3 June 2010

Director Metropolitan
Department of Environment Climate Change and Water
Metropolitan - Illawarra
P O Box 513
WOLLONGONG NSW 2520

Also by Email.

Attention: Mr Bob Buchanan

Section 91 Application – Tahmoor Colliery Surface Water Consolidation Project

Dear Bob,

As you are aware, Tahmoor Coal Pty Ltd was issued with a Section 95 Certificate under s95(2) of the Threatened Species Conservation Act 1995 (TSC Act) on 19 June 2009. The certificate authorised the removal of four individuals of *Persoonia bargoensis* and vegetation classed as Shale Sandstone Transition Forest as part of the construction of the Surface Water Consolidation Project required under PRP15 on EPL1389.

A review of this certificate has shown that it expired on the 15 May 2010. As you are aware, construction is still proceeding after significant delays in starting the project have been experienced with the selected construction contractor.

Therefore as per your advice, please find attached our s91 (TSC Act 1995) application to allow the remaining vegetation clearing to be completed and the project to be progressed. The area of vegetation to be removed has not changed from that specified in the original application, as detailed by the Option 2 pipeline route outlined in the attached flora and fauna assessment. As before, The Section 91 Application is for the removal of four plants of *Persoonia bargoensis*, a small area of Shale Sandstone Transition Forest is attached. The following information is also attached:

- Map showing the location of the proposed works in a regional context;
- Aerial photo showing the location of the threatened plants in the vicinity of the study area and the location of the proposed works;
- Aerial photo showing the location of previous records of *Persoonia bargoensis* in the vicinity of the proposed works;
- Plates showing the plants of *Persoonia bargoensis* that will require removal;

Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Remembrance Drive, Tahmoor NSW 2573 Australia
Telephone 61 2 4640 0100 • Facsimile 61 2 4640 0140

- A Significant Impact Criteria Assessment for potentially impacted threatened species and ecological communities undertaken under the Environment Protection and Biodiversity Conservation Act 1999.
- TSC Act assessments of significance for threatened fauna species with potential habitat in the study area.

We expect that an approval for a further 12 month period would be more than adequate to see the project to completion.

If you have any further queries regarding this request, please contact me on 02 4640 0158.

Yours faithfully,

Ben de Somer
ENVIRONMENTAL COORDINATOR– TAHMOOR COLLIERY

Tahmoor Coal Pty Limited ABN 97 076 663 968
PO Box 100, Remembrance Drive, Tahmoor NSW 2573 Australia
Telephone 61 2 4640 0100 • Facsimile 61 2 4640 0140

Application for a

Department of
Environment and Conservation (NSW)

Section 91 Licence

to harm or pick a threatened species, population or ecological community*, or damage habitat under the *Threatened Species Conservation Act 1995.*

1. Applicant's Name: *(if additional persons require authorisation by this licence, please attach details of names and addresses)*	Ben de Somer		
2. Organisation name and position of Applicant: *(if applicable)*	Tahmoor Coal Pty Ltd Environmental Coordinator		
3. Postal address:	PO Box 100 Tahmoor NSW 2573		4. Telephone: 02 4640 0158
5. Location of the action *(including grid reference and local government area and delineated on a map).*	Tahmoor Colliery, within Wollondilly Local Government Area (Easting 278065; Northing 6207176, WGS 84). See attached Figure 1.		
6. Full description of the action and its purpose *(eg. scientific research, environmental assessment, regeneration activities, development etc.).*	As part of Environmental Protection License 1389 pollution reduction program it is proposed to construct a pipeline, which will be used to transport surface run off water which currently discharges to Tea Tree Hollow. The run off water is being transported to Dam S4 for the following reasons: • so it is discharged through licensed discharge point LDP4		

* A threatened species, population or ecological community means a species, population or ecological community identified in Schedule 1, 1A or Schedule 2 of the *Threatened Species Conservation Act 1995*.

<table>
<tr><td></td><td colspan="4">• to improve discharge water quality to meet EPL 1389 requirements

A 5 m wide disturbance area will be required for installation of the proposed pipeline. A trench will be dug along most of its length, with the pipeline buried underground and vegetation left to regenerate once works are completed. The trenches will be approximately 600 mm wide and several meters deep. The 5 m wide disturbance area will allow access for construction equipment. Along some sections of its length, underground boring will be used to direct the pipeline and trenching will not be required in these areas. See report in Appendix 1 for further details.</td></tr>
<tr><td>7. Details of the area to be affected by the action (in hectares).</td><td colspan="4">An area of regrowth native vegetation along an existing haul road will be impacted. A 5 m wide area will be cleared, including 0.18 ha of Shale Sandstone Transition Forest and 0.16 ha of Sydney Hinterland Transition Woodland. See report in Appendix 1 for details.</td></tr>
<tr><td>8. Duration and timing of the action (including staging, if any).</td><td>7 Weeks</td><td colspan="3"></td></tr>
<tr><td>9. Is the action to occur on land declared as critical habitat*? (please tick appropriate box)</td><td>Yes
☐</td><td>No
✓</td><td colspan="2"></td></tr>
<tr><td rowspan="2">10. Threatened species, populations or ecological communities to be harmed or picked.</td><td><u>Scientific Name</u>

Persoonia bargoensis</td><td><u>Common Name</u>
(if known)

Bargo Geebung</td><td><u>Conservation Status</u>
(ie. endangered or vulnerable)

Endangered on NSW Threatened Species Conservation Act 1995 (TSC Act)</td><td><u>Details of no. of individual animals, or proportion and type of plant material</u>
(eg. fertile branchlets for herbarium specimens or whole plants or plant parts)

Four (4) whole plants would be removed by the proposed works.</td></tr>
<tr><td>Shale Sandstone Transition Forest</td><td>-</td><td>Endangered Ecological Community on the TSC Act</td><td>Approximately 0.18 ha of regrowth SSTF occurring along an artificial</td></tr>
</table>

* Critical habitat means habitat declared as critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*.

				better for an existing haul road.

11. Species impact: *(please tick appropriate box)* a) For action proposed on land declared as critical habtat; or b) For action proposed on land <u>not</u> declared as critical habitat.	☐ An SIS is attached ☑ Items 12 to 25 have been addressed

N.B: Provision of a species impact statement is a statutory requirement of a licence application, if the action is proposed on critical habitat.
The provision of information addressing items 12 to 17 is a statutory requirement of a licence application if the action proposed is <u>not</u> on land that is critical habitat. Information addressing any of the questions below must be attached to the application.

12. Describe the type and condition of habitats in and adjacent to the land to be affected by the action.	Approximately 1.6 ha of Sydney Hinterland Transition Woodland in Good to Moderate Condition and approximately 1.8 ha of Shale Sandstone Transition Forest in poor condition will be impacted by the Proposal. The area to be cleared occurs along an existing haul road within the disturbed batter edge. The area of native vegetation to be impacted consists mostly of regrowth shrubs and small trees and is adjacent to existing disturbances including active coal wash stockpiles and haul roads (Figure 2). Fauna habitat in the Study Area includes dams providing some sheltering resources for common native amphibians and regrowth woodland with limited tree hollows. Dams and tree hollows will be avoided by the proposed works. However, the most suitable fauna habitat occurs in the adjoining woodland areas which will be avoided by the proposed works. Similar habitats occur in the vicinity of the proposed works, with Shale Sandstone Transition Forest and Sydney Hinterland Transition Woodland occurring to the south and north of the proposed works (Figure 2 and Figure 3 in Appendix 1).
13. Provide details of any known records of a threatened species in the same or similar known habitats in the locality *(include reference sources).*	***Persoonia bargoensis*** *Persoonia bargoensis* has been recorded in a number of locations in the vicinity of the proposed works, including (Figure 2 and Figure 4 of Appendix 1): ▪ Approximately 61 plants recorded in the immediate vicinity of the proposed works, four (4) of which would be removed (Plate 1). ▪ Greater than 131 individuals (five of which were proposed to be removed) (Biosis Research 2006) recorded immediately to the north of the Study Area along the path of a proposed

	upgrade of an electricity transmission line between Tahmoor Colliery and N^{o} 2 Vent Shaft off Rockford Road, Tahmoor. ▪ Approximately 218 records, representing an unknown number of plants, within 10 km of the Study Area, from the DECC Atlas of NSW Wildlife. In determining whether a significant impact is considered for a local population of the species, the definition of local population becomes crucial. According to DECC threatened species assessment guidelines (DECC 2007), a 'local population' is that which occurs in the Study Area or the cluster of plants that extend into habitat adjoining and contiguous with the Study Area that could reasonably be expected to be cross-pollinating with those in the Study Area (DECC 2007). Assessment of what constitutes a distinct population with reference to some species of plants is discussed by Keith (2000). Keith defined a distinct population as occurrences of plants that are separated by discontinuities of at least one kilometre. On this basis, the likely pollination mechanisms for *Persoonia bargoensis* needs to be discussed. Based on the ecology of the species, pollinators and dispersers for the species are likely to be native bees (NPWS 2000). Bees are considered highly mobile insect pollinators, as such all individuals recorded within the Study Area and to the immediate north of the Study Area (greater than 187 plants within 1 km) can be considered to cross-pollinate and therefore be considered to constitute a single local population.
	Shale Sandstone Transition Forest DECC (DEC 2005c) have mapped approximately 2201.2 ha of SSTF within 10 km of the Study Area. This mapping also shows the vegetation community generally occurs as small disturbed remnants within agricultural land and developed land.
14. Provide details of any known or potential habitat for a threatened species on the land to be affected by the action *(include reference sources).*	***Persoonia bargoensis*** The proposed works would impact on known habitat for *Persoonia bargoensis*, with 61 plants recorded from the immediate vicinity of the proposed works, four of which would be removed (Figure 2, Plate 1). Known habitat for *Persoonia bargoensis* on the site is SSTF and is approximately 0.18 ha in size. The *Persoonia bargoensis* plants to be removed are located on an artificial road batter, along the edge of the haul road.
	Shale Sandstone Transition Forest The Proposal would result in direct removal of approximately 0.18 ha of Shale Sandstone Transition Forest, with an additional 0.35 ha being indirectly impacts (based on a 10 m wide zone of indirect impacts).
15. Provide details of the amount of such habitat to be affected by the action proposed in	***Persoonia bargoensis*** The Proposal would result in the removal of approximately 0.18 ha of SSTF, with indirect impacts to a further 0.35 ha that is habitat for *Persoonia bargoensis* (Plate 1). Four plants would be removed, from a relatively large local population of the species (at least 187 plants

relation to the known distribution of the species and its habitat in the locality.	recorded from within 1 km of proposed works – see question 13 above).
	Shale Sandstone Transition Forest DECC (DEC 2005c) have mapped approximately 2201.2 ha of SSTF within 10 km of the Study Area. This mapping also shows the vegetation community generally occurs as small disturbed remnants within agricultural land and developed land. The removal of 0.18 ha and possible indirect impacts to a further 0.35 ha (assuming a 10 m wide area of indirect impact), would result in the removal of approximately 0.02 percent of SSTF within the locality.
16. Provide an assessment of the likely nature and intensity of the effect of the action on the lifecycle and habitat of the species.	***Persoonia bargoensis*** The proposed works would result in the temporary removal of approximately 0.18 ha of known habitat (area left to regenerate after installation of pipeline) and permanent removal of four individual plants of *Persoonia bargoensis* (Plate 1). Given the extent of similar habitat in the locality (2201.2 ha within a 10 km radius) and the size of the local population of the species (over 187 plants known to occur within 1 km of proposed works), the removal of 0.18 ha of habitat and four plants is not likely to place the local population at risk of extinction.
	Shale Sandstone Transition Forest The Proposal would result in the temporary removal of approximately 0.18 ha of SSTF. This area will be actively regenerated post completion of construction works.
17. Provide details of possible measures to avoid or ameliorate the effect of the action.	Four plants of *Persoonia bargoensis* and 0.18 ha of Shale Sandstone Transition Forest would be removed by the proposed works. However, the remaining 183 plants (minimum) in the vicinity of the proposed works would be protected from direct impact. The plants in close vicinity to the direct impact area would be marked on site and temporarily fenced to protect them from construction activities. Vehicles should be washed down prior to use on site to avoid the spread of weed seed and *Phytophthora cinnamomi*' that may impact on the remaining areas of native vegetation. Given the position of the existing haul road, impacts to the four *Persoonia bargoensis,* plants within the impact area cannot be avoided and the plants would therefore be removed. The following measures are proposed to mitigate these impacts. • The pipeline route should avoid threatened species as far as is practicable. The threatened plant species along the pipeline route have been marked with tape. Where works are to occur adjacent to threatened plant species, any disturbance to these individuals should be avoided. Clearing of areas within the vicinity of threatened plant species should be undertaken under the supervision of a suitably qualified person, experienced in identification of *Persoonia bargoensis*. • Utilise pre-existing tracks and access points wherever

	possible to avoid disturbance to native vegetation. • Where clearing of native vegetation is required, the top 100 mm of topsoil containing the soil stored seed bank should be put aside and not mixed with the subsoil layers during trenching. This topsoil should then be replaced over the surface upon completion of the works. • Suitably maintained erosion and sedimentation controls such as siltation fencing should be installed during construction and rehabilitation as part of an erosion and sedimentation control plan. Particular emphasis should be given to the areas around Tea Tree Hollow. • Machinery and equipment that is brought in from another site, or from outside of the immediate area is to be cleaned before entering bushland areas. This is necessary in order to prevent the spread of weed seed and soil pathogens between sites. • Weed control and bush regeneration strategies, such as brush matting, should be implemented within the Study Area after completion of proposed works to ensure regeneration of cleared areas is expedited. • Vegetation that is cleared or trimmed could be either a) mulched and spread on-site, if it is native and no weeds are present or b) if the vegetation is weedy, removed off-site.

N.B: The Director-General must determine whether the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats. To enable this assessment the Applicant is required to address items 18 to 25. Information addressing any of the questions below must be attached to the application.

18. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	***Persoonia bargoensis*** *Persoonia bargoensis* is known to: ▪ Occur in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravely soils. ▪ Be likely killed by fire and recruitment is solely from seed. ▪ Benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005j). Since *Persoonia bargoensis* is known to benefit from disturbance, the proposed underground pipeline will have minimal impact on this species as it will not change the existing land use. However the Proposal will involve some initial disturbance during access clearing and construction of the trench. *Persoonia bargoensis* is known to respond well to disturbance and the potential habitat for this species is likely to regenerate after the initial disturbance. The Proposal will result in direct impact of approximately 0.18 ha of potential habitat for *Persoonia bargoensis* for the installation of the pipeline. There will also possibly be indirect impacts to a further 0.35 ha of potential habitat for this species (assuming a 10 m wide area of indirect impact). This is considered to be a relatively small area of habitat given that a total of approximately 2201.2 ha of similar potential habitat has been mapped (DEC 2005h) as occurring in the local area (10 km radius). The Proposal is not likely to alter the existing fire frequency of the local area. Although approximately four individuals would be directly impacted by the Proposal, on the basis of the numbers recorded in the Study Area in the current survey (61, see Figure 2) and the numbers previously recorded (>131, see Figure 3), this is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
19. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not applicable. No Endangered Populations listed on the TSC Act will be impacted by the proposed works.
20. In the case of an endangered ecological community or critically endangered ecological community, whether the	**Shale Sandstone Transition Forest** The Proposal will result in direct impacts on approximately 0.18 ha of SSTF in the Study Area. DECC (DEC 2005h) have mapped approximately 2201.2 ha of SSTF within 10 km of the Study Area. This mapping also shows the vegetation community generally

action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	occurs as small disturbed remnants within agricultural land and developed land. The removal of 0.18 ha of SSTF is not likely to have an adverse effect on the extent of the ecological community. The patches of SSTF that will be disturbed as a result of the Proposal are in poor to moderate condition, existing as regrowth shrubs and small trees along the embankment of the haul road. The species composition of the patches of SSTF are already modified, with the canopy having been removed in some areas. The ecosystem functioning of this community has been significantly altered due to the variety of disturbances that the vegetation is exposed to. Indirect impacts from edge effects, such as weed invasion and erosion, could potentially further modify the composition of the SSTF in the Study Area. The Proposal is not likely to substantially and adversely modify the ecological community such that its local occurrence is likely to be placed at risk of extinction.

21. In relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	**Shale Sandstone Transition Forest** DECC (DEC 2005h) have mapped approximately 2201.2 ha of SSTF with a 10 km radius of the Study Area. The SSTF within the Study Area is in poor condition, with impacts from vegetation clearance, edge effects, fragmentation and weed invasion altering the species composition and structure of the ecological community. The habitat within the Study Area (area of direct and indirect impacts) equates to less than 0.1 % of the local distribution of SSTF. Approximately 0.18 ha of the habitat in the Study Area will be directly impacted by the Proposal with further indirect impacts to approximately 0.35 ha (assuming a 10 m wide area of indirect impact). Indirect impacts on SSTF equate to approximately 0.02% of that which has been mapped in the local area (DEC 2005h). Shale Sandstone Transition Forest that will be disturbed as part of the Proposal consists of previously disturbed areas adjacent to mine infrastructure and along a haul road. The Proposal would not result in the isolation of any areas of SSTF and impacted areas will be allowed to regenerate post clearing. Given the condition and size of the SSTF to be impacted, the area of SSTF is not considered to be important for the long term survival of the ecological community in the locality.

	Persoonia bargoensis SSTF in the Study Area is known to be potential habitat for *Persoonia bargoensis.* There are areas of known and potential habitat for *Persoonia bargoensis* in the local area, with: ▪ 61 recordings of the species in the Study Area (Figure 2); ▪ Greater than 131 individuals (five of which were removed) (Biosis Research 2006) recorded immediately to the north of the Study Area along the path of a proposed upgrade of an electricity transmission line between Tahmoor Colliery and No 2 Vent Shaft off Rockford Road, Tahmoor. ▪ Approximately 218 records, representing an unknown number of plants, within 10 km of the Study Area, from the DECC Atlas of NSW Wildlife. ▪ DEC (DEC 2005h) mapping approximately 2201.2 ha of similar potential habitat (SSTF) within a 10 km radius of the Study Area; and Approximately 0.18 ha of habitat in the Study Area will be impacted by the Proposal, with 0.35 ha being indirectly impacted from edge effects. The area of habitat in the Study Area to be impacted (directly and indirectly) by the Proposal equates to 0.02% of similar habitat types in the local area (10 km radius). The habitat to be affected in the Study Area was considered to be in poor condition, consisting mostly of regrowth small trees and shrubs with little to no understorey in most places. Potential habitat for *Persoonia bargoensis* that will be disturbed as part of the Proposal occurs along an existing haul road and will not result in further fragmentation or isolation of habitat. Where the Proposal passes through potential habitat, few trees will require removal and areas will be allowed to regenerate post construction. Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area, the large number of recordings in the locality, the area of impact on potential habitat and direct impact on approximately four individuals is not considered to be important for the long term survival of the species in the locality.
22. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Under the TSC Act, the Director-General of Department of Environment and Climate Change maintains a Register of Critical Habitat. No areas of critical habitat will be impacted by the proposed works. The Proposal would not have an adverse effect on critical habitat (directly or indirectly).
23. Whether the action	

proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	To date no recovery plan or threat abatement plans have been prepared for these threatened species or endangered ecological communities.
24. Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following Key Threatening Processes listed under Schedule 3 of the TSC Act may impact on SSTF in the Study Area: • 'Clearing of native vegetation' - approximately 0.18 ha of SSTF and 0.16 ha of SHTW will be cleared for the Proposal. • 'Ecological consequences of high frequency fires' – the Proposal is not likely to increase the frequency of fires in the area. • 'Invasion of native plant communities by exotic perennial grasses' – the Proposal may increase the threat of weed invasion by exotic perennial grasses. Recommended mitigation measures aimed at reducing the impact of weed invasion are detailed above (Question 17). • 'Infection of native plants by *Phytophthora cinnamomi* – the Proposal is not likely to increase this KTP in the Study Area. As a precaution, all vehicles should be washed down prior to use on site (see mitigation measures in Question 17). The Proposal would increase the impact of Key Threatening Processes on threatened species and endangered ecological communities in the Study Area.

Important information for the Applicant

Processing times and fees

The *Threatened Species Conservation Act 1995* provides that the Director-General must make a decision on the licence application within 120 days where a species impact statement (SIS) has been received. No timeframes have been set for those applications which do not require a SIS. The Director-General will assess your application as soon as possible. You can assist this process by providing clear and concise information in your application.

Applicants may be charged a processing fee. The Director-General is required to advise prospective applicants of the maximum fee payable before the licence application is lodged. Therefore, prospective applicants should contact the DEC prior to submitting a licence application .

A $30 licence application fee must accompany a licence application.

Protected fauna and protected native plants*

Licensing provisions for protected fauna and protected native plants are contained within the *National Parks and Wildlife Act 1974.* However, a Section 91 Licence may be extended to include protected fauna and protected native plants when these will be affected by the action.

If you are applying for a licence to cover both threatened and protected species please provide the information requested in Item 10 and a list of protected species and details of the number of individuals animals or proportion and type of plant material which are likely to be harmed or picked.

Request for additional information

The Director-General may, after receiving the application, request additional information necessary for the determination of the licence application.

Species impact statement

Where the application is not accompanied by a SIS, the Director-General may decide, following an initial assessment of your application, that the action proposed is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. In such cases, the *Threatened Species Conservation Act 1995* requires that the applicant submit a SIS. Following initial review of the application, the Director-General will advise the applicant of the need to prepare a SIS.

Director-General's requirements for a SIS

Prior to the preparation of a SIS, a request for Director-General's requirements must be forwarded to the relevant DEC Office. The SIS must be prepared in accordance with section 109 and 110 of the TSC Act and must comply with any requirements notified by the Director-General of the Department of Environment and Conservation (NSW).

Certificates

* Protected fauna means fauna of a species not named in Schedule 11 of the *National Parks and Wildlife Act 1974.*
Protected native plant means a native plant of a species named in Schedule 13 of the *National Parks and Wildlife Service 1974.*

If the Director-General decides, following an assessment of your application, that the proposed action is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Section 91 Licence is not required and the Director-General must, as soon as practicable after making the determination, issue the applicant with a certificate to that effect.

N.B: An action that is not required to be licensed under the Threatened Species Conservation Act 1995, may require licensing under the National Parks and Wildlife Act 1974, if it is likely to affect protected fauna or protected native plants.

I confirm that the information contained in this application is correct. I hereby apply for a licence under the provisions of Section 91 of the *Threatened Species Conservation Act 1995.*

Applicant's name, organisation and position *(Please print)* | Applicant's signature | Date

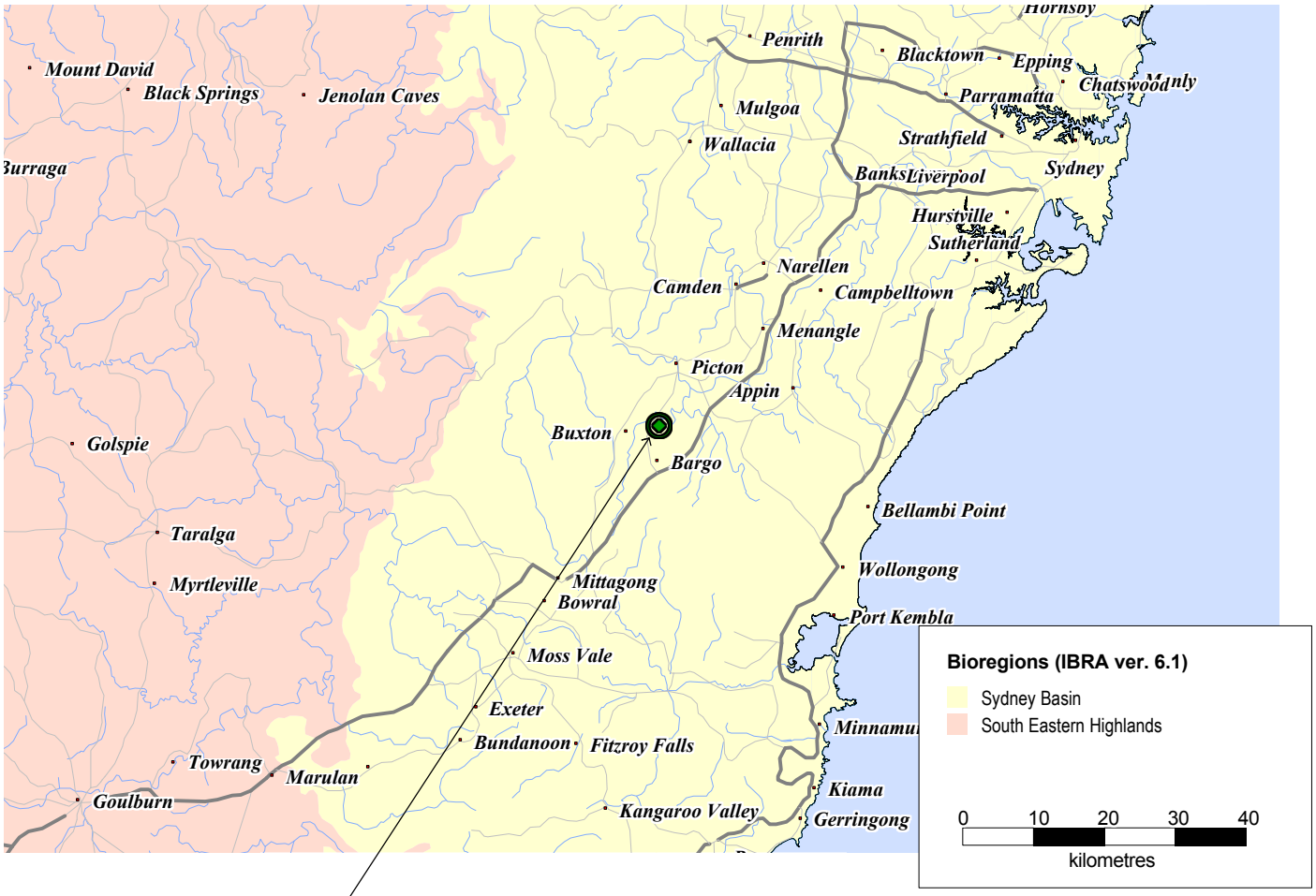
Ben de Somer
Environmental Coordinator
Tahmoor Coal Pty. Ltd.

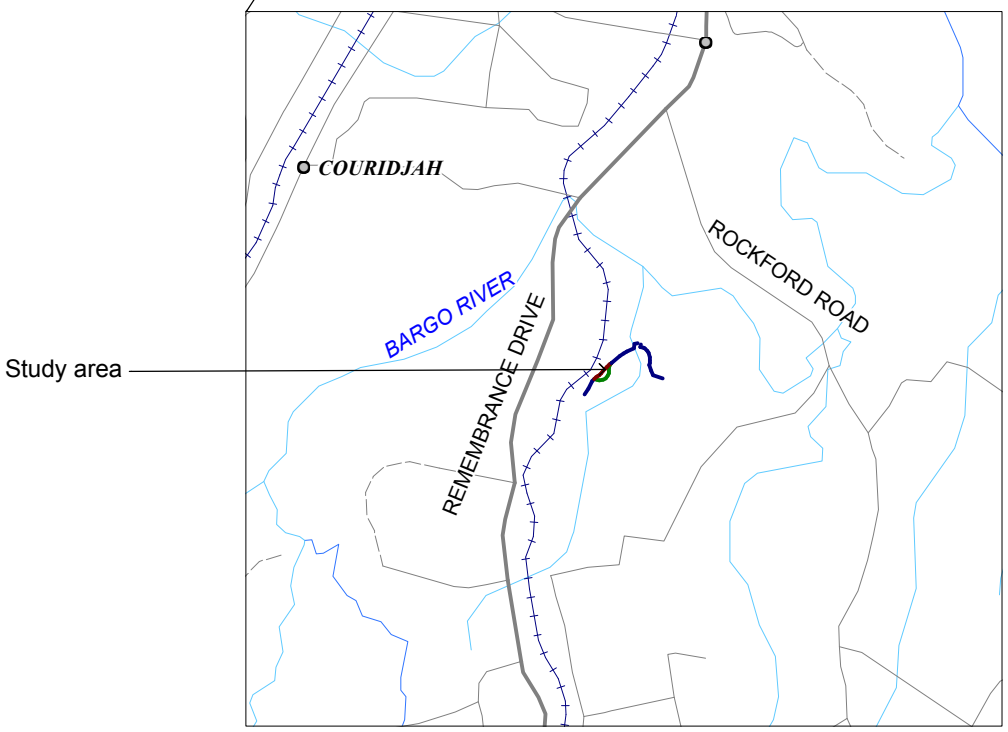
For more information or to lodge this form, contact the Environment Protection and Regulation Division in your nearest office:

Sydney Metro Branch	Southern Branch	Northern Branch	Western Branch
P: 02 9995 5000	P: 02 6122 3100	P: 02 6640 2500	P: 02 6841 9800
F: 02 9995 6900	F: 02 6299 3525	F: 02 6642 7743	F: 02 6882 9217
PO Box 668	PO Box 622	PO Box 498	PO Box 1020
Parramatta	Queanbeyan	Grafton	Dubbo
NSW 2124	NSW 2620	NSW 2460	NSW 2830

Department of Environment and Conservation
Head Office, PO Box A290, Sydney South NSW 1232
Phone: 2 9995 5000 (switch) Fax: 9995 5999 Email: info@environment.nsw.gov.au

Figures





BIOSIS RESEARCH Pty. Ltd.

8 Tate St
WOLLONGONG
NEW SOUTH WALES 2500

Figure 1: Location of the Study Area in a regional context.

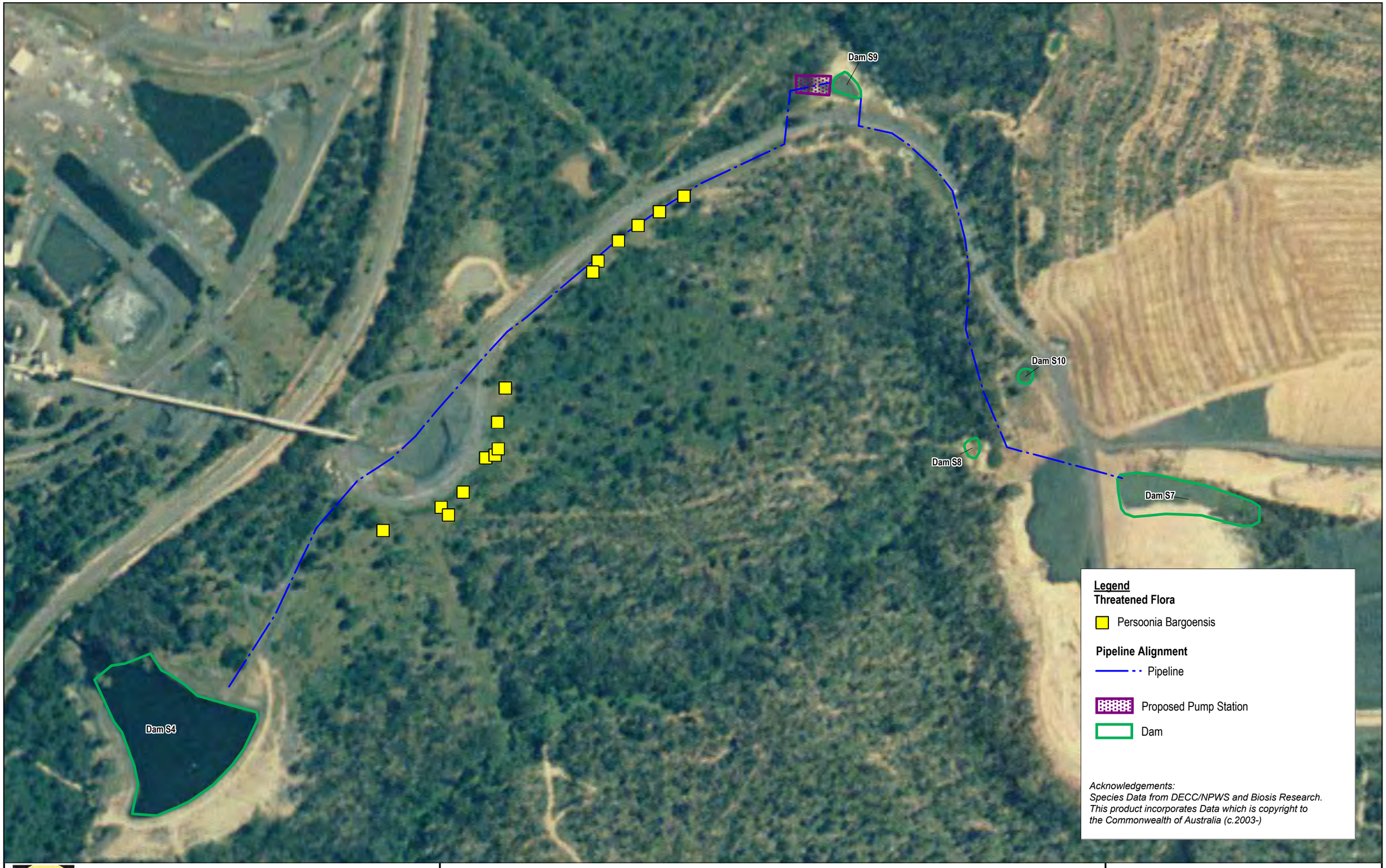
Date: 22 March 2009

Checked by: SEW | File number: S5370

Location:\5000\5300s\5370\Mapping\S5370 F1 Region.WOR

Scale: 0 0.75 1.5 2.25 3 kilometres

N W E S



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8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 2 - Proposal showing the pipeline alignment, showing threatened species recorded in study area.

Date: 16 April 2009
Checked by: SEW
File number: S5370
Location: P:\5000\5300s\5370\Mapping\S5370 F2 Proposal.WOR

Scale: 0 30 60 90 120 150 Meters

N W E S

Figure 2 - Proposal showing the pipeline alignment, showing threatened species recorded in study area.

Legend

Threatened Flora from Current Survey

Persoonia Bargoensis

Threatened Flora from Previous Survey

Persoonia Bargoensis

Pipeline Alignment

Pipeline

Proposed Pump Station

Dam

Acknowledgements:
Species Data from DECC/NPWS and Biosis Research.
This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)

BIOSIS RESEARCH Pty. Ltd.

No Window

8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 3 - Showing threatened species recorded in study area.

Date: 17 April 2009

Checked by: SEW | File number: S5370

Location: P:\5000\5300s\5370\Mapping\S5370 F3 Persoonia Bargoensis.WOR

Scale: 0 80 160 240 320 400 Meters

N W E S

Figure 3 - Showing threatened species recorded in study area.

Plates

Plate 1: Shale Sandstone Transition Forest and *Persoonia bargoensis* occurring along haul road.

Appendices

APPENDIX 1

Flora & Fauna Assessment Proposed Water Pipeline - Tahmoor Colliery

BIOSIS
RESEARCH

Flora & Fauna Assessment Proposed Water Pipeline - Tahmoor Colliery

March 2009

Natural & Cultural Heritage Consultants 8 Tate St Wollongong NSW 2500

BIOSIS
RESEARCH

Report for Tahmoor Colliery

Flora & Fauna Assessment Proposed Water Pipeline – Tahmoor Colliery

March 2009

Sian Wilkins

Matthew Swan

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***BIOSIS** RESEARCH Pty. Ltd. A.C.N. 006 075 197*
Natural & Cultural Heritage Consultants

Project no: s5370

Front Cover – *Persoonia bargoensis*

ACKNOWLEDGMENTS

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ABBREVIATIONS

DECC	Department of Environment and Climate Change
DEWHA	Department of Environment, Water Heritage and the Arts
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
EEC	Endangered Ecological Community
LGA	Local Government Area
NPWS	National Parks and Wildlife Service (now part of DECC)
ROTAP	Rare or Threatened Australian Plant as listed by Briggs and Leigh (1995)
SIS	Species Impact Statement
SEPP	State Environmental Planning Policy
SSTF	Shale Sandstone Transition Forest
TSC Act	*Threatened Species Conservation Act* 1995
sp.	Species (singular)
spp.	Species (plural)
ssp.	Subspecies
var.	Variety

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1.0 SUMMARY

Biosis Research Pty Ltd was commissioned by Tahmoor Colliery to undertake a terrestrial flora and fauna assessment in relation to a proposed water pipeline at Tahmoor Colliery (the proposal). The purpose of the pipeline is to transport surface run off water which currently discharges to Tea Tree Gully.

The proposed pipeline route generally follows existing disturbed and cleared areas such as the embankment of the haul road and the transmission line. Some areas of native vegetation will be impacted by the proposal, including areas supporting Sydney Hinterland Transition Woodland and Shale Sandstone Transition Forest (EEC on the TSC and EPBC Acts) and the threatened plant species *Persoonia bargoensis* (listed on both the TSC and EPBC Acts).

The study area provides habitat for common reptiles, birds and small mammals, with few large tree hollows within the impact area, and shelter in the forms of logs and leaf litter scarce along the majority of the proposed route. Logs, leaf litter and ground-cover vegetation were common in the understorey of adjoining woodland areas, providing sheltering habitat for reptiles and small mammals. There is potential habitat for 30 threatened and/or migratory animal species in the vicinity of the study area.

Impacts to threatened biota were compared between the two options being considered for the proposed pipeline. Option 2 follows the existing haul road and stockpile area and will not require the removal of any additional areas of native vegetation on top of what will be impacted by the common section of the proposed pipeline. In comparison, Option 1 would result in additional areas of SSTF and *Persoonia bargoensis* being cleared. Therefore, Option 2 is the preferred option for the proposed pipeline route to minimise impacts to threatened biota.

Impact assessments under the TSC and EPBC Acts will need to be undertaken for both Shale Sandstone Transition Forest and *Persoonia bargoensis* once the proposed pipeline route is finalised. A Section 91 licence will be required under the TSC Act for removal of any areas of Shale Sandstone Transition Forest and any *Persoonia bargoensis* in relation to the proposal. An Assessment of Impact will be required under the EPBC Act for both Shale Sandstone Transition Forest and *Persoonia bargoensis.* Impact assessments under the TSC (Section 91 licence) and/or EPBC Act will be required for eight bird species and six mammal species, once the proposed pipeline route is finalised.

The following are key recommendations to minimise impacts to flora and fauna values:

- Option 2 is the preferred over Option 1 to minimise impacts to the EEC Shale Sandstone Transition Forest and the local population of *Persoonia bargoensis.*
- The proposed route should avoid threatened species as far as is practicable. Clearing of areas within the vicinity of threatened plant species should be undertaken under the supervision of a suitably qualified botanist.
- Utilise pre-existing tracks, transmission line corridors and access points wherever possible to avoid disturbance to native vegetation.
- Where clearing of native vegetation is required, the top 100 mm of topsoil should be put aside and replaced over the surface upon completion of the works.
- Suitably maintained erosion and sedimentation controls should be installed during construction and rehabilitation, particularly around Tea Tree Hollow.
- Hollow bearing trees should be avoided. In those areas where vegetation clearing is necessary a two staged process should be undertaken. Clearing of hollow bearing trees will be preformed by careful felling and should be undertaken under the supervision of a suitably qualified ecologist.
- Where clearing of hollow bearing trees is unavoidable, hollows should be re-instated in surrounding habitat by attaching the hollow limbs to other trees, if possible.
- Where reinstatement of hollows is not possible, nest boxes should be placed in trees to replace hollows lost due to clearing.
- Within Tea Tree Hollow, care should be taken to reduce disturbance to the creekline.
- Machinery and equipment should be cleaned before entering bushland areas to prevent the spread of weed seed and soil pathogens between sites.
- Weed control and bush regeneration strategies should be implemented after completion of proposed works to ensure regeneration is expedited.

2.0 INTRODUCTION

Biosis Research Pty Ltd (Biosis Research) was commissioned by Tahmoor Colliery to undertake a terrestrial flora and fauna assessment in relation to a proposed water pipeline at Tahmoor Colliery (the proposal). The purpose of the pipeline is to transport surface run off water which currently discharges to Tea Tree Gully.

This report has been prepared in accordance with the requirements of the NSW *Environmental Planning and Assessment Act* 1979 (EP&A Act) and NSW *Threatened Species Conservation Act* 1995 (TSC Act) in relation to threatened species, populations and ecological communities and their habitats, and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) in relation to nationally threatened species and ecological communities and listed migratory species.

The proposal is falls under the category of 'complying development' under the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP). Therefore, there is no requirement for impact assessments under the TSC Act. However, a Section 91 Application for removal of any threatened species, population or community listed on the TSC Act is required, if relevant. Impact assessments under the Commonwealth EPBC Act in relation to nationally threatened species and ecological communities and listed migratory species are also required. These assessments have not been included in this report, as the final route of the proposal has not yet been determined. These impact assessments will be conducted at a later date once the route has been finalised.

2.1 Aims

The overall aim of this report is to determine whether the proposed development is likely to have a significant impact on flora or fauna of conservation significance. For the purposes of this report, flora and fauna of conservation significance are defined as threatened species, populations or ecological communities listed on the Schedules of the TSC Act, and/or are listed as matters of national environmental significance under the EPBC Act.

The specific objectives of this study were to:

- conduct a literature review and database search of the study area
- provide a brief assessment of the habitat values of the study area
- carry out a field study along the route of the proposed pipeline, to examine the fauna habitats and plant communities present

- carry out targeted searches for threatened plant species and potential habitat for threatened fauna in the vicinity of the proposed pipeline
- provide recommendations to minimise impacts on flora and fauna

2.2 Study Area

2.2.1 Location

The proposed pipeline is located within Tahmoor Colliery's existing surface mining lease to the South of Tahmoor Township, NSW (Figure 1). The pipeline generally follows the existing haul road, running from Dam S7, past Dam S8, S10 and S9, across Tea Tree Gully and along the transmission line in a westerly direction, ending at Dam S4 (Figure 2).

2.2.2 Description of the Proposal

The proposed water pipeline will be used to transport surface run off water which currently discharges to Tea Tree Gully. The run off water is being transported to Dam S4 for the following reasons:

- so it is discharged through only one licensed discharge point
- so the water quality can be managed to meet Environmental Protection License requirements

A 5 m wide disturbance area will be required for installation of the proposed pipeline. A trench will be dug along most of its length, with the pipeline buried underground and vegetation left to regenerate once works are completed. The trenches will be approximately 600 mm wide and several meters deep. The 5 m wide disturbance area will include allowing for access for construction equipment. Along some sections of its length, boring will be used to direct the pipeline and trenching will not be required.

A brief description of the proposal is as follows (Figure 2):

- a gravity pipeline will run from Dam S7, pass Dam S10, then follow the line of the haul road to Dam S9. The pipeline will traverse the creek via an aqueduct, where the haul road crosses the creek. Under road boring will be used to direct the pipeline from Dam S7 across the haul road, and also to direct the pipeline back under the haul road at Dam S9.

- Another gravity line will run from Dam S10 to Dam S9 but will connect into the existing road drainage system approximately half way between Dam S10 and Dam S9.

- A pump station will be built on the edge of Dam S9. The station site will also have a valve chamber and electrical kiosk all being serviced by an all weather access road.

- A pressure main from the pump station will deliver water to Dam S4. This pressure main follows the Haul Road. In one section, a number of options are being considered, including following the existing transmission line or through the haul road loop.

- At the back end of Dam S4 an overflow weir will be constructed.

2.2.3 Definitions

The **proposal** includes the proposed pipeline, pumping station and overflow weir, as described above.

The **subject site** is the area directly impacted by the proposal, and includes clearing for installation of the buried pipeline and associated infrastructure.

The **study area** includes the subject site and any area indirectly impacted by the proposal. The subject site occurs within existing edge affected areas. For the purposes of this assessment, a buffer of 10 metres for indirect impacts has been assumed as the proposal may introduce edge effects to the area.

The **local area** is defined as a 10 km radius from the subject site.

For the purposes of this study, the **region** within which the study area occurs is the Sydney Basin Bioregion as defined by Thackway & Cresswell (1995).

Direct impacts include but are not limited to acute death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (DEC 2005n). In relation to the proposal, direct impacts include the clearing and crushing of native vegetation within the subject site.

Indirect impacts include but are not limited to starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (DEC 2005n). In relation to the proposal, indirect impacts include the potential for the introduction and spread of

weed species, erosion, sedimentation, loss of habitat and edge effects. The indirect impacts have been calculated based on a 10 m buffer around the subject site.

Threatened biota means threatened species, populations or ecological communities (or their potential habitats) as listed under the Threatened Species Conservation Act 1995 or Environmental Protection and Biodiversity Conservation Act 1999.

A **key threatening process** (KTP) is defined in the TSC Act as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities (DEC 2006b). Something can be a threatening process if it;

- adversely affects two or more threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

A list of KTPs is maintained in the relevant sections of the TSC Act and EPBC Act and includes such processes as bush rock removal, predation and competition by a variety of introduced plants and animals and the clearing of native vegetation.

3.0 METHODS

3.1 Literature and Database Review

Information regarding plant communities previously mapped within the local area was obtained from the vegetation maps provided by the NPWS in their 2002 publication *Native Vegetation of the Cumberland Plain* and from previous work carried out by Biosis Research in the vicinity of Tahmoor Colliery. A list of documents used to prepare this report is presented in *References*.

Database records for the area within a 10 km radius of the study area were obtained, as follows:

- records of threatened species, populations and ecological communities listed on the TSC Act were obtained from the NSW Department of Environment and Climate Change (DECC) *Atlas of NSW Wildlife*
- records of matters of national environmental significance were obtained from the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) *Protected Matters Database*

3.2 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1993b, 1993a, 2000, 2002). If required, subsequent advice was sought from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names, where available, have been included in the Appendices.

Names of terrestrial vertebrates follow the Census of Australian Vertebrates maintained by DEWHA. In the body of this report, all fauna species are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

3.3 Legislation

Commonwealth and NSW Acts and Policies that apply to the study area with regard to flora and fauna are listed below.

- Commonwealth *Environmental Protection and Biodiversity Conservation Act* 1999
- NSW *Threatened Species Conservation Act* 1995

- NSW *Environmental Planning and Assessment Act* 1979
- State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)
- NSW *State Environmental Planning Policy Number 44 – Koala Habitat Protection* (SEPP 44)

3.4 Field Assessment

3.4.1 Survey Effort and Technique

A terrestrial and flora and fauna survey was undertaken within the study area on 5 March 2009. The survey involved an examination of the type and condition of the plant communities and fauna habitats occurring along the length of the proposed pipeline. Targeted searches for threatened plant species and for potential habitat of threatened fauna were carried out. The total abundance and geographic coordinates of all threatened flora was recorded within the study area. A fauna survey was not undertaken as part of the field survey, though significant habitat features were noted.

3.4.2 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- species composition (species richness, extent of weed invasion);
- structure (representation of each of the original layers of vegetation); and,
- resilience (degree to which the natural soil profile of the area has been disturbed, affecting the capacity for natural regeneration).

Plant community condition was categorised as follows:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact;

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact;

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing; and

Disturbed: highly modified landscape containing few or no indigenous species; exotic species dominant; original native vegetation layers removed; natural soil profile disturbed; unable to be regenerated to natural condition; high input intervention required to revegetate.

The above condition categories are used to describe the state of vegetation at the time of survey. The criteria used in the assessments (e.g. species composition) help indicate the likelihood of the vegetation providing potential habitat for threatened plants, or if an EEC, how much it resembles its natural state. Whilst some vegetation may be in poorer condition than other areas, if it contains the right attributes, it may still be considered suitable potential habitat for threatened species. Depending on the level of resilience, it is possible for vegetation in Moderate or Poor condition to be improved under appropriate corrective management.

3.4.3 Fauna Habitat Assessment

Fauna habitats within the study area were assessed on the basis of a variety of criteria, including: plant community structure; level of disturbance; existence of threatening processes; and potential value as a habitat corridor. The presence of particular habitat features was examined, including: potential food, nesting or roosting resources; ground shelter such as logs and litter; rock outcrops; and water sources.

3.5 Limitations

This study was by design a habitat level assessment, with the methodology developed for the purposes of conducting an assessment in accordance with Section 5A of the EP&A Act. No terrestrial fauna trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used.

The report does not include impact assessments under the EPBC Act to determine if a referral to the Commonwealth Environment Minister is required, as the final route of the proposed pipeline has not yet been determined. Further, once the final route of the pipeline is determined, a Section 91 Application under the TSC Act will also be required for impacts to threatened species listed on the TSC Act.

4.0 RESULTS

A list of all plant species recorded during the survey is provided in Appendix 1. Fifty vascular plant species were recorded from the study area, comprising 45 (90%) locally indigenous species and 5 (10%) exotic species and non local native species.

4.1 Plant communities

It is important to note that ground-truthing during the field survey revealed some discrepancies between the NPWS mapping and the actual boundaries of the plant communities in the field. These discrepancies are minor and do not affect the outcome of this assessment. As such, Figure 3 should be regarded as a guide to the vegetation of the study area only.

4.1.1 Sydney Hinterland Transition Woodland

The dominant plant community in the study area is Sydney Hinterland Transition Woodland. This community intergrades with the surrounding Shale Sandstone Transition Forest – High Sandstone Influence. Within the study area Sydney Hinterland Transition Woodland is co-dominated by canopy species including *Eucalyptus piperita, Eucalyptus punctata* and *Eucalyptus haemastoma* with an understorey of *Allocasuarina littoralis, Persoonia linearis, Kunzea ambigua* and *Banksia spinulosa.* Ground layer species included *Themeda australis* and *Astroloma humifusum.*

Sydney hinterland Transition Woodland occurs within the study area from Dam S8 to Dam S9.

4.1.2 Shale Sandstone Transition Forest

One Endangered Ecological Community (EEC) was recorded in the study area during the current surveys: Shale Sandstone Transition Forest (SSTF). Shale Sandstone Transition Forest is listed as an EEC on both the TSC and EPBC Acts.

Within the study area, SSTF supports a canopy of *Eucalyptus fibrosa* and *E. punctata,* with a small tree layer of *Acacia parramattensis* and shrubs of *Kunzea ambigua* occurring in the understorey. The groundlayer was sparse and supported grasses such as *Themeda australis* and *Astroloma humifusum.* The threatened shrub species *Persoonia bargoensis* occurs within this plant community within the study area.

Shale Sandstone Transition Forest was recorded adjoining the disturbed embankment along the Haul Road between Dam S9 and Dam S4. Minimal areas

of SSTF will be impacted by the proposal, with the majority of the plant community occurring adjacent to the impact area. Potential impacts of the proposal on Shale Sandstone Transition Forest are required to be considered further under the TSC and EPBC Acts.

4.2 Flora Habitats

Dam S7 to Dam S9

The area surrounding Dam S7 and Dam S9 has been previously disturbed by the construction of the dams and the haul road. Most of the area has a disturbed soil profile due to these construction activities. Despite this, a number of native plant species were recorded in this area, including a few large remnant trees of *Eucalyptus racemosa* and juvenile trees of *E. piperita.* Native understorey plants recorded in this area include *Kunzea ambigua, Leptospermum polygalifolium, Eriostemon australasicus* and *Hakea sericea.* The ground layer supported a mix of native and exotic species including *Themeda australis, Imperata cylindrica, Astroloma humifusum, Chloris gayana* and *Cynodon dactylon.*

Pumping Station at Dam S9

The site of the proposed pumping station supports Sydney Hinterland Transition Woodland in Good to Moderate condition, with a disturbed structure due to partial clearing of the understorey and some smaller trees. Dominant trees in this area included *Eucalyptus punctata, E. pilularis X piperita, E. piperita, E. racemosa* and *E. fibrosa.* The small tree layer was scattered and supported trees such as *Melaleuca linearifolius, Hakea sericea, Allocasuarina littoralis* and juvenile eucalypts. The shrub layer was dominated by *Acacia terminals, A. linifolia, Persoonia linearis, Hakea sericea* and *Kunzea ambigua.* The groundlayer supported native species including *Themeda australis, Hardenbergia violacea* and *Imperata cylindrica* and the exotic perennial grass species *Andropogon virginicus.*

Proposed Pumping Station to Transmission Line

From the site of the proposed pumping station, the proposed pipeline will be bored under the haul road and then follows the haul road to the transmission line. This area has been previously disturbed by the construction of the haul road, consisting of an artificial embankment along most of its length, and supports mainly shrubs and small trees, with larger trees adjoining the disturbed area to the south-west. The vegetation to the south of this area is considered to be consistent with Shale Sandstone Transition Forest. Dominant tree species occurring in this area were *Eucalyptus fibrosa* and *E. punctata,* with *Acacia parramattensis* occurring as a scattered small tree layer. Dominant shrubs

included *Kunzea ambigua* and *Callistemon rigidus*, with *Themeda australis* and *Astroloma humifusum* occurring in the sparse understorey. The impact area of the proposed pipeline will be restricted to the previously cleared and disturbed area adjoining the haul road and will impact on mainly regrowth shrubs. The subject site was considered to be in poor condition, due to the absence of structural layers and disturbances due to construction of the haul road.

A total of twenty five plants of *Persoonia bargoensis* were recorded in the disturbed area along the embankment of the haul road. The majority of these plants should be able to be avoided by the proposal, as they occur adjoining the road edge.

Transmission Line to Haul Road Stockpile

The proposed pipeline diverts from the haul road to follow an existing transmission line clearing. This area is cleared of a tree layer and supports only regrowth shrubs such as *Melaleuca thymifolia, Kunzea ambigua* and *Leptospermum trinervium* to approximately 1 m in height, with *Themeda australis* occurring in the ground layer.

A total of nine *Persoonia bargoensis* were recorded in this section of the easement. The majority of these plants should be able to be avoided by the proposal, as they occur on the edge of the regrowth SSTF adjoining the road.

Options Around Haul Road Stockpile

From where the transmission line meets the haul road stockpile, there are two options for the pipeline being considered:

- Option 1 - continuing along the transmission line; or
- Option 2 - across the haul road and through the centre of the stockpile area.

Both of these options were assessed as part of the field survey.

Option 1

From where it continues around the stockpile area, the transmission line supports numerous *Persoonia bargoensis* amongst the other native regrowth shrubs. A total of 26 *Persoonia bargoensis* were recorded within the transmission line in this area. Twelve *Persoonia bargoensis* are likely to be cleared if the pipeline was to take this route.

The proposed pipeline route then diverges from the transmission line and transects a small patch of regrowth SSTF adjoining the haul road. Dominant tree species in this area include *Eucalyptus crebra* and *E. globoidea*, with *Hakea*

sericea, *Acacia decurrens* and *Kunzea ambigua* occurring in the shrub layer over a ground layer of *Themeda australis.* One *Persoonia bargoensis* was recorded in this area.

Option 2

The haul road and stock pile area does not support any vegetation. The entire area has been covered with coal wash and is not considered to support any flora or fauna habitats.

Haul Road Stockpile to Dam S4

From where the two options rejoin at the south-western end of the haul road stockpile, the proposed pipeline will continue along the access track to Dam S4. The trench will be retained within the existing track in this area and no vegetation clearing will be required.

4.3 Fauna Habitats

Transmission Line and Tracks

The majority of the route runs along the previously cleared transmission line corridor and within the embankment for the haul road, which is dominated by shrubby plants and groundcover species. The transmission line corridor is bordered on one side by intact woodland and forests which provided potential habitat for a wide range of native fauna. Threatened species recorded in the vicinity of this area include the Black-chinned Honeyeater, *Melithreptus gularis gularis* Brown Treecreeper *Climacteris pucumnus* and Diamond Firetail *Stagonopleura guttata.* The transmission line corridor itself would provide foraging habitat for a wide range of fauna, particularly small birds such as Brown Thornbills *Acanthiza pusilla,* Superb Fairywrens *Malurus cyaneus* and New-Holland honeyeaters *Phylidonyris novaehollandiae,* Red Wattlebirds *Anthochaera carunculata* and Eastern Spinebills *Acanthorhynchus tenuirostris*. It provided limited sheltering and roosting habitat due to the lack of canopy trees and ground habitat such as fallen logs, however, some smaller reptiles are likely to utilise this area.

Dams and Creeklines

Generally the dams did not support emergent or overhanging vegetation that would provide shelter to frog species. However, a small amount of *Typha domingensis* was recorded growing around Dam S9, providing sheltering resources for common native amphibians such as Verreeaux's Tree Frog *Litoria verreauxii* and Common Eastern Froglet *Crinia signifera* and waterfowl such as the Australasian Grebe *Tachybaptus novaehollandiae*.

Tea-tree Hollow Creek will be traversed by the proposed pipeline, though the proposed crossing will follow that of the haul road crossing of the creekline. The current creek crossing of the haul road consists of a large culvert.

Regrowth Woodland

Regrowth woodland adjoins the disturbed tracks and easements which form the majority of the subject site. There were limited tree hollows observed along the route however some hollows were available in the mature trees. Logs, leaf litter and ground-cover vegetation were common in the understorey of woodland areas, providing sheltering habitat for reptiles and small mammals. Scattered *Allocasuarina littoralis* were recorded in the woodland areas, these may provide an important food source for Glossy Black Cockatoos *Calyptorhynchus lathami*.

4.4 Significant Species

4.4.1 Significant Flora

Seventeen threatened flora species listed on the TSC and or EPBC acts have previously been recorded from within 10 km of the study area or are considered to have the potential to occur within the study area (Table 1, Figure 4).

One threatened plant species, *Persoonia bargoensis,* was recorded during the field survey (see Figure 2). *Persoonia bargoensis* is listed as Endangered on the TSC Act and Vulnerable on the EPBC Act. This species was growing within regrowth vegetation beside the haul road and within the slashed transmission line, with approximately 61 plants recorded in the study area. Associate species included *Eucalyptus crebra, E. globoidea, E. punctata, Hakea sericea, Acacia decurrens, Kunzea ambigua* and *Themeda australis.* Potential impacts of the proposed pipeline are discussed further in Section 5.0.

Potential habitat for an additional three threatened plant species; *Grevillea parviflora* subsp. *parviflora, Persoonia hirsuta* and *Pomaderris brunnea*; is considered to occur in the study area (Table 1). The potential impacts to these species are discussed further in Section 5.0.

Table 1: Terrestrial flora listed on the TSC Act or EPBC Act that have the potential to occur in the local area

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Acacia bynoeana	V	E1	3V	*Acacia bynoeana* is found in central eastern NSW, in the following catchment regions – Hawkesbury/Nepean, Hunter/Central Rivers, Southern Rivers, and Sydney Metropolitan. More specifically it is found from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra (DEC 2005a). It seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and recently burnt patches (DEC 2005a). It grows in sandy clay soils often containing ironstone gravels (Fairley 2004). Main vegetation types include heath or dry sclerophyll forest on sandy soils (DEC 2005a). Associated overstorey species include *Corymbia gummifera*, *Corymbia maculata*, *Eucalyptus parramattensis*, *Banksia serrata* and *Angophora bakeri* (DEC 2005a). Flowering period is mainly summer	No
Acacia flocktoniae	V	V	2V	*Acacia flocktoniae* is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie) (DECC 2005a). It grows in dry sclerophyll forest on low nutrient soils derived from sandstone. Associated species include *A. stricta* and *Podolobium ilicifolium*. The species occurs within the Hawkesbury/Nepean and Hunter/Central Rivers (NSW) Catchment Management Areas. The distribution of *Acacia flocktoniae* overlaps with the following EPBC Act-listed ecological communities: Shale/Sandstone Transition Forest, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodlands, Turpentine-Ironbark Forest in the Sydney Basin Bioregion, and Temperate Highland Peat Swamps on Sandstone (DEWHA 8 A.D.). Flowers usually in June to September, also recorded March, April, October and December.	No
Caladenia tessellata	V	E1	3V	*Caladenia tessellata* is found in the following Catchment Management Areas: Sydney Metropolitan, Southern Rivers, Hawkesbury/Nepean, and Hunter/Central Rivers. Currently known from three disjunct areas: Braidwood on Southern Tablelands, Ulladulla on the south coast and three populations in Wyong area on the Central Coast (DEC 2005c). It is generally found in grassy, dry sclerophyll forests/woodland, particularly those associated with clay loam, or sandy soils. However, there is one population at Braidwood in lowland on stony soil (DEC 2005c). This species only grows in very dense shrubbery in coastal areas (Bishop 1996). Flowers appear between September and November, but generally late September or early October in extant southern populations (DEC 2005c).	No
Callistemon linearifolius	-	V	2Ri	Occurs chiefly from Georges River to the Hawkesbury River where it grows in dry sclerophyll forest (Harden 2002), open forest, scrubland (Fairley and Moore 2000) or woodland on sandstone. Found in damp places, usually in gullies (Robinson 1994). Flowers in Spring.	No

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Cryptostylis hunteriana	V	V	3V	This species typically grows in swamp-heath on sandy soils chiefly in coastal districts (Harden 1993) but has also been recorded on steep bare hillsides (Bishop 1996). Within the Central Coast bioregion, this species has been recorded within Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland (Bell 2001). This species does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla, E. sieberi*, *Corymbia gummifera* and *Allocasuarina littoralis;* appears to prefer open areas in the understorey of this community and is often found in association with *Cryptostylus subulata* (DEC 2005d). It occurs in the following Catchment Management Regions Hawkesbury/Nepean, Hunter/Central Rivers, Northern Rivers and Southern Rivers.	No
Cynanchum elegans	E	E1	3Ei	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. Catchment Management Regions include Hawkesbury/Nepean , Hunter/Central Rivers, Northern Rivers, Southern Rivers and Sydney Metropolitan (DEC 2005r). *Cynanchum elegans* usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; *Leptospermum laevigatum, Banksia integrifolia* subsp. *integrifolia*; *Eucalyptus tereticornis* open forest and woodland; *Corymbia maculata* open forest and woodland; and *Melaleuca armillaris* scrub to open scrub (DEC 2005r). Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific (DEC 2005r).	No
Darwinia peduncularis	-	V	3Ri	Occurs from Hornsby to Hawkesbury River and west to near Glen Davis where it grows in dry sclerophyll forest on sandstone hillsides and ridges (Harden 2002). Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone. Flowers in winter to early spring (DEC 2005e)..	No
Diuris lanceolata	E	-	-	Grows in moist grassy areas, among shrubs in sclerophyll forest and heath; coast and tablelands (Harden 1993).	No

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Epacris purpurascens var. *purpurascens*	-	V	2K	Located in the Hawkesbury/Nepean, Hunter/Central Rivers/and Sydney Metropolitan catchment authority region – from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South (DEC 2005f). *Epacris purpurascens* var. *purpurascens* grows in dry sclerophyll forests, scrub and swamps (Harden 1992). Characteristically found in a range of habitat types, most of which have a strong shale soil influence. These include ridge top drainage depressions supporting wet heath within or adjoining shale cap communities (including Shale Sandstone Transition Forest, Turpentine Ironbark Margin Forest, Stringybark/Scribbly Gum Woodland and Scribbly Gum/Grey Gum/Red Bloodwood Woodland). Also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium (NPWS 2002b).	No
Genoplesium baueri	-	V	3R	This terrestrial orchid species grows in open sclerophyll forest or moss gardens on sandstone. Typically the habitat is a drier heathy forest (Harden 1993) (Bishop 1996). The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. Flowers Dec. - Mar (DEC 2005g).	No
Grevillea parviflora subsp. *parviflora*	-	V	-	Located in Hawkesbury/Nepean, Hunter/Central Rivers and Sydney Metropolitan Catchment. Sporadically distributed throughout the Sydney Basin with the main occurrence centred in Picton, Appin, Wedderburn and Bargo. Northern populations are found in the Lower Hunter Valley. To the west of Sydney, small populations occur at Kemps Creek & Voyager Point (DEC 2005h). *Grevillea parviflora* ssp. *parviflora* grows on sandy clay loam soils, often with ironstone gravels. Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones (NPWS 2002a). It is found on crests, upper slopes or flat plains in both low-lying areas and on higher topography. The plant prefers open habitat conditions with the largest populations in open woodland and along exposed roadside areas (NPWS 2002a). *G. parviflora* subsp. *parviflora* has been recorded in a range of vegetation types from heath and shrubby woodland to open forest. Canopy species vary greatly with community type but generally are species that favour soils with a strong lateritic influence including *Eucalyptus fibrosa, E. parramattensis, Angophora bakeri* and *Eucalyptus sclerophylla* (NPWS 2002a). Flowering has been recorded between July to December as well as April-May (NPWS 2002a).	Yes

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Lepidium hyssopifolium	E	E1	3Ei	Associated with introduced weedy species that tend to populate areas that receive little maintenance and are generally allowed to lie as derelict pasture. Original habitat is eucalypt woodland with grassy groundcover, low open Casuarina woodland with a grassy ground cover and tussock grassland (Cropper 1993).	No
Leucopogon exolasius	V	V	2V	Occurs in Hawkesbury/Nepean and Sydney Metropolitan Catchment (DEC 2005s), restricted to the Woronora and Grose Rivers (Harden 1991). The plant occurs in woodland on sandy alluvium and rocky sandstone hillsides near creeks, and on low nutrient soils (Powell J.M 2007). Flowering occurs in August and September (Harden 1991). Associated species include *Eucalyptus piperita* and *E. sieberi* and the shrubs *Pultenaea flexilis*, *Leptospermum trinervium* and *Dillwynia retorta* (Powell J.M 2007).	No
Melaleuca deanei	V	V	3R	*Melaleuca deanei* occurs in Catchment Management Regions Hawkesbury/Nepean, Southern Rivers, and Sydney Metropolitan. Distinctly it occurs in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas (DEC 2005k). The species grows in wet heath on sandstone (Harden 1991) and Dry Sclerophyll Forests. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate (DEC 2005k).	No
Persicaria elatior	V	V	3V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance (DEC 2005l).	No

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Persoonia bargoensis	V	E1	2V	Found in the Sydney Metropolitan and Hawkesbury/Nepean Catchment Authority Regions. Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau. Its entire range falls between Picton, Douglas Park, Yanderra, Cataract River and Thirlmere (DEC 2005m). *P. bargoensis* grows in woodland to dry sclerophyll forest on sandstone and clayey laterite on heavier, well drained, loamy, gravelly soils of the Hawkesbury Sandstone and Wianamatta Shale (NPWS 2000a). More specifically, *P. bargoensis* seems to prefer the interfaces between shale-derived soils such as the Blacktown Soil Landscape, the complex soils of the Mittagong Formation (Lucas Heights Soil Landscape), and the underlying sandstone (Hawkesbury and Gymea Soil Landscapes). Some of the vegetation in which *P. bargoensis* occurs can be recognised as the EEC Shale/Sandstone Transition Forest (NPWS 2000a). This species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005m). Flowering occurs mainly in summer but can extend into autumn (NPWS 2000a).	Yes
Persoonia glaucescens	V	E1	2V	Woodland to dry sclerophyll forest on sandstone from Picton to Bargo (Harden 1991). More specifically this species prefers clayey and gravelly laterites with ridgetops, plateaus and upper slopes being preferred topography (NPWS 2000b)	No
Persoonia hirsuta	E	E1	3Ki	Occurs from Gosford to Royal NP and in the Putty district from Hill Top to Glen Davis where it grows in woodland to dry sclerophyll forest on sandstone (Harden 2002) or rarely on shale (NSW Scientific Committee 1998). Two subspecies are recognised, *P. hirsuta* ssp. *hirsuta* (Gosford to Berowra and Manly to Royal NP) and *P. hirsuta* ssp. *evoluta* (Blue Mountains, Woronora Plateau and Southern Highlands). Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas (DEC 2005n).	Yes
Pomaderris brunnea	V	V	2V	*Pomaderris brunnea* is found in a very limited area around the Nepean and Hawkesbury Rivers, including the Bargo area. Occurs in the Central West, Hawkesbury/Nepean, Hunter/Central Rivers Catchments. Occurs on clay & alluvial soils (Fairley and Moore 1995). In the Hawkesbury/Nepean region, the species is known to be associated with Dry sclerophyll forests (Cumberland, Upper Riverina, Sydney Coastal, Sydney Hinterland, Sydney Sand Flats), Coastal Floodplain Wetlands and Coastal Valley Grassy Woodlands (DEC 2005o). Flowers appear in September and October.	Yes
Pultenaea glabra	V	V	3Va	Found in dry sclerophyll forest on sandstone in the higher Blue Mountains and Glen Davis area (Harden 1991). Grows above south facing escarpments of the main plateau and sometimes in forest with an open canopy and moist soil (Baker and Corringham 1995). Flowers September to November, fruit matures October to December.	No

Latin Name	EPBC Act	TSC Act (NSW)	ROTAP	Habitat	Potential habitat
Rulingia prostrata	E	E1	2Ei	*Rulingia prostrata* occurs on the Southern Tablelands, and on the North Coast, in the Hawkesbury/Nepean, Hunter/Central Rivers, Murrumbidgee and Southern Rivers Catchments. Occurs on sandy, sometimes peaty soils in a wide variety of habitats: *Eucalyptus pauciflora* Woodland at Rose Lagoon; *E. agglomerata* Open Forest at Tallong; and in *E. mannifera* Low Open Woodland at Penrose; *Eucalyptus haemostoma/E. robusta* Ecotonal Forest at Tomago (DEC 2005q). Associated native species may include *Imperata cylindrica, Empodisma minus* and *Leptospermum continentale*. Appears to respond positively to some forms of disturbance (DEC 2005q)	No
Thelymitra sp. Kangaloon	CE	-	-	*Thelymitra sp.* Kangaloon is a terrestrial orchid endemic to New South Wales, and is known from three locations near Robertson in the Southern Highlands. The swamp habitat in which the species occurs has an extent of occurrence of 300 km2 and an area of occupancy of 10 km2. The three swamps are Butlers Swamp, Stockyard Swamp and Wildes Meadow Swamp, and are all located above what is known as the Kangaloon aquifer. It flowers in late October and early November. The species grows amongst tall sedges and rushes in seasonally swampy sedgeland on grey silty clay loam at 600-700 m above sea level (Threatened Species Listing Advice 2008).	No

Key: - Listed on the TSC Act as Critically Endangered (CE), Endangered (E), Endangered Population (EP) or Vulnerable (V);
- Listed on the EPBC Act as Endangered (E) or Vulnerable (V);
- ROTAP= Rare or Threatened Australian Plant (Briggs and Leigh 1995); for description of codes see Appendix 2.

4.4.2 Significant Fauna

Fifty-one threatened fauna species listed on the TSC and or EPBC acts have previously been recorded from within 10 km of the study area or are considered to have the potential to occur within the study area and are listed in Table 2 (Figure 5). Potential impacts of the proposed pipeline on these threatened fauna are discussed further in Section 5.0.

Table 2: Threatened fauna species potentially occurring within 10 km of the study area

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
Amphibians					
Litoria aurea	Green and Golden Bell Frog	V	E1	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (NSW Government 2008). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering	No

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				sites nearby such as vegetation or rocks (NPWS 1999c; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DECC 2005b).	
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker *et al.* 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker *et al.* 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996; Recsei 1996). Can also occur within shale outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker *et al.* 1995).	No
Mixophyes balbus	Stuttering Frog	V	E1	This species is usually associated with mountain streams, wet mountain forests and rainforests (Barker *et al.* 1995). It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains (Barker *et al.* 1995).	No
Pseudophryne australis	Red-crowned Toadlet	-	V	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs (Thumm and Mahony 1997).	No
Birds					
Haliaeetus leucogaster	White-bellied Sea-eagle	M	-	A migratory species that is generally sedentary in Australia, although immatures and some adults are dispersive (Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep	No

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees (Marchant and Higgins 1993).	
Sterna fuscata	Sooty Tern	-	V	Pelagic species of tropical waters. Offshore species, rarely inshore unless forced by bad weather. Breeds on islands, coral bays and stacks (Higgins and Davies 1996).	No
Apus pacificus	Fork-tailed Swift	M	-	Almost exclusively aerial (foraging and roosting). Breed in Asia (Higgins 1999).	No
Hirundapus caudacutus	White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breed in Asia (Pizzey and Knight 1997).	No
Ardea alba	Great Egret	M	-	Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare saltpans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990).	Yes
Ardea ibis	Cattle Egret	M	-	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990).	Yes
Burhinus grallarius	Bush Stone-curlew	-	E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	No
Callocephalon fimbriatum	Gang-gang Cockatoo	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	Yes
Calyptorhynchus lathami	Glossy Black-cockatoo	-	V	Inhabits forest with low nutrients, characteristically with key *Allocasuarina* species. Tends to prefer drier forest types (NPWS 1999b). Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or	Yes

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				dead (Higgins 1999).	
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	V	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	Yes
Monarcha melanopsis	Black-faced Monarch	M	-	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey and Knight 1997).	Yes
Myiagra cyanoleuca	Satin Flycatcher	M	-	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey and Knight 1997).	Yes
Rhipidura rufifrons	Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey and Knight 1997).	Yes
Anthochaera phrygia	Regent Honeyeater	E	E1	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999d; Pizzey and Knight 1997). Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: *E. microcarpa, E. punctata, E. polyanthemos, E. moluccana, Corymbia robusta, E. crebra, E. caleyi, Corymbia maculata, E. mckieana, E. macrorhyncha, E. laevopinea*, and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, A. cambagei* are also eaten during the breeding season (DECC 2005c). Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female (DECC 2005c).	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	V	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins *et al.* 2001). It is rarely recorded east of the Great Dividing Range (Higgins *et al.* 2001).	Yes
Merops ornatus	Rainbow Bee-eater	M	-	Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter (Higgins 1999).	Yes
Pyrrholaemus sagittatus	Speckled Warbler		V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy	Yes

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				understorey, often on ridges or gullies (Blakers *et al.* 1984; NSW Scientific Committee 2008). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers *et al.* 1984; NSW Scientific Committee 2008). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2008).	
Stagonopleura guttata	Diamond Firetail	-	V	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997). Often occur in vegetation along watercourses (Higgins *et al.* 2006).	Yes
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	V	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000).	Yes
Lathamus discolor	Swift Parrot	E	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997).	Yes
Neophema pulchella	Turquoise Parrot	-	V	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist (Higgins 1999).	Yes
Rostratula australis	Australian Painted Snipe	VM	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).	Yes
Gallinago hardwickii	Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No
Ninox connivens	Barking Owl	-	V	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey and Knight 1997). Territories range from 30 to 200 ha (DEC 2005b).	Yes
Ninox strenua	Powerful Owl	-	V	Occupies wet and dry eucalypt forests and	Yes

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas (Debus and Chafer 1994b; Debus and Chafer 1994a). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997). Has a large home range of between 450 and 1450 hectares (DEC 2005p).	
Tyto novaehollandiae	Masked Owl	-	V	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting (Higgins 1999). Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead (Higgins 1999). Nest hollows are usually located within dense forests or woodlands (Gibbons and Lindenmayer 1997). Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet (Gibbons and Lindenmayer 1997; Higgins 1999). Has a large home range of between 500 to 1000 hectares (DEC 2005j).	Yes
Tyto tenebricosa	Sooty Owl	-	V	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude <500 m. Nests and roosts in hollows of tall emergent trees, mainly eucalypts (Higgins 1999) often located in gullies (Gibbons and Lindenmayer 1997). Nests have been located in trees 125 to 161 centimeters in diameter (Gibbons and Lindenmayer 1997).	No
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	-	E1	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 1999a).	No
Mammals					
Cercartetus nanus	Eastern Pygmy-possum	-	V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of	Yes

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period (Ward 1990).	
Dasyurus maculatus maculatus	Spotted-tailed Quoll (southeastern mainland)	E	V	Occurs along the east coast of Australia and the Great Dividing Range (Belcher *et al.* 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995). 70% of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999e). The home range of a female is between 180 – 1000 ha, while males have larger home ranges of between 2000 – 5000 ha. Breeding occurs from May to August (Belcher *et al.* 2008).	Yes
Petrogale penicillata	Brush-tailed Rock-wallaby	V	E1	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices, particularly where these have a northerly aspect. Individuals defend a specific rock shelter, emerging in the evening to forage on grasses and forbs, as well as browse in drier months. Home sizes range from 2-30 ha (Eldridge and Close 1995).	No
Mormopterus norfolkensis	Eastern Freetail Bat	-	V	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites (Churchill 2008; Hoye *et al.* 2008).	Yes
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E1	Prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time (Braithwaite 1995). A mosaic of post fire vegetation is	No

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				important for this species (Maxwell *et al.* 1996).	
Petaurus australis	Yellow-bellied Glider	-	E2	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999f). Live in family groups of 2-6 individuals which commonly share a number of tree hollows. Family groups are territorial with exclusive home ranges of 30-60 ha. Very large expanses of forest (>15,000ha) are required to conserve viable populations (Goldingay 2008)	No
Petaurus norfolcensis	Squirrel Glider	-	V	Sparsely distributed along the east coast and immediate inland areas as far west as Coonabarabran (DEC 1999) in the northern part of the state and as far west as Tocumwal along the southern border of the state (NSW Government 2008). Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Require abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Van der Ree and Suckling 2008). Within a suitable plant community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked (Menkhorst *et al.* 1988). They live in family groups of 2-10 individuals and maintain home ranges of 0.65 and 10.5 hectares, varying according to habitat quality and food resource availability (Quin 1995; Goldingay and Jackson 2004).	Yes
Phascolarctos cinereus	Koala	-	V	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region (DEC 2005i). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally (Martin *et al.* 2008). Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma* and *E. signata* (Department of Planning 1995). They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100ha (Martin *et al.* 2008).	Yes
Bettongia penicillata penicillata	Brush-tailed Bettong (south-east mainland)	X	E4	Preferred habitats are open forest and sclerophyll woodlands with clumped low understorey of tussock grasses or woody scrub (Strahan 1995, NPWS 1996).	No, extinct from NSW
Potorous tridactylus	Long-nosed Potoroo	V	V	Occurs from Queensland to Victoria, normally within 50km of the coast (Claridge *et al.* 2007). Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively	No

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				thick ground cover where the soil is light and sandy. Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue. It is solitary and sedentary, buts tends to aggregate in small groups. It has two breeding seasons, one in late winter-early spring and the other in late summer. (Johnston 2008). This species appears to benefit from a lack of recent disturbance (Claridge *et al.* 2007).	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Roosts include rock overhangs, caves, Fairy Martin nests and mines, in colonies of between three and 40. Forages on small, flying insects below the forest canopy. Likely that it hibernates during the cooler months. Females give birth in November, and young are independent by late February (Churchill 2008; Hoye and Schulz 2008).	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-	V	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude forests. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings and caves, in colonies of between 3 and 80. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha (Churchill 2008; Law *et al.* 2008). Records show movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	No
Miniopterus schreibersii oceanensis	Eastern Bentwing Bat	-	V	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry	Yes

Latin Name	Common Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat
				sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways (Churchill 2008; Hoye and Hall 2008).	
Myotis macropus (adversus)	Large-footed Myotis	-	V	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects ((Richards *et al.* 2008)).	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	-	V	Occurs along the Great Dividing Range, up to 1200m, and in coastal areas. Occurs in woodland and rainforest, but prefers open habitats or natural or human-made openings in wetter forests. Often hunts along creeks or river corridors. Flies slowly and directly at a height of 30m or so to catch beetles and other large, flying insects. Also known to eat other bats and spiders. Roosts in hollow tree trunks and branches (Churchill 2008; Richards *et al.* 2008).	Yes
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996; Webb and Shine 1998).	No

Key: 1) Listed on the TSC Act as Endangered (E1), Vulnerable (V)
2) Listed on the EPBC Act as Endangered (E) or Vulnerable (V) or covered under migratory provisions (M) on the EPBC Act

5.0 POTENTIAL IMPACTS

To date, two options for the proposed pipeline are being considered:

- Option 1 – follows the transmission line adjoining the haul road
- Option 2 – cuts through the haul road and stockpile area.

Impact assessments under the TSC and/or EPBC Acts cannot be completed until the final route of the haul road has been determined. However, impacts of both options have been compared to determine which option has least impact on flora and fauna values.

5.1 Endangered Ecological Communities

Shale Sandstone Transition Forest was recorded in the study area. The proposed pipeline route will result in impacts to SSTF, through clearing of some regrowth shrubs and small trees along the embankment of the haul road from Dam S9 to where the transmission line diverts from the haul road. In this section, only one option for the proposed pipeline route exists.

From the transmission line to Dam S4 two options are being considered, as described above. Comparatively, Option 1 would result in a larger area of SSTF being cleared, as it traverses an area of regrowth SSTF where it diverts from the transmission line, north-east of Dam S4. In comparison, Option 2 diverts through the middle of the haul road, through the stockpile area, and would not result in impacts to SSTF in this section. Therefore, in terms of impacts to EECs, Option 2 is the preferred option.

Once the finalised route has been determined, impacts assessments under the TSC and EPBC Acts will be required for the EEC, SSTF.

5.2 Threatened Flora

Persoonia bargoensis was recorded in the study area along the proposed pipeline route. Potential impacts of the proposal on this threatened plant species are discussed further in Section 5.2.1 below.

Potential habitat for an additional three threatened plant species; *Grevillea parviflora* subsp. *parviflora*, *Persoonia hirsuta* and *Pomaderris brunnea*; is considered to occur in the study area (see Section 4.4.1). All of these three species are considered relatively conspicuous, do not have seasonal survey requirements, and if present in the study area, would have been observed during the field survey. Based on the nature of the proposal, database interrogation, literature review regarding the ecology of these species, their occurrence in the

locality, and information gathered during field surveys within the study area, each of these four species are considered unlikely to be subject to any negative impacts resulting from the proposal. Impact assessments for these species are considered unnecessary.

5.2.1 *Persoonia bargoensis*

The proposed pipeline will result in impacts to a local population of *Persoonia bargoensis* recorded in the study area. Between Dam S9 and the beginning of the transmission line, approximately 34 individuals were recorded. The proposed pipeline route in this section is likely to result in the loss of four plants, with the majority occurring along the embankment of the haul road being avoided. To ensure *Persoonia bargoensis* are not removed inadvertently, plants have been marked with pink and black flagging tape. It is recommended that a botanist be on site during clearing works to ensure plants are adequately protected where possible.

An additional 27 individuals were recorded along the transmission line and in the SSTF adjoining the transmission line. Option 1 would result in the removal of an additional 13 plants, resulting in a total of 17 *Persoonia bargoensis* being removed over the entire route of the proposed pipeline. In comparison, Option 2 would not remove any additional *Persoonia bargoensis*, and only 4 individuals would be removed over the entire route. Comparatively, the potential impact of Option 1 on the local population of *Persoonia bargoensis* is greater than the potential impact of Option 2. Therefore, in terms of impacts to threatened plant species, Option 2 would be the preferred option.

Once the route of the proposed pipeline has been finalised, potential impacts of the proposal on the local population of *Persoonia bargoensis* will need to be considered further under the TSC and EPBC Acts.

5.3 Threatened Fauna

There is potential habitat for 30 threatened and/or migratory animal species in the vicinity of the study area.

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposal on these species. The proposed pipeline may impact threatened species by resulting in any of the following situations arising:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and/or
- loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting resources include specialised foraging habitats that have a restricted distribution (such as Koalas feeding only on specific tree species).

Option 2 is likely to have less of an impact upon the habitat as this involves less vegetation clearing. However, Option 1 is mostly located within a regenerating powerline easement and, as such the significance of this as habitat for threatened species is low. Both options will need to consider potential impacts to the same species as discussed below.

Birds

Potential habitat for 20 threatened and/or migratory bird species occurs in Forest habitats within study area (Table 2):

Table 3 shows the potential for impacts and the need for Assessments of Significance (TSC Act) and/or Significant Impact Criteria Assessments (EPBC Act) for each of these 20 species. Impact assessments will be required for 8 of these species. The remaining species were not considered to be at risk of individual death or injury or loss of limiting foraging or breeding resources given the small area of habitat to be modified and the mobility of these species. Furthermore, both proposed pipeline options utilise existing disturbed areas and will avoid habitat features such as tree hollows and dams.

Mammals

Ten threatened mammals have been identified as having potential habitat in the vicinity of the study area (Table 2). Table 3 (see over) shows the potential for impacts and the likely need for Assessments of Significance (TSC Act) and/or Significant Impact Criteria Assessments (EPBC Act) for each of these 10 species.

Based on the potential impacts of either pipeline option, impact assessments will be required for six mammal species. The remaining species were not considered to be at risk of individual death or injury or loss of limiting foraging or breeding resources given the small area of habitat to be modified and the mobility of each of these species.

Table 3. Potential impacts and impact assessment requirements for threatened or migratory species with potential habitat in the study area

Threatened or Migratory Species	Potential impacts			Impact assessment required
	Individual death or injury	Loss or disturbance of limiting foraging resources	Loss or disturbance of limiting breeding resources	
Great Egret	No	No	No	No
Cattle Egret	No	No	No	No
Gang-gang Cockatoo	No	No	Yes	Yes
Glossy Black-cockatoo	No	Yes	Yes	Yes
Turquoise Parrot	No	No	Yes	Yes
Brown Treecreeper	No	No	Yes	Yes
Black-chinned Honeyeater	No	No	No	Yes
Rainbow Bee-eater	No	No	No	No
Black-faced Monarch	No	No	No	No
Rufous Fantail	No	No	No	No
Satin Flycatcher	No	No	No	No
Regent Honeyeater	No	No	No	No
Speckled Warbler	No	No	Possible	Yes
Diamond Firetail	No	No	Possible	Yes
Hooded Robin	No	No	Possible	Yes
Australian Painted Snipe	No	No	No	No
Powerful Owl	No	No	No	No
Barking Owl	No	No	No	No
Masked Owl	No	No	No	No
Swift Parrot	No	No	No	No
Eastern Pygmy-possum	No	No	Yes	Yes
Spotted-tailed Quoll	No	No	No	No
Eastern Freetail Bat	No	No	Yes	Yes
Squirrel Glider	No	No	Yes	Yes
Koala	No	No	No	No
Grey-headed Flying Fox	No	No	No	No
Large-eared pied Bat	No	No	Yes	Yes
Eastern Bentwing Bat	No	No	No	No
Large-footed Myotis	No	No	Yes	Yes
Greater Broad-nosed Bat	No	No	Yes	Yes

6.0 RECOMMENDATIONS

In order to eliminate or minimise potential impacts upon threatened species, populations and ecological communities, the following general measures are recommended:

- Option 2 should be selected as the preferred route over Option 1 to minimise impacts to the EEC Shale Sandstone Transition Forest and the local population of *Persoonia bargoensis.*

- The proposed route should avoid threatened species as far as is practicable. The threatened plant species along the proposed pipeline route have been marked with tape. Where works are to occur adjacent to threatened plant species, any disturbance to these individuals should be avoided. Clearing of areas within the vicinity of threatened plant species should be undertaken under the supervision of a suitably qualified botanist.

- Utilise pre-existing tracks, transmission line corridors and access points wherever possible to avoid disturbance to native vegetation.

- Where clearing of native vegetation is required, the top 100 mm of topsoil containing the soil stored seed bank should be put aside and not mixed with the subsoil layers during trenching. This topsoil should then be replaced over the surface upon completion of the works.

- Suitably maintained erosion and sedimentation controls such as siltation fencing should be installed during construction and rehabilitation as part of an erosion and sedimentation control plan. Particular emphasis should be given to the areas around Tea Tree Hollow.

- Hollow bearing trees should be avoided. In those areas where vegetation clearing is necessary, a two staged process should be undertaken. Hollow bearing trees should be marked in stage 1 as the surrounding trees are cleared. These hollow bearing trees should then be left for 24 – 48 hours before clearing to allow fauna to escape. Clearing of hollow bearing trees will be preformed by careful felling and should be undertaken under the supervision of a suitably qualified ecologist.

- Where clearing of hollow bearing trees is unavoidable, hollows should be re-instated in surrounding habitat by attaching the hollow limbs to other trees, if possible.

- Where reinstatement of hollows is not possible, nest boxes should be placed in trees to replace hollows lost due to clearing. Quantity, size, installation, management, target species (e.g. bats) and location of nest boxes would need

to be considered and advice should be sought from an appropriately qualified ecologist;

- The length of installation trench open at any one time should be minimised and earth ramps provided every 50 m of open trench to allow any animals which fall into the trench to escape. Any trapped animals should be removed prior to back filling of the trench.

- Within Tea Tree Hollow care should be taken to reduce disturbance to the creekline. The footprint should be kept to a minimum, sedimentation and erosion controls must be utilised and the gradient, habitat features and form of the drainage line retained or reconstructed during rehabilitation.

- Machinery and equipment that is brought in from another site, or from outside of the immediate area is to be cleaned before entering bushland areas. This is necessary in order to prevent the spread of weed seed and soil pathogens between sites.

- Weed control and bush regeneration strategies should be implemented within the study area after completion of proposed works to ensure regeneration of cleared areas is expedited.

- Vegetation that is cleared or trimmed could be either a) mulched and spread on-site, if it is native and no weeds are present or b) if the vegetation is weedy, removed off-site.

7.0 CONCLUSION

The proposed pipeline route generally follows existing disturbed and cleared areas such as the embankment of the haul road and the transmission line, however some areas of native vegetation will be impacted, including areas mapped as supporting Sydney Hinterland Transition Woodland. One threatened plant species, *Persoonia bargoensis*, and one EEC, Shale Sandstone Transition Forest, were recorded during the field surveys of the proposed pipeline route.

Impacts to threatened biota were compared between the two options being considered for the proposed pipeline. Option 2 follows the existing haul road and stockpile area and will not require the removal of any additional areas of native vegetation. In comparison, Option 1 would result in additional areas of SSTF being cleared and additional plants of *Persoonia bargoensis* being removed. Therefore, Option 2 is the preferred option for the proposed pipeline route to minimise impacts to threatened biota.

Impact assessments under the TSC and/or EPBC Acts will be required to be undertaken for Shale Sandstone Transition Forest and *Persoonia bargoensis*, as well as eight bird species and six mammal species, once the proposed pipeline route is finalised. A Section 91 licence will be required under the TSC Act for removal of any areas of Shale Sandstone Transition Forest and any plants of *Persoonia bargoensis* in relation to the proposal. An Assessment of Impact will be required under the EPBC Act for both Shale Sandstone Transition Forest and *Persoonia bargoensis.*

Recommendations to minimise the impact of the proposed pipeline on flora and fauna values have been detailed in Section 6.0 above.

PLATES

Plate 1. Regrowth shrubs colonising the embankment of Dam S7

Plate 2. Disturbed Sydney Hinterland Transition Woodland adjacent to the Dam S9, near site of proposed pumping station

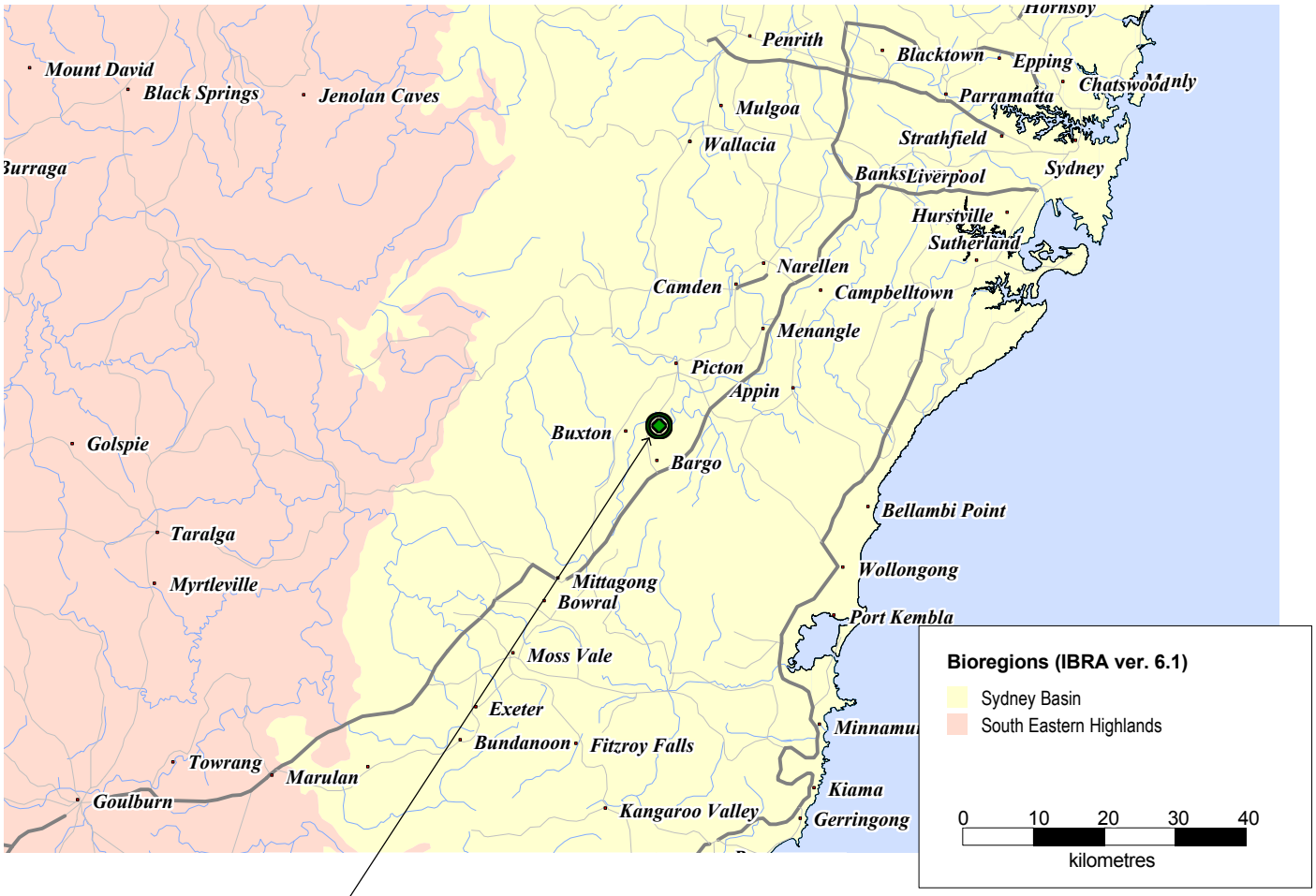
Plate 3. Site of proposed pumping station

Plate 4. Dam S9, showing emergent aquatic vegetation

Plate 5. *Persoonia bargoensis* occurring in disturbed area adjacent to haul road

Plate 6. Haul Road stockpile area

FIGURES



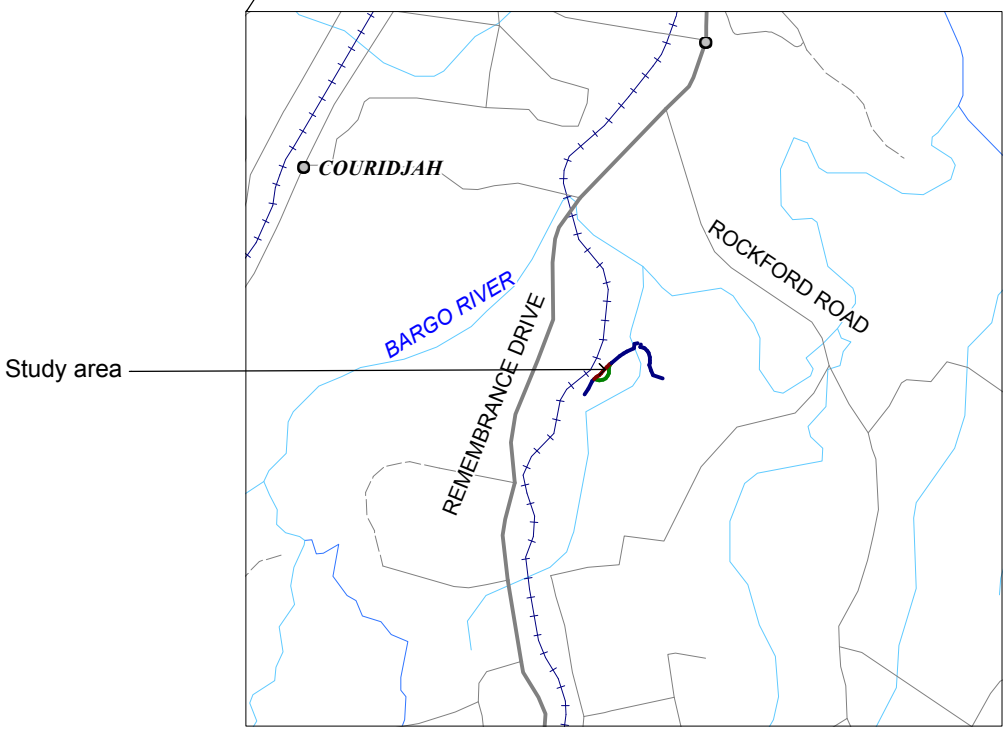


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Figure 1: Location of the Study Area in a regional context.

Date: 22 March 2009

Checked by: SEW | File number: S5370

Location:\5000\5300s\5370\Mapping\S5370 F1 Region.WOR

Scale: 0 0.75 1.5 2.25 3 kilometres

N W E S

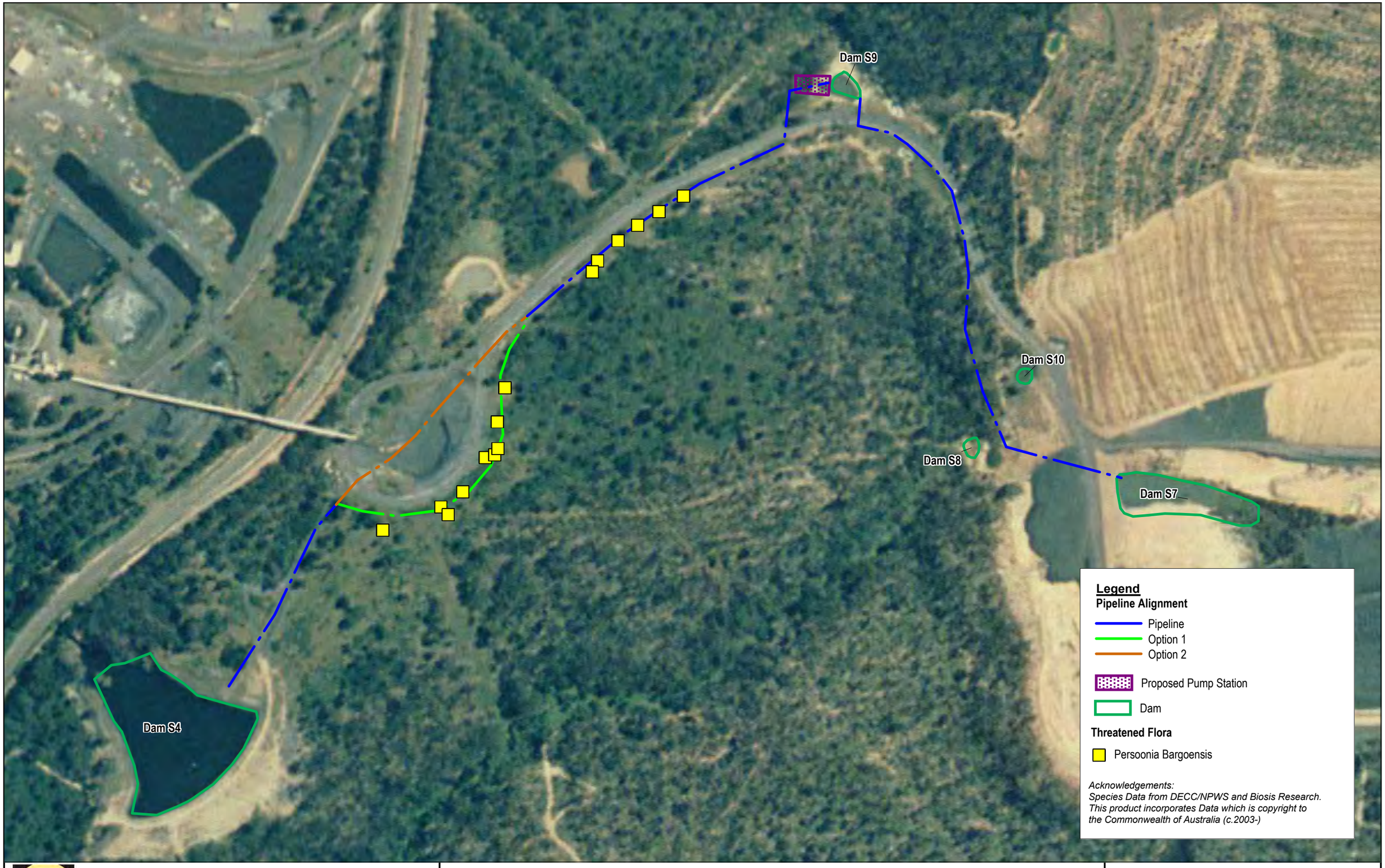

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Figure 2 - Proposal showing two options for part of the pipeline, showing threatened species recorded in study area.

Date: 22 March 2009
Checked by: SEW
File number: S5370
Location: P:\5000\5300s\5370\Mapping\S5370 F2 Proposal.WOR

Scale: 0 30 60 90 120 150 Meters

N W E S

Figure 2 - Proposal showing 2 options for part of the pipeline, showing threatened species recorded in study area.

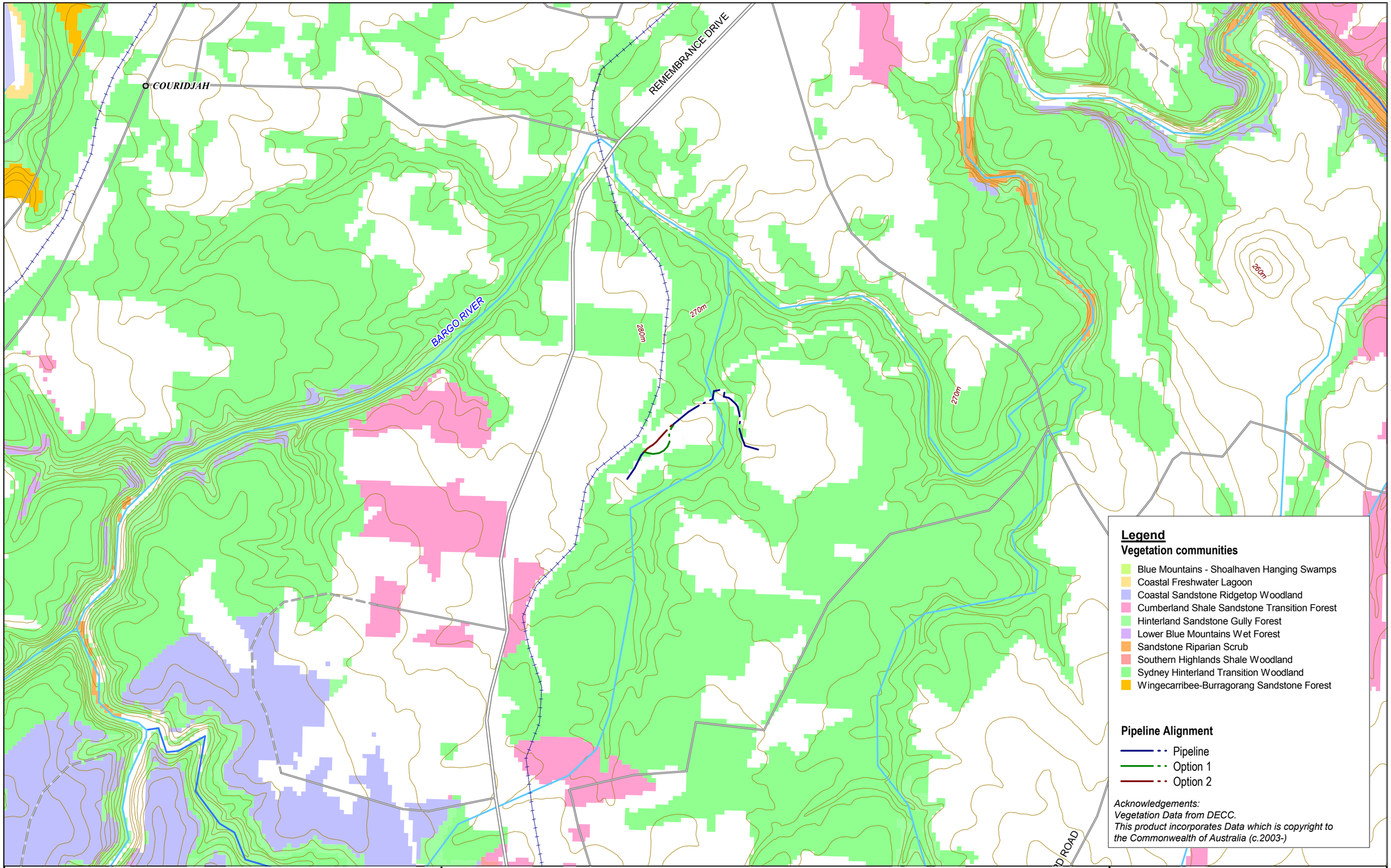

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Figure 3: Vegetation Mapping of the Survey area and Surrounds

Figure 3: Vegetation Mapping

Date: 20 March 2009

Checked by: SEW | File number: S5370

Location: P:\5000\5300s\5370\Mapping\S5370 F3 Veg.WOR

Scale: 0 0.2 0.4 0.6 0.8 1 kilometres

N W E S

Legend

Threatened Flora

- Callistemon linearifolius
- Cynanchum elegans
- Darwinia peduncularis
- Diuris lanceolata
- Epacris purpurascens var. purpurascens
- Genoplesium baueri
- Grevillea parviflora subsp. parviflora
- Leucopogon exolasius
- Melaleuca deanei
- Persicaria elatior
- Persoonia Bargoensis
- Persoonia glaucescens
- Persoonia hirsuta
- Pomaderris brunnea
- Rulingia prostrata

Pipeline Alignment

- Pipeline
- Option 1
- Option 2

Survey Areas

- 10km Search Area

Acknowledgements:
Species Data from DECC/NPWS and Biosis Research.
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Figure 4: Threatened Flora records within 10Km Pipeline

Figure 4: Threatened Flora

Date: 20 March 2009

Checked by: SEW | File number: S5370

Location:P:\5000\5300s\5370\Mapping\S5370 F4 Flora.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

Legend

Threatened and Migratory Faune

- Barking Owl
- Black-chinned Honeyeater (eastern subspec
- Black-faced Monarch
- Broad-headed Snake
- Brown Treecreeper
- Brush-tailed Bettong (South-East Mainland
- Brush-tailed Rock-wallaby
- Bush Stone-curlew
- Cumberland Plain Land Snail
- Diamond Firetail
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Eastern Pygmy-possum
- Gang-gang Cockatoo
- Giant Burrowing Frog
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Hooded Robin
- Koala
- Large-eared Pied Bat
- Large-footed Myotis
- Macquarie Perch
- Powerful Owl
- Rainbow Bee-eater
- Red-crowned Toadlet
- Regent Honeyeater
- Rufous Fantail
- Sooty Owl
- Sooty Tern
- Speckled Warbler
- Spotted-tailed Quoll
- Squirrel Glider
- Swift Parrot
- Turquoise Parrot
- White-bellied Sea-Eagle
- White-throated Needletail
- Yellow-bellied Glider

Pipeline Alignment

- Pipeline
- Option 1
- Option 2

10km Search area

Acknowledgements:
Species Data from DECC/NPWS and Biosis Research.
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Figure 5: Threatened Fauna records within 10Km of the Pipeline

Figure 5: Threatened Fauna records

Date: 20 March 2009

Checked by: SEW | File number: S5370

Location: P:\5000\5300s\5370\Mapping\S5370 F5 Fauna.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

APPENDICES

APPENDIX 1

Plant Species Recorded in the Study Area

Plant species present in the study area.

Family		Scientific Name	Common Name
Ferns and Fern-like Plants			
Dennstaedtiaceae			
		Pteridium esculentum	Bracken
Monocotyledons			
Cyperaceae			
		Cyathochaeta diandra	Sheath Sedge
Iridaceae			
		Patersonia sericea	Silky Purple-flag
Lomandraceae			
		Lomandra longifolia	Spiny-headed Mat-rush
		Lomandra obliqua	
Poaceae			
	*	*Andropogon virginicus*	Whisky Grass
		Anisopogon avenaceus	Oat Speargrass
		Aristida vagans	Threeawn Speargrass
		Austrodanthonia spp.	
	*	*Chloris gayana*	Rhodes Grass
		Cynodon dactylon	Common Couch
		Echinopogon ovatus	Forest Hedgehog Grass
	*	*Eragrostis curvula*	African Lovegrass
		Imperata cylindrica var. *major*	Blady Grass
	*	*Setaria gracilis*	Slender Pigeon Grass
		Themeda australis	Kangaroo Grass
Dicotyledons			
Apiaceae			
		Platysace linearifolia	
Asteraceae			
	*	*Hypochaeris radicata*	Catsear
Casuarinaceae			
		Allocasuarina littoralis	Black Sheoak
Epacridaceae			
		Astroloma humifusum	Native Cranberry
Fabaceae (Mimosoideae)			
		Acacia decurrens	Black Wattle
		Acacia linifolia	Flax-leaved Wattle
		Acacia longifolia	Coast/Sallow Wattle
		Acacia parramattensis	Parramatta Wattle

Family		Scientific Name	Common Name
		Acacia terminalis	Sunshine Wattle
Fabaceae (Faboideae)			
		Hardenbergia violacea	False Sarsaparilla
Myrtaceae			
		Callistemon rigidus	Stiff Bottlebrush
		Eucalyptus crebra	Narrow-leaved Ironbark
		Eucalyptus fibrosa	Red Ironbark
		Eucalyptus globoidea	White Stringybark
		Eucalyptus pilularis	Blackbutt
		Eucalyptus piperita	Sydney Peppermint
		Eucalyptus punctata	Grey Gum
		Eucalyptus racemosa	Narrow-leaved Scribbly Gum
		Kunzea ambigua	Tick Bush
		Leptospermum polygalifolium ssp. *polygalifolium*	Tantoon
		Leptospermum trinervium	Paperbark Tea-tree
		Melaleuca linariifolia	Budjur
		Melaleuca thymifolia	
Proteaceae			
		Banksia spinulosa var. *spinulosa*	Hairpin Banksia
		Hakea dactyloides	Finger Hakea
		Hakea sericea	Bushy Needlewood
		Isopogon anemonifolius	
		Lambertia formosa	Mountain Devil
		Persoonia bargoensis	
		Persoonia levis	Broad-leaved Geebung
		Persoonia linearis	Narrow-leaved Geebung
		Petrophile pulchella	
Rubiaceae			
		Pomax umbellata	Pomax
Rutaceae			
		Eriostemon australasius	

*Denotes weed species
+ Denotes threatened species

APPENDIX 2

Conservation Rating According to Briggs and Leigh (1996)

Conservation Rating According to Briggs and Leigh (1996)

Briggs and Leigh (1996) list over 5,031 species, subspecies and varieties of plants (5% of native vascular flora of Australia) that have been ranked according to their conservation status. While many of these species are contained within the schedules of various state and federal threatened species legislation (eg. TSC Act and *EPBC* Act), and are subject to legislative provisions under those acts, a great many more do not and as a such are extraneous to statutory assessment processes.

The modified list below presents the range of codes that are, in various combinations, applied to each listed plant species.

- **1** Species only known from one collection
- **2** Species with a geographic range of less than 100km in Australia
- **3** Species with a geographic range of more than 100km in Australia
- **X** Species presumed extinct; no new collections for at least 50 years
- **E** Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
- **V** Vulnerable species at risk of long-term disappearance through continued depletion.
- **R** Rare, but not currently considered to be endangered.
- **K** Poorly known species that are suspected to be threatened.
- **C** Known to be represented within a conserved area.
- **a** At least 1,000 plants are known to occur within a conservation reserve(s).
- **i** Less than 1,000 plants are known to occur within a conservation reserve(s).
- **-** The reserved population size is unknown.
- **t** The total known population is reserved.
- + The species has a natural occurrence overseas.

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APPENDIX 2

Significant Impact Criteria Assessment under the Environment Biodiversity and Conservation Act 1999

Significant Impact Criteria Assessment under the Environment Biodiversity and Conservation Act 1999

Biosis Research Pty Ltd was commissioned by Tahmoor Colliery to undertake a terrestrial flora and fauna assessment in relation to a proposed water pipeline at Tahmoor Colliery (the Proposal). The purpose of the pipeline is to transport surface run off water which currently discharges to Tea Tree Hollow, to improve on site environmental management. A flora and fauna constraints assessment has been undertaken for the Proposal and is attached (Appendix *).

Shale Sandstone Transition Forest

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community (EEC) under the EPBC Act. The potential impacts of the Proposal on this EEC are assessed against the Significant Impact Criteria of the EPBC Act below.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

• reduce the extent of an ecological community;

The Proposal will result in the removal of approximately 0.18 ha of SSTF in the Study Area. DECC (DEC 2005h) has mapped approximately 2201.2 ha of SSTF within 10 km of the Study Area. This mapping also shows the vegetation community generally occurs as small disturbed remnants within agricultural land and developed land. The removal of 0.18 ha of SSTF is not likely to have an adverse effect on the extent of the ecological community.

• fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;

Shale Sandstone Transition Forest disturbed as part of the Proposal consists of previously disturbed fragments adjacent to a haul road and mine infrastructure. The Proposal would not result in the isolation or fragmentation of any areas of SSTF and impacted areas will be allowed to regenerate post clearing.

• adversely affect habitat critical to the survival of an ecological community;

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited t; habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for SSTF has been listed on the Register of Critical Habitat. A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain.

The Proposal is not likely to impact on habitat critical to the survival of this EEC.

• 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 Proposal will result in the clearing of approximately 0.18 ha of SSTF. The proposed will not further modify or destroy abiotic factors necessary to the EECs survival, provided mitigation measures, such as erosion and sedimentation control, are implemented.

• 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 Proposal would potentially increase the threat of weed invasion in the SSTF in the Study Area; however the SSTF in the Study Area is represented by small trees and shrubs, with little or no understorey in many places. Areas of SSTF are already modified by existing haul road management practices and the Proposal is unlikely to result in any substantial change in species composition. Implementation of mitigation measures such as bush regeneration would reduce the threat of weed invasion on SSTF.

• 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; or

Shale Sandstone Transition Forest in the Study Area is considered to be in poor condition, with impacts from surrounding land uses resulting in altered structure, weed invasion and vegetation clearance, in the SSTF in the Study Area.

The Proposal would potentially increase the threat of invasive species becoming established in the SSTF in the Study Area, however implementation of mitigation measures such as bush regeneration, would reduce the threat of weed invasion on SSTF.

The Proposal will not involve the introduction of chemicals into the SSTF in the Study Area. Any chemicals or pollutants (eg. fuels) used on site during the construction phase of the Proposal will be taken off site after use.

The Proposal is not likely to cause a substantial reduction in the quality or integrity of the occurrence SSTF in the Study Area, provided mitigation measures are implemented as appropriate.

- **interfere with the recovery of an ecological community.**

A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The Proposal is not likely to interfere with the recovery of this EEC.

Conclusion

Based on the above assessment, Shale Sandstone Transition Forest is unlikely to be significantly impacted by the proposed works and as such a Referral under the provisions of the EPBC Act is not recommended for this species.

Persoonia bargoensis

The proposed works would impact on known habitat for *Persoonia bargoensis*, with 61 plants recorded from the vicinity of the proposed works, four of which would be removed (Figure 2). Known habitat on the site is Shale Sandstone Transition Forest (SSTF) and a total of approximately 0.18 ha would be removed. The *Persoonia bargoensis* plants to be removed are located on the edge of the patch of SSTF, adjoining an existing haul road.

Important population

An ‘important population’ is defined by DEWHA as a population that is necessary for a species’ long-term survival and recovery (DEH 2006). This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or,

- populations that are near the limit of the species range.

Persoonia bargoensis has been recorded recently in a number of locations in the vicinity of the proposed works, including (Figure 2 and Figure 3 in Appendix 1):

- Approximately 61 plants recorded in the immediate vicinity of the proposed works, four (4) of which would be removed.
- Greater than 131 individuals (five of which were removed) (Biosis Research 2006) recorded immediately to the north of the Study Area along the path of a proposed upgrade of an electricity transmission line between Tahmoor Colliery and No 2 Vent Shaft off Rockford Road, Tahmoor.
- Approximately 218 records, representing an unknown number of plants, within 10 km of the Study Area, from the DECC Atlas of NSW Wildlife.
- DEC (DEC 2005h) mapping approximately 2201.2 ha of similar potential habitat (SSTF) within a 10 km radius of the Study Area; and

Given the size of the local population of *Persoonia bargoensis*, the plants within the impact area are considered to be part of an important population of the species.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

The proposed works would result in the temporary removal of approximately 0.18 ha of known habitat and four individual plants of *Persoonia bargoensis.* Given the extent of similar habitat in the locality (2201.2 ha within a 10 km radius) and the size of the local population of the species, the removal of 0.18 ha of habitat and four plants is not likely to lead to a long term decrease in the size of an important population of the species.

Is the action likely to reduce the area of occupancy of an important population?

Persoonia bargoensis was recorded in the Study Area predominantly within the existing haul road and transmission line corridor. Like most species of Persoonia this species seems to benefit from the reduced competition and increased light available on disturbance margins such as roadsides (DEC 2005j). The proposed underground water pipeline will run alongside the existing haul road. The impact area will then be actively regenerated post construction. Mitigation measures include appropriate actions designed to encourage regeneration. On this basis the Proposal is unlikely to reduce the area of occupancy for the *Persoonia bargoensis* populations present in the Study Area.

Is the action likely to fragment an existing important population into two or more populations?

The current Proposal is predominantly along existing haul road and will not further fragment any areas of habitat. On this basis, the population of *P. bargoensis* in the Study Area is unlikely to be fragmented into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEWHA as areas that are necessary (DEH 2006):

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or,
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or, habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *Persoonia bargoensis* and a recovery plan for the species is in preparation, but not yet available to the public.

The area of habitat for *Persoonia bargoensis* in the Study Area is not likely to be critical to the survival of this species. The area of impact within habitat for this species will be actively regenerated post construction. The habitat that will be impacted by the Proposal is not likely to be necessary for breeding, dispersal, long-term maintenance, maintaining genetic diversity or long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

Persoonia bargoensis is known to (DEC 2005j):

- Occur in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravely soils.
- Be likely killed by fire and recruitment is solely from seed.

- Benefit from the reduced competition and increased light available on disturbance margins including roadsides.

Since *Persoonia bargoensis* is known to benefit from disturbance, the proposed buried pipeline will have minimal impact on this species as it will not change the existing land use. However the Proposal will involve some initial disturbance during access clearing and construction of the trench. *Persoonia bargoensis* is known to respond well to disturbance and the potential habitat for this species is likely to regenerate after the initial disturbance.

The Proposal will result in direct impact of approximately 0.18 ha of potential habitat for *Persoonia bargoensis* for the installation of the pipeline. There will also possibly be indirect impacts to a further 0.35 ha of potential habitat for this species. This is considered to be a relatively small area of habitat given that a total of approximately 2201.2 ha of similar potential habitat has been mapped (DEC 2005h) as occurring in the local area (10 km radius).

The Proposal is not likely to alter the existing fire frequency of the local area.

Although approximately four individuals would be directly impacted by the Proposal, on the basis of the numbers recorded in the Study Area in the current survey (61, see Figure 2) and the numbers previously recorded (>131, see Figure 2), this is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Known habitat for *Persoonia bargoensis* in the Study Area occurs in SSTF. Approximately four individuals will be directly impacted by the Proposal. The Proposal will also clear approximately 0.18 ha of vegetation that is habitat for *Persoonia bargoensis*. This vegetation will be allowed to regenerate post construction. At least 2201.2 ha of SSTF occurs within 10 km of the Study Area (DEC 2005h). The directly impacted area amounts to 0.08% of similar vegetation that exists in the locality.

Given the relatively small area of habitat (approximately 0.18 ha) to be removed and the large number of individuals that have been recorded in the area, it is unlikely that the Proposal will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Proposal would potentially increase the threat of invasive species becoming established in the Study Area. Implementation of mitigation measures such as bush regeneration, would reduce the threat of weed invasion to *Persoonia bargoensis.*

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 0.18 ha of potential habitat for *Persoonia bargoensis* is not likely to introduce disease that may cause the species to decline. However, as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *Persoonia bargoensis*. The Proposal is not likely to interfere with the recovery of this species.

Conclusion

Based on the above assessment, *Persoonia bargoensis* is unlikely to be significantly impacted by the proposed works and as such a Referral under the provisions of the EPBC Act is not recommended for this species.

Large-eared Pied-bat

Populations of the Large-eared Pied-bat that may occur within the development footprint are not considered important populations because:

- they are unlikely to be key source populations either for breeding or dispersal;
- they are unlikely to be necessary for maintaining genetic diversity; and/or,
- the study site is not at or near the limit of the species range.

This species was not recorded within the Study Area during the current or previous surveys. However, the DEC Atlas of NSW Wildlife has a previous record of this species within a 10 km radius of the study site.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

Potential habitat for these species occurs in the Woodland habitat (SSTF and SHTW) types. The Proposal is likely to impact approximately 0.65 ha (0.34 directly and 0.31 ha due to indirect impacts) of potential habitat for these species. These habitat types are widely distributed within the locality and adjacent to the Study Area. The removal and /or modification of potential habitat for these species represent approximately 0.1% of the available habitat within the locality. Given the mobility of this species, lack of potential roost sites and the extent of potential habitat within the local region, it is unlikely that the Proposal would lead to a long-term decrease in the size of an important population.

Is the action likely to reduce the area of occupancy of an important population?

The Study Area is not considered to contain an important population of the Large-eared Pied Bat. Furthermore, the Proposal is unlikely to impact potential roosts, although foraging habitat (woodland and forest) for this species may be impacted. Therefore, it is unlikely that the Proposal would reduce the area of occupancy of an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

The study corridor is not considered to contain an important population of the Large-eared Pied Bat; also this species is highly mobile. Therefore, the Proposal is unlikely to fragment an existing important population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. The potential habitat within the Study Area is not considered to be habitat critical for survival of the Large-eared Pied Bat.

Is the action likely to disrupt the breeding cycle of an important population?

The Study Area is not considered to contain an important population of the Large-eared Pied Bat. Therefore the proposed action is unlikely to disrupt the breeding cycle of an important population.

The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, none of which occur in the Study Area.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Proposal is likely to impact approximately <0.01% of potential habitat for this species within the locality. Given the range of this species, the lack of potential roost sites within the Study Area and the small amount of habitat that will be removed it is unlikely that the Proposal would result in the decline of this species.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Given the scope of the proposed works the action is unlikely to result in an increase in the establishment of invasive species within the potential habitat of this species, which would result in an impact on this species.

Is the action likely to interfere substantially with the recovery of the species?

The action will not interfere with the recovery of any threatened species in the locality.

Conclusion

Based on the above assessment, the Large-eared Pied Bat is unlikely to be significantly impacted by the Proposal, and as such, a Referral under the provisions of the EPBC Act is not recommended for this species.

APPENDIX 3

TSC Act Assessments of Significance – Fauna

Woodland Birds (Glossy Black-cockatoo, Gang-gang Cockatoo, Turquoise Parrot, Brown Treecreeper, Black-chinned Honeyeater, Speckled Warbler, Diamond Firetail, Hooded Robin).

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The woodland bird species listed above are all dependent on similar habitat in the locality for foraging and reproduction. The Diamond Firetail prefers nesting in mistletoe (Cooney and Watson 2005), but will also nest in the shrubby understorey, or higher up, especially under hawk's or raven's nests (DEC 2005a). The Black-chinned Honeyeater nests in a breeding territory within foraging habitat, usually high in the crown of a tree with fibrous bark (the bark is used to weave into the nest along with other materials) (Higgins *et al.* 2001).

The Study Area contains potential foraging and breeding habitat for these species within Woodland habitat types.

Clearing for the proposed pipeline will involve the removal of 0.34 ha of mostly regenerating native vegetation and possible indirect impacts to a further 0.65 ha, which will lead to a reduction in potential foraging habitat, however, given the extent of potential foraging habitat within the locality (approximately 9000 ha of continuous vegetation in the greater locality) it is unlikely that these foraging resources would be significantly impacted for a local population of these species. Furthermore the vegetation will be allowed to regenerate post installation.

Some specific breeding resources such as hollow bearing trees which are used by Glossy Black-cockatoos, Gang-gang Cockatoos, Turquoise Parrots, and Brown Treecreepers are present in the Study Area and may be indirectly impacted. However, care will be taken to avoid impacts to these trees. Furthermore nesting resources for all of the woodland bird species are widely available in adjacent areas.

Given the small amount of potential habitat to be removed and/or disturbed, the temporary nature of the vegetation removal/disturbance and the mobility of these species it is considered unlikely that the Proposal would disrupt the life cycle of these species to the extent that a viable local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of any of these species listed under the Act.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable to threatened species.

In relation to the habitat of a threatened species, population or ecological community:

i. **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

ii. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

iii. **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

Potential habitat for these species occurs in the Woodland habitat (SSTF and SHTW) types. The Proposal is likely to impact approximately 0.65 ha (0.34 directly and 0.31 ha due to indirect impacts) of potential habitat for these species. These habitat types are widely distributed within the locality and adjacent to the Study Area. The removal and /or modification of potential habitat for woodland birds represent approximately 0.1% of the available habitat within the locality.

The vegetation types which provide habitat for these species within the subject site are continuous in the greater locality and habitat surrounding the Study Area is of similar quality to the habitat within the Study Area. These species are mobile and fragmentation is not considered to be exacerbated by this project. Furthermore the Proposal will utilise existing disturbances (e.g. haul road) as such clearing of vegetation will be minimised. As such, the proposed works are unlikely to cause significant long-term isolation or fragmentation of the habitat.

The habitat for these species within the Study Area is considered to be in a moderate condition, with some limited foraging and breeding resources present. These habitat features are widely distributed within the locality and hollow bearing trees will be avoided by the pipeline. The habitat within the Study Area is not considered to be important for the long term survival of these species in the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species (DEC Threatened Species Unit).

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, there is no recovery plan or threat abatement plan for the Glossy Black-cockatoo, Gang-gang Cockatoo, Turquoise Parrot, Brown Treecreeper, Black-chinned Honeyeater, Speckled Warbler, Diamond Firetail or Hooded Robin.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Proposal may result in the operation of the following KTPs.

- 'Clearing of native vegetation' - approximately 0.34 ha of vegetation will be cleared for the Proposal.
- Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2003) – limited dead wood and dead trees will be removed.
- Loss of Hollow-bearing Trees (NSW Scientific Committee 2007) – Hollow-bearing trees will avoided by the proposed development,

The operation of key threatening processes by the Proposal is considered to be minor.

Conclusion

Based on the above assessment the Proposal is considered unlikely to significantly impact any local populations of these woodland bird species (Glossy Black-cockatoo, Gang-gang Cockatoo, Turquoise Parrot, Brown Treecreeper, Black-chinned Honeyeater, Speckled Warbler, Diamond Firetail, Hooded Robin). As such a Species impact Statement is not recommended.

Arboreal Mammals (Eastern Pygmy Possum and Squirrel Glider)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Eastern Pygmy-possum inhabits rainforest through to sclerophyll forest and tree heath, but in most areas woodlands and heath appear to be preferred. The species feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; as well as flowers and insects (DEC 2005b; Ward and Turner 2008). They often nest in tree hollows, but can also construct its own nests (Ward and Turner 2008).

The Squirrel Glider generally occurs in dry sclerophyll forests and woodlands and requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Van der Ree and Suckling 2008).

The Study Area contains potential foraging and breeding habitat for both of these species within the woodlands however the habitat is not considered optimal for either species given existing disturbances and surrounding habitat in better condition.

Clearing for the proposed pipeline will involve the removal of 0.34 ha of mostly regenerating native vegetation and possible indirect impacts to a further 0.65 ha, which will lead to a reduction in potential foraging habitat, however, given the extent of potential foraging habitat within the locality (Approximately 9000 ha) it is unlikely that foraging resources in the locality would be significantly impacted for a local population of these species. Furthermore the vegetation will be allowed to regenerate post installation.

Some hollow bearing trees are present in the Study Area and may be indirectly impacted however care will be taken to avoid impacts to these trees. Hollow bearing trees are widely available in adjacent areas.

Given the small amount of potential habitat to be removed and/or disturbed, the temporary nature of the vegetation removal/disturbance, the lack of preferred feed trees for these species it is considered unlikely that the Proposal would disrupt the life cycle of this species to the extent that a viable local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

An endangered population is defined under the TSC Act as ‘a population specified in Part 2 of Schedule 1’. At the present time, there are no endangered populations of any of these species listed under the Act.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable to threatened species.

In relation to the habitat of a threatened species, population or ecological community:

iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

vi. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Potential habitat for the Eastern Pygmy-possum and Squirrel Glider occurs in the Woodland habitat (SSTF and SHTW) types. The Proposal is likely to impact approximately 0.65 ha (0.34 directly and 0.31 ha due to indirect impacts) of potential habitat for these species. These habitat types are widely distributed within the locality and adjacent to the Study Area. The removal and /or modification of potential habitat for Eastern Pygmy-possum and Squirrel Glider represent approximately 0.1% of the available habitat within the locality.

The vegetation types which provide habitat for these species within the subject site are continuous in the greater locality and habitat surrounding the Study Area is of similar quality to the habitat within the Study Area. Furthermore the Proposal will utilise existing disturbances (e.g. haul road) as such clearing of vegetation will be minimised. As such, the proposed works are unlikely to cause two species within the Study Area is considered to be in a moderately suitable for these two species. With some limited foraging and breeding resources present. These habitat features are widely distributed within the locality and hollow bearing trees will be avoided by the pipeline. The habitat within the Study Area is not considered to be important for the long term survival of the Eastern Pygmy-possum and Squirrel Glider in the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Eastern Pygmy-possum and Squirrel Glider (DEC Threatened Species Unit).

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, there is no recovery plan or threat abatement plan for the Eastern Pygmy-possum or Squirrel Glider.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Proposal may result in the operation of the following KTPs.

- 'Clearing of native vegetation' - approximately 0.34 ha of regenerating vegetation will be cleared for the Proposal.
- Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2003) – limited dead wood and dead trees will be removed.
- Loss of Hollow-bearing Trees (NSW Scientific Committee 2007) – Hollow-bearing trees will avoided by the proposed development,

The operation of key threatening processes by the Proposal is considered to be minor.

Conclusion

Based on the above assessment the Proposal is considered unlikely to significantly impact any local populations of these two species. As such a Species impact Statement is not recommended for Eastern Pygmy-possum and Squirrel Glider.

Microbats (Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat).

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Greater Broad-nosed Bat tends to forage along gaps and edges of forests and bushland patches (Churchill 1998; Law *et al.* 2000). The Large-footed Myotis mainly utilises water sources for foraging, catching small fish and insects with its feet (Churchill 1998). The Large-eared Pied Bat forages below the canopy in woodlands and rainforest (Churchill 1998) Little is known of the foraging habits of the Eastern Freetail Bat. The Greater Broad-nosed Bat, Large-footed Myotis and Eastern Freetail Bat are known to roost in tree hollows, the Large-eared Pied Bat is usually cave dwelling but is also known to roost in fairy martin nests(Churchill 1998).

Factors likely to disrupt the life cycle of these four species include the loss, disruption or modification of roost sites, particularly "maternity roosts" and loss of foraging habitat. The main potential impact of the proposed development is the loss of potential roosting sites through impacts to hollow-bearing trees. However the hollow bearing trees within the Study Area will be avoided during clearing. Hollow bearing trees are widely available in adjacent areas.

Clearing for the proposed pipeline will involve the removal of 0.34 ha of mostly regenerating native vegetation and possible indirect impacts to a further 0.65 ha, which will lead to a reduction in potential foraging habitat, however, given the extent of potential foraging habitat within the locality (Approximately 9000 ha) it is unlikely that foraging resources in the locality would be significantly impacted for a local population of these species. Furthermore the vegetation will be allowed to regenerate post installation.

Given the mobility of these species, the extent of potential habitat within locality and in adjacent areas, it is unlikely that the proposed development would disrupt the life cycle of the Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat such that a viable local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

An endangered population is defined under the TSC Act as ‘a population specified in Part 2 of Schedule 1’. At the present time, there are no endangered populations of any of these species listed under the Act.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable to threatened species.

In relation to the habitat of a threatened species, population or ecological community:

vii. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

viii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

ix. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Potential habitat for the Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat occur in the Woodland habitat (SSTF and SHTW) types. The Proposal is likely to impact approximately 0.65 ha (0.34 directly and 0.31 ha due to indirect impacts) of potential habitat for these species. These habitat types are widely distributed within the locality and adjacent to the Study Area. The removal and /or modification of potential habitat for these bat species represent approximately 0.1% of the available habitat within the locality.

The vegetation types which provide habitat for these species within the subject site are continuous in the greater locality and habitat surrounding the Study Area is of similar quality to the habitat within the Study Area. Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat are highly mobile and the loss of a small area of vegetation is unlikely to fragment patches of habitat. Furthermore the Proposal will utilise existing disturbances as such clearing of vegetation will be minimised. As such, the proposed works are unlikely to cause significant long-term isolation or fragmentation of the habitat.

The potential habitat within the Study Area is considered to be in Moderate condition with some limited breeding resources and foraging resources. These habitat features are widely

distributed within the locality and in areas adjacent to the Study Area. These bat species are very mobile, so are unlikely to be affected by further fragmentation. Potential habitat in the Study Area is unlikely to be of high importance to the long-term survival of a local population or populations of Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat in the Locality

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species (DEC Threatened Species Unit).

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, there is no recovery plan or threat abatement plan for these species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Proposal may result in the operation of the following KTPs.

- 'Clearing of native vegetation' - approximately 0.34 ha of regenerating vegetation will be cleared for the Proposal.
- Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2003) – limited dead wood and dead trees will be removed.
- Loss of Hollow-bearing Trees (NSW Scientific Committee 2007) – Hollow-bearing trees will avoided by the proposed development,

The operation of key threatening processes by the Proposal is considered to be minor.

Conclusion

Based on the above assessment the Proposal is considered unlikely to significantly impact any local populations of Greater Broad-nosed Bat, Large-footed Myotis, Large-eared Pied Bat and Eastern Freetail Bat. As such a Species impact Statement is not recommended.

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