

Classification/ Scientific name	Recent Synonyms	Common Name	Status
Cirsium vulgare		Scotch Thistle	i
Conyza bonariensis		Fleabane	i
Dittrichia graveolens		Stinkwort	i
Schkuhria pinnata var. abrotanoides		Dwarf Marigold	
Senecio madagascariensis		Fireweed	i
Senecio quadridentatus		Cotton Fireweed	
Sonchus oleraceus		Common Sow-thistle	i
Tagetes minuta		Stinking Roger	i
Xanthium occidentale	Xanthium strumarium pp	Noogoora Burr	i
CAMPANULACEAE			
Wahlenbergia stricta		Tall Bluebell	
CLASS LILIOPSIDA		Monocotyledons	
SUBCLASS COMMELINIDAE			
Order Poales			
CYPERACEAE			
Cyperus eragrostis		Umbrella Sedge	i
Cyperus polystachyos		Bunchy Flat-sedge	
Fimbristylis dichotoma		Common Fringe-rush	
Isolepis cernua	Scirpus cernuus	Nodding Club-rush	
Schoenoplectus validus	Scirpus validus	River Club-rush	
JUNCACEAE			
Juncus acutus		Spiny Rush	i
Juncus usitatus		Common Rush	
POACEAE			
Aristida ramosa		Three-awned Spear Grass	
Austrostipa verticilliata	Stipa verticilliata	Slender Bamboo Spear Grass	
Avena barbata		Beared Oat	i
Chloris truncata		Windmill Grass	
Chloris virgata		Feathertop Rhodes Grass	
Cortadieria selloana		Pampas Grass	i
Cynodon dactylon		Common Couch	n
Digitaria brownii		Cotton Panic Grass	
Digitaria parviflora		Small-flower Finger Grass	
Digitaria sanguinalis		Crab Grass	i
Ehrharta erecta		Panic Veldtgrass	i
Eragrostis curvula		African Lovegrass	i
Lachnagrostis filiformis	Agrostis avenacea	Blown Grass	



Panicum effusum Paspalum dilatatum		Hairy Panic	
Paspalum dilatatum		_	
		Paspalum	i
Phragmites australis		Common Reed	
Setaria parviflora	Setaria gracilis	Slender Pigeon Grass	i
Sporobolus creber S	Sporobolus indicus var. creber	Slender Rats Tail Grass	
Vulpia bromoides		Foxtail Grass	i
TYPHACEAE			
Typha orientalis		Broad-leaf Cumbungi	
Order Commelinales			
COMMELINACEAE			
Commelina cyanea		Scurvy Weed	
STATUS ABBREVIATIONS:			
i = introduced (i.e. not indigenous to Australia)			
n = native Australian species not considered to be indigenous	us to the site		
SCIENTIFIC NAMES & AUTHORITIES:			
Scientific names & families are those used in the Flora of New	ew South Wales as maintaine	ed by the Royal Botanic Ga	rdens
(http://.plantnet.rbgsyd.gov.au).			
The classification scheme used for orders and higher taxa is	detailed at http://www.hunte	erwetlands.com.au)	
For sake of simplicity, scientific names in this list do not inc <i>Wales.</i>	clude authorities. These car	be found in the Flora of	New South

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Appendix B- Analysis of Proposal Area Habitat

Table 2. Analysis of the Proposal Areas habitat potential for significant species recorded in the Local Area and the identification of impacts.

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Plants				
Lobbed Blue grass (Bothriochloa biloba)	Lobbed blue grass is a tall (1.0m) perennial that flowers in summer. It was recorded on the Ravenswroth site in 2009. This species is often found in woodland and derived grassland communities. It is believed that grazing may have a positive effect on the species, due to it being less palatable than its completion and reduces the competitive advantage of its main competitor.	No	No	No
Finger Panic Grass (Digitaria porrecta)	This species is found in native grassland, woodlands or open forest with a grassy understory, on richer soils in the North West Slopes and North West Plains botanical divisions of NSW. In NSW, the most frequently recorded associated tree species are <i>Eucalyptus albens</i> and <i>Acacia pendula</i> .	No	No	No
White-flowered Wax Plant (Cynanchum elegans)	Rainforest gullies and thick scrub in wet sheltered areas.	No	No	No
Olearia cordata	Dry forest species that is known from Wisemens Ferry to Wollombi	No	No	No
Ozothamnus tesselatus	A rare woodland species that has a very small known distribution in the Rylstone area.	No	No	No
Dillwynia tenuifolia	A rare woodland species known to sandstone, shale and laterite.	No	No	No
Acacia pendula (Acacia pendula population in the Hunter catchment)	Individuals recorded in the Local Area within 100 meters of the proposal area in the north western sector (gas wells 13,14,16,17,18). Extensive surveys located a mixture of Acacia pendula and a superficially similar species Acacia salicina.	No	No. Well removed from activity.	No
Singleton Mint Bush (Prostanthera cineolifera)	Little is known of about this species. One record known to the Wollimi region.	No	No	No
Charmhaven Apple (Angophora inopina)	Known to the Lake Macquarie, Central Coast and Bulahdelah areas. Only found in four vegetation types of which one: Eucalyptus haemastoma–Corymbia gummifera– Angophora inopina woodland/forest was recorded onsite. No individuals were recorded onsite.	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Netted Bottle Brush (Callistemon linearifolius)	A dry sclerophyll forest on the coast and adjacent ranges, nearest records north in the Lake Macquarie Cessnock boarder. No individuals were recorded onsite.	No	No	No
Darwinia biflora	Often found on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	No. No such habitat onsite.	No	No
Darwinia peduncularis	Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone. No such habitat onsite.	No. No such habitat onsite.	No	No
Eucalyptus camaldulensis (population in the Hunter catchment Eucalyptus camaldulensis)	Creek River and floodplain species of the interior river system of the East coast of Australia. Scattered remnants in the Local Area and recorded on the lower reaches of Bowmans Ck and Glennies Ck.	No	No. Well removed from activity and no downstream effects predicted.	No
Broken Back Ironbark (Eucalyptus fracta)	Found on Sandstone escarpments in the ranges.	No	No	No
Slaty Red Gum (Eucalyptus glaucina)	Grows in grassy woodland and dry eucalypt forest, in moderately fertile and well-watered soils.	No	No	No
Grove's Paperbark (Melaleuca groveana)	Grove's Paperbark grows in heath and shrubland, often in exposed sites, at high elevations, on rocky outcrops and cliffs.	No	No	No
Cymbidium canaliculatum (Cymbidium canaliculatum population in the Hunter Catchment)	Grows in the hollows of trees in dry sclerophyll forest or woodland.	No	No	No
Illawarra Greenhood (Pterostylis gibbosa)	All known populations grow in open forest or woodland.	No	No	No
Evans Grevillea (Grevillea evansiana)	Restricted to a small area east of Rylstone on the Central Tablelands. Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone.	No	No	No
Hairy Geebung (Persoonia hirsute)	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No	No
Leionema lamprophyllum subsp. obovatum (Leionema	Leionema lamprophyllum subsp. obovatum occurs in dry eucalypt forest on exposed rocky terrain.	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
lamprophyllum subsp. obovatum population in the Hunter Catchment)				
Frogs				
Green and Golden Bell Frog <i>(Litoria aurea)</i> E1	Recorded approximately 1 kilometre to the north west in 2009. Past records on the Ravensworth Hunter Valley project area show a range of records that are likely dispersing individuals from the core population in the Liddell main population. Bowmans Creek provides some habitat for individuals but not for breeding populations. No individuals recorded onsite.	No	No	No
Davies' Tree Frog (Litoria daviesae) V	Davies Tree Frog occurs in permanently flowing streams above 400 m elevation.	No	No	No
Littlejohn's Tree Frog (Litoria littlejohni) V	Plateaus and eastern slopes of the Great Dividing Range. Records are isolated and tend to be at high altitude.	No	No	No
Glandular Frog (Litoria subglandulosa) V	Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	No	No	No
Giant Burrowing Frog (Heleioporus australiacus) V	Breeding habitat of this species is generally soaks or pools within first or second order streams.	No	No	No
Stuttering Frog (Mixophyes balbus) E1	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No	No	No
Sphagnum Frog (Philoria sphagnicolus) V	Rainforests, including Antarctic Beech forest, moist eucalypt forest and sphagnum moss beds, usually at higher elevations.	No	No	No
Red-crowned Toadlet (Pseudophryne australis)	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	No	No	No
Birds				
Speckled Warbler (Pyrrholaemus saggitatus) V	Recorded onsite and in the Local Area. Inhabits woodland and forest where it forages on the ground at the edges and within the interior of remnants. Can fly into open areas and use road verges. Requires large remnants for stable populations.	Known to the Local Area and ACOL lands, but requires forest or woodland for habitat.	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Spotted Harrier (Circus assimilis)	Occurs in grassy open woodland including acacia and Mallee remnants, inland riparian woodland, grassland and shrub lands. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No	No.	No
Red Goshawk (Erythrotriorchis radiates) E4A	Red Goshawk appear to move from nesting sites in the ranges to coastal plains, where they are associated with permanent wetlands.	No	No	No
Black-breasted Buzzard (Hamirostra melanosternon)	Black-breasted Buzzard prefers timbered watercourses as breeding habitat. It also hunts over grasslands and sparsely timbered woodlands.	No	No	No
Little Eagle (Hieraaetus morphnoides) V	Recorded in Glennies Creek 2010. Occupies open eucalypt forest, woodland or open woodland. She oak or acacia woodlands and riparian woodlands of interior NSW are also used.	No	No	No
Blue-billed Duck (Oxyura australis) V	Wetlands, ponds and sewerage works.	No	No	No
Black Bittern (Ixobrychus flavicollis) V	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	No	No	No
Gang-gang Cockatoo (Callocephalon fimbriatum) V	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.	No	No	No
Glossy Black- Cockatoo (Calyptorhynchus lathami) V	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (<i>Allocasuarina</i> <i>littoralis</i>), Forest She-oak (<i>A.</i> <i>torulosa</i>) or Drooping She-oak (<i>A.</i> <i>verticillata</i>) occur.	No	No	No
Black-necked Stork (Ephippiorhynchus asiaticus) E1	Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters,	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.			
Brown Treecreeper (Climacteris picumnus) V	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	No	No	No
Brown Treecreeper (eastern subspecies) (Climacteris picumnus victoriae) v	Local record two kilometres to the north of the site. Could be a transient in the Local Area.	No	No	No
Diamond Firetail (Stagonopleura guttata) V	This species is often found in the Local Area in grassy eucalypt woodlands, including Box-Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Recorded two kilometres north of the site.	Does forage on exotic and native grassland in Autumn in the local area.	No. This very minor removal of a common potential foraging habitat in the regional area does not constitute an impact.	No
Painted Honeyeater (Grantiella picta) v	Inhabits Boree, Brigalow and Box- Gum Woodlands and Box-Ironbark Forests.A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	No	No	No
Black-chinned Honeyeater (eastern subspecies) (Melithreptus gularis gularis) v	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>) and Forest Red Gum (<i>E.</i>	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	tereticornis).			
Regent Honeyeater <i>(Anthochaera Phrygia)</i> E1	The species inhabits dry open forest and woodland, particularly Box- Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species.	No	No	No
Varied Sittella (Daphoenositta chrysoptera) V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, Mallee and Acacia woodland. Recorded in the ranges to the south of the site.	No	No	No
Olive Whistler (Pachycephala olivacea) v	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes.	No	No	No
Hooded Robin (Melanodryas cucullata)v	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and Mallee, often in or near clearings or open areas.	No.	No	No
Hooded Robin (south-eastern form) (Melanodryas cucullata cucullata) v	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and Mallee, often in or near clearings or open areas.	Known to the Ashton Lease area and can sometimes be recorded in pasture near to woodland edge or scattered trees.	No. This very minor removal of a common potential marginal foraging habitat in the regional area does not constitute an impact.	No
Scarlet Robin (Petroica boodang) v	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	No	No	No
Flame Robin (Petroica phoenicea) v	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense.	No	No	No
Grey-crowned Babbler (eastern subspecies) (Pomatostomus temporalis temporalis)	Recorded onsite and in the Proposal Area. Inhabits woodland and mallee and in the lower Hunter will be recorded on the edges of forests and gardens of rural lots and recreational gardens, such as golf courses. Forages on-ground and on the branches and trucks of trees.	No	No.	No
Little Lorikeet (Glossopsitta pusilla) V	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	productivity.			
Swift Parrot (Lathamus discolour) e1	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	No	No	No
Turquoise Parrot (Neophema pulchella) v	Recorded in the southern woodland in 2010. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.	Can be recorded foraging on grass under the shade of paddock trees or in woodlands.	The isolation of these grasses and the high presence of similar marginal habitats in the local area results in this no being an impact on this species.	No
Barking Owl (Ninox connivens) V	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Is flexible in its habitat use and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils.	No	No	No
Powerful Owl (Ninox strenua) V	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well.	No	No	No
Red-backed Button-quail (Turnix maculosa) V	In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass <i>Heteropogon</i> , Blady Grass <i>Imperata</i> <i>cylindrica</i> , <i>Triodia</i> , <i>Sorghum</i> , and Buffel Grass <i>Cenchrus ciliaris</i> . One record 10 kilometres north at Greenland.	Known to be recorded in pasture near to woodland edge or scattered trees.	No. This very minor removal of a common potential marginal foraging habitat in the regional area does not constitute an impact.	No
Masked Owl (Tyto novaehollandiae) v	Lives in dry eucalypt forests and woodlands from sea level to 1100 metres.	No	No	No
Sooty Owl (Tyto tenebricosa) v	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No	No	No
Mammals				



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Eastern Pygmy- possum (Cercartetus nanus) v	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north- eastern NSW where they are most frequently encountered in rainforest.	No	No	No
Spotted-tailed Quoll (Dasyurus maculatus) v	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub- alpine zone to the coastline.	No	No	No
Brush-tailed Phascogale (Phascogale tapoatafa) v	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.	No	No	No
Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris) V	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	No	No	No
Parma Wallaby (Macropus parma) v	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	No	No	No
Brush-tailed Rock-wallaby (Petrogale penicillata) E1	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	No	No	No
Red-legged Pademelon (Thylogale stigmatica) V	Inhabits forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub.	No	No	No
Eastern Freetail- bat (Mormopterus norfolkensis) v	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	No	No	No
Hastings River Mouse (Pseudomys oralis) E1	A variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs.	No	No	No
Yellow-bellied Glider (Petaurus australis) v	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	No	No	No
Squirrel Glider (Petaurus	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
norfolcensis) v	Dividing Range and Blackbutt- Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.			
Koala (Phascolarctos cinereus)	Inhabit eucalypt woodlands and forests.	No	No	No
Rufous Bettong (Aepyprymnus rufescens) v	Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	No	No	No
Long-nosed Potoroo (Potorous tridactylus) v	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	No	No	No
Grey-headed Flying-fox (Pteropus poliocephalus) v	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	No	No	No
Large-eared Pied Bat (Chalinolobus dwyeri) v	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Hirundo ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	No	No	No
Eastern False Pipistrelle (Falsistrellus tasmaniensis) v	Prefers moist habitats, with trees taller than 20 metres.	No	No	No
Golden-tipped Bat (Kerivoula papuensis) v	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, <i>Casuarina-dominated riparian</i> <i>forest and coastal Melaleuca forests.</i>	No	No	No
Little Bentwing- bat (Miniopterus australis) v	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.	No	No	No



Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Eastern Bentwing- bat (Miniopterus schreibersii oceanensis) v	Hunt in forested areas, catching moths and other flying insects above the tree tops.	No	No	No
Southern Myotis (Myotis macropus) v	Recorded onsite and in the vicinity of the Proposal Area. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow- bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	No	No.	No
Greater Long- eared Bat (Nyctophilus timoriensis) (South- eastern form)	Inhabits a variety of vegetation types, including mallee, bulloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north- south belt along the western slopes and plains of NSW.	No	No	No
Greater Broad- nosed Bat (Scoteanax rueppellii)	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	No	No	No
Eastern Cave Bat (Vespadelus troughtoni)	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	No	No	No
Reptiles				
Broad-headed Snake (Hoplocephalus bungaroides)	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	No	No	No
Rosenberg's Goanna (Varanus rosenbergi)	Found in heath, open forest and woodland.	No	No	No



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Traffic and Transport Impact Assessment







Ashton Coal Operations Limited Ventilation and Service Shafts Project

- Final
- 19 December 2011



Ashton Coal Operations Limited Ventilation and Service Shafts Project

TRAFFIC IMPACT ASSESSMENT – STAGE 1

- Final
- 19 December 2011

Sinclair Knight Merz ABN 37 001 024 095 100 Christie Street St Leonards NSW 2065 Australia Postal Address PO Box 174 St Leonards NSW 2065 Australia Tel: +61 2 9928 2100 Fax: +61 2 9928 2500 Web: www.skmconsulting.com

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Executive Summary

This Traffic Impact Assessment report examines the impact of construction and operational traffic associated with the installation and operation of proposed ventilation and service shafts at Ashton Coal Mine.

The traffic generated by the construction of the Ventilation and Service Shafts Project amounts to approximately 25 additional two way vehicle movements per day. During the operational phase, up to 30 additional two way vehicle movements will be generated on an intermittent basis.

The vehicles will access the southern side of the New England Highway each day for up to about 30 weeks in order to construct the ventilation and service shafts. Vehicles will use the unnamed Dairy Lane intersection with the New England Highway.

Vehicles accessing the Ventilation and Service Shafts Project from the unnamed Dairy Lane will use the existing intersection, with the exception of southbound right turning vehicles. An alternative access route would be put in place for these southbound right turning vehicles, with construction traffic to continue straight on and turn left into Glennies Creek Road, u-turn, and then travel northbound on New England Highway to turn left into the unnamed Dairy Lane.

The construction work may take place concurrently with other Aston Coal Operations Limited (ACOL) construction projects, including the proposed South East Open Cut (SEOC) Project (including the construction of a conveyor belt across the New England Highway), the previously approved Bowmans Creek Diversion Project and the Gas Drainage Project. Should the Ventilation and Service Shafts Project occur concurrently with these other ACOL construction projects using unnamed Dairy Lane, then ventilation and service shaft construction traffic would utilise the temporary traffic arrangements proposed for SEOC and Bowmans Creek.

The additional 25 two way vehicle movements per day arising from the construction of the ventilation and service shafts and up to 30 vehicle movements during operation would be added to the existing New England Highway traffic volume. The impact of this small volume of additional traffic is negligible given the current Average Annual Daily Traffic (AADT) of the New England Highway of around 11,000 vehicles per day.

The intersection configuration of unnamed Dairy Lane and the New England Highway is considered to be sufficient to cater for vehicle movements proposed to be generated by the construction and operation of the ventilation and service shafts, based on an assessment against Austroads warrants for treatments for unsignalised intersections.



Due to the small number of construction and operational trips arising, and there being no changes required to traffic conditions on the New England Highway to facilitate access, no significant impacts or cumulative impacts from other concurrent ACOL construction works are anticipated.

Given the very small volume of traffic proposed to be generated by the Ventilation and Service Shafts Project, no special measures or traffic management strategies during construction of the project are considered to be required, other than the southbound right turn detour, 80kph road works speed limit and provision of advance trucks turning warning signage.



1. Introduction

1.1. Scope and Objectives

This Traffic Impact Assessment (TIA) examines the traffic impact associated with the construction and operation of the proposed ventilation and service shafts to serve ACOL underground operations on the south western side of the New England Highway. This project will also involve the construction of minor support infrastructure for each shaft.

The ventilation and service shafts work cover only a small element of the overall Ashton Coal Project (ACP). The ACP comprises a number of concurrent medium to large scale projects including the proposed South East Open Cut (including the construction of a Conveyer Crossing across the New England Highway), the approved Bowmans Creek Diversion, and Gas Drainage projects. Previous studies and reports have been prepared which cover the impact of the other projects, and this report concentrates on the additional traffic impact that the construction and operation of the ventilation and service shafts will have on the New England Highway and local traffic.

A detailed description of the ventilation and service shafts can be found in the Environmental Assessment Report.

1.2. Construction Approach

1.2.1. Ventilation Shaft

The ventilation shaft is a discrete excavation which will be constructed on land located on the south western side of the New England Highway. The excavation will be carried out to match the depth of the proposed underground mining works, and will involve the installation of a fan and other infrastructure in order to ventilate air in the existing approved mining operations.

The construction of the ventilation shaft requires the use of different vehicle types. The impact of traffic movements on the operation of the adjacent road network is assessed for both the construction and operation stages.

1.2.2. Service Shafts

Drilling of the vertical service shafts will occur from the surface using a conventional drilling rig. Above ground sumps that are able to be relocated may be used to limit ground disturbance during drilling operations if required for environmental reasons. Various support vehicles will be required for drilling operations, and the impact of these traffic movements will be assessed.



2. Statutory Requirements

All temporary or permanent traffic controls put into place for the construction or operation of the Ventilation and Service Shafts will be in accordance with Australian Standards 1742 - Manual of Uniform Traffic Control Devices.

The Roads and Traffic Authority (RTA) manual for Traffic Control at Worksites Revision 4 will be used to guide the installation of any temporary traffic controls required during the construction period.



3. Existing Environment

3.1. Adjoining Road Network

The construction of the ventilation and service shafts, comprising an additional and necessary component of the larger scale ACP, is located near the village of Camberwell, 16 kilometres northwest of Singleton on the New England Highway. The New England Highway is part of the National Highway network, and forms the main inland route between Sydney and Brisbane. The location of the mine is shown in **Figure 3-1** overleaf.

The ACP's current operations are accessed via Glennies Creek Road, which intersects with the New England Highway north-west of Camberwell. Current operations include administrative offices, a coal handling and processing plant, the north-east open cut (NEOC) and an underground mine.

In the vicinity of the ACP's operations, the highway varies in width from two to four lanes. Southeast of the intersection with Glennies Creek Road the highway is generally one lane per direction; however a southbound overtaking lane commences approximately 1km south-east of the village of Camberwell. A four-lane section (two lanes per direction) begins north of the intersection with Glennies Creek Road and extends to the north-west. Details of the lane configuration of the New England Highway in the vicinity of the ACP are shown in **Figure 3-2**.

Glennies Creek Road is a local road providing access to the existing ACP, and to rural landholdings north of the New England Highway.



Figure 3-1 Site Location





Map source: Google Maps (2009)





Figure 3-2 Lane Configuration on New England Highway

3.2. Existing Traffic Volumes

A 7-day classified count of traffic on the New England Highway east of Camberwell was undertaken from 23 to 29 October 2008. The average daily traffic volume during that week was 11,109 vehicles, including 17% heavy vehicles. The average weekday volume was slightly higher at 12,391 vehicles, including 18% heavy vehicles.

The average weekday hourly profile of traffic activity is shown in Figure 3-3.





Figure 3-3 New England Highway weekday average hourly profile

The AM peak hour on a weekday is between 6:00 and 7:00AM, with an average weekday volume of 1,306 vehicles per hour, the majority of which are heading westbound. The PM peak is between 4:00 and 5:00PM, with an average of 947 vehicles per hour. The peak direction in the afternoon is eastbound. Peak hour volumes on the New England Highway are presented in **Table 3-1**.

Table 3-1 Peak hour volumes on the New England Highway

	October 2008	
	Eastbound	Westbound
AM	370	1,090
PM	650	340

The NSW Roads and Traffic Authority (RTA) also collect and publish traffic volume data for the New England Highway. The nearest RTA data point is located at Foy Brook Bridge (over Bowmans Creek) in Camberwell (station number 05.037). **Figure 3-4** shows growth in traffic¹ on

¹ Volume at this location is measured in axle pairs, rather than vehicles. A 2-axle car is one axle pair. A 3-axle truck is 1.5 axle pairs. The number of vehicles is less than the number of axle pairs.



the New England Highway at this RTA data point since 1980. Traffic has generally risen steadily, with a peak in the late 1990s and an overall linear trend growth rate of 1.7% per annum (base year 2004).

Figure 3-4 Growth in Annual Average Daily Traffic on the New England Highway at Foy Brook Bridge, Camberwell (Station number 05.037)



3.3. Road safety

Data was obtained from the RTA about the recent road crash history of the New England Highway between Singleton and Muswellbrook. In the five years from September 2003 to August 2008, there were 88 crashes recorded, including four fatal crashes and 32 injury crashes. The most common types of crashes involved the vehicle leaving the carriageway, accounting for 52% of all crashes. The number of crashes was highest in the year September 2003 to August 2004, when 24 crashes were recorded. There were 13 crashes recorded in the year September 2007 to August 2008.

A crash rate, where the number of crashes is compared to the volume of passing traffic, has been calculated at approximately 10 crashes per 100 Million Vehicle Kilometres Travelled (MVKT). This is significantly below the NSW state average crash rate of approximately 75 crashes per 100MVKT.



Three collisions, including one injury collision, were recorded in the past five years within close proximity of Bowmans Creek and thus within close range of the proposed construction access points. These collisions involved two off-path type crashes and one collision where a temporary object on the roadway was hit.



4. Traffic Impacts

This TIA examines the effect the construction and operation of the ventilation and service shafts will have on traffic flow in the area, with a particular focus on the impact it will have on the New England Highway. The ventilation and service shafts will be located south west of the New England Highway between south of the unnamed Dairy Lane and north of Glennies Creek Road. The location of the underground mining and proposed shaft and fan site is shown in **Figure 4.1** below. The access tracks in **Figure 4.1** are shown indicatively, with more detail of the access track provided in **Figure 4.3**.



Figure 4.1 – Location of Proposed Ventilation and Service Shafts and Access Tracks

Construction work may be carried out concurrently with a number of ACOL projects including the proposed South East Open Cut (SEOC) and the approved Bowmans Creek Diversion. In order to assess the overall impact of the additional traffic generated as a result of the project, the traffic induced from all projects proposed in the area has been taken into account. **Figure 4.2** below



shows the location of adjacent construction sites that have the potential to be active during ventilation and service shafts construction.

Figure 4.2: Location of adjacent potentially concurrent worksites



The following assessment examines the main construction access points on the New England Highway affected by the ventilation and service shafts project and the cumulative impacts that will arise from all potentially concurrent works proposed.

4.1. Unnamed Dairy Lane

The unnamed Dairy Lane is located adjacent to the existing NEOC, and provides access to a work site located on the southern side of New England Highway. The lane is owned and maintained by ACOL and general public access is not permitted. It is an unsealed access track serving an existing rural property and dairy farm, located to the south of the New England Highway. Dairy operations will continue during the period of construction and operation of the ventilation and service shafts,



with a milk tanker and other associated minor traffic continuing to use the intersection. No change to the existing farming or dairy traffic operation is proposed.

The unnamed Dairy Lane joins the New England Highway on a straight alignment, where there is a southbound overtaking lane. The topography slopes uphill to the east of the intersection.

4.1.1. Works Proposed

Access to the proposed site will be via the existing unnamed Dairy Lane and then via an existing farm access track, which will require upgrading (solid east-west oriented red line in **Figure 4.3**). Alternatively, access from the unnamed Dairy Lane to the worksite will be provided by extending an existing track from the hay sheds to the shaft worksite as shown by the dashed red line in **Figure 4.3**.



Figure 4.3: Proposed Access Track

The unnamed Dairy Lane will provide the only work site access points for the ventilation and service shafts.



Vent Shaft

During the construction stage, the approximate average daily number of vehicles accessing the worksite will be as follows:

- 2 flat bed trucks (delivery of concrete/pre cast segments, steel etc);
- 1 water cart;
- 5 light vehicles associated with contractors/onsite staff; and
- 1 diesel fuel delivery truck will be required to deliver fuel to the site approximately every two days.

On some days there will be arrival or departure of other vehicles and vehicle types on a one off basis, such as delivery of cranes, hoists, pre-fabricated fan elements etc. However as these are one off type movements, the average number of vehicle movements presented above is considered to be an accurate reflection of the ongoing traffic generation attributable to construction.

The drilling rig will remain on site during construction, while the flat bed trucks and the water cart would travel to and from the site once per day. The light vehicles would make two round trips per day. The diesel delivery truck delivers fuel to the site every two days. As such, the maximum likely number of daily vehicle movements along the unnamed Dairy Lane and New England Hwy intersection arising from the ventilation shaft is 17.

During the operation stage the expected traffic generation from the ventilation shaft and fan site will be significantly lower. Only ad-hoc inspections of the ventilation fan would be required.

Service Shafts

During the construction stage, the approximate average daily number of vehicles accessing the worksite will be as follows:

- 2 flat bed trucks (drill rig operational support/pre cast segments, steel etc); and
- 2 light vehicles.

As such the maximum number of daily vehicle two way movements at the unnamed Dairy Lane and New England Highway intersection arising from the construction of the service shafts is 8.

During operation of the service shafts, the maximum number of daily vehicle movements will be a maximum of 30. This is detailed below:



- Ballast drop hole
 - A small sized delivery tip truck will deposit ballast at the location of the small stockpile, when required. A small earth mover (bobcat or similar) may also occasionally be required to reform the stockpile over the shaft.
 - At maximum usage rates, a ballast delivery is expected to be required once every 7 days.
- Concrete drop hole
 - Concrete will be required intermittently for underground operations as mining progresses, and at maximum rates concrete may be delivered up to 15 times per day, once every 2 weeks.
- Access track
 - Construction of the access track is expected to generate movements of a grader, excavator and roller at the start and end of the construction, as well as a water cart each day.

Traffic Generation Summary

The worst case scenario for traffic generation occurs if construction of both ventilation and service shafts occur concurrently. This is considered unlikely but possible, and hence forms the basis of this assessment on a worst case scenario. The construction of the access track occurs prior to construction of the ventilation or service shafts and results in significantly less traffic impact, and hence has not been assessed.

Table 4-1 summarises the worst case expected traffic movements during the construction of both shafts.

Period	Trucks (Movements per day ¹)	Light Vehicles (Movements per day ¹)
Construction	11	14
Operation	30	<1

Table 4-1 Traffic Generation

¹One trip = 2 vehicle movements (approaching and departing)

4.1.2. Access

Construction vehicles accessing the site will utilise the existing northbound running lane and/or 2.5m wide shoulder lane on the New England Highway to decelerate and undertake left turns into



the work site. The method of access for southbound vehicles will depend on the configuration of New England Highway and the unnamed Dairy Lane at the time.

There is a proposal arising from other ACOL construction works to construct a temporary right turn bay utilising the existing southbound overtaking lane, to provide for southbound right turns into the site. The temporary right turn treatment would be painted on the road or established by other temporary traffic control devices, and removed following completion of those construction works. During the time this temporary traffic layout is in place, vehicles accessing the ventilation and service shafts construction site would use the channelised right turn bay if approaching from the north.

Should construction of the ventilation and service shafts not occur concurrently with this temporary traffic layout, any southbound vehicles would continue past the unnamed Dairy Lane, turn left into Glennies Creek Road, perform a u-turn, turn right back into New England Highway and turn left into the unnamed Dairy Lane.

4.1.3. Traffic Impacts and Cumulative Impacts Arising

The unnamed Dairy Lane will provide the main work site access point for other ACOL construction works. The unnamed Dairy Lane is proposed to be the main access point to the works compound, and as such is anticipated to generate a combined total of up to 100 vehicle movements per day associated with the Bowmans Creek and Gas Drainage projects. It is noted that the timing of the projects has not been confirmed and it is currently unknown whether the projects will run concurrently.

The worst case scenario occurs where construction of the ventilation and service shafts and all other ACOL projects run concurrently. In this case, up to an aggregate of up to 125 vehicle movements could be generated per day on the New England Highway by staff, delivery of materials and plant. This worst case scenario is unlikely to be achieved in practice, due to the likelihood of utilisation of shared resources such as man power, supervision, deliveries etc or the timing of projects not occurring simultaneously.

Construction vehicles accessing the work site approaching from the northbound direction will be required to decelerate on the New England Highway on approach to the unnamed Dairy Lane, which may have a minor impact on the travel speed of following traffic.

Traffic delays will be generally isolated to vehicles turning onto the New England Highway from the unnamed Dairy Lane. Left turns from the unnamed Dairy Lane to the New England Highway may impact on traffic flow on the New England Highway northbound as vehicles accelerate up to the posted speed limit. Sight distances in both directions are good, enabling entering traffic to select appropriate gaps. The proposed temporary channelised right turn treatment, should this be



installed concurrently with construction of the ventilation and service shafts, will provide a protection area for vehicles turning right from the unnamed Dairy Lane onto the New England Highway to use as an acceleration lane.

If the channelised right turn configuration is not in place, vehicles wishing to turn right from the New England Highway onto the unnamed Dairy Lane will be required to continue travelling along the highway until they reach Glennies Creek Road, turn left onto Glennies Creek Road, perform a U-turn on this road, turn right onto the New England Highway and turn left onto the unnamed Dairy Lane. Further, all ACOL related traffic will be required to turn left onto the New England Highway, and then U-turn in Brunkers Lane to access the New England Highway southbound.

The additional 25 trips per day arising from the ventilation and service shafts construction works would be added to the existing New England Highway traffic volume. The impact of this volume of additional traffic is negligible given the current AADT of the New England Highway of around 11,000 vehicles per day.

Austroads' *Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections* (Second Edition, 2010) details warrants for various intersection treatments. The warrants provide guidance on where a full-length deceleration lane must be used and where a basic turn treatment (Type BAL) is appropriate based on traffic volume. The existing intersection is a type BAL treatment, with two through lanes southbound and a well formed 2.5m sealed shoulder northbound.

Based on the proposed construction speed limit of 80kph on the New England Highway, where there are 1,090 vehicles travelling westbound on the New England Highway during the AM peak hour (6:00AM-7:00AM), a maximum of 5 turning vehicles are permitted for a Type BAL intersection.

For the remainder of the day there is an average of approximately 350 vehicles per hour travelling westbound on the New England Highway – therefore a maximum of 15 turning vehicles per hour would be permitted to turn into site for a Type BAL intersection before the warrant for an intersection upgrade would be met.

Assuming that the 25 daily vehicle movements (average 12.5 vehicles per day) generated by the construction of the ventilation and service shafts, and a maximum of 30 daily vehicle movements (15 vehicles) generated in the operational phase, will not be permitted to access the site during the morning peak hour of 6-7am, and given the short-term nature of the work and that it is highly unlikely that the vehicles will all arrive in the one hour, it is considered that the Type BAL intersection as currently exists at the unnamed Dairy Road/New England Highway is sufficient and does not warrant upgrade.