QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.25 - EDGEROI
(Ten Mile Creek)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

149°46' 149°47' 149°48' 149°49' 149°50' 149°51' 149°52' 149°53'

29°59' 30°0' 30°1' 30°2' 30°3' 30°4' 30°5' 30°6' 30°7'

398 399 400 401 402 403 404 405 406 407 408 410 411 412 413 414

NEWELL HIGHWAY

Edgeroi

Bobbiwaa CCA Zone 3 State Conservation Area

Fauna Survey Effort
- Fauna survey area
- Reptile survey
- Fauna habitat assessment
- Herpetofauna habitat assessment

Flora Survey Effort
- Flora survey area
- Vegetation Assessment proforma
- Visual Assessment

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°47' 149°48' 149°49' 149°50' 149°51' 149°52' 149°53'

29°51' 29°52' 29°53' 29°54' 29°55' 29°56' 29°57' 29°58' 29°59'

381 382 383 384 385 386 387 388 389 390 391 393 394 395 396 397

Bellata

GEHAN CREEK

MYALL HOLLOW CREEK

NEWELL HIGHWAY

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.26 - BELLATA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort
- Fauna survey area
- Aquatic Assessment
- Reptile survey
- Fauna habitat assessment
- Herpetofauna habitat assessment
- Hair tube line

Flora Survey Effort
- Flora survey area
- Random meander Survey
- Vegetation Assessment proforma

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.27 - GURLEY AREA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

149°49' 149°50' 149°51' 149°52' 149°53' 149°54' 149°55'

29°42' 29°43' 29°44' 29°45' 29°46' 29°47' 29°48' 29°49' 29°50'

Gurley

GURLEY CREEK

365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381

Fauna Survey Effort

- Fauna survey area
- Anabat
- Bird Survey
- Reptile survey
- Fauna habitat assessment
- Herpetofauna habitat assessment
- Elliot line
- Hair tube line
- Spotlighting
- Call playback

Flora Survey Effort

- Flora survey area
- Visual Assessment
- Vegetation Assessment proforma

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°50' 149°51' 149°52' 149°53' 149°54' 149°55' 149°56'

29°33' 29°34' 29°35' 29°36' 29°37' 29°38' 29°39' 29°40' 29°41'

NEWELL HIGHWAY

349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364

TYCANNAH CREEK

GURLEY CREEK

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.28 - TYCANNAH CREEK
(South of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort
- Fauna survey area
- Bird Survey
- Call playback
- Fauna habitat assessment
- Spotlighting
- Hair tube line

Flora Survey Effort
- Flora survey area
- Visual Assessment

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°51' 149°52' 149°53' 149°54' 149°55' 149°56' 149°57'

29°24' 29°25' 29°26' 29°27' 29°28' 29°29' 29°30' 29°31' 29°32'

332 333 334 335 336 337 338 341 342 343 344 345 346 348

GWYDIR RIVER

MEHI RIVER

NEWELL HIGHWAY

GWYDIR HIGHWAY

NEWELL HIGHWAY

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT Map 2.29 - MEEHI RIVER
(East of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort

- Fauna survey area
- Aquatic Assessment
- Anabat
- Fauna habitat assessment
- Call playback
- Spotlighting
- Frog survey

Flora Survey Effort

- Flora survey area
- Visual Assessment

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°48' 149°49' 149°50' 149°51' 149°52' 149°53' 149°54'

29°16' 29°17' 29°18' 29°19' 29°20' 29°21' 29°22' 29°23' 29°24'

313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331

Ashley

CARNARVON HIGHWAY

MARSHALLSPONDS CREEK

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.30 - ASHLEY AREA
(North of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort
- Fauna survey area
- Bird Survey
- Fauna habitat assessment
- Elliot line

Flora Survey Effort
- Flora survey area
- Visual Assessment
- Random meander Survey

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.31 - CAROLE CREEK AREA
(North of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort

- Fauna survey area
- Bird Survey
- Fauna habitat assessment
- Elliot line
- Reptile survey
- Herpetofauna habitat assessment

Flora Survey Effort

- Flora survey area
- Visual Assessment
- Targeted Search
- Random meander Survey

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.32 - GARAH AREA
(North of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

149°37' 149°38' 149°39' 149°40' 149°41' 149°42' 149°43' 149°44'

29°0' 29°1' 29°2' 29°3' 29°4' 29°5' 29°6' 29°7' 29°8'

276 277 278 279 280 281 282 283 284 285 286 287 288 289 293

Garah

CARNARVON HIGHWAY

GIL GIL CREEK

WALLON CREEK

Fauna Survey Effort
- Fauna survey area
- Bird Survey
- Fauna habitat assessment
- Reptile survey
- Herpetofauna habitat assessment

Flora Survey Effort
- Flora survey area
- Visual Assessment

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°37' 149°38' 149°39' 149°40' 149°41' 149°42' 149°43'

28°52' 28°53' 28°54' 28°55' 28°56' 28°57' 28°58' 28°59' 29°0'

260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276

Boonal

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.33 - BOONAL TANK AREA
(South of Boomi)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort
- Fauna survey area
- Bird Survey
- Fauna habitat assessment
- Hair tube line

Flora Survey Effort
- Flora survey area
- Visual Assessment
- Random meander Survey
- Targeted Search

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.34 - BOOMI SOUTH

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

0 0.5 1 2 3 4
Kilometers

149°35' 149°36' 149°37' 149°38' 149°39' 149°40' 149°41'

28°43' 28°44' 28°45' 28°46' 28°47' 28°48' 28°49' 28°50' 28°51'

240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259

Boomi Nature Reserve

WHALAN CREEK

Fauna Survey Effort
- Fauna survey area
- Aquatic Assessment
- Frog survey
- Reptile survey
- Herpetofauna habitat assessment
- Fauna habitat assessment
- Hair tube line

Flora Survey Effort
- Flora survey area
- Visual Assessment
- Targeted Search

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)
- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

149°31' 149°32' 149°33' 149°34' 149°35' 149°36' 149°37'

28°34' 28°35' 28°36' 28°37' 28°38' 28°39' 28°40' 28°41' 28°42'

221 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239

BARWON RIVER

BOOMI RIVER

Queensland

New South Wales

QUEENSLAND TO HUNTER GAS PIPELINE PRELIMINARY ENVIRONMENTAL ASSESSMENT

SURVEY EFFORT MAP 2.35 - BOOMI NORTH

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

ngh environmental

0 0.5 1 2 3 4
Kilometers

Fauna Survey Effort

- Fauna survey area
- Reptile survey
- Bird Survey
- Frog survey
- Fauna habitat assessment
- Elliot line
- Hair tube line
- Herpetofauna habitat assessment
- Aquatic Assessment
- Anabat

Flora Survey Effort

- Flora survey area
- Visual Assessment
- Targeted Search
- Vegetation Assessment proforma

- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

3 FLORA AND FAUNA RESULTS

3.1 FLORA ASSESSMENT AND SURVEY RESULTS

3.1.1 Flora Survey Results

The pipeline extends through a number of different vegetation types including agricultural land, scattered paddock trees, remnant patches of native vegetation, riparian vegetation, woodland, forest, grassland, mangroves, floodplain forests and saltmarsh. **Table 3-1** provides a summary of the vegetation recorded at each survey location. In most cases the dominant species recorded are listed and any constraints including EECs, threatened species or populations are noted in the relevant column below along the proposed pipeline corridor.

Table 3-1: Results of the flora surveys at each survey location and the constraints identified.

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
222.5-224	River Red Gum/Coolibah Woodland Good quality riparian vegetation along the Barwon River. Scattered trees, mostly mature to over-mature, scattered shrubs and ground-cover sparse Dominant species *Eucalyptus camaldulensis, E. coolabah, Acacia salicina, A. stenophylla, Melaleuca bracteata, Casuarina cristata, Eremophila bignoniflora, Marsilea drummondii, Myoporum montanum, Wahlenbergia stricta* and *Swainsona (?) galegifolia*.	KP 222.5-222.8: Coolibah Black Box Woodland EEC (TSC Act)
225-226 236 238	Adjacent to Boomi Road; level, to very gently sloping, mainly grassland with sparse, scattered trees and/or shrubs Native and naturalised Grasslands/Chenopods. Dominant species *Themeda australis, Chloris truncata, Dichanthium sericeum, Veronica plebeia, Sida trichopoda, Swainsona galegifolia, Swainsona (?)*[2] *queenslandica, Atriplex leptocarpa, Einadia nutans, Sclerolaena muricata, Enchylaena tomentosa* and *Rhagodia spinescens*.	KP 225.2-226; 236.2-236.4; 238.2-238.4 *Dichanthium* spp. Dominant grasslands of the Brigalow belt Bioregions, (EPBC EEC)
231.6	Gnoura Gnoura Creek, moderate quality riparian vegetation. Dominant species include *Eucalyptus camaldulensis, E. coolabah, Acacia stenophylla, Casuarina cristata, Dichanthium sericeum, Einadia nutans, Sclerolaena muricata* and *Wahlenbergia stricta.*	No
233-235	Coolibah and Coolibah/Belah with some Cooba. Dominant species include *Eucalyptus coolabah, Casuarina cristata, Acacia salicina, A. pendula, Chloris ventricosa, Dichanthium sericeum, Aristida sp., Enteropogon acicularis, Thelungia advena, Sida corrugata, Sida trichopoda, Swainsona galegifolia, Atriplex leptocarpa, Einadia nutans, Sclerolaena muricata, Enchylaena tomentosa* and *Rhagodia spinescens.*	*Dichanthium* spp. Dominant grasslands of the Brigalow belt Bioregions (EPBC Act) Coolibah Black Box Woodland EEC (TSC Act)

[2] ? denotes where the identification to species level has some degree of uncertainty. It should be noted that in all cases where there was an uncertainty any confusion with threatened species have been ruled out.

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
227.7-228.2 239-240	**KP 227.7-228.2:** Dicanthium spp grassland, although not dominant, and therefore having a very low potential to conform to be EEC. **KP 239-240:** Very sparse trees and shrubs; sparse ground-cover. Some *Dicanthium* spp. Dominant species include *Dodonaea viscosa* subsp. *cuneata, Corymbia tesselaris, Eucalyptus populnea* subsp. *bimbil.*	*Dicanthium* spp grassland - with low potential to be EEC.
249	Native and naturalised Grasslands/Chenopods, heavily cropped. *Chloris* sp., *Dichanthium sericeum, Sida* spp., *Atriplex leptocarpa, Einadia nutans, Sclerolaena muricata,* and *Enchylaena tomentosa.* No individuals of *Swainsona murrayana* or *Sida rohlenae* recorded.	No
251-252	**KP 251:** North of Whalan Creek crossing, Coolibah woodland, sparse, scattered trees, some shrubs, mainly *Eucalyptus coolabah* and *Acacia pendula.* Poor to moderate condition. **KP 251.8:** Whalan Creek Crossing, Coolibah – River Cooba, grazed; ground-cover sparse.	KP 250.9-251.2 Coolibah Black Box Woodland EEC (TSC Act)
253 254-256	**KP 253:** Native and naturalised Grasslands/Chenopods with chenopods forming dense clumps. Dominant species include *Chloris ventricosa, Dichanthium sericeum, Einadia nutans, Sclerolaena muricata* and *Enchylaena tomentosa.* **KP 254-256:** Adjacent to road, Coolibah – Belah Woodland poor to moderate condition. No individuals of *Swainsona murrayana* or *Sida rohlenae* recorded.	KP 254-256: Coolibah Black Box Woodland EEC (TSC Act)
260 262.6 264-268	**KP 260:** Native and naturalised Grasslands/Chenopod. Clumps of *Vachellia farnesiana,* restricting native spp, including *Chloris truncata, Sclerolaena* spp., *Einadia nutans, Atriplex* spp., *Panicum decompositum* and *Paspalidium* sp. **KP 262.6:** Unnamed creek crossing. Some riparian vegetation, disturbed. Poplar Box-Belah, some over-mature River Red Gum; ground cover sparse, heavily grazed and weedy. Species recorded include *Cyperus* spp., *Eleocharis* sp., *Goodenia* sp., and *Tetragonia tetragonioides.* **KP 264-268:** Poplar Box woodland, Native and naturalised Grasslands/Chenopod; extensive stands of exotic grasses; some *Callitris glaucophylla* and *Casuarina cristata, Enchylaena tomentosum, Marsilea drummondii, Austrodanthonia (?) setacea,* and *Carex inversa.* No individuals of *Swainsona murrayana* or *Sida rohlenae* recorded.	No
272.8	Poplar Box – Belah; sparse ground-cover. Dominant species include *Vachellia farnesiana, Enteropogon* sp., *Oxalis (?) chnoodes, Carex inversa, Goodenia* sp., and *Sclerolaena* spp.	No
275.8-276.5	Myall Woodland with scattered individuals of *Acacia pendula*. Ground cover includes *Austrodanthonia* spp., *Chloris truncata, Maireana sp., Chrysocephalus apiculatum, Enchylaena tomentosa, Salsola kali, Panicum* sp., *Atriplex leptocarpa*, *Calotis* sp., and *Glycine* sp.	KP 276-276.5 Myall Woodland EEC
283.8-286.8	Native and naturalised Grasslands/Chenopod; mostly introduced grasses, restricted access, low potential for *Sida rohlenae* and *Swainsona murrayana.*	No
287.8-288.8	Native vegetation along Gil Gil Creek, River Red Gum-Coolibah with some scattered Coobah. Heavily grazed, Willows interspersed with scattered native	No Low potential

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
	trees. Refer to Section 4 for detail on the process to manage these limitations.	for *Sida rohlenae* and *Swainsona murrayana* to occur
289.8	South of Gil Gil Creek, native and naturalised Grasslands/Chenopod; mostly introduced grasses, occasionally *Austrodanthonia setacea, Paspalidium* sp., *Sporobolus* sp. and *Sclerolaena* spp.	No
296.8- 299	West of Carnarvon Hwy, pipeline runs near railway corridor. Poplar box woodland; extensive stands of introduced grasses; mature and over-mature Poplar Boxes, with some shrubs: *Geijera parviflora, Alectryon oleifolius, Eremophila mitchellii, Muehlenbeckia florulenta.;* ground cover includes *Chloris truncata, Sida corrugata, Eremophila debilis,* and *Austrostipa scabra*. Clumps of *Vachellia farnesiana* appear to inhibit other grasses and herbs. No individuals of *Swainsona murrayana* or *Sida rohlenae* recorded.	No
302.7-303.1	Roadside vegetation in agricultural landscape. Poplar Box, Belah, Wilga woodland.	No
305-306 306.8-308 317-318 319-324	**KP 305-306:** Adjacent to Carnarvon Highway, Poplar Box Woodland and Native and naturalised Grasslands/Chenopod; mostly introduced grasses. **306.8-308:** TSR, Native and naturalised Grasslands/Chenopod and Weeping Myall. *Themeda australis* is common, apart from areas infested by *Vachellia farnesiana.* **KP 317-318:** Dry creek-bed with mature *Eucalyptus camaldulensis, E. coolabah* and *E. largiflorens*. Mostly weedy in creek-bed, with some stands of *Juncus* spp and *Persicaria* sp. **KP 319-324**: South of creekline, mostly ploughed and cropped; some scattered Myall	KP 306.8-308 Myall Woodland EEC (within TSR) KP 317-318 Coolibah Black Box Woodland EEC
332.8	Gwydir River Crossing, Mature *Eucalyptus camaldulensis* along river banks and on adjacent floodplain. Understorey grazed.	No
333.8 337.8	**KP 333.8-339.8**: No access. Refer to Section 4 for detail on the process to manage these limitations.	Potential for *Sida rohlenae* and *Swainsona murrayana*
338.8	**KP 333.8-339. 8** No access. Refer to Section 4 for detail on the process to manage these limitations.	Potential for Coolibah Black Box Woodland EEC
339.8	**KP 339.8:** Crossing of the Mehi River, restricted access. River Red Gum – Baradine Gum. Mature *Eucalyptus camaldulensis* scattered ~10 m apart. Refer to Statement of Commitments Ref# B22 with regard to inaccessible constraint areas.	Potential for *Sida rohlenae* and *Swainsona murrayana*
341.8 348.8	**KP 340.8-348.8:** No access. Refer to Section 4 for detail on the process to manage these limitations.	Potential for *Sida rohlenae* and *Swainsona*

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
		murrayana
356-357 357.8 365	**KP 356-357:** Two narrow bands of Belah woodland on northern and southern limits of floodway. Understorey sparse to absent, with scattered individuals of *Goodenia* sp, *Swainsona* sp., *Dicanthium* sp., and *Lycium ferocissimum.* **KP 357.8:** Tycannah Creek crossing, moderate quality riparian vegetation with mostly exotic understorey. Dominant species include *Eucalyptus camaldulensis, Melaleuca bracteata, Acacia salicina, Geijera parviflora, Pittosporum phylliraeoides, Santalum lanceolatum, Flindersia maculosa, Bidens pilosa, Brassica sp., Austrostipa nodosa, Paspallum sp., Tagetes minuta* and *Sonchus oleraceus.* **KP365:** Belah open woodland along road, good condition. Dominant species include *Casuarina cristata, Eucalyptus populnea, Geijera parviflora, Acacia stenophylla, Eremophila bignoniiflora, Muehlenbeckia florulenta, Atriplex sp., Exocarpus pressiformis, Flindersia maculosa, Cynodon dactylon, Einadia hastata, Enchylaena tomentosa, Einadia nutans* subsp. *eremaea, Paspalidium caespitosum* and *Sclerolaena muricata*	No
366.8-367	Degraded riparian vegetation, scattered *Eucalyptus camaldulensis* approx 20m apart, exotic understorey dominated by *Brassica rapa* and *Ricinus communis* with scattered *Atriplex sp., Acacia sp., and Sclerolaena muricata.*	No
379.8-380.8	Millie Creek and anabranch. Belah; River Red Gum – Belah. Bands of *Casuarina cristata*, occasional *Geijera parviflora, Acacia salicina, Flindersia maculosa, Citrus glauca.* Scattered mature specimens of *Eucalyptus camaldulensis, E. populnea* and *E. coolabah* (one large individual in paddock area). Sparse ground-cover, occasional stands of grassland, including *Dichanthium* sp. and *Swainsona (?) greyana.* Some *Corymbia tessellaris* near entrance to property, but no Carbeen woodland near corridor.	No
390.8-392	**KP 390.8-392:** Grazed paddocks, moderate condition. Dominate species include *Lolium sp., Themeda australis, Brassica rapa, Sonchus oleraceus, Vachellia farnesiana, Eragrostis curvula, Swainsona sp., Solanum sp., Sida sp., Sclerolaena muricata, Goodenia sp., Chloris truncata, Hordeum sp., Eremophila sp.,* and *Wahlenbergia sp.* **KP 392:** Myall Hollow Creek crossing, very degraded. Creekline dominated by *Melaleuca bracteata* with scattered *Acacia pendula.* Understorey dominated by exotic species including *Ricinus communis, Paspalum, Lycium ferocissimum, Onopordum acanthium. Tetragonia tetragoides, Atriplex sp.,* and *Zygophyllum sp.,* also present.	No
399.8 401.8 404.8	**KP 398.6-402.1:** Restricted access **KP 404.7:** Unnamed creekline, with *Eucalyptus camaldulensis* overstorey, *Acacia stenophylla* midstorey and exotic understorey dominated by *Brassica rapa*.	No
405.6	Belah woodland adjacent to road, good condition, dominant species include *Casuarina cristata, Geijera parviflora, Myoporum sp.,* and *Chloris truncata.*	No
411.8	TSR area, Weeping Myall Woodland, good condition with a diverse number of species, including herbs, in the understorey. Dominant species include *Acacia pendula*, *Geijera parviflora, Casuarina cristata, Austrostipa* sp., *Goodenia* sp., *Wahlenbergia* ap., *Chloris truncata*, *Sclerolaena muricata., Atriplex* sp.,	KP 411.8-412.3 Weeping Myall EEC

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
	Muehlenbeckia diclina, *Hypericum japonicum.*	
416.8	Belah Woodland adjacent to road, good condition with a moderate sparse understorey. Dominant species include *Casuarina cristata,* occasional *Acacia pendula, Atriplex* sp., *Tetragonia* sp., *Brassica rapa*, and *Sclerolaeana muricata.*	No
420 423.8	**KP 420:** Bobbiwaa Creek crossing, scattered *Eucalyptus camaldulensis, Acacia salicina, Pittosporum phylliraeoides*, understorey dominated by exotics including *Urtica incisa, Echium sp.,* and *Brassica rapa.* **KP423.8:** Visual assessment from where Spring Creek crosses the Highway. Mature *Eucalyptus camaldulensis* scattered 10m apart with exotic understorey of *Avena fatua, Echium sp., Brassica rapa* and *Sonchus oleraceus.*	No
430.8	Road side vegetation, mature scattered *Eucalyptus* sp., (ironbark), *Geijera parviflora, Wahlenbergia* sp., *Avena fatua, Austrostipa* sp., and *Salvia verbenaca.*	No
433.5-435, 451.5	Paddock areas with scattered mature Eucalypts (*Eucalyptus populnea*) and exotic pasture understorey.	No
454	TSR area, woodland dominated by *Eucalyptus macrocarpa, Eucalyptus populnea, Callitris glaucophylla* and *Casuarina* sp., *Geijera parviflora*, understorey dominated by *Bryophyllum delagoense* with occasional *Opuntia* sp., and *Cheilanthes sieberi.* Pipeline would run through adjacent paddock areas and would cross the TSR along a cleared powerline easement.	No
462.2	Kurrajong Creek, survey undertaken where creek crosses the Kamilaroi Highway, scattered *Eucalyptus camaldulensis, Eucalyptus populnea, Geijera parviflora, Callitris glaucophylla*, understorey is exotic and dominated by *Eragrostis curvula*. Severe erosion is evident.	No
476.8-477.8	Grassland area at base of mountain range. Scattered immature *Callitris glaucophylla* with dominant understorey species including *Austrostipa* sp., *Chloris truncata, Avena fatua*, *Sida* sp., *Wahlenbergia* sp., *Sclerolaeana muricata, Echium* sp., and *Eragrostis* sp.	No
481	Degraded road side vegetation, scattered individuals of *Eucalyptus blakelyi* and *Eucalyptus populnea*, weedy understorey of *Lolium perenne, Brassica rapa* and *Echium* sp.	No
491-492	Roadside vegetation, scattered individuals of Eucalyptus populnea, with a moderate condition native understorey of *Chloris truncata, Digitaria sp., Wahlenbergia sp., Dichanthium sp., Goodenia sp. Lolium perenne* and *Lycium ferocissimum* also present.	No
501.8 505.4	Namoi River crossings, good condition overstorey with poor to moderate condition understorey. Dominant species include*, Eucalyptus camaldulensis, Casuarina cunninghamiana, Eucalyptus populnea, Angophora floribunda, Phragmites australis, Atriplex spp., Solanum nigrum, Bidens pilosa, Avena spp., Sclerolaena spp. Brassica spp., Wahlenbergia sp, Lolium sp.,* and *Gallium aparine*. *Salix babylonica* and *Lycium ferocissimum* also recorded.	No
513	Bimble Box woodland, good condition, dominant species include *Eucalyptus populnea, E. albens, Acacia stenophylla, Eremophila sp., Senna sp., Austrostipa sp., Austrodanthonia sp., Chloris truncata, Hordeum sp., Sclerolaena sp., Brassica sp., Sida sp., Alyssum sp., Glycine sp., Wahlenbergia sp., Solanum sp.,* and *Enchalaena tomentosa.*	No

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
528.4	Namoi River Crossing riparian vegetation dominant species include: *Eucalyptus camaldulensis, Salix babylonica* (in river along bank), *Casuarina* cunninghamiana, *Lycium ferocissimum, Apiaceae sp., Lolium sp, Onopordum acanthium, Acacia stenophylla, Avena sp,* and *Austrostipa sp.*	No
533	Anabranch of the Namoi River, moderate condition riparian vegetation, scattered *Eucalyptus camaldulensis* with predominately exotic understorey. *Juncus* sp and *Persicaria* sp. recorded in creekline. *Lycium ferrocissimum* recorded here.	No
544-556	Roadside grassland vegetation, poor to moderate condition. Dominant species include *Rumex crispus, Avena fatua, Brasica rapa, Lolium rigidum, Wahlenbergia* sp., *Phalaris* sp., *Cynodon dactylon* and *Marsilea* sp.	No
559.8	Small creekline adjacent to agricultural land, poor condition, dominated by *Salix babylonica* with scattered *Eucalyptus camaldulensis*, understorey composed of exotic species.	No
581.5 585	**KP 581.5:** Grazed paddock with scattered *Eucalyptus conica*, and understorey dominated by exotic grasses including *Hordeum* sp., and *Cynodon dactylon.* **KP585:** Box Gum Woodland at base of hills. Good condition. Dominant species include *Eucalyptus blakelyi, E. albens, Callitris glaucophylla, Wahlenbergia sp., Sida sp., Austrostipa sp., Swainsona sp., Plantago* sp., *Lolium perenne*, *Bromus* sp., *Onopordum acanthium* and *Euchiton sphaericus.*	KP 583-586: Box Gum Woodland (TSC Act)
593	Quirindi Creek crossing, Riparian River Oak and Riparian Woodland *Casuarina cunninghamiana, Eucalyptus camaldulensis Acacia pendula* Groundcover weedy and grazed.	No
604-605 606.5	**KP 604.3:** Box Gum Woodland within TSR, moderate condition, dominant species include Eucalyptus melliodora, E. blakelyi, *Plantago spp., Lolium sp., Onopordum acanthium, Austrostipa spp., Bromus spp., Juncus acutus, Chloris truncata, Dichondra sp., Eragrostis sp., Geranium potentilloides, and Gnaphalium sp.* **KP 606.5:** Survey undertaken within roadside vegetation adjacent to pipeline corridor. Vegetation is consistent with Box Gum Woodland and should be avoided for access.	KP 604-605.3 Box Gum Woodland (TSC Act) within TSR
612-618	Visual assessment with binoculars due to restricted access. Pipeline will run through privately owned land, the majority of which has been previously cultivated. Possible area of native grasses at KP 615. Refer to Statement of Commitments Ref# B22 with regard to inaccessible constraint areas.	Potential constraint area.
620-621	Survey undertaken upstream of creekline that crosses the pipeline at KP 620 due to restricted access. Canopy species include *Eucalyptus camaldulensis* and *Casuarina cunninghamiana.* Understorey is dominantly exotic and includes *Onopordum acanthium, Lolium sp., Hordeum sp., Avena fatua, Cynodon dactylon* and *Cyperus eragrostis.*	No
626	Grazed paddock area, moderate to good condition. Dominant canopy species include Eucalyptus albens and E. melliodora. Understorey vegetation dominated by native forbs and grasses, species include *Austrostipa spp., Dichanthium spp; Austrodanthonia spp, Wahlenbergia spp., Lolium spp, Bromus spp, Urtica dioica, Echium spp., Dichondra rubens, Onopordum acanthium, Galium spp, Eragrostis spp, Goodenia spp, Trifolium arvense, Daucus glochidiatus, Petrohagia spp, Calotis lappulacea, Medicago truncatula.*	KP 625.5-626.5 Box Gum Woodland (TSC Act and EPBC Act)

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
639-641	Kaputar Shrubby Box Woodland. Scattered mature trees with grazed pasture. *Eucalyptus melliodora, E. blakelyi, E. albens and Angophora floribunda* are all common canopy species.	KP 639-642.8 Box Gum Woodland (TSC Act)
642.8-644	Eastern Angophora Herb woodland; Kaputar Shrubby Box Woodland Very large over-mature *Angophora floribunda*, with dense to open regenerating stands of *Eucalyptus blakelyi*, and occasional individuals of *E. albens. E. conjuncta* and *E. sparsifolia* on higher crests. Mid-storey and ground-cover species include *Pultenaea microphylla*, *Cryptandra spinescens, Pimelea linifolia, Myoporum montanum, Hypericum gramineum, Hydrocotyle laxiflora, Dichondra repens, Wahlenbergia* spp*, Diuris sulphurea, Microlaena stipoides, Aristida ramosa, Bothriochloa macra*.	KP 642.8-644 Box Gum Woodland (TSC and EPBC Act)
664-666	Foothills to the east of Wingen Maid, White Box-Ironbark-Red Gum Woodland *Angophora floribunda, Eucalyptus tereticornis, E. crebra* Targeted searches for *Philotheca ericifolia* and *Cymbidium canaliculatum* revealed no individuals.	No
KP 673.8-674.8	Several large specimens of *Angophora floribunda, Eucalyptus crebra* and *Eucalyptus tereticornis* were recorded in this area. Targeted searches for *Cymbidium canaliculatum* were undertaken but no individuals were recorded.	No
692-693	Visual assessment confirmed no Box Gum Woodland n this area.	No
698-699	Hunter River crossing, north of Aberdeen. Riparian vegetation, searches for *Eucalyptus camaldulensis.* (Endangered population of *Eucalyptus camaldulensis* recorded to the south-west of the corridor). No individuals found during the survey.	No
708-709	**KP 708-709**: Footslopes of Bells Mountain. Scattered *Angophora floribunda, Eucalyptus tereticornis, E. crebra, E. moluccana and Corymbia maculata* with a groundcover of grazed pasture grasses. Searches for *Eucalyptus camaldulensis, Diuris tricolor, Commersonia rosea, Pomaderris queenslandica and Lasiopetalum longistamineum* revealed no individuals within the pipeline corridor.	No
719-721 724	**KP 719-721:** Vegetation consists of pasture with scattered trees. Commonly occurring tree species include *Angophora floribunda, Corymbia maculata, Eucalyptus moluccana, and E. crebra.* No over-mature specimens recorded within the proposed corridor. Shrub species are sparse to absent and mainly consist of isolated roadside specimens of *Acacia falcata* and *Allocasuarina luehmannii.* **KP 724:** Vegetation along Foy Brook Creek consists of a narrow stand of Casuarina cunninghamiana. Searches for *Eucalyptus camaldulensis* population. *Ozothamnus tesselatus, Bothriochloa biloba and Eucalyptus glaucina* revealed no individuals.	No
768-769	Footslopes of Tangory mountain. Canopy species include *Corymbia maculata, Eucalyptus moluccana, E. crebra, E. tereticornis.* Mid-storey species include *Breynia oblongifolia, Indigofera australis, Acacia flacata, A. parramattensis, and A. melanoxylon*. Weed species include *Lantana camara, Olea europaea* subsp. *cuspidata* and *Sida rhombifolia.* Vegetation within the proposed corridor has	No

Flora survey Locations KP (Rev K)	Description of Vegetation	Constraint Identified
	components which are more typical of Seaham Spotted Gum Ironbark Forest, rather than the Lower Hunter Spotted Gum Ironbark Forest EEC (refer to Section 3.1.2).	
790-791	Escarpment slopes to the north of Rutherford. Canopy species include *Corymbia maculata, Eucalyptus crebra, E. acmenoides, Angophora floribunda; E. tereticornis* on lower slopes and occasionally *E. siderophloia, E. moluccana, E. fibrosa, E. resinifera* subsp. *resinifera.* The area has been mapped as Lower Hunter Spotted Gum Ironbark Forest by Hill (2003).	KP 790-791 Lower Hunter Spotted Gum Ironbark Forest EEC
806-833	**KP 812-818:** Agricultural areas, highly disturbed, may have once been Freshwater Wetland EEC. **KP 819:** On the floodplain south of the Hunter River near KP 819 the vegetation consists of grassland with clumps of Swamp Oak-Rushland forest (Swamp Oak Floodplain Forest EEC). **KP 820:** Where the proposed corridor enters the existing easement, to the north of KP 820, the vegetation on both sides of the easement is Central Foothills Spotted Gum Ironbark Forest. At the southern end of the easement, near Tomago Road, there are stands of Coastal Sand Apple – Blackbutt Forest, as well as gradients of Redgum Apple Banksia Forest. The Redgum Apple Banksia Forest is included within the determination for River-flat Eucalypt Forest on Coastal Floodplain EEC. A meta-population of *Grevillea parviflora* subsp. *parviflora*, was recorded near KP 820 along the edge of the powerline easement, adjacent to the proposed pipeline corridor. **KP 821:** To the south of Tomago Road, at KP 821, the proposed corridor angles across existing grasslands on a playing field, adjacent to stands of Swamp Mahogany – Paperbark Forest (Swamp Sclerophyll Forest on Coastal Floodplain EEC). Between the northern banks of the Hunter River and the playing field is a dense belt of Swamp Oak Forest and a continuous band of Mangrove-Estuarine Complex. **KP822-833:** No access at the time of the flora survey. Potential for Mangrove-Estuarine Complex and Coastal Saltmarsh EEC between KPs 821.5-827. Potential Swamp Oak Floodplain EEC between KPs 824-825.	KP 819.5-821.3 (potentially KP 824-825) Swamp Oak Floodplain Forest EEC KP 820-821.3 River-flat Eucalypt Forest on Coastal Floodplains EEC Adjacent to KP 820 *Grevillea parviflora* subsp. *parviflora* KP821 Swamp Sclerophyll Forest EEC KP 821.5-827 Mangrove-Estuarine Complex (FM Act) KP 821.5-827 Coastal Saltmarsh EEC

3.1.2 Vegetation communities of conservation significance

Nine Endangered Ecological Communities (EECs) listed under the TSC Act and two EECs listed under the EPBC Act were recorded within the proposed pipeline corridor. The following details the location and condition of each EEC recorded.

Coolibah – Black Box woodland of the northern riverine plains in the Darling Riverine Plain and Brigalow Belt South bioregions

This woodland community was recorded at six locations along the northern section of the pipeline corridor between KPs 222-357. The community was recorded on riverine floodplain areas and was found to occur without Black Box (*Eucalyptus largiflorens*) at all but one location. Within the stream channels and inner floodplain areas *Eucalyptus coolabah* was found to occur predominantly with *Eucalyptus camaldulensis*, *Casuarina cristata, Acacia stenophylla* and *Acacia salicina*. On outer floodplain areas the community was dominated by *Eucalyptus coolabah* and *Eucalyptus populnea* subsp. *bimbil.* The understorey vegetation at all sites varied considerable depending upon past disturbance history and consisted mostly of sparse shrubs and grasses.

Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions

Myall woodland EEC was recorded at three locations within the proposed pipeline corridor between KPs 276-412**.** At two locations *Acacia pendula* was recorded as the dominant canopy species and was found to occur as sparse open woodland. The understorey vegetation at all sites differed, most likely as a result of different grazing regimes and disturbance histories.

White Box Yellow Box Blakely's Red Gum Woodland (TSC Act) and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act)

Box Gum Woodland EEC was recorded at five locations along the proposed pipeline corridor between KPs 583-644. The presence of Box Gum Woodland was identified using the TSC Act and EPBC Act listing determinations and related policy and identification guidelines. At all sites one or more of the characteristic tree species were present and the canopy layer was relatively intact. Where the understorey stratum was found to have more than 50% native groundcover and a diverse number of native forbs and grasses these areas were classified as Box Gum Woodland under the TSC Act and EPBC Act. At sites where the ground stratum was relatively disturbed with a small number of native species but the potential to respond to assisted natural regeneration these areas were classified as Box Gum Woodland under the TSC Act only. The composition of the groundlayer at most sites consisted predominately of exotic species most likely a result of past disturbance and grazing pressure. Two of the five sites contained a number of native understorey species and satisfied the criteria for Box Gum Woodland under the EPBC Act.

Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South) (EPBC Act)

Dichanthium spp. dominated grassland EEC was recorded at four locations along the proposed pipeline corridor between KPs 225-235. This community was recorded within the road reserve north of Boomi and contained the species *Dichanthium sericeum*. While this species was typically found to be co-dominant a precautionary approach has been adopted. The presence of dense thickets of *Vachellia farnesiana* through much of the area was noted to be inhibiting native plant growth and restricting the occurrence of this EEC. At two locations along the pipeline (227.7-228.2 and 238.4-240) *Dicanthium sericeum* was found to be occasional and thus a low potential to conform to the EEC determination.

Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion

This community potentially occurs at one location adjacent to the proposed pipeline corridor at KP 790-791. The species composition and vegetation structure of the escarpment vegetation at this location complies in part with the description of Lower Hunter Spotted Gum – Ironbark Forest EEC and it is mapped as such by Hill (2003). Recent attempts to define the differences between types of Spotted Gum-Ironbark forest types (DECC 2008b) have stressed that *Eucalyptus fibrosa* is the most common ironbark species in Lower Hunter Spotted Gum Ironbark Forest, while in Central Hunter Spotted Gum-Ironbark Forest, *E. crebra* is the most common ironbark species. As no over-mature trees were observed within the escarpment stand, it is possible that the uncertainty in determining whether the vegetation constitutes an EEC is an artefact of previous land-clearing and selective logging.

Spotted Gum-Ironbark Forest was also recorded in areas adjacent to the proposed pipeline corridor at KP 768-769. However, in this area the vegetation is more typical of Seaham Spotted Gum Ironbark Forest, rather than the Lower

Hunter Spotted Gum Ironbark Forest EEC as no individuals of *Eucalyptus fibrosa* were recorded within this area. Thus this vegetation is not considered to be part of the EEC under the TSC Act.

Freshwater Wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

The area to the north of the Hunter River between KPs 812-818 may have once conformed to Freshwater Wetland EEC, however this area has been developed for agricultural purposes and is now heavily grazed and disturbed with highly altered drainage patterns. Thus it is unlikely that this area would conform to the scientific determination of this community. During periods of heavy rain, low-lying areas of the landscape could become periodically inundated by freshwater, however it is unlikely that native sedges and /or herbs would occur here due to the level of disturbance across the area.

Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions

This community was recorded between KPs 819.5-821.3 within the floodplain areas of the Hunter River to the east of Hexham. The area consisted predominately of grassland with clumps of Swamp Oak-Rushland Forest. These areas were in moderate condition, not particularly weedy and would have been established for approximately 20 years. This EEC may also potentially occur between KPs 824-825, however, access to this area was not possible at the time of the flora survey and this determination is based upon existing vegetation maps and high resolution aerial photography.

River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Redgum Apple Banksia Forest was recorded on both sides of the electrical easement (KP 820-821), north of Tomago Road, as well as near the playing field at KP 821-821.3. This vegetation type is included within the determination for River-Flat Eucalypt Forest on Coastal Floodplains. The vegetation was predominately regrowth and consistently disturbed throughout with an understorey of bitou bush.

Swamp Sclerophyll Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

A relatively large patch of this EEC was recorded at KP821 south of Tomago Road where the Swamp Oak Floodplain Forest and the River-Flat Eucalypt Forest's merged. The primary trees of this community were recorded in this area (*Eucalyptus robusta* and *Melaleuca quinquenervia*). The vegetation within the proposed pipeline corridor is of poor to moderate condition, predominately regrowth with a high weed content.

Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions

This community occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea and is typically found as a zone on the landward side of mangrove stands. At the time of the flora survey access was not possible to KPs 821.5-833. However, based on vegetation maps produced by the Northern Comprehensive Resource Assessment (CRA), orthophoto interpretation and survey work undertaken by the fauna teams, it is considered that a section of this area is likely to comprise the Coastal Saltmarsh EEC. This section extends from KP 821.5-827. Beyond KP 827 the area has been disturbed and is unlikely to contain this EEC.

3.1.3 Species of conservation significance

The results of the Biodiversity Assessment for the Concept EA (**ngh**environmental September2008) identified a number of threatened species and populations that had the potential to occur along the proposed pipeline corridor based upon previous records and known suitable habitat. The flora field surveys targeted a number of these species and populations within previously identified areas of suitable habitat. One threatened species, *Grevillea parviflora* subsp. *parviflora,* listed as vulnerable under the TSC and EPBC Act was recorded along the proposed pipeline corridor at KP 820. No other threatened species or threatened populations listed under the TSC Act and/or the EPBC Act were recorded during the flora surveys. The following lists all the species and populations identified in the Biodiversity Assessment for the Concept EA (**ngh**environmental September2008) and provides detail as to their potential to occur along the proposed pipeline corridor based upon suitable habitat type identified during the flora surveys.

Grevillea parviflora subsp. parviflora

Records of this species are sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo. Separate populations are also known further north from Putty to Wyong and Lake Macquarie on the Central Coast and Cessnock and Kurri Kurri in the Lower Hunter. The species often occurs in open, slightly disturbed sites such as along tracks. A meta-population of this species was recorded just north of KP 820 on the western side of the proposed corridor, outside of the impact area. Care should be taken to ensure that the population is not accidentally harmed by parking of vehicles or storage of materials. The entire population should be protected by a temporary fence during clearing, excavation and filling.

Sida rohlenae

Shrub Sida grows on flood-out areas, creek banks and at the base of rocky hills. Within NSW specimens have been found along roadsides in hard red loam to sandy-loam soils. At these sites the species can become locally abundant and is often more common in disturbed areas. Targeted searches for this species were undertaken within areas of suitable habitat along the northern sections of the proposed pipeline corridor between KPs 222.5-299. No individuals of this species were recorded within these areas. Suitable habitat for this species was also identified during the preliminary assessment between KPs 333.8 and 348.8. These areas were not accessible at the time of the flora survey and thus no targeted searches were undertaken in this section. Thus it is considered that this species could still occur along the proposed pipeline corridor within the Barwon River to Moree area. B22 of the Statement of Commitments should be applied here.

Digitaria porrecta

This species occurs within native grassland, woodlands or open forest with a grassy understorey, on richer soils and is often found along roadsides and travelling stock routes (TSRs) where there is light grazing and occasional fire. Targeted searches for this species were undertaken within the TSRs along the proposed corridor and where there was an abundance of native grasses in the understorey. This species was not recorded during the surveys however its flowering season is noted to occur between mid-January and late February and it has been known to occur as occasional in populations. Thus although this species was not recorded during the surveys there is still the potential for this species to occur along the proposed pipeline corridor within areas of suitable habitat within the Border Rivers/Gwydir, Central West and Namoi catchment management areas. B22 of the Statement of Commitments should be applied here.

Zannichellia palustris

This species grows in fresh or slightly saline stationary or slowly flowing water, and flowers during the warmer months. A number of records for this species occur within areas adjacent to the pipeline corridor between KPs 823-827. These areas were not surveyed during the flora survey due to restricted access, however, suitable habitat for this species is found within the pipeline corridor. Thus this species has the potential to be impacted by the proposal and B22 of the Statement of Commitments should be applied in this area.

Bothriochloa biloba

Bothriochloa biloba occurs in a variety of grassland and woodland associations. The species has a broad distribution in northern New South Wales. The species is known to prefer heavier textured soils (Bean 1999) and a number of records are known from stands of the Endangered Ecological Community 'White Box Yellow Box Blakely's Red Gum Woodland' (Earl and Kahn 2001, Austen 2002). Targeted searches for this species were undertaken within areas of suitable habitat along the proposed pipeline corridor. This species was not recorded during the flora surveys however suitable habitat is present within the pipeline corridor and thus the presence of this species within the pipeline corridor cannot be ruled out. B22 of the Statement of Commitments should be applied within areas of suitable habitat along the proposed corridor, in particular areas of Box Gum Woodland.

Tylophora linearis

This species grows in dry scrub and open forest areas and has been recorded from low-altitude sedimentary flats in dry woodlands of *Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii.* This species was not recorded along the proposed pipeline corridor and

suitable habitat was not recorded along the route. Suitable habitat for this species is typically found to the south and southwest of the proposed corridor and thus it is unlikely that this species would be present along the route.

Tetratheca juncea

This species is associated with shale-sandstone transition habitat where shale-cappings occur over sandstone and is typically found in vegetation types from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa*, and/or *E. sparsifolia,* with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. This species was not recorded along the proposed pipeline corridor during the flora surveys. Suitable habitat for this species was not recorded within the proposed pipeline corridor and thus the presence of this species along the route is considered unlikely.

Rhizanthella slateri

This underground orchid occurs from south-east Queensland to south-east NSW. In NSW the species is currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements for this species are poorly understood and the species is typically only found following excavation. Thus this species could still be present along the proposed pipeline corridor, most likely in areas of deep, coastal loams and B22 of the Statement of Commitments should be applied in these areas.

Philotheca ericifolia

This species is known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. The records are scattered over a range of over 400 km between West Wyalong and the Pilliga Scrub. *Philotheca ericifolia* grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies and has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. This species was not recorded during the targeted searches. Suitable habitat for the species includes rocky sites around Wingen Maid NR outside of the proposed pipeline corridor. Suitable habitat for this species within the proposed corridor is limited and thus this species is unlikely to be present along the route.

Lepidium monoplocoides

This species is widespread in the semi-arid western plains regions of NSW and occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by *Allocasuarina luehmannii* (Bulloak) and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or *Eucalyptus populnea* (Poplar Box). This species was not recorded along the proposed pipeline corridor during the flora surveys, however its presence along the route particularly within areas of suitable habitat between Moree and Narrabri cannot be ruled out. B22 of the Statement of Commitments should be applied in these areas.

Desmodium campylocaulon

This species occurs chiefly in the Collarenebri and Moree districts in the north-western plains of NSW and is confined to clay soils, usually with *Astrebla* and *Iseilema* species. In NSW *Desmodium campylocaulon* grows on cracking black soils in the Narrabri, Moree and Walgett local government areas. Associated species include *Acacia harpophylla*, *Astrebla pectinata* and *Sorghum*, *Dichanthium* and P*anicum* species. This species was not recorded along the proposed pipeline corridor during the flora surveys and its presence is considered unlikely due to the disturbed nature of areas of suitable habitat within the pipeline corridor.

Pomaderris queenslandica

This species is widely scattered but not common in north-east NSW and in Queensland and is only known from a few locations on the New England Tablelands and North West Slopes, including near Torrington and Coolatai, and also from several locations on the NSW north coast. The species is found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks. The species was not recorded within the proposed pipeline corridor during the targeted searches and its presence within the corridor is considered unlikely as nearby records are from hilly sites with different habitat to that with the corridor.

Dichanthium setosum

Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, as well as in Queensland. The species is associated with heavy basaltic black soils and is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Targeted searches for this species were undertaken within areas of suitable habitat and where the *Dichanthium* spp Dominant grasslands EEC had been identified as potentially occurring during the preliminary assessment. While this species was not recorded during the flora surveys one species of this genus, *Dichanthium sericeum,* was found to occur as a co-dominant to occasional species within many of the grassland areas. In addition, a number of associated species were recorded within the proposed pipeline corridor. Thus it is considered likely that this species could occur within the proposed pipeline corridor and B22 of the Statement of Commitments should be employed in areas of suitable habitat, particularly along the northern sections of the proposal.

Diuris tricolor

Records of this species are sporadically distributed along the western slopes of NSW, extending from south of Narrandera all the way to the far north of NSW. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. Associated species include *Callitris glaucophylla*, *Eucalyptus populnea, Eucalyptus intertexta,* Ironbark and *Acacia* shrubland. The understorey is often grassy with herbaceous plants such as *Bulbine* species. Targeted searches for this species were undertaken during the flora surveys which coincided with the species flowering period. The species was not recorded within the proposed pipeline corridor during the surveys. However, suitable grassy woodland habitat is present within the proposed corridor, particularly between Muswellbrook and Cessnock and the presence of this species within these areas cannot be ruled out. B22 of the Statement of Commitments should be applied in these areas.

Swainsona murrayana

This species is found throughout NSW and has been recorded at various localities between Dubbo and Moree. It grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with *Maireana* species. This species was not recorded during targeted searches undertaken within areas of suitable habitat during the flora surveys. However, suitable habitat for this species was identified during the preliminary assessment between KPs 333.8 and 348.8. This area was not accessible at the time of the flora survey and thus no targeted searches were undertaken in this section. Thus it is considered that this species could still occur along the proposed pipeline corridor within the Barwon River to Moree area, particularly as a number of other *Swainsona* species were recorded within this area. B22 of the Statement of Commitments should be applied in these areas.

Eucalyptus parramattensis subsp. decadens

This species generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey or as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. This species has been previously recorded near the pipeline route within similar habitat types to that found within the pipeline corridor. Targeted searches for this species within accessible areas between KPs 806-833 did not locate any individuals of this species. However, as a number of areas of suitable habitat along the proposed pipeline corridor were unable to be surveyed, it is considered possible that this species could occur along the proposed route and B22 of the statement of Commitments should be applied in areas of suitable habitat.

Homopholis belsonii

This species has been recorded north from the Warialda district and into Queensland. It typically grows in dry woodland (eg. Belah) on poor soils, although its habitat and ecology appear to be poorly known. This species is found in the Border Rivers/Gwydir catchment management authority regions. This species was not recorded within any of the Belah woodland areas surveyed during the flora surveys. Given that this species has been recorded within areas near the proposed corridor, its presence along the route cannot be ruled out and B22 of the Statement of Commitments should be applied, particularly in areas from the Barwon River to Moree.

Thesium australe

This species is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It typically occurs in grassland or grassy woodland and is often found in damp sites in association with Kangaroo Grass (*Themeda australis*). This species is difficult to detect due to its cryptic nature and its potential presence along the proposed pipeline route cannot be ruled out. However, it should be noted that the distribution of *Themeda australis* recorded along the route was limited. B22 of the Statement of Commitments should be applied in areas of grassland dominated by *Themeda australis*.

Goodenia macbarronii

This species grows on the western slopes of the Great Dividing Range in NSW, south from the Guyra and Inverell districts. It is widely distributed throughout the tablelands, western slopes and western plains. It is often found in sites with some form of recent disturbance, such as depressions and clearings made by grading and excavation along roadsides, open grazing land and paddocks inundated by weed species and areas previously cleared and grazed by cattle. This species was not recorded during the flora surveys along the proposed pipeline corridor. However, given the species preference for disturbed sites, its potential occurrence along the proposed route cannot be ruled out. B22 of the Statement of Commitments should be applied, particularly in damp sandy sites.

Prostanthera cineolifera

Records of this species are restricted to only a few localities near Walcha, Scone and St Albans. It grows in open woodlands on exposed sandstone ridges and is usually found in association with shallow or skeletal sands. This species was not recorded within the proposed pipeline corridor during the flora surveys. Nearby records indicate a different habitat preference to that which is found along the proposed route. Thus this species is considered unlikely to occur within the corridor.

Cyperus conicus

Records for this species occur rarely in the Pilliga area of NSW. It grows in open woodland on sandy soil and has been recorded from *Callitris* forest in the Pilliga area, growing with *Cyperus gracilis*, C. *squarrosus* and *C. fulvus.* This species was not recorded within the proposed pipeline corridor during the flora surveys. Records from nearby areas indicate similar habitat preferences to those occurring within the proposed corridor. Thus there is the potential for this species to occur specifically within areas of Pilliga scrub north east of Narrabri. B22 of the Statement of Commitments should be applied in these areas.

Monotaxis macrophylla

The distribution and supposed rarity of *Monotaxis macrophylla* within NSW is related to the occurrence of fire. At least within NSW, the species has not been found in the absence of fire. There is also a great diversity in the associated vegetation within NSW, encompassing coastal heath, arid shrubland, forests and montane heath from almost sea level to 1300 m altitude. This species was not recorded within the proposed pipeline corridor during the flora surveys. Given the lack of recent fire within areas surveyed along the route and the short life span of this species it is considered unlikely that this species would be present within the proposed corridor.

Commersonia rosea

This species is only known from four localities in the Sandy Hollow district of the upper Hunter Valley, west of Muswellbrook. It occurs on skeletal sandy soils in scrub or heath vegetation with occasional emergents of *Eucalyptus crebra*, *Callitris endlicheri* or *Eucalyptus caleyi* subsp. *caleyi.* It is known to occupy relatively small areas at its known sites and has a total population of less than 200 plants. Targeted searches for this species were undertaken at KPs 708-709 and did not reveal any individuals. This species is typically found within rocky areas and all 8 records within NSW are found within an 8 km radius of Sandy Hollow west of Muswellbrook. The proposed pipeline route is located to approximately 8-10km east of Muswellbrook. Based on survey results and know locations of this species it is considered unlikely to occur within the proposed corridor.

Lasiopetalum longistamineum

This species occurs in the Mt Dangar - Gungal area within Merriwa and Muswellbrook Local Government Areas. The species is known to flower in spring and grows in rich alluvial deposits. Little information is known about the ecology or biology of this species. Targeted searches for this species were undertaken at KPs 708-709 and did not reveal any individuals. All 15 records of this species within NSW are found within close proximity to Sandy Hollow west of Muswellbrook.. The proposed pipeline route is located to approximately 8-10km east of Muswellbrook and thus this species is considered unlikely to occur within the proposed corridor.

Ozothamnus tesselatus

This species grows in Eucalypt woodland, typically on rocky sites and is restricted to a few locations north of Rylstone and west of Muswellbrook. Targeted searches for this species were undertaken at KPs 719-721 and724 and did not reveal any individuals. All 14 records of this species within NSW are located west of Muswellbrook with the exception of one out-lying record located to the southeast of Muswellbrook. Given the habitat preference of this species for rocky sites it is unlikely to be present along the proposed pipeline corridor.

Eucalyptus glaucina

This species is found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. It grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils. Targeted searches for this species were undertaken at KPs 719-721 and 724 and did not reveal any individuals. A number of records of this species occur around the Maitland area to the north of the proposed pipeline corridor. Given the location of these records and the presence of suitable habitat within the proposed pipeline corridor the presence of this species within impacted areas cannot be ruled out. B55 of the statement of Commitments should be applied to areas of suitable habitat around and north of Maitland.

Diuris tricolor, the Pine Donkey orchid population in the Muswellbrook LGA

The Muswellbrook local government area (LGA) population of *Diuris tricolour* comprises the large-flowered form of the species. The area of occupancy of the population is less than 50 km^2. Therefore, the geographic distribution of the population is estimated to be highly restricted. Targeted searches for this species were undertaken and no individuals were recorded during the surveys. This species has been recorded at five locations within the Muswellbrook LGA, all to the south of Muswellbrook. Given the restricted nature of this population and the distance from the proposed pipeline corridor it is considered unlikely that this population would occur or be impacted by the proposal.

Cymbidium canaliculatum (commonly known as the black tiger orchid or black orchid) population in the Hunter Catchment

Within the Hunter Catchment, *C. canaliculatum* is most commonly found in *Eucalyptus albens* (white box)-dominated woodlands, usually occurring singly or as a single clump. It has been found, less commonly, to grow on *E. dawsonii* (slaty box), *E. crebra* (narrow-leaved ironbark), *E. moluccana* (grey box), *Angophora floribunda* (rough-barked apple), *Acacia salicina* (cooba) and on some other species. Targeted searches for this species within the Hunter catchment area were undertaken during the surveys. No individuals of this species were recorded within the Hunter catchment, however, the species was recorded at two locations on the Barwon River and just south at Gnoura Gnoura Creek. Records of this species within the Hunter Catchment are restricted to the northern area and are predominately from rocky sites where *Eucalyptus albens* is more prevalent. Thus it is unlikely that this species would occur within the proposed corridor as the pipeline runs predominately within low-lying areas.

Eucalyptus camaldulensis, River Red Gum population in the Hunter Catchment

This species may occur with *Eucalyptus tereticornis, Eucalyptus melliodora, Casuarina cunninghamiana subsp. cunninghamiana* and *Angophora floribunda* within the Hunter Catchment. Targeted searches for this species were undertaken within areas of suitable habitat along the proposed pipeline corridor. No individuals were recorded at the survey locations. All known records for this species within the hunter Catchment occur to the west of the proposed pipeline route and thus it is considered unlikely that this population would be present within the corridor.

3.1.4 Disturbance and Weeds

The majority of the pipeline route runs through previously disturbed land such as agricultural areas, road margins and rail corridors. A large number of weeds were recorded along the entire route with no flora survey site being totally free of exotic species. In total nine noxious weeds as listed under the Noxious Weeds Act 1993 were recorded at flora survey locations along the proposed pipeline corridor. Details of these weeds along with location they were recorded and their class rating within the relevant LGA area are summarised in **Table 3-2.**

Noxious weeds within the proposed pipeline corridor would be managed in accordance with the weed management measures developed as part of the CEMP (refer to Statement of Commitment B5-B7)

Table 3-2: Location and description of noxious weeds recorded at survey locations along the proposed pipeline corridor

Noxious Weed Species	Ecology	Distribution along Route	*Class
Lantana *(Lantana camara)*	Originally native to the tropical regions of the Americas and Africa, lantana forms dense, impenetrable thickets that take over native bush land and pastures along the east coast of Australia. There are two main forms of lantana in Australia: a cultivated form planted in gardens and a weedy variety found in bushland and pastures. The cultivated form of lantana is non-thorny, produces few seeds and is compact in shape. The weedy form is a prolific seeder with straggly, thorny stems. Both forms include many varieties, which differ from each other in shape, flower colour, prickliness, response to enemies and toxicity. Weedy lantana is a much branched, thicket-forming shrub, 2–4 m tall. The woody stems are square in cross-section and hairy when young but become cylindrical and up to 150 mm thick with age. This weed competes for resources with, and reduces the productivity of, pastures and forestry plantations. It adds fuel to fires and is toxic to stock. The spread of lantana is aided by the characteristic of their leaves, with their fruit being a delicacy for many bird species including the Superb Fairy Wren, this contributes to the spread of the weed.	This species was recorded within an area of woodland in the pipeline corridor at KPs 768-769 (Singleton LGA) Lantana was also recorded in areas adjacent to the pipeline corridor at KPs 790-791 (Maitland LGA) and KP 820-821 (Port Stephens LGA)	Class 5 (All of NSW)
Blackberry *(Rubus fruticosus)*	Blackberry is a perennial, semi-deciduous shrub with prickly stems (canes) that take root where they touch the ground, often forming thickets up to several metres high. It varies from sprawling to almost erect. The stems, which grow up to 7 m long, may be green, purplish or red, and are generally thorny and moderately hairy. The berries change colour from green to red to black as they ripen. The plant is semi-deciduous and sheds its leaves in winter. Blackberry has invaded the banks of watercourses, roadsides, pastures, orchards, plantations, forests and bushland throughout temperate Australia. On farming areas, the weed reduces pasture production, restricts access to water and provides shelter for pest species such as foxes.	Blackberry was recorded at a number of locations along the pipeline within the Maitland LGA.	Class 4 (All of NSW)
Crofton Weed *(Ageratina adenophora)*	A member of the Asteraceae or daisy family, Crofton weed is a native of Mexico. It is a rapid-spreading weed that has become a nuisance in many areas along the eastern coast of Australia. It is particularly invasive on cleared land that is not grazed, such as public reserves. Crofton weed is an erect, perennial shrub with numerous chocolate-brown woody stems emanating from an underground crown and reaching a height of 1–2 m. It has broad, slightly crinkled, trowel-shaped, toothed leaves with chocolate-coloured petioles. It produces white flowers in spring.	Crofton was recorded along the pipeline corridor within the Maitland LGA.	Class 4 (Maitland LGA)
African Boxthorn	African boxthorn is an aggressive invader of pastures, roadsides, railway reserves, remnant bushland and waterways. It forms an impenetrable, spiny thicket that inhibits the movement of stock and provides a haven for feral animals. It was introduced into Australia from South Africa in the mid 1800s and was	African boxthorn was recorded at the following sites:	Class 4 (All LGAs along the

Noxious Weed Species	Ecology	Distribution along Route	*Class
(Lycium ferocissimum)	commonly used as a hedge plant. African boxthorn is an erect perennial shrub. It can grow up to 5 m high and 3 m across but usually reaches only 2 or 3 m in height. It is characterised by its woody, thorny growth. The stems are rigid and very branched, and the main stems have spines up to 15 cm long. The plant has an extensive, deep, branched taproot that will sucker and produce new growth if broken. Early root growth is rapid to allow seedlings to compete with other plants.	KP356-357, KP 392, KP491-492, KP501.8, KP505.4, KP 528.4	proposed corridor)
Willow *(Salix species)*	Willows are deciduous trees or shrubs. They have small seeds with long, silky hairs attached to one end like a parachute, which help them spread. The seeds are usually short-lived, from days to a few weeks. Most species of willow are Weeds of National Significance. They are among the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts. They have invaded riverbanks and wetlands in temperate Australia, occupying thousands of kilometres of streams and numerous wetland areas. Unlike most other vegetation, willows spread their roots into the bed of a watercourse, slowing the flow of water and reducing aeration. They form thickets which divert water outside the main watercourse or channel, causing flooding and erosion where the creek banks are vulnerable.	Two species of Salix (*S. flagilus and S. alba*) were recorded along creekline crossings of the proposed route within the Maitland LGA.	Class 5 (All of NSW, excluding *S. babylonica*)
Prickly Pear *(Opuntia stricta)*	The species occurs naturally in the United States as well as Mexico, West Indies and Central America. It has been introduced to Australia where it has become an invasive weed. They quickly became a widespread invasive weed, rendering 40,000 km² of farming land unproductive. An erect shrub to 1 m (rarely to 2 m) high. True leaves are shed early and stem segments are often incorrectly referred to as leaves. Lower segments may be thickened and trunk-forming on older plants while flattened upper segments are up to 40 cm long and up to 25 cm wide. Fruit are egg-shaped with a depressed top, purple when ripe and edible. Seeds pale brown, to 5 mm long. Prickly Pear was the major weed problem in large areas of northern NSW and central Queensland in the early 1900s. This cactus is now found over a larger area but is rarely a problem. During the 1920s and 1930s various biological control agents were released for its control. Two of these, Cactoblastis *Cactoblastis cactorum* and a cochineal, *Dactylopius opuntiae*, control this cactus in most areas.	Prickly pear was recorded at one location within a TSR area adjacent to the proposed pipeline corridor at KP 454 (Narrabri LGA).	Class 4 (All of NSW)
Mother of Millions (*Bryophyllum delagoense*)	Mother of millions (*Bryophyllum delagoense*) is a native of Africa and Madagascar and was introduced to Australia as a garden plant. It is a serious weed on the coast and the northwest slopes and plains of NSW and is consequently a declared noxious weed in these areas. Its ability to reproduce vegetatively in large numbers makes Mother of millions hard to eradicate and follow up controls are necessary. Mother of millions is a succulent perennial plant growing 30 cm to 1 m in height. Distinguished by erect cylindrical stems; simple, almost cylindrical, pale green to pale brown leaves with dark green patches and a shallow	Mother of millions was recorded as the dominant understorey species at one location within a TSR area adjacent to the proposed	Class 4 (Narrabri LGA)

Noxious Weed Species	Ecology	Distribution along Route	*Class
	groove on the upper surface, often with plantlets produced towards the apex, and drooping tubular flowers. Mother-of-Millions forms colonies on roadsides and vacant land. It is a garden escapee. Plants, particularly flowers, are poisonous to stock.	pipeline corridor at KP 454 (Narrabri LGA).	
Patterson's Curse *(Echium plantagineum)*	Paterson's curse, also known as salvation Jane, is a major weed in winter pastures throughout southern Australia and can be a problem in areas of natural vegetation. The weed is native to Mediterranean Europe and northern Africa. It was both accidentally and deliberately introduced to Australia in the 1850s and by 1890 it was showing potential as a major weed. Erect annual herb to 60 (rarely to 150) cm high. Stems one to several. Stems and leaves hairy with coarse hairs and sometimes shorter soft hairs. Leaves oval to lanceolate; basal leaves, in a rosette, to 20 (rarely to 30) cm long, with a short stalk; stem leaves reducing in size towards flowers. Distinguished by leaves with spreading hairs having an enlarged base; flowers in caterpillar-like curved spikes; funnel-shaped flowers, usually purple but also blue or pink, less often white.	Patterson's Curse was recorded within the pipeline corridor at the following survey locations: KP420, KP423.8, KP476.8-477, KP481, KP626 It is likely that this species is present at a number of locations within and adjacent to the proposed pipeline corridor.	Class 4 (Maitland, Moree, Liverpool Plains, Muswellbrook, Singleton, Newcastle, Upper Hunter and Port Stephens LGAs)
Oxalis (*Oxalis spp.*)	Of the thirty species of *Oxalis* in Australia, twenty are naturalised and many are existing or potential serious pests in various parts of the country. The species originates from South Africa and South America. Oxalis is a forb which is often succulent with an acid taste, the leaves of 3 leaflets at the end of a ling stalk; flowers with 5 overlapping petals, at the end of a long flower stalk; fruit capsule.	This species was recorded within the pipeline corridor within the Maitland LGA.	Class 5 (All of NSW)

Class Categories

Class 1 noxious weeds are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.

Class 2 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.

Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.

Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

Class 5 noxious weeds are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

3.1.5 Flora Constraint Areas and Proposed Mitigation

Constraint areas are illustrated on **Figures 3-1 to 3-35.** **Table 3-3** provides a summary of all the flora constraint areas and the relevant measure used to manage the constraint. Wherever feasible these constraint areas were avoided as a first option and the Right of Way (ROW) realigned. Where avoidance was not possible mitigation is recommended. The mitigation suggested has been used to guide the development of the Statement of Commitments outlined in the Submissions Report. It is expected that successful implementation of these mitigations will ensure that significant impacts to biodiversity values will be avoided.

Table 3-3: Summary of constraint areas and proposed mitigation.

Rev K KP	CONSTRAINT	Mitigation
222.5–222.8	Coolibah Black Box woodland EEC (TSC)	The Right of Way (ROW) would be minimised to 20m wide and constructed to ensure no net loss of mature trees. No hollow bearing trees would be removed. All coarse woody debris and other habitat features (terrestrial and aquatic) would be reinstated. The ROW would be aligned adjacent to complimentary infrastructure to ensure minimal impacts on native vegetation and habitat relative to approved projects, such as roads at that location.
225.2-226 236.2- 236.4 238.2-238.4	*Dichanthium* spp. Dominant grasslands of the Brigalow belt Bioregions (EPBC)	ROW realigned (See Rev L)
227.7-228.2 238.4-240	Adjacent to *Dichanthium* spp. grasslands	The construction period would be minimised and grass would be turfed to 100mm depth, stored and kept moist (Sods would not be stacked). Sods would be reinstated in rehabilitation phase. Clearing of any mature trees would be avoided.
233-235	*Dichanthium* spp. Dominant grasslands of the Brigalow belt Bioregions (EPBC) Coolibah Black Box woodland EEC (TSC Act)	ROW realigned to avoid (See Rev L)
250.9-251.2	Coolibah Black Box EEC (TSC Act)	The ROW would be minimised to a maximum width of 20m and clearing of mature trees would be avoided.
254-256	Coolibah Black Box woodland EEC (TSC Act)	The ROW would be minimised to a maximum width of 20m and clearing of mature trees would be avoided.
276-276.5	Myall woodland EEC	The ROW has been realigned to avoid good quality vegetation. The ROW has been shifted to the TSR, however it will remain in the cleared existing road easement within the TSR (see Rev L).
306.8- 308 (B2B	Myall Woodland EEC within TSR	No clearing of native vegetation would be required for the existing ROW.
317-318	Coolibah Black Box EEC	The ROW would be minimised to a maximum of 20m width and

Rev K KP	CONSTRAINT	Mitigation
		would avoid clearing mature native trees in dry creek-bed.
356-357	Coolibah Black Box EEC	The ROW would be minimised to a maximum width of 20m and would be positioned to avoid clearing mature trees, particularly hollow bearing River Red gums.
411.8-412.3	Myall Woodland EEC	The ROW would be minimised to a maximum width of 20m and would avoid all mature vegetation.
583-586	White Box Yellow Box Blakeley's Red Gum Grassy Woodland and derived Grassland with exotic ground-cover (TSC Act)	The ROW would be minimised to a maximum width of 20m and would be positioned to avoid clearing mature trees.
604-605.3	White Box Yellow Box Blakeley's Red Gum Grassy Woodland and derived Grassland with exotic ground-cover. TSC Act	The ROW would be minimised to a maximum width of 20m and would be positioned to avoid clearing mature trees.
625.5-626.5	Box Gum Woodland EEC (TSC and EPBC)	The ROW only just touches on edge of this vegetation type. The ROW would be minimised to a maximum width of 20m and would be positioned to avoid clearing mature trees. All disturbed areas would be revegetated with local provenance native grass and understorey species indicative of this community type.
639-642.8	White Box Yellow Box Blakeley's Red Gum Grassy Woodland and derived Grassland with exotic ground-cover (TSC Act)	The ROW would be minimised to a maximum width of 20m and would be positioned to avoid clearing mature trees.
642.8-644	Box Gum Woodland EEC (TSC and EPBC)	The ROW has been realigned to avoid this community (See Rev L)
790 - 791	Lower Hunter Spotted Gum Ironbark Forest EEC	There is an existing track which the ROW would follow and no mature trees would be removed.
819.5-820	Patches of Swamp Oak Floodplain Forest EEC	The ROW would remain as much as possible in the powerline easement to minimise vegetation clearing. The corner of vegetation at KP 820 would be completely avoided and the ROW would remain in the powerline easement.
820-821.3	Patches of River Flat Eucalypt Forest on Coastal flood plain EEC Patches of Swamp Oak	The ROW would be in the cleared areas as close as possible to the electrical easement to KP821. From KP821 to 822 the Hunter River the crossing would be by Horizontal Directional Drilling (HDD). There is a patch of Swamp Sclerophyll Forest ECC at KP821 south of Tomago Road. The pad required for HDD would not be located

Rev K KP	CONSTRAINT	Mitigation
	Floodplain Forest EEC Patches of Swamp Sclerophyll Forest EEC Patches of Mangrove-Estuarine Complex EEC	within this EEC and should clearing be required the ROW would be minimised and all mature trees would be retained. The patch of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW north coast EEC from KP821 to 821.3 would be avoided by the use of the HDD for the crossing of the Hunter River. The stand of *Grevillea parviflora* subsp. *parviflora* is located on the western side and outside of the ROW just north of KP 820 and care would be taken to ensure that the population is not accidentally harmed by parking of vehicles or storage of materials. The entire population would be protected by a temporary fence during clearing, excavation and filling.
821.5-827	Mangrove-Estuarine Complex & Coastal Saltmarsh EEC	The ROW would remain in the existing cleared access tracks and dyke. The method of waterway crossings would be undertaken in consultation with CMA, DECC (Parks and Wildlife) and DPI.

The following list contains threatened flora species have been identified with a potential of occurring in the pipeline corridor, while not being located despite targeted searches. Given that the survey was undertaken over a relatively short period of time and that access to some areas was not possible there is potential for the occurrence of any of these species and further targeted searches are proposed prior to construction as detailed below:

- *Sida rohlenae* Undertake further targeted searches between KPs 333.8 and 348.8.
- Digitaria porrecta – survey occurred outside of the flowering period therefore searches in suitable habitat should be undertaken between KP 447-451, KP 466-468 and KP602-603.
- *Zannichellia palustris* undertake targeted searches between KP 823-827.
- *Bothriochloa biloba* undertake targeted searches in areas of box-gum woodland.
- *Rhizanthella slateri* this species is very cryptic and little is known of its distribution or habitat requirements therefore targeted searches should be undertaken during excavation to gain more knowledge on this species.
- *Lepidium monoplocoides* – undertake targeted searches in suitable habitat between Moree and Narrabri.
- *Dichanthium setosum* undertake targeted searches in areas suitable habitat with heavy black soils from KP 222-535
- *Diuris tricolor* undertake targeted searches in suitable habitat between Musswellbrook and Cessnock (Approximately KP721-765)
- *Swainsona murrayana* undertake targeted searches in suitable habitat between KPs 333.8 and 348.8.
- *Eucalyptus parramattensis subsp. Decadens* – undertake targeted searches between KPs 806-833.
- *Homopholis belsonii* –undertake targeted searches in suitable habitat in areas of belah woodland (from the Queensland Border to Moree).
- *Cyperus conicus* – undertake targeted searches within areas of Pilliga scrub north east of Narrabri.

3.2 FAUNA SURVEY RESULTS

This section discusses the outcomes of the field work targeting the identified constraints relating to threatened fauna and known or potential habitat for threatened fauna. Potential impacts to threatened species and species specific mitigation designed and proposed to reduce such impacts are outlined in **Sections 3.5 and 4.**

Appendix C lists all fauna species recorded along the pipeline route over the two week survey period. Locations of threatened species are shown on **Figures 3-1 to 3-35.**

3.2.1 Birds

One hundred and eighty bird species were recorded along the pipeline route over the survey period. Seven of these were threatened species listed as vulnerable on the TSC Act. None of these species are listed as threatened on the schedules of the EPBC Act.

Listed Migratory Species

Thirty-two species listed as Migratory on the schedules of the EPBC Act, and various international treaties and conventions were recorded along the route. The majority of these species are not truly migratory in that they do not undertake large scale annual migrations to range states outside of Australia. The schedules of the EPBC Act are based on schedules of the Bonn Convention which lists entire bird families. Some species belonging to those families that occur in Australia are not migratory, but nonetheless are captured in the schedules. For example, all species in the family Anatidae (ducks), Accipitridae (birds of prey) and Falconidae (Falcons) are listed as migratory but Australian species of these families are not migratory in the sense of international conventions.

Rainbow Beeater (Meropidae) and Rufous Fantail (Muscicapidae) are terrestrial migratory species whose families are listed on the Bonn Convention and therefore on the EPBC Act.

Banded Stilt, Black-winged Stilt, Black fronted Dotterel and Masked Lapwing are migratory waders protected by the EPBC, the Ramsar Convention and the Bonn Convention, JAMBA, CAMBA and ROKAMBA. Banded Stilt, Black-winged Stilt, Black fronted Dotterel rely on wetland habitats and were largely recorded in the southern section of the route associated with Kooragang wetlands or isolated wetlands in a cleared landscape. The Kooragang wetlands and Ramsar site are internationally recognised as important wetlands providing habitats for both resident and migratory birds. Approximately 200 bird species have been recorded using the wetlands since 1980. This matter is being addressed in an EPBC referral to the Commonwealth Environment Minister and specific mitigation measures have been put in place to prevent any damage to the wetlands and species dependent on them, including changes to water quality, as a result of the project.

Threatened Bird Species

A brief description of the location of each of the threatened species is provided below and locations of observations are shown in **Figures 3-1 to 3-35**.

Table 3-4: Threatened Bird species recorded along the Gas Pipeline route.

Common name	Species	TSC Act Status
Turquoise Parrot	*Neophema pulchella*	V
Brown Treecreeper	*Climacteris picumnus*	V
Speckled Warbler	*Pyrrholaemus saggitatus*	V
Pied Honeyeater	*Certhionyx variegatus*	V

Common name	Species	TSC Act Status
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	V
Diamond Firetail	*Stagonopleura guttata*	V
Masked Owl	*Tyto novaehollandiae*	V

Grey crowned Babbler

Grey-crowned Babblers were observed at seven locations along the pipeline route, particularly in the sections between KP 303 to 455 and KP 640 to 664. Group sizes observed ranged from 3 to 8 individuals. Juveniles and nests of the species were observed at several locations confirming that the species is breeding in the area. The Grey-crowned Babbler nests from July to December.

Brown Tree Creeper

Three individuals of this species were observed at KP 640.4. Important habitat components for this species are hollow bearing trees for nesting and ground layer microhabitat complexity for foraging on insects.

Pied Honeyeater

This species was recorded at KPs 240.5 and 365. This species is highly nomadic and follows flowering of shrub species.

Diamond Firetail

The Diamond Firetail It was recorded at KP 454.9 within remnant bushland of the TSR and KP 640.4. This species is found in grassy Eucalypt woodland and is often associated with box-gum and snow gum woodlands.

Speckled Warbler

Speckled Warblers were observed at KP 455 within remnant bushland of the TSR. Another observation was made at KP 769.2 in an area dominated by regrowth, acacia and eucalypts. This species is mostly found in relatively large undisturbed remnant vegetation. It feeds predominantly on the ground on insects and seeds.

Turquoise Parrot

Observations of Turquoise Parrots were made at KP 235 near the Boomi River where hollow bearing River Red Gums may provide nesting habitat. They were also recorded at KP 289.8 where the Gil Gil Creek riparian vegetation may also provide nesting habitat. Turquoise Parrots were also recorded at KP 365 in a largely cleared landscape with some Casuarina woodland on roadside of approx 5m wide on either side of the road. The species forages on the ground feeding on the seeds of grasses and herbaceous plants in grassy woodlands. It nests August to December.

Masked Owl

A Masked Owl was recorded at KP 455 in the TSR in response to call playback. Another two potential Masked Owl responses were heard at KP 333 and 339.7. Masked Owls utilise a very large home range so it is possible all three individuals utilise habitat along the pipeline route. The species utilises hollows for nesting so a precautionary approach has been taken to protecting nesting habitat for this species along the route.

Magpie Goose

Magpie Geese were observed utilising River Red Gums on the Meehi River west of where the route could cross the river. However they are likely to utilise similar habitat along the route. The species utilises tall trees over water for roosting and nesting.

3.2.2 Mammals

Forty species of mammals were recorded from field survey; 31 native and nine introduced species. This included eight (8) threatened species; the Koala, listed as vulnerable on the TSC Act, and 7 species of threatened microchiropteran bats listed on the TSC Act and 1 on the EPBC Act.

Microchiropteran Bats

Seven species of threatened Microchiropteran bats were detected at various sites along the route where Anabat detectors had been placed (3 species at KP235 2 species at KP365 and 2 species at 455) (**Table 3-5**). These are all listed as Vulnerable on the TSC Act. In addition, *Chalinolobus dwyeri* is listed as Vulnerable on the EPBC Act. Anabat surveys targeted likely flyway and foraging locations such as creeks and forest tracks. Actual locations of records are shown on **Figures 3-1 to 3-35** and listed in **Appendix C.** Microchiropteran bats forage mainly on insects and rely on hollow bearing trees for roosting habitat. In addition to riparian vegetation and remnant woodland, isolated paddock trees can be important as bat habitat.

Table 3-5: Threatened bat species recorded.

Common Name	*Species*	*TSC Act*	*EPBC Act*
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	*V*	
Beccari's Freetail Bat	*Mormopterus beccarii*	*V*	
Large-eared Pied Bat	*Chalinolobus dwyeri*	*V*	*V*
Little Pied Bat	*Chalinolobus picatus*	*V*	
Little Bentwing Bat	*Miniopterus australis*	*V*	
Eastern Bentwing Bat	*Miniopterus schreibersii oceanensis*	*V*	
Large-footed Myotis	*Myotis adversus*	*V*	

Koala (TSC Act Vulnerable)

In NSW Koalas mainly occur on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the north coast and ranges. It inhabits eucalypt woodlands and forests. Koalas feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.

Koalas were recorded from four locations: KP 455 (in the TSR), 505, 528.5 and 557. In addition, suitable habitat was recorded in the form of favoured food trees such as River Red Gums.

Squirrel Glider (TSC Act Vulnerable)

Squirrel Gliders are found in dry sclerophyll woodland, preferring dense, white-barked eucalyptus country (Klippel 1992) and is generally absent from closed forest (Menkhorst *et al*., 1988). A mix of eucalypts, banksias and acacias including some winter flowering species and abundant hollows are required by this species. Fragmentation, predation by foxes and cats and inappropriate fire regimes are listed as threats to this species.

This species was not recorded during the fauna survey. It may occur along the route in suitable habitat, and there are known records at the Lateral near Rutherford. A precautionary approach has been taken to the potential presence of the species and mitigation measures such as retaining hollow bearing trees will minimise the loss of Squirrel Glider habitat.

Stripe-faced Dunnart (TSC Act Vulnerable)

This species is most commonly encountered along inland watercourses and other drainage features amongst native grasslands and low chenopod shrublands on clay, sandy or stony soils. They are known to shelter in cracks in the soil, beneath rocks and logs and within grass tussocks.

Suitable habitat for this species was recorded along the route however no individuals were captured. Not all areas supporting suitable habitat were trapped during survey due to survey limitations. It is possible the species occurs in habitats along the route and mitigation measures have been put in place to ensure potential impacts to the species are minimised.

3.2.3 Reptiles

Thirty-nine species of reptile were recorded during the survey period. This included a diverse range of species groups such as dragons, snakes, skinks, worm skinks, geckos, monitors and a turtle. One threatened species, the Five-clawed Worm Skink was recorded and habitat with high potential for the Pale-headed snake (TSC Act Vulnerable) was identified.

Five-clawed Worm-skink

The Five-clawed Worm-skink, *Anomalopus mackayi*, is listed as endangered on the TSC Act and Vulnerable on the EPBC Act. The species was recorded at a single location along the route at within Myall Woodland EEC KP 391.8 east of the township of Bellata on the on Myall Hollow Creek. It was located under fallen timber during active hand searches and the identification was confirmed by herpetologists with experience in the identification of *Anomalopus* species. Additional searches within seemingly suitable habitat within the proposal corridor, and in other areas in the locality, failed to reveal further individuals. However, suitable habitat with high potential for supporting the species was identified at KP226 and 231 in the form of native grasslands on black cracking soils. Mitigation measures for the species are outlined in **Section 3.5** and **Section 4.**

Occurring in a small area of north-eastern NSW and south-eastern Qld, it is primarily an inhabitant, in NSW, of open woodland with moist black soil, scattered eucalypts and cropped grass cover (Swan *et al* 2004). In Qld it inhabits open grasslands on heavy cracking soil in the Darling Downs where it is normally found in soil under dead grass, and is largely confined to relict roadside verges (Wilson 2005). There have however been some exceptions. A single specimen north of Oakey, Qld was found under a railway sleeper on sandy soil (S. Wilson in Cogger *et al* 1993) and a specimen in NSW was taken in largely cleared woodland near granite outcrops (Shea *et al* 1987). Shea *et al* (1987) identify three features that suggest *A. mackayi* is rare and probably endangered. Very little natural vegetation remains within its known range; the majority of specimens were collected more than 40 years ago with more recent searches in the same areas unsuccessful; and the very similar *Anomalopus leuckartii* is generally common and readily found where it occurs, even in degraded habitat. Potential threats to *Anomalopus mackayi* include clearing and fragmentation of habitat, disturbance of soil structure and invasion of weeds (DECC 2008c).

Pale headed snake

The pale-headed snake has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. It is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. It also favours streamside areas, particularly in drier habitats. Known records occur near Gunnedah.

This species was not recorded during surveys but suitable habitat was identified at KP 222 to 224 and 333. The species prefers streamside areas and shelters in loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.

3.2.4 Amphibians

Fourteen amphibian species were recorded including the threatened Green and Golden Bell Frog (*Litoria aurea*). The species is listed as Vulnerable on the EPBC Act and Endangered on the TSC Act.

The Green and Golden Bell Frog (*Litoria aurea*) formerly had a wide distribution across NSW with historical records extending along the coastline and inland to Bathurst, Tumut and the ACT (DECC 2008c, d). However, since the 1970s, populations have undergone a widespread contraction (Hamer *et al.* 2002) and it is considered that the species is now absent from at least 90% of its former distribution (DECC 2005). Populations are now widely separated and many are regarded as isolated from each other (DECC 2005, 2008c). The habitat requirements of *Litoria aurea* is variable, however, Pyke & White (1996) define several attributes considered necessary to support populations. These include grassy areas nearby to water bodies that have a sandy or rocky substrate. Water bodies should be still, shallow, ephemeral and unpolluted with aquatic plants such as *Typha sp*. present, and should also be unshaded and free of *Gambusia* and other predatory fish (Pyke and White 1996).

Litoria aurea generally breeds between September and February with peak breeding associated with heavy summer rain events.

Litoria aurea display a wide variation in spatial and temporal dynamics of habitat use. However, recent studies of the Kooragang population provide detail specific to this population (Hamer *et al.* 2002, 2008). A large number (779) of individuals were the subject of a mark-recapture study across two breeding seasons, with 29% of males and 18% of females being recaptured in the same permanent waterbody (adjacent to the proposal). As many as 50% of the movements of this population were to another permanent waterbody within 50 m, however, males moved greater than 200m to ephemeral waterbodies after heavy rains. The study highlighted high site fidelity to individual and groups of neighbouring waterbodies, especially those of a permanent nature (Hamer *et al.* 2008).

Surveys of the Hunter floodplain revealed potential habitat of varying quality for *Litoria aurea* between KP822 and KP827. Summer breeding habitat was more dominant south of the proposal between KP824.2 and KP827, while habitat suitable for winter refuge was located directly north of this easement, separated by an existing track built up above the surrounding wetlands. Potential summer breeding areas were also located adjacent to the proposal between KP823 and KP824. During the surveys, *Litoria aurea* was identified between KP824 and KP826 with numerous individuals heard calling. There are existing records of this species near KP825.5 from previous survey work in the area. Hamer *et al.* (2002, 2008) provide similar accounts of the spatial distribution of *Litoria aurea* in this area.

3.3 FAUNA HABITATS

A diverse range of habitats was recorded along the pipeline route including woodlands, grasslands, riparian vegetation, wetlands, mangroves and salt marsh. Within these habitats, microhabitats such as hollow bearing trees and fallen timber provide important breeding, roosting and foraging habitat, particularly for birds, bats and arboreal mammals but also for some reptile species. The decorticating bark of woodland trees is the preferred roosting habitat of some bats. Wetlands, particularly in the southern end of the route support large numbers of wetland birds, as well as threatened amphibians.

An overview description of bioregions along the pipeline route was provided in the Biodiversity Assessment for the Concept EA (**ngh**environmental September 2008).

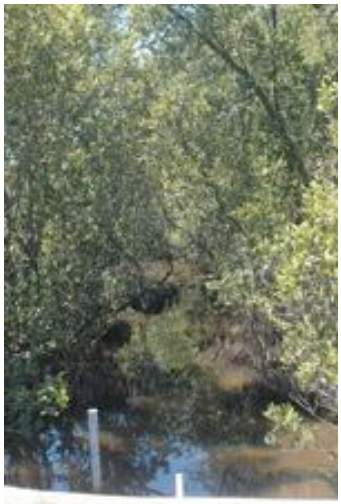
Photographs below demonstrate typical habitats observed along the pipeline route, as described above. Project specific mitigation measures have been designed to protect important habits for threatened species.

Photographs of typical fauna habitat types

Hollow bearing tree habitat

Grassland habitat

Woodland habitat



Mangrove habitat

Riparian vegetation

Saltmarsh

3.4 POTENTIAL IMPACTS TO FAUNA

The proposal has the potential to have a range of direct and indirect impacts on native fauna and their habitats.

Direct impacts include:

- vegetation clearance or modification, and
- loss of fauna habitat (foraging and breeding).

Indirect impacts have the potential to occur both along the route and in the locality of the route such as:

- fragmentation of habitat and loss of regional connectivity (dispersal)
- weed invasion
- increase in predation by non-native species
- increased noise and dust levels during construction
- change in hydrology
- changes in water quality
- microhabitat changes, and

Potential impacts will vary depending on the species and their degree of dependence on the subject site for habitat. Given the narrow (30 m) linear nature of direct impact, a substantial extent of any given species habitat is unlikely to be directly or indirectly affected. Species and habitat specific mitigation measures have been designed to ensure impacts to threatened fauna and their habitat are absolutely minimised. Mitigation of habitat related impacts been addressed via a precautionary approach, which has been adopted where potential threatened species habitat exists, regardless of known records of threatened species.

A more detailed consideration of impact significance is provided in **Section 3.6** and species and habitat mitigation is outlined in **Section 3.5**

3.4.1 Key threatening processes

The following Key threatening process listed on state and commonwealth legislation are relevant to the project. Potential impacts on threatened species and associated mitigation measures are addressed in following sections. None of these threatening processes will be exacerbated by the proposal to the extent that they cause a significant impact on a threatened species.

Table 3-6: Key Threatening Processes and relevant mitigation measures

Listings	Threatening Process	Mitigation
State	Bushrock removal	All habitat features including bush rock will be reinstated when construction is complete.
State and Commonwealth	Biological effects, including lethal toxic ingestion, caused by Cane Toads (*Bufo marinus*)	A procedure will be developed in line with the DECC (2007) publication "Stop the toad, check your load" to ensure that Cane Toads (*Bufo marinus*) are not transported away from known infestation areas by construction plant or equipment.
State and Commonwealth	Land clearance	The alignment has been specifically designed to avoid native vegetation where ever feasible. Where the pipeline could not avoid native vegetation the ROW has been reduced to a minimum width and mature trees are being avoided wherever possible. In certain areas revegetation with local provenance native species is proposed.
State and Commonwealth	Infection of frogs by amphibian chytrid causing disease chytridiomycosis	Clear instructions on the management of the area between KP822 and KP826 would follow those within the protocols developed by NPWS to manage chytrid (NPWS 2001). The onsite hygiene protocols set out for persons, vehicles and equipment must be adopted within the *Litoria aurea* management plan and compliance by all persons entering and leaving each site must be administered.
State and Commonwealth	Infection of native plants by *Phytophthora cinnamomi*	Management measures will be developed and implemented to minimise the spread of Cinnamon Fungus and will include a risk assessment to determine areas of the ROW where risk of the disease may be high. Liaison will occur with DECC and other relevant government agencies in order to ensure that management measures include current available initiatives relating to hygiene, and chemical or other control mechanisms.
State	Invasion of native plant communities by exotic perennial grasses Invasion on Native Plant communities by Bitou Bush *Lantana camara*	A weed management plan or protocol will be developed and included in the CEMP. The plan will consider the findings of the field assessment as detailed in **Table 3-2**. The plan or procedure will include hygiene protocols to reduce the risk of spreading weeds. Excavated material that contains weeds and weed seeds or propagules will not be stored near waterways or areas of native vegetation. Noxious weed management will occur for at least two years post construction.
State	Loss of hollow-bearing trees	The initial biodiversity assessment (September 2008) coupled with the field survey has identified fauna movement corridors and areas containing bearing trees. Fauna movement corridors and areas of significance for biodiversity are displayed on Figures 3-1 to 3-35. Where these areas

Listings	Threatening Process	Mitigation
		could not be avoided through alignment changes, the ROW would be the minimum width feasible and be aligned to avoid clearance of hollow bearing trees. An ecologist would be onsite during all clearing operations and a two stage clearing process would be employed in all areas.
State	Removal of dead wood and dead trees	Logs dead trees and other habitat features features in identified sensitive woodland areas will be relocated from the area of clearing to provide habitat in adjacent areas where feasible and practical during construction. Habitat features will be reinstated within the ROW, following construction.

3.5 PROPOSED MITIGATION - FAUNA

The table below lists all threatened species recorded along the pipeline route and all habitat types encountered along the route and provides measures to manage impacts to these species or habitats. Where the commitment is applied to specific sites, the table in **Section 4** provides detail on the location.

Table 3-7: Threatened species mitigation measures

Threatened Species	Species Specific Mitigation
Grey-crowned Babbler	In order to minimise impact to known Grey-crowned Babbler nesting sites works would be undertaken outside of the breeding season wherever possible (July-December) and an ecologist would check the site for nests prior to any clearing. The nest surveys would be undertaken with enough lead time to accommodate minor ROW adjustments (including narrowing the ROW) required to avoid nests should active nest be found.
Brown Treecreeper Speckled Warbler Turquoise Parrot	The onsite ecologist would undertake pre clearing surveys to check for the presence of these species. Removal of Hollow Bearing Trees (HBT) would be avoided. It should be noted that in order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area will be likely to cause the tree to die. Coarse woody debris would be reinstated and the disturbed area would be revegetated with local provenance native grasses and ground covers.
Diamond Firetail	The onsite ecologist would undertake pre clearing surveys to check for the presence of this species. The ROW would be reduced to the minimum width and mature trees would be avoided. Coarse woody debris would be reinstated and the disturbed area would be revegetated with local provenance native grasses and ground covers.
Masked Owl	Removal of Hollow Bearing Trees (HBT) would be avoided. It should be noted that in order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area will be likely to cause the tree to die.

Threatened Species	Species Specific Mitigation
Koala	The onsite ecologist would undertake pre clearing surveys to check for the presence of this species. The ROW would be reduced to a minimum width in areas of known Koala habitat. As this occurs essentially at waterway crossing throughout the study area crossing points would be selected to minimise the extent of riparian vegetation clearing.
Microchiropteran Bats	Waterway crossing points will be selected to minimise the extent of riparian vegetation clearing and limited to the narrowest area practicable. The removal of mature vegetation would be avoided.
Green and Golden Bell Frog	Construction will occur entirely within the existing disturbed area associated with the access track that traverses through this known *Litoria aurea* habitat. Indirect impacts such as Chytrid contamination, disruption of breeding and movement will be controlled through construction timing and the preparation of a '*Litoria aurea* management plan'. Construction between KP822 and KP826 would only occur outside of the known breeding season of *Litoria aurea*. This confines any planning or construction activities between these KP's to between the 1st March and the 30th August inclusive. An experienced herpetologist will be onsite during the entire construction period between KP822 and KP826 to ensure construction activities comply with the management plan, which will include 24 hr monitoring of open trenches and holes to ensure any animals entrapped are quickly released. Clear instructions on the management of the area between KP822 and KP826 would follow those within the protocols developed by NPWS to manage chytrid (NPWS 2001). The onsite hygiene protocols set out for persons, vehicles and equipment must be adopted within the *Litoria aurea* management plan and compliance by all persons entering and leaving each site must be administered. A soil and water management plan (SWMP) for this area and the method of construction through green and golden bell frog habitat will be prepared with input from DPI, DECC (Parks and Wildlife), Hunter Rivers Catchment Management Authority (CMA) a specialist soil conservationist and a qualified ecologist. The SWMP would include requirements for water quality monitoring.
Five-clawed Worm-Skink	A qualified herpetologist capable of distinguishing between *A. mackayi* and closely related species will be present during the clear and grade process to inspect surface litter and top soil that is removed during the clear and grade process as well as during trench excavation. Within areas identified as potential habitat for this species, any open trenches must be checked by walking inside the trench, and not from above which normally occurs. Soil structure rehabilitation would occur in identified habitat for this species. This includes the re-construction of soil profile as was present prior to construction, and the rehabilitation of ground micro-habitats such as fallen timber and native grasses. Weed control is crucial in ensuring the