and external to the levee
Paradelma orientalis	Brigalow Scaly-foot	Vulnerable	**High likelihood**. Recorded from *Callitris* woodland several kilometres downstream of the weir during recent ground survey and suitable habitat exists within remnant and regrowth Brigalow woodland adjacent to the inundation area and along the pipeline route.
Egernia rugosa	Yakka Skink	Vulnerable	**Unlikely** within inundation area, although suitable habitat exists in rocky areas within dry sclerophyll woodlands along the pipeline route.
Furina dunmalli	Dunmall's Snake	Vulnerable	**Possible**. Species not detected during targeted ground survey and there are no database records from the area, although suitable habitat exists within remnant and regrowth Brigalow woodlands on cracking clay soils within and immediately adjacent to the inundation area and along the pipeline route.
Erythrotriorchis radiatus	Red Goshawk	Vulnerable	**Unlikely** to be present within the impact area. Extensive riparian woodlands associated with the downstream Nathan Gorge provide suitable habitat.
Turnix melanogaster	Black-breasted Button-quail	Vulnerable	**Unlikely**. Some potentially suitable vine thicket vegetation is present along the pipeline route, although the species is considered extinct for the Dawson River floodplain and the region generally (Venz *et al*. 2002).
Rostratula australis [1]	Australian Painted Snipe	Vulnerable	**Possible**. Study area is within species range and wetlands associated with the floodplains of the Dawson River near Taroom and its tributaries are likely to provide seasonal habitat for this species.

Genus Species	Common Name	EPBC Act Status	Likelihood of Occurrence
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Vulnerable	**Likely**. Species detected in woodland of River Red Gum during ground survey downstream of the inundation area. Suitable habitat also occurs along the pipeline route.
Lathamus discolor	Swift Parrot	Endangered	**Unlikely**. The impact area is well north of the known range for the species.
Neochmia ruficauda ruficauda	Star Finch (eastern and southern subspecies) [3]	Endangered	**Unlikely**. Some suitable habitat may occur within the inundation area and along the pipeline route, however no field observations were made and there are no Wildlife Online records of this species in the area. The range of this subspecies of the Star Finch has contracted and in Queensland it is now only found at scattered sites in northern Queensland. The more recent southerly records are considered to be aviary escapees (Higgins *et al*. 2006). The species is regarded as regionally extinct (EPA 2003c).
Nyctophilus timoriensis [2]	Greater Long-eared Bat	Vulnerable	**Likely**. Species not detected during ground survey, although suitably large patches of habitat occur within the inundation area and along the pipeline route. Three Wildlife Online records exist for this species within the broader study area.
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	**Likely**. Species not detected during ground survey, although suitable habitat may exist in caves in the Dawson ranges and other areas of remnant vegetation and may occasionally utilise habitats within the inundation area. Suitable habitat for this species occurs along the pipeline route.

[1] Australian Painted Snipes have been considered a subspecies of *Rostratula benghalensis*, a species found in sub-Saharan Africa and Asia (Marchant and Higgins 1993). Australian birds are now considered to be an endemic species, in which case *R. benghalensis* does not occur in Australia (Garnett and Crowley 2000; Geering *et al*. 2007; Christidis and Boles 2008).
[2] Also known as Eastern Long-eared Bat. *Nyctophilus timoriensis* is currently undergoing taxonomic revision and will be re-described as four separate species. The South-eastern Long-eared Bat is the 'form' which may occur in the study area (Turbill *et al*. 2008).

14.4.3 Listed Migratory Species

Based on database searches and previous investigations, a number of species listed as Migratory under the provisions of the EPBC Act have been recorded or potentially occur within the vicinity of the Study Area. These are listed in Table 14-4, along with an assessment of their likelihood of occurrence in the impact area following recent ground survey.

Table 14-4. EPBC-listed migratory species known or potentially occurring within the impact area

Genus Species	Common Name	Likelihood of Occurrence
Nettapus coromandelianus	Cotton Pygmy-goose	**Likely** within the inundation area. Recorded from floodplain wetlands of the Dawson River at Lake Murphy Conservation Reserve and preferred habitat exists within the existing inundation area. Suitably large wetland areas do not occur along the pipeline route.
Plegadis falcinellus	Glossy Ibis	**Likely** within the inundation area. Suitable freshwater wetland areas do not occur along the pipeline route, although this species may occur in adjacent areas during seasonal flooding.
Bubulcus ibis [1]	Cattle Egret	**Likely**. Recorded during ground survey, including observations within the inundation area. This species is likely to utilise a range of habitats, including modified landscapes throughout the pipeline route.
Ardea alba	Great Egret [2]	**Likely**. Recorded on Wildlife Online Database and preferred habitat exists within the inundation area. Suitable freshwater wetland areas do not occur along the pipeline route, although this species may occur in adjacent areas during seasonal flooding.
Haliaeetus leucogaster	White-bellied Sea-Eagle	**Present**. Recorded from the Dawson River and an active nest is located immediately below the weir. The existing inundation area provides foraging habitat. This species may overfly the pipeline route, following larger tributaries.
Gallinago hardwickii	Latham's Snipe	**Likely**. No records, but floodplain wetlands of the Dawson River provide ideal habitat, including areas within the inundation area. Floodplain wetlands along the pipeline route also provide some habitat during seasonal flooding.
Numenius minutus	Little Curlew	**Possible**. No records, but may use floodplain within the inundation area and floodplain wetlands along the pipeline route during seasonal flooding.
Tringa nebularia	Common Greenshank	**Likely**. No records, but may use floodplain within the inundation area and floodplain wetlands along the pipeline route during seasonal flooding.
Tringa stagnatilis	Marsh Sandpiper	**Likely**. No records, but may use floodplain within the inundation area and floodplain wetlands along the pipeline route during seasonal flooding.
Calidris acuminata	Sharp-tailed Sandpiper	**Likely**. No records, but may use floodplain within the inundation area and floodplain wetlands along the pipeline route during seasonal flooding.

Genus Species	Common Name	Likelihood of Occurrence
Cuculus saturatus	Oriental Cuckoo	**Likely**. Preferred riparian habitats for this species occur downstream of Glebe Weir and suitable habitat occurs along the pipeline route, particularly along water courses.
Hirundapus caudacutus	White-throated Needletail	**Present**. Known from over the inundation area and the species is likely to occur over a range of habitats within the pipeline route.
Apus pacificus	Fork-tailed Swift	**Likely**. The species is a likely occurrence in the airspace over the inundation area and over a range of habitats within the pipeline route.
Merops ornatus	Rainbow Bee-eater	**Likely**. Recorded during ground survey and is a likely occurrence within the inundation area and in a range of habitats along the pipeline route.
Myiagra cyanoleuca	Satin Flycatcher	**Likely**. Recorded during the ground survey within lower Cockatoo Creek and immediately adjacent to the inundation area. Suitable patches of habitat also occur within and adjacent to the pipeline route along well vegetated water courses.

[1] Also known as *Ardea ibis.*
[2] Also known as Eastern Great Egret *Ardea modesta.*

14.5 Assessment of the Significance of Impacts on Matters of National Environmental Significance

Table 14-5 to Table 14-8 provide an assessment of the significance of the impacts of the Glebe Option on the relevant Matters of National Environmental Significance described in Section 14.2 for ecological communities and species that are known, likely or possibly present within the area of impact. These ecological communities and species are:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) community
- Community of native vegetation species dependent on natural discharge of groundwater from the Great Artesian Basin
- *Arthraxon hispidus Hairy Joint Grass*
- *Cadellia pentastylis* Ooline
- *Eriocaulon carsonii* Salt Pipewort, Button Grass
- *Adclarkia dawsonensis* Boggomoss Snail
- *Paradelma orientalis* Brigalow Scaly-foot
- *Egernia rugosa* Yakka Skink
- *Furina dunmalli* Dunmall's Snake
- *Rostratula australis* Australian Painted Snipe
- *Geophaps scripta scripta* Squatter Pigeon (southern subspecies)
- *Nyctophilus timoriensis* Greater Long-eared Bat
- *Chalinolobus dwyeri* Large-eared Pied Bat

- *Nettapus coromandelianus* Cotton Pygmy-goose
- *Plegadis falcinellus* Glossy Ibis
- *Bubulcus ibis* Cattle Egret
- *Ardea alba* Great Egret
- *Haliaeetus leucogaster* White-bellied Sea-Eagle
- *Gallinago hardwickii* Latham's Snipe
- *Numenius minutus* Little Curlew
- *Tringa nebularia* Common Greenshank
- *Tringa stagnatilis* Marsh Sandpiper
- *Calidris acuminata* Sharp-tailed Sandpiper
- *Cuculus saturatus* Oriental Cuckoo
- *Hirundapus caudacutus* White-throated Needletail
- *Apus pacificus* Fork-tailed Swift
- *Merops ornatus* Rainbow Bee-eater
- *Myiagra cyanoleuca* Satin Flycatcher

In each case, the significance of impacts is determined against the relevant significant impact criteria developed by the Australian Government (2006) under the EPBC Act.

Table 14-5. EPBC Assessment of Impact Significance on Listed Endangered Ecological Communities– Glebe Option Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:	Brigalow (*Acacia harpophylla* dominant and co-dominant) communities This community is analogous to areas classified as a number of Regional Ecosystems (RE's) under the provisions of the Queensland *Vegetation Management Act 1999*. Two such RE's (11.3.1 and 11.9.5) have been identified as being within the area of direct impact.
Reduce the extent of an ecological community.	3.92 ha of RE11.3.1 would be subject to inundation and 0.3 ha of RE11.3.1 would be cleared for pipeline construction. 0.29 ha of RE11.9.5 would be subject to inundation and 0.78 ha of RE 11.9.5 would be cleared for pipeline construction. The total areas affected are composed of a number of very small patches which do not form continuous habitat. With mitigation through the offsetting which is formally required for part of this area under the Vegetation Management Act, and habitat restoration and enhancement of comparable ecosystems in the local area, the result of the proposed action would not significantly reduce the extent of these Brigalow communities.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	There are no continuous areas of these vegetation types within the inundation area or along the pipeline route. With mitigation through offsetting, and habitat restoration and enhancement of comparable ecosystems in the local area, there is an opportunity to improve connectivity between currently fragmented remnants of these Brigalow communities as a result of the proposed action.
Adversely affect habitat critical to the survival of an ecological community.	0.004% of the bioregional extent of RE11.3.1 and <0.001% of the bioregional extent of RE11.9.5 would be affected by the proposed action. With mitigation through offsetting, and habitat restoration and enhancement of comparable ecosystems in the local area, the result of the proposed action would not adversely affect habitat critical to the survival of these Brigalow communities.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	There are a number of locations where fragments of Brigalow communities will be present adjacent to the inundation area and pipeline easement. These communities will be subject to increased edge effects, including weed invasion and exposure to changed environmental conditions (e.g. altered surface water movement, noise, light and wind). In particular, the spread of weeds from impoundment edges is likely. The development and implementation of an Operational Habitat Management Plan will be undertaken which will include detection and control of weeds, and rehabilitation and enhancement of remnants adjacent to the inundation area and pipeline easement to improve their integrity and resilience. Groundwater impacts are not expected adjacent to the inundation area. Revegetation of riparian areas is predicted to minimize any seepage to surrounding areas from the levee near Boggomoss Ck. Revegetation will use species native to the area, including Brigalow where it is the appropriate vegetation type.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular	An Operational Habitat Management Plan will be developed and implemented and will include detection and control of weeds, fire management, and rehabilitation and enhancement of remnants adjacent to the inundation area and pipeline easement to improve their integrity and resilience.

Criteria	Assessment of Significance
burning or flora or fauna harvesting.	
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established; or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	There are a number of locations where fragments of Brigalow communities will be present adjacent to the inundation area and pipeline easement. These communities will be subject to increased edge effects as noted above An Operational Habitat Management Plan will be developed and implemented and will include detection and control of weeds, and rehabilitation and enhancement of remnants adjacent to the inundation area and pipeline easement to improve their integrity and resilience.
Interfere with the recovery of an ecological community.	0.004% of the bioregional extent of RE11.3.1 and <0.001% of the bioregional extent of RE11.9.5 would be affected by the proposed action. With mitigation through offsetting, and habitat restoration and enhancement of comparable ecosystems in the local area, the result of the proposed action would not interfere with the recovery of these Brigalow communities. A recovery plan for this ecological community is currently being prepared by DEWHA.

An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:	Community of native vegetation species dependent on natural discharge of groundwater from the Great Artesian Basin – includes the "Boggomosses" of the Dawson River. This community is not analogous to specific regional ecosystems as each boggomoss is unique, and its vegetation assemblage is influenced by the vegetation community in which it occurs. Sixteen boggomosses have been mapped within the local area. Nine of these are recorded on the Queensland Spring database, and seven additional boggomosses have recently been recorded by CEPLA (2008). One of these newly identified boggomosses is located within the inundation area (Figure 14-4). Fourteen of the remaining boggomosses are located north of Glebe Weir, in association with Boggomoss Creek.
Reduce the extent of an ecological community.	These ecological communities are distributed through Queensland, Northern New South Wales and South Australia in association with the Great Artesian Basin. The loss of the boggomoss within the inundation area will result in a local reduction in extent of the ecological community as it occurs at present. Boggomosses are dynamic in that the outlets of the boggomosses close over from time to time and new outlets appear (DNR 1996). Potential impacts on the boggomosses associated with Boggomoss Creek to the north of Glebe Weir are related to the indirect impact of waterlogging. Waterlogging has been identified as a possible though unlikely issue immediately adjacent to the new levee. Chapter 12

Criteria	Assessment of Significance
	concluded that mitigation strategies including cessation of irrigation in the immediate area adjacent the levee and planting of a significant buffer of riparian trees in its place would reduce the potential impact for waterlogging to negligible levels. A groundwater monitoring program will be included to identify any changes in groundwater levels over time. While considered very unlikely to eventuate, a further mitigation option has been identified (subsurface drainage) should it be shown to be necessary. As a result, while the probability for unmitigated impact was considered unlikely, following mitigation the probability is reduced to negligible levels.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	As these communities are small and isolated in nature, fragmentation would not result from the proposed action.
Adversely affect habitat critical to the survival of an ecological community.	The only identified risk relates to potential waterlogging and this was assessed as negligible following mitigation.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The only identified risk relates to potential waterlogging and this was assessed as negligible following mitigation.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The only identified risk relates to potential waterlogging and this was assessed as negligible or zero following mitigation. Changes to the fire regime or flora and fauna harvesting are highly unlikely.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established; or – causing regular mobilisation of fertilisers, herbicides or other	The only identified risk relates to potential waterlogging and this was assessed as negligible following mitigation. As part of the mitigation includes cessation of irrigated farming in the immediate vicinity, the risks from fertilizers etc will be less than is currently the case.

Criteria	Assessment of Significance
chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	
Interfere with the recovery of an ecological community.	These ecological communities are distributed through Queensland, Northern New South Wales and South Australia in association with the Great Artesian Basin. Boggomosses are dynamic in that the outlets of the boggomosses close over from time to time and new outlets appear (DNR 1996). The loss of one boggomoss community within the inundation area would not interfere with the recovery of the ecological community. The loss of any further Boggomoss communities in this location would not necessarily interfere with the recovery of the ecological community due to the dynamic nature of the springs, although it could potentially affect Endangered species associated with springs in nearby locations – specifically the Boggomoss Snail and *Myriphyllum* sp. (Table 14-6), by reducing potential translocation sites. A recovery plan for this ecological community is currently under preparation by DEWHA.

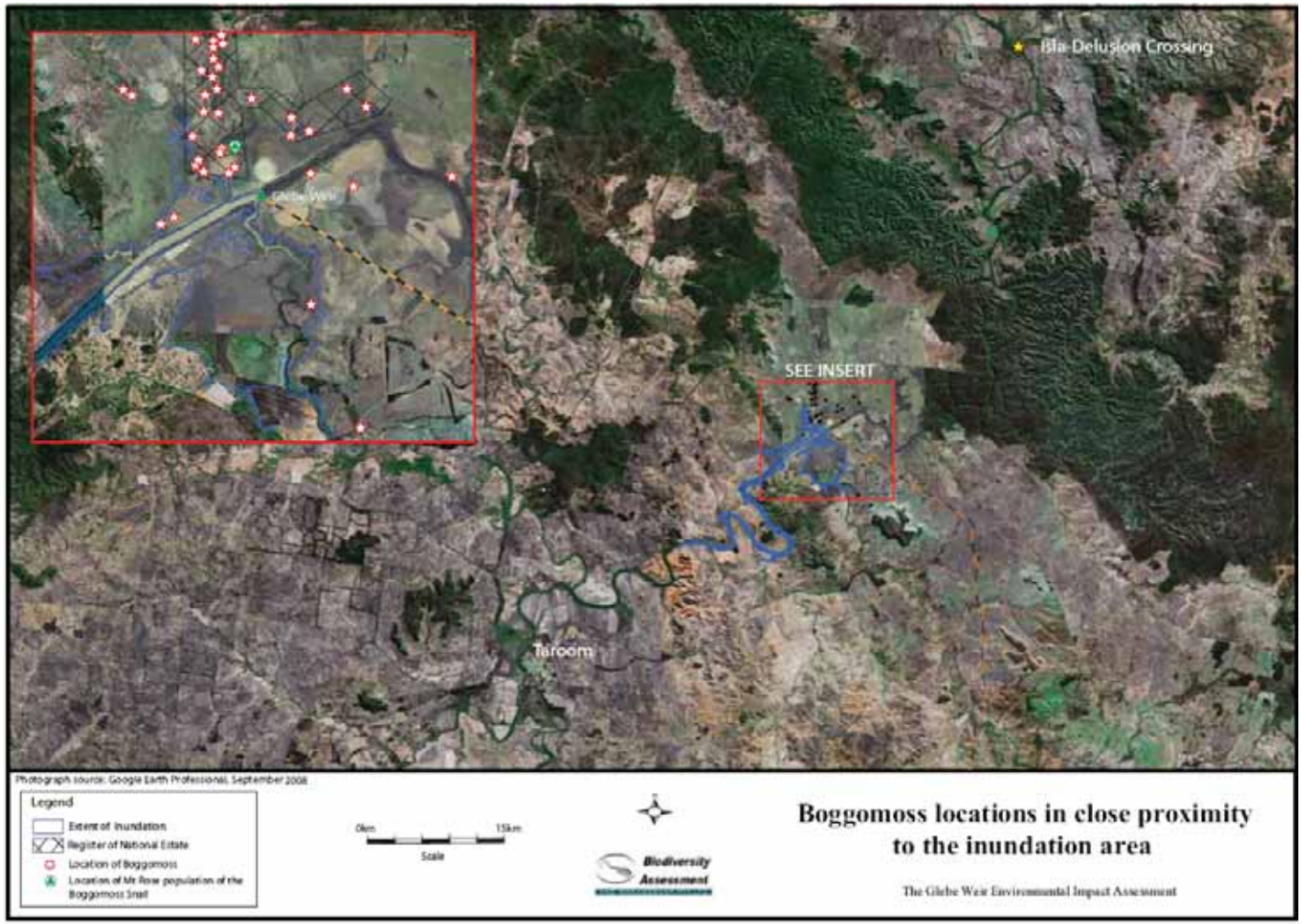

Figure 14-5. Boggomoss Locations in a regional context

Table 14-6. EPBC Assessment of Significance on Listed Endangered and Critically Endangered Species – Glebe Option Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	*Adclarkia dawsonensis* Boggomoss Snail The Boggomoss Snail has historically been found in a specific boggomoss (no.8) on the Mt Rose Station, north of the Glebe Weir as well as at one other site 30 km downstream (Figure 14-5). Recent specific surveys conducted by Dr John Stanisic have confirmed these locations but broadened the area inhabited at Isla-Delusion and found the species at two other boggomoss sites very near to boggomoss no.8. Further survey is being undertaken and will be formally reported in December 2008. It is a terrestrial species with a preference for riverine alluvial flats. Almost nothing is known of its biology though it is known to require dry land and moist humid micro-environments. No direct impact will occur to any of the known inhabited areas. The only potential impact recognized is a secondary impact of groundwater level change related to potential waterlogging immediately adjacent to the levee proposed on Boggomoss Ck. The assessment concluded that the likelihood of this occurring, without mitigation, was unlikely. With mitigation as described above, the likelihood was reduced to negligible. As Boggomoss no.8, host to a significant population, is not immediately adjacent to the levee but is approximately 1km away, no impact on the Boggomoss snail at this location is predicted. The flow regime at the downstream location, which is downstream of Gyranda Weir, will remain in conformance with environmental flow objectives of the Fitzroy Basin WRP and as such no change is expected.
Lead to a long-term decrease in the size of a *population*.	As no direct impact will occur and no indirect impact is predicted, the works will not lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of the species.	Given the above, the works will not reduce the area of occupancy of the species.
Fragment an existing *population* into two or more populations.	The proposed action will not fragment an existing population into two or more populations.
Adversely affect *habitat critical to the survival of a species*.	Given the above, the works will not adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a *population*.	Given the above, the works will not disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Given the above, the works will not modify, decrease or remove the availability or quality of habitat to the extent that the species is likely to decline.
Result in *invasive species* that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	Given the above, the works will not increase the risk of invasion by weeds and thereby alter fire regimes.

Criteria	Assessment of Significance
Introduce disease that may cause the species to decline.	The proposed action is not expected to introduce disease that may cause the species to decline. Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site.
Interfere with the recovery of the species.	The proposed action will not interfere with the recovery of the species. A recovery plan for the Boggomoss snail is in place.

Table 14-7. EPBC Assessment of Significance on Listed Vulnerable Species – Glebe Option Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Arthraxon hispidus* Hairy Joint Grass This species was recorded by CEPLA (2008) within RE 11.3.27b outside of the pipeline area and the Glebe Weir FSL, although it is possibly present within the impact area.
Lead to a long-term decrease in the size of an *important population* of a species.	As the species was not recorded within the impact area, if present, it would be present in very low numbers. It is expected that any decrease in the size of any local population of the species (if present) would be short-term. Local provenance seed of the species will be included in rehabilitation and restoration.
Reduce the area of occupancy of an *important population*.	It is expected that any reduction in the area of occupancy of the species would be minor and temporary.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	The Glebe Option area is not considered to contain habitat critical to the survival of the species.
Disrupt the breeding cycle of an *important population*.	It is expected that any disruption to any local population of the species (if present) would be short-term.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Glebe Option area is not considered to contain habitat important enough for the species such that its modification, destruction, removal or isolation, or a decrease in its availability or quality would result in overall species decline.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.

Criteria	Assessment of Significance
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	The species is not known to occur in the Glebe Option impact area, however, habitat rehabilitation and restoration activities using seed of local provenance are likely to assist, rather than interfere, with the recovery of the species in the local area.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Cadellia pentastylis* Ooline This species was not recorded by CEPLA (2008) within the pipeline area or the Glebe Weir FSL, although it is possibly present. It is associated with a number of REs including 11.9.5, of which 0.29ha exists within the inundation area and 0.78ha would be cleared for the pipeline route.
Lead to a long-term decrease in the size of an *important population* of a species.	As the species was not recorded within the impact area, if present, it would be present in very low numbers. It is expected that any decrease in the size of any local population of the species (if present) would be short-term. It has been recommended that local provenance seedlings or seed of the species is included in rehabilitation and restoration.
Reduce the area of occupancy of an *important population*.	It is expected that any reduction in the area of occupancy of the species would be minor and temporary.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	The Glebe Option area is not considered to contain habitat critical to the survival of the species.
Disrupt the breeding cycle of an *important population*.	It is expected that any disruption to any local population of the species (if present) would be short-term.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Glebe Option area is not considered to contain habitat important enough for the species such that its modification, destruction, removal or isolation, or a decrease in its availability or quality would result in overall species decline.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.

Criteria	Assessment of Significance
Interfere with the recovery of the species.	The species is not known to occur in the Glebe Option area, however, habitat rehabilitation and restoration activities using seedlings or seed of local provenance are likely to assist, rather than interfere, with the recovery of the species in the local area.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Paradelma orientalis* Brigalow Scaly-foot. The Brigalow Scaly-foot was once thought to be confined to remnant Brigalow or sparse tussock grass vegetation on grey cracking soils. Recently the species has been found in a wide variety of additional habitats. Records typically are from relatively undisturbed habitats but the species does also occur in young regrowth (two-three years old) and heavily grazed areas. The species has been recorded nearby and suitable habitat occurs within and immediately adjacent to the Glebe Option area.
Lead to a long-term decrease in the size of an *important population* of a species.	A portion of potential habitat for this species would be lost as a result of the proposed action. With mitigation through offsetting, the result of the proposed action would not significantly reduce the local extent of these habitats. It is not expected that the Glebe Option area supoorts an important population of the species. It is expected that any possible decrease in any possible local population would be minor and temporary.
Reduce the area of occupancy of an *important population*.	Whether or not any population can be considered an important population, the proposed action is not expected to reduce the area of occupancy for the species.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	A lack of historical records and field data indicates that there is no habitat present that is critical to the survival of the species.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term and no known breeding sites would be lost. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Glebe Option area is not considered to contain habitat important enough for the species such that its modification, destruction, removal or isolation, or a decrease in its availability or quality would result in overall species decline.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.

Criteria	Assessment of Significance
Interfere with the recovery of the species.	Population scale movement would be unaffected in the long-term and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Egernia rugosa* Yakka Skink Yakka Skinks live in colonies, occupying communal burrows, often under dead timber or deep rock crevices. They are found in dry open forests and woodlands, usually on coarse gritty soils that are well drained. There is little suitable habitat for this species within and immediately adjacent to the Glebe Option area. There are no database or survey records for the Glebe Option area.
Lead to a long-term decrease in the size of an *important population* of a species.	No long-term decrease in the size of any local populations is expected due to the proposed action.
Reduce the area of occupancy of an *important population*.	The proposed action is not expected to reduce the area of occupancy for the species.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term and no known breeding sites would be lost. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the proposed action would result in decline of the species.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected in the long-term and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely. A recovery plan for the species is currently under preparation by DEWHA.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Furina dunmalli* Dunmall's Snake This species is highly cryptic and extremely secretive. Only a handful of records occur within any given decade. Consequently, the biology of the snake is virtually unknown. Most records appear in open forests and woodlands, particularly Brigalow and woodlands growing on cracking black clay and clay loams. However, the species has also been recorded from dry eucalypt forests. The species was not detected during targeted surveys and there are no database records. Suitable habitat does exist within and immediately adjacent to the Glebe Option area.
Lead to a long-term decrease in the size of an *important population* of a species.	No long-term decrease in the size of any local populations is expected due to the proposed action.
Reduce the area of occupancy of an *important population*.	The proposed action is not expected to reduce the area of occupancy for the species.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term and no known breeding sites would be lost. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the proposed action would result in decline of the species.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected in the long-term and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely. A recovery plan for the species is currently under preparation by DEWHA.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Rostratula australis* Australian Painted Snipe The Australian Painted Snipe is a secretive, cryptic, crepuscular species that occurs in terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains. The species is patchily distributed throughout Australia, with most records being in the south-east. Records are erratic, the species being absent from areas in some years and common in others. There are no database or survey records for the Glebe Option area but the species may use the existing impoundment seasonally or sporadically. As this species inhabits wetland areas, including artificial waterbodies, the proposed action is likely to result in an overall positive impact in the long term via an increase in these habitats due to raising of the weir and subsequent inundation.
Lead to a long-term decrease in the size of an *important population* of a species.	Any impacts on any local population will be minor and temporary. The proposed action is not expected to lead to any long-term decrease in the size of any population, whether or not the population can be considered an important population.
Reduce the area of occupancy of an *important population*.	The actual area of occupancy of the species will be unaffected in the long-term.
Fragment an existing *important population* into two or more populations.	No population of this highly mobile species will be fragmented due to the proposed action.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	It is expected that any disruption to any possible local population of the species would be minor and temporary.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the Glebe Option would result in the species decline.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected in the long-term and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Geophaps scripta scripta* Squatter Pigeon (southern subspecies) Squatter Pigeons are terrestrial, foraging and breeding on the ground. The species occurs in open dry sclerophyll woodland with grassy understorey, nearly always near permanent water. Birds may occasionally feed in sown grasslands and pastures. Squatter Pigeons eat mainly seeds, including those of exotic pasture plants. The Squatter Pigeon, despite substantial declines and even local extinctions in the southernmost parts of its range, remains common locally, even in areas heavily degraded by cattle. The species appears more susceptible to the effects of grazing by sheep compared to cattle (Frith 1982), which may explain the more severe declines in southern areas. The species was recorded during surveys near the Glebe Option area.
Lead to a long-term decrease in the size of an *important population* of a species.	The proposed action is not expected to result in a long-term decrease in an important population of the species.
Reduce the area of occupancy of an *important population*.	The proposed action is not expected to reduce the area of occupancy of an important population of the species.
Fragment an existing *important population* into two or more populations.	No important population of this species would be fragmented due to the proposed action.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the proposed action would result in species decline.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected in the long-term and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Nyctophilus timoriensis* Greater Long-eared Bat (south-eastern form) The Greater Long-eared Bat occurs in dry forest and woodland, mallee, Brigalow/Belah and other arid and semi-arid habitats. The species is most common in box/ironbark/*Callitris* woodland on sandy soils and it roosts in tree hollows or under bark. It is a little known species that is rarely caught. The four geographically separate forms of this species are currently undergoing taxonomic revision. The form in question is the South-eastern Long-eared Bat. There are no database or survey records for the Glebe Option area. There are three database records for the surrounding area.
Lead to a long-term decrease in the size of an *important population* of a species.	No long-term decrease in the size of any local population, whether or not the population is considered an important population, is expected due to the proposed action.
Reduce the area of occupancy of an *important population*.	The proposed action is not expected to reduce the area of occupancy for the species.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term and no known breeding sites would be lost. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the proposed action would result in decline of the species.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely. A recovery plan for the species is currently under preparation by DEWHA.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Chalinolobus dwyeri* Large-eared Pied Bat This species has been reported roosting in caves, mineshaft entrances, tunnels and culverts. Very little is known of its biology. The species is threatened by clearing of forest near cliffs, old mines and caves and disturbance to roosting and nesting sites. The Large-eared Pied Bat was not detected during surveys, although suitable habitat may exist in caves in the Dawson ranges and other areas of remnant vegetation and the species may occasionally utilise habitats within the Glebe Option area.
Lead to a long-term decrease in the size of an *important population* of a species.	No long-term decrease in the size of any local population, whether or not the population is considered an important population, is expected due to the proposed action.
Reduce the area of occupancy of an *important population*.	The proposed action is not expected to reduce the area of occupancy for the species.
Fragment an existing *important population* into two or more populations.	If this species is present, any population is unlikely to be of a sufficient size for fragmentation to occur.
Adversely affect *habitat critical to the survival of a species*.	No habitat considered critical to the survival of the species is present in the Glebe Option area.
Disrupt the breeding cycle of an *important population*.	Population scale movement would be unaffected in the long-term and no known breeding sites would be lost. As such, significant disruptions to breeding cycles as a result of the proposed action are unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No habitat to be modified, destroyed, removed, isolated or decreased by the proposed action would result in decline of the species.
Result in *invasive species* that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Habitat rehabilitation and restoration activities in the local area will include regular monitoring and treatment of weed infestation to ensure any harmful invasive species do not become established. An overall Weed Management Plan for the Glebe Option will also be developed and implemented to minimize the establishment of weeds along edges of the inundation area and pipeline easement and their subsequent spread to adjacent habitats.
Introduce disease that may cause the species to decline.	Implementation of a Pest Animal and Weed Management Plan during construction and implementation of an Operational Habitat Management Plan will reduce the likelihood of the introduction of disease to the Glebe Option area as these plans will include hygiene protocols for plant, machinery and workers on the site, and will prescribe the use of seedlings or seed of local provenance in habitat rehabilitation.
Interfere with the recovery of the species.	Population scale movement would be unaffected and significant disruptions to breeding cycles and interference to species recovery is therefore unlikely. A recovery plan for the species is currently under preparation by DEWHA.

Criteria	Assessment of Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	*Rheodytes leukops* (Fitzroy River turtle) is listed as 'vulnerable' under the EPBC Act. It is found over a restricted distribution that includes the Fitzroy River and its tributaries, and the Dawson River up to the Theodore Weir. Fitzroy river turtles were originally thought to be found only in shallow, fast-flowing riffle zone habitats characterised by well-oxygenated water. However, whilst riffle zones may be present across the species distribution during the wet season, they are often dry or non-flowing for much of the year. During these drier periods and at many other times, Fitzroy River turtles have been observed in high abundance in large slow flowing pools and in non-flowing permanent water holes. Little information is available on the breeding status and reproductive biology of *R. leukops* across the species' distribution but the core nesting area is known to be within the weir pool of the Fitzroy barrage (Limpus *et al* 2007). Nesting in Fitzroy River turtles occurs between September and March, with females typically laying 46 to 59 eggs across 3 to 5 clutches. Females nest on sandy banks with a deep layer of sand and a low vegetative cover. No Fitzroy river turtles have been recorded in the vicinity of the Glebe Weir; the most upstream records for the Fitzroy River turtle in the Dawson River are from the Theodore Weir, some 100 km downstream of Glebe Weir. This does not totally preclude the possibility of their presence but the likelihood is assessed as low.
Lead to a long-term decrease in the size of an *important population* of a species.	There are no known populations of *R. leukops* in the vicinity of the Glebe Weir.
Reduce the area of occupancy of an *important population*.	There are no known populations of *R. leukops* in the vicinity of the Glebe Weir. Raising the weir will not result in any loss of upstream riffle habitat. .
Fragment an existing *important population* into two or more populations.	Populations of this species are naturally fragmented due to habitat requirements; the effect of the existing weir will not be exacerbated if there are representatives of the species in the area.
Adversely affect *habitat critical to the survival of a species*.	Raising the weir will not result in any loss of upstream riffle habitat. As the species is not known from the area, local habitat is unlikely to be critical
Disrupt the breeding cycle of an *important population*.	There are no known populations of *R. leukops* in the vicinity of the Glebe Weir. Breeding is thought to be related to rainfall and perhaps temperature, neither of which will be affected by the Glebe Option.

Table 14-8. EPBC Assessment of Significance on Listed Migratory Species – Glebe Option Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	• *Nettapus coromandelianus albipennis* Australian Cotton Pygmy-Goose; • *Ardea alba* Great Egret; • *Bubulcus ibis* Cattle Egret • *Plegadis falcinellus* Glossy Ibis • *Haliaeetus leucogaster* White-bellied Sea-Eagle; • *Rostratula benghalensis* Painted Snipe; • *Gallinago hardwickii* Latham's Snipe; • *Numenius minutus* Little Curlew; • *Tringa nebularia* Common Greenshank; • *Tringa stagnatilis* Marsh Sandpiper; • *Calidris acuminata* Sharp-tailed Sandpiper • *Cuculus saturatus* Oriental Cuckoo; • *Apus pacificus* Fork-tailed Swift; • *Hirundapus caudacutus* White-throated Needletail; • *Merops ornatus* Rainbow Bee-eater; • *Myiagra cyanoleuca* Satin Flycatcher
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of *important habitat* for a migratory species.	There is little evidence to suggest that the Glebe Option area supports 'important habitat' for migratory species. Given their migratory habits, the ephemeral nature of food and habitat resources, and the extent of habitat across their range, it is likely that the existing resources within the Glebe Option area would be utilised infrequently and on a transitory basis only. Furthermore, for those species inhabiting wetland areas and known or considered likely to occur within the Glebe Option area, the Glebe Option will result in an overall positive impact in the long term via an increase in these habitats due to raising of the weir and subsequent inundation, particularly the relatively shallow areas near Cockatoo and Boggomoss creeks. This includes Great Egret, Cattle Egret, Glossy Ibis, Painted Snipe, Latham's Snipe, Common Greenshank, Marsh Sandpiper and Sharp-tailed Sandpiper. Those remaining wetland species for which specific potential impacts need to be considered are discussed separately below, along with those migratory species that do not inhabit wetland areas. • *Nettapus coromandelianus albipennis* Australian Cotton Pygmy-Goose This species was not recorded within the Glebe Option area, but is predicted to occur sporadically in low numbers. It is known from floodplain wetlands of the Dawson River at Lake Murphy Conservation Reserve and preferred habitat exists within the existing impoundment within the Glebe Option area. There is potential for a direct impact associated with the replacement of existing wetland habitat by inundation and the removal of large dead trees suitable for nesting during

Criteria	Assessment of Significance
	construction. Any such impacts involving habitat (whether or not it can be considered 'important' habitat') will be mitigated by the retention of large, dead trees, where possible, and the habitat creation noted above for other wetland species, which are likely to result in an overall positive impact on the species in the long term. • *Haliaeetus leucogaster* White-bellied Sea-Eagle The species is known from the Dawson River and an active nest is located immediately below the existing weir. The existing impoundment probably provides foraging habitat. There is potential for a direct impact associated with the removal of large trees, live and dead, and replacement of existing wetland habitat by inundation during construction. Any such impacts involving habitat (whether or not it can be considered 'important' habitat) will be mitigated by the retention of large trees (both live and dead), where possible, and the habitat creation noted above for other wetland species, which are likely to result in an overall positive impact on the species in the long term. • *Cuculus saturatus* Oriental Cuckoo Preferred habitat for this species lies outside of the Glebe Option area. The proposed action is not expected to modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for this species. • *Apus pacificus* Fork-tailed Swift and *Hirundapus caudacutus* White-throated Needletail Both species are non-breeding summer visitors and are aerial species for which the Glebe Option area will not represent 'important habitat'. No impacts are expected due to the proposed action as these species forage over a wide variety of land use, including human infrastructure and large waterbodies. • *Merops ornatus* Rainbow Bee-eater Rainbow Bee-eater and is a very common, widespread species. The Glebe Option area does not represent 'important habitat' for the species and any potential impacts from the proposed action, such as loss of breeding substrate and loss of prey species due to clearing and inundation, will be insignificant. • *Myiagra cyanoleuca* Satin Flycatcher This species is known from the immediate vicinity of the Glebe Option area. There is the potential for a direct impact within the Glebe Option area due to loss of riparian habitat suitable for foraging and resting during passage. Any such impacts involving habitat (whether or not it can be considered 'important' habitat) will be insignificant and will not constrain the movement of the species across the landscape.
Result in invasive species that are harmful to the migratory species becoming established in an area of *important habitat*	As noted above, the Glebe Option area is not considered to be an area of 'important habitat' for migratory birds, whether they are wetland or terrestrial species. The local area has a history of forest clearing and habitat modification, which has benefited a number of feral and invasive flora and fauna species. The proponent will implement a weed and feral animal control program for the Glebe

Criteria	Assessment of Significance
for the migratory species.	Option in accordance with any local and/or State government pest or weed management plans that will contribute to the overall enhancement of habitat for migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an *ecologically significant proportion* of the *population* of a migratory species.	There is no evidence to suggest that the Glebe Option area supports an 'ecologically significant proportion of a population' of any of the migratory birds known or considered likely to occur. Furthermore, for those species inhabiting wetland areas, the Glebe Option will result in an overall positive impact in the long term via an increase in these habitats due to raising of the weir and subsequent inundation, and the formal control of feral predators and competitive exotic plant species through the implementation of a pest and weed management plan. This includes Great Egret, Cattle Egret, Glossy Ibis, Painted Snipe, Latham's Snipe, Common Greenshank, Marsh Sandpiper and Sharp-tailed Sandpiper. It should also be noted that Latham's Snipe, Common Greenshank, Marsh Sandpiper and Sharp-tailed Sandpiper breed in the northern hemisphere. Those remaining wetland species for which specific potential impacts need to be considered are discussed separately below, along with those migratory species that do not inhabit wetland areas. • *Nettapus coromandelianus albipennis* Australian Cotton Pygmy-Goose This species was not recorded within the Glebe Option area, but is predicted to occur sporadically in low numbers. It is known from floodplain wetlands of the Dawson River at Lake Murphy Conservation Reserve and preferred habitat exists within the existing impoundment within the Glebe Option area. It breeds from late spring to mid autumn, nesting high in hollow trees near water and, if present, there is potential for a direct impact associated with the replacement of existing wetland habitat by further inundation and the removal of large dead trees suitable for nesting during dam construction. However, any associated impacts on the life cycles of any local population will be mitigated by the retention of large, dead trees, where possible, and the habitat creation noted above for other wetland species, which are likely to result in an overall positive impact on the species in the long term. • *Haliaeetus leucogaster* White-bellied Sea-Eagle The species is known from the Dawson River and an active nest is located immediately below the existing weir. The existing impoundment probably provides foraging habitat. There is potential for a direct impact associated with the removal of large tress, live and dead, and replacement of existing wetland habitat by inundation during construction. However, any associated impacts on the life cycles of the local population will be mitigated by the retention of large trees (both live and dead), where possible, and the habitat creation noted above for other wetland species, which are likely to result in an overall positive impact on the species in the long term. • *Cuculus saturatus* Oriental Cuckoo The Oriental Cuckoo does not breed in Australia. Preferred habitat for this species lies outside of the Glebe Option area. The proposed action is not expected seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of any population of the species. • *Apus pacificus* Fork-tailed Swift and *Hirundapus caudacutus* White-throated Needletail Both species are non-breeding summer visitors and are aerial species for which the Glebe Option area will not represent

Criteria	Assessment of Significance
	'important habitat'. The proposed action will not disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of any population of these species. • *Merops ornatus* Rainbow Bee-eater Rainbow Bee-eater is a very common, widespread species which occurs in a wide variety of habitats. The proposed action will not disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of any population of this species. • *Myiagra cyanoleuca* Satin Flycatcher This species is known from the immediate vicinity of the Glebe Option area. There is the potential for a direct impact within the Glebe Option area due to loss of riparian habitat suitable for foraging and resting during passage. The proposed action will not, however, disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of any population of this species.

14.5.1 Places on the Register of the National Estate

A search of the EPBC online protected matters database identified three areas in the broader study area on the Register of the National Estate; Boggomoss Area No.1, Boggomoss Area No 2 and the Brigalow Invertebrate Site, Qld (Figure 14-6). The latter is located on the Leichhardt Highway and beyond any area of potential impact. Boggomoss Area No.2 is situated 12 km downstream of the weir in a well forested area upstream of Nathan Gorge. This area will also not be physically impacted and as the flow regime downstream of the weir will remain in conformance with the Fitzroy Basin WRP, no secondary impact is expected.

Boggomoss Area No.1 in the area of the Glebe Option is shown in more detail on Figure 14-4. It is located on the Mt Rose property which is owned by the State of Queensland and leased to the former owner. As can be seen from the figure, part of the area is within and near the Glebe Option footprint and it has been largely cleared and is currently farmed, including by centre pivot irrigation. 1.8% of the reserve will be inundated as a result of the Glebe Option. The area of impact is constrained by the levee marked on Figure 14-4. This levee excludes any specific boggomosses from inundation. Mitigation measures to be incorporated within this area to ensure waterlogging near the levee does not occur included cessation of use of the centre pivot irrigators nearest the levee and replacement of a substantial area with native forest. Hyder Environmental (1997) suggested that one reason why the isolated population of the Boggomoss snail may be located at Boggomoss no.8 is that the area contains some of the only remnant coolibah woodland in the area. As such, the intended reforestation strategy is likely to enhance the environmental values of the area. No impact on the boggomoss related values of the area are expected.

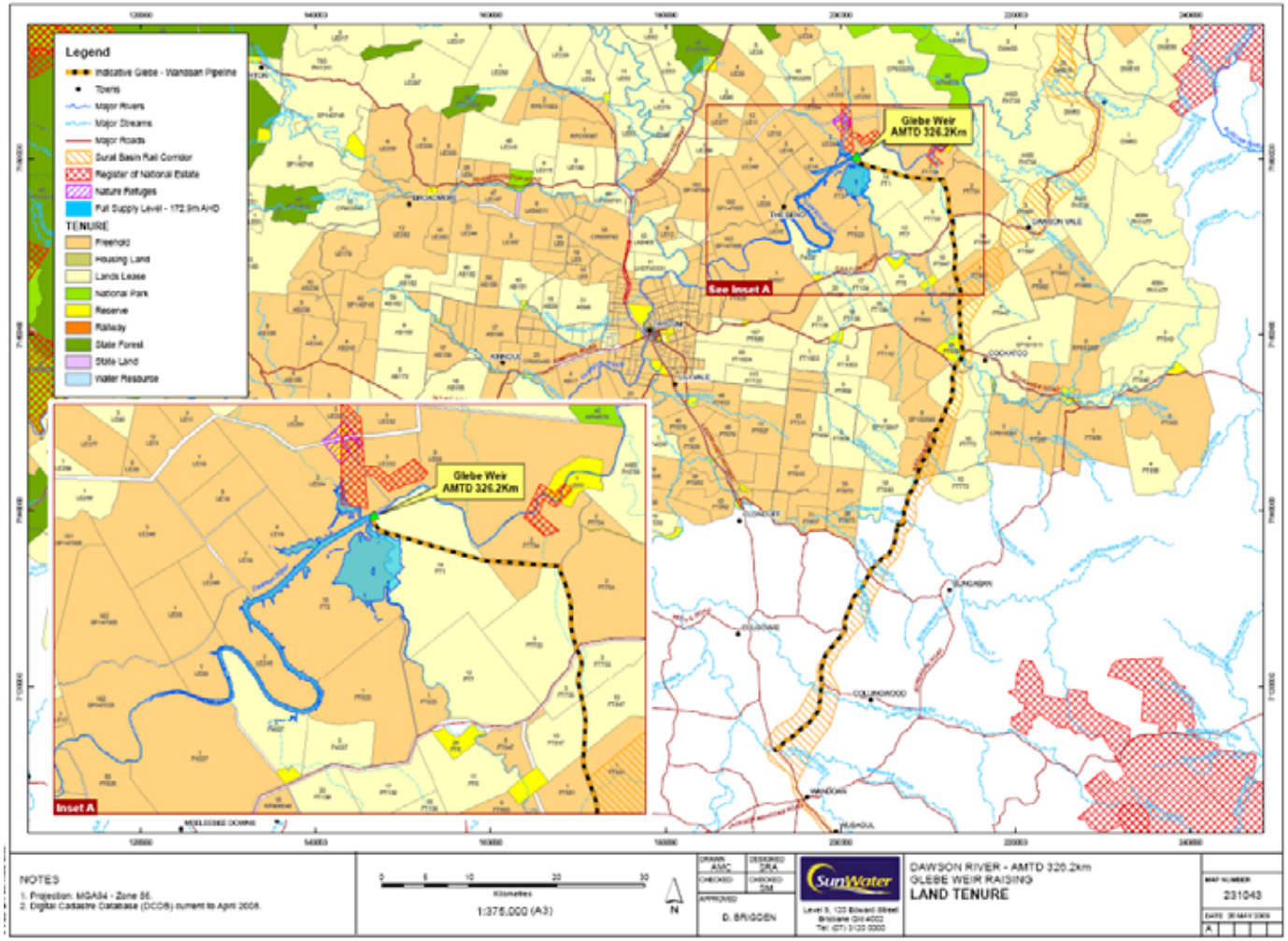

Figure 14-6. Areas on the Register of the National Estate and other reserves