Appendix C

Ecological Assessment

AGL Energy in action®

EMM
EMGA Mitchell McLennan

C

EMGA Mitchell McLennan Pty Limited

Gloucester Gas Project
AGL Upstream Infrastructure Investments Pty Limited

Minor Pipeline Corridor Realignments

Ecological Assessment Report

November 2013

Alison Hunt and Associates Pty Ltd

TERRESTRIAL | MARINE | AQUATIC

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

APPENDICES

1 INTRODUCTION

1.1 Background

AGL Upstream Infrastructure Investments Pty Limited (AGL) has Commonwealth and State government approval to construct and operate the Gloucester Gas Project (GGP) in the Hunter region of NSW. One component of the GGP is an approximately 95 to 100 km long high pressure gas transmission pipeline from a central processing facility (CPF) at Stratford to a gas delivery station at Hexham. The approved GGP is described and assessed in detail in the AECOM (2009) Gloucester Gas Project Environmental Assessment, inclusive of a comprehensive ecological assessment.

AGL proposes to realign four sections of its proposed pipeline corridor and connect it into AGL's approved Newcastle Gas Storage Facility (NGSF) at Tomago, rather than the Hexham Delivery Station (HDS). End of pipeline facilities are proposed within a compound at the NGSF connection point, referred to as the Tomago Receiving Station (TRS). The proposed TRS facilities are similar to those previously assessed and approved for the HDS. The minor realignments are to further minimise vegetation clearing and other environmental impacts, achieve economic and efficiency benefits, and allow the connection with the NGSF.

EMGA Mitchell McLennan Pty Limited (EMM) has been engaged by AGL to prepare an Environmental Assessment (EA) of the proposed modification, including an Ecological Assessment by Alison Hunt & Associates Pty Ltd. This ecological assessment has been made in accordance with relevant guidelines and standards and with consideration to the relevant Director-General's requirements previously issued for the GGP. This report documents the assessment methodology and results, including comparison with results of the original AECOM (2009) assessment of the approved pipeline corridor alignment and HDS. It also identifies mitigation and management measures, including referencing commitments from the original AECOM (2009) EA and approval conditions, which will also be applied to the modified elements where relevant.

1.2 Overview of the proposed modification

The proposed modification is for four minor pipeline corridor realignments and connection to the NGSF via the TRS. The realigned sections are referred to as the Seaham, Brandy Hill and Tomago sections as follows:

- Seaham section (Figure 1) – an approximately 0.65 km long section of pipeline corridor at East Seaham, proposed to be straightened and realigned up to 100 m north, to be mostly within a cleared area within and adjacent to a TransGrid transmission line easement;
- Brandy Hill section (Figure 2) – an approximately 5 km long section of pipeline corridor near Brandy Hill, proposed to be straightened and realigned generally up to 335 m west. The proposed realignment is further from sensitive receptors at Brandy Hill;
- Millers Forest section (Figure 3) – an approximately 2.5 km long section of pipeline corridor at Millers Forest, proposed to be realigned around 50 m east, to avoid the recently constructed TransGrid transmission line; and

- Tomago section (Figure 4) – an approximately 6.5 km long section of the pipeline corridor's southern end, proposed to be realigned to connect with the NGSF at Tomago (rather than the HDS). The proposed realignment avoids a wetland area, reduces disturbance to acid sulfate soils and only involves one crossing of the Hunter River (rather than the two crossings approved). Consistent with the approved pipeline, the river crossing is proposed to be by horizontal directional drilling (HDD).

The realigned sections of pipeline corridor generally traverse rural and semi-rural landscapes and cleared utility and access track corridors. Consistent with the approved project, the pipeline includes road, waterway and drainage line crossings. There are rural and semi-rural residences in the surrounding area, however the realigned sections of pipeline corridor are further from most of the residences than the approved route. The pipeline culminates at the proposed TRS, at the NGSF, which is within an existing industrial area (Figure 4).

The proposed pipeline construction and operating activities are unchanged from those described in the AECOM (2009) EA for the original (approved) pipeline route. In summary, the pipeline will mostly be constructed by open trenching, though some sections will be by thrust boring or HDD. The Seaham section will include a main line valve (MLV) which will be the same as that approved and described in the AECOM (2009) EA. While the AECOM (2009) EA identified that an MLV would be required (anticipated to be approximately half way along the pipeline), and approved further detail on its potential location was not available at that stage. The current preferred location has since been identified to be within the Seaham section, within the 100 m wide area assessment area as part of this modification EA (Figure 1).

Disturbed areas will be rehabilitated consistent with the existing landuse after construction, with ongoing maintenance activities limited to an approximately 10 m wide easement above the buried pipeline. To allow flexibility in final siting and design of the pipeline, and consistent with the approach in the AECOM (2009) EA for the approved project, this assessment has generally considered a 100 m wide pipeline corridor. However, the disturbance footprint for construction will be within a right of way (ROW) up to around 30 m wide. Further details on the proposed modification are provided in the EA main report.

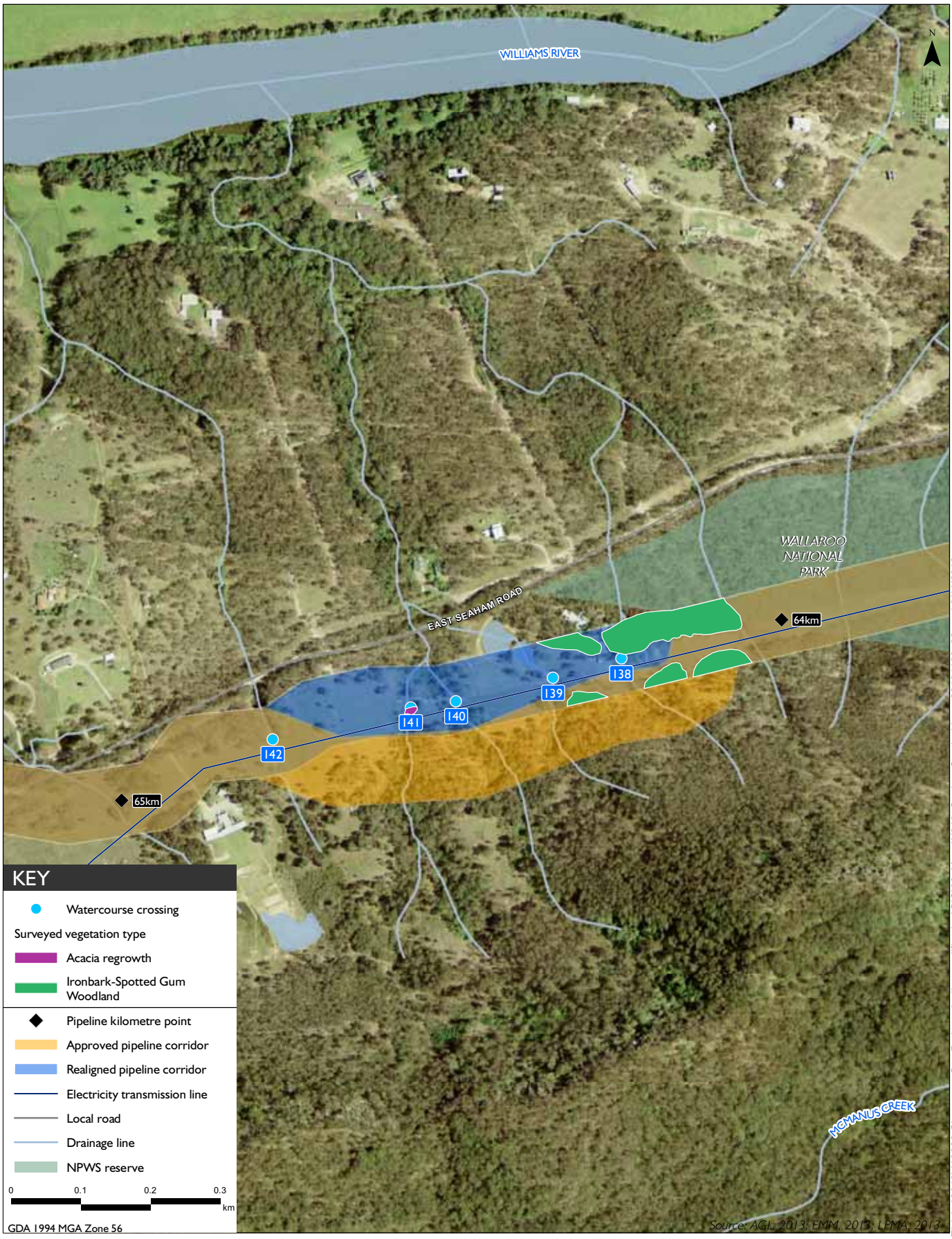
1.3 Aims

This study was undertaken to assess the potential for ecological impacts along the modified pipeline alignments at Seaham, Brandy Hill, Millers Forest and Tomago which have the potential to occur as a result of the minor change to the location of works associated with the construction and operation of the proposed modified pipeline alignments.

Key ecological issues that required clarification included:

- The potential for endangered ecological communities (EECs), threatened populations and species and / or their habitat listed under the TSC Act to occur within the study areas (being the Seaham, Brandy Hill, Millers Forest and Tomago sections);
- The potential presence of any Matters of National Environmental Significance (NES) listed under the EPBC Act;

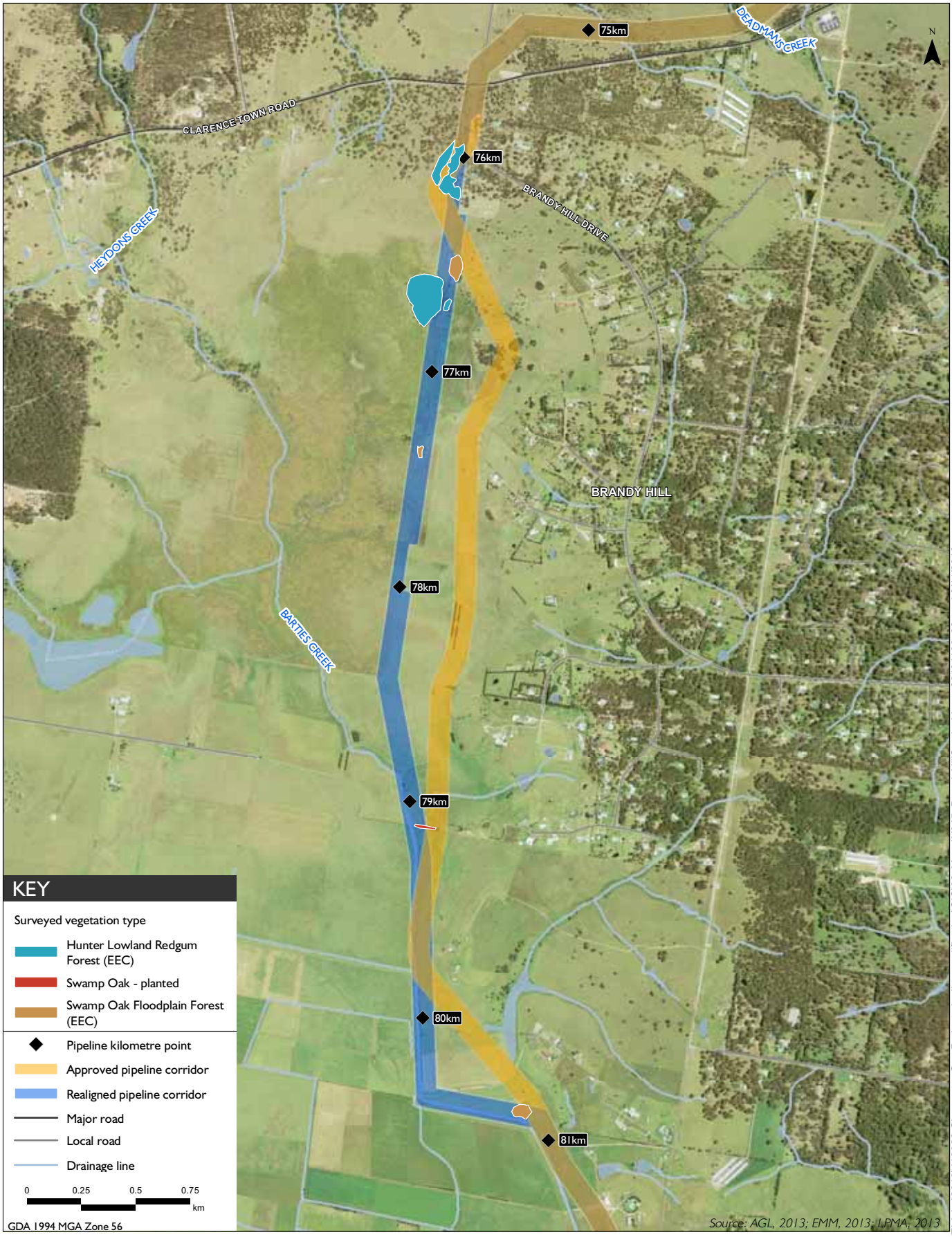
- The potential for impacts of the modification of the alignment on the ecology along the sections and locality; and
- Any avoidance, management or mitigation options beyond those which AGL has already committed to implementing for the GGP and which are in the Project Approval conditions.



Seaham section - surveyed vegetation and watercourse crossings

Minor pipeline corridor realignments EA - Ecological assessment report

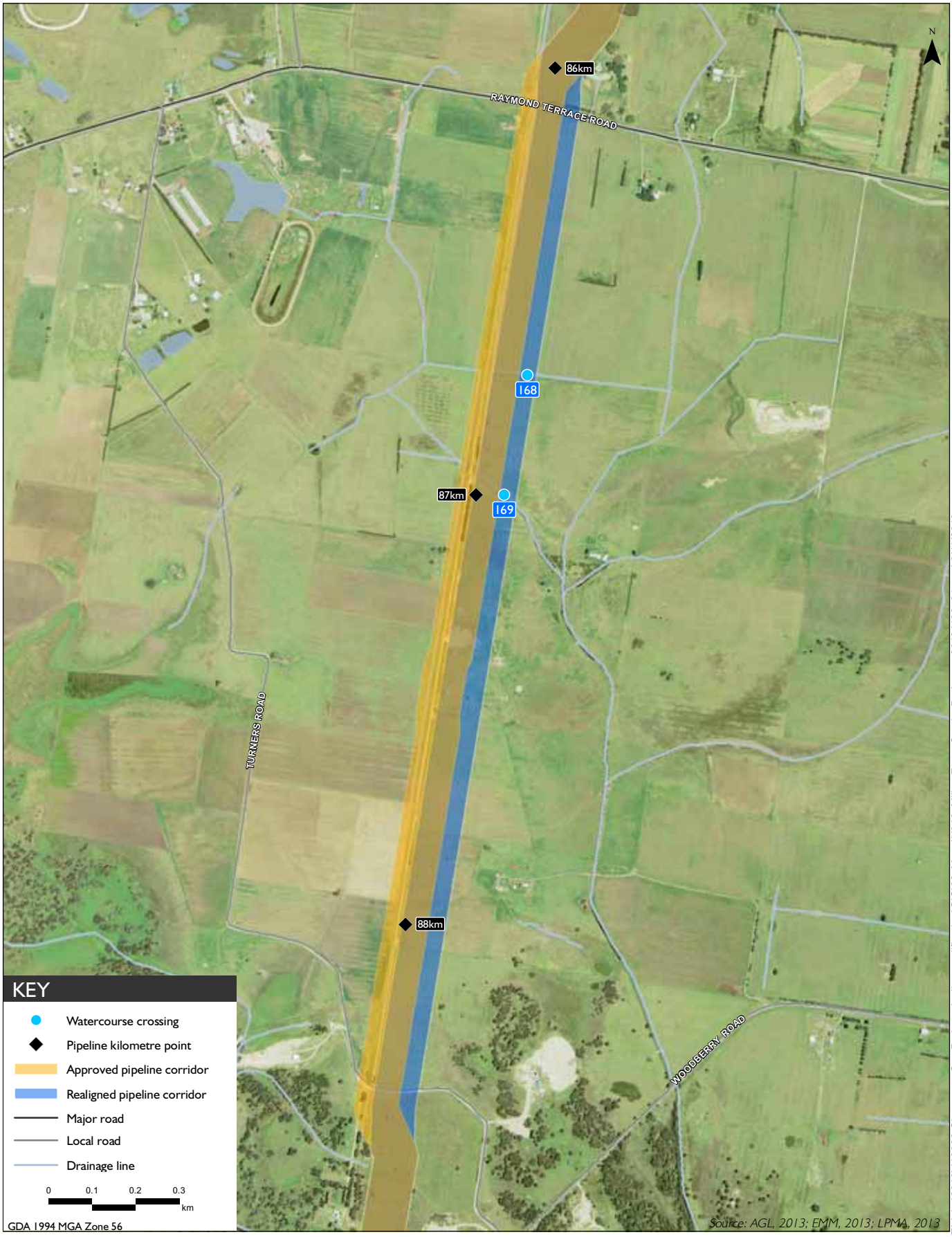
Figure 1



Brandy Hill section - surveyed vegetation

Minor pipeline corridor realignments EA - Ecological assessment report

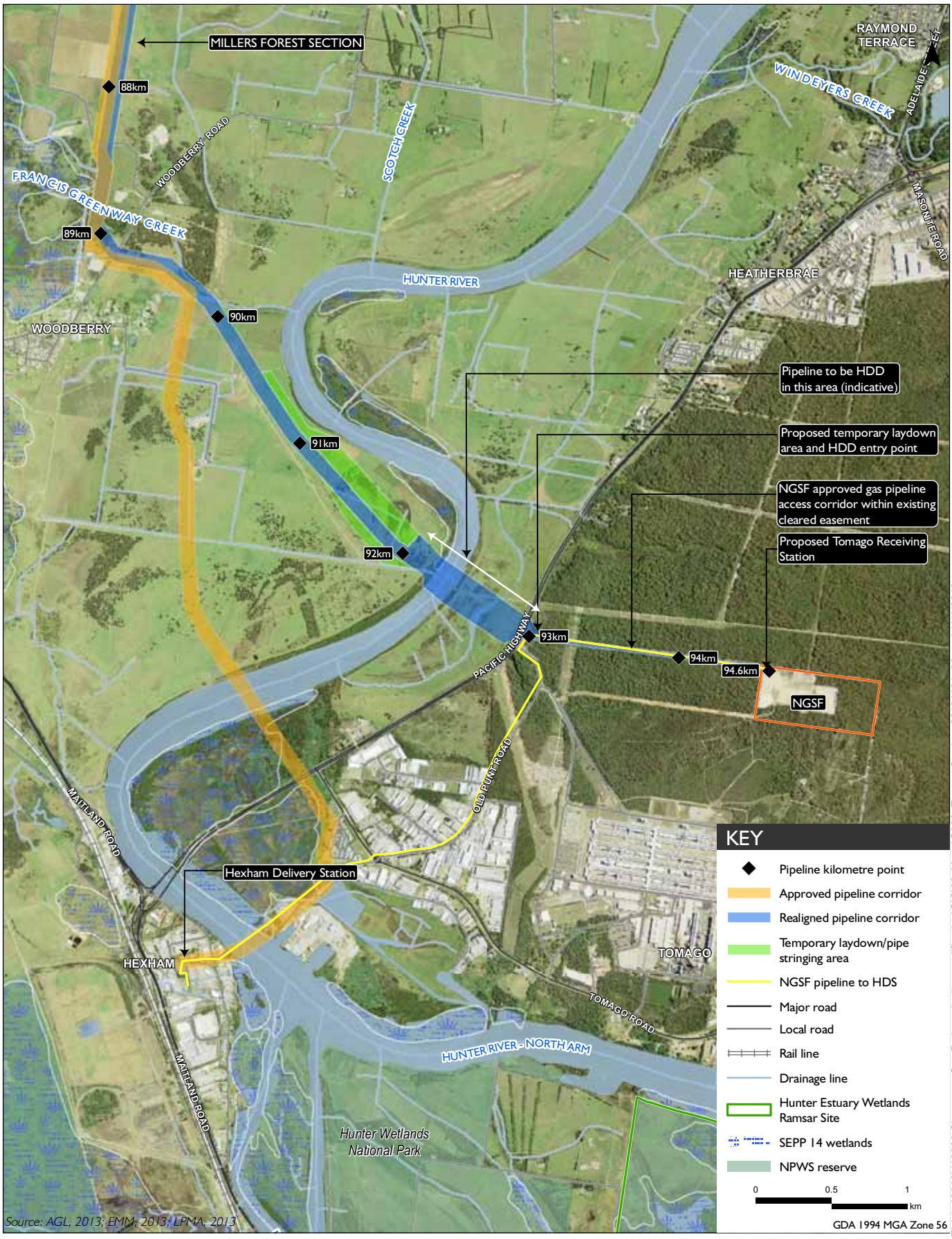
Figure 2



Millers Forest section - watercourse crossings

Minor pipeline corridor realignments EA - Ecological assessment report

Figure 3



Tomago section

Minor pipeline corridor realignments EA

Figure 1.6

2 METHODS

2.1 Background

This assessment was undertaken to describe the biodiversity values within the Seaham, Brandy Hill, Millers Forest and Tomago sections and determine the likely potential impacts associated with the proposed modification. It has been undertaken within the framework provided by the NSW *Environment Planning and Assessment Act 1979* (EP&A Act), NSW *Threatened Species Conservation 1995* (TSC Act), NSW *Fisheries Management Act 1994* (FM Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) with reference to the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2005 & DECC 2007) and *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (Department of the Environment 2013).

Changes to the approved pipeline corridor alignment are relatively minor and consequently the background information contained in the documents listed below is relevant in providing background for this assessment:

- AECOM 2009 Gloucester Coal Seam Gas Project. Ecological Assessment. Gloucester to Hexham. Report prepared for AGL, Gloucester NSW;
- Alison Hunt & Associates Pty Ltd 2009 Gloucester Coal Seam Gas Project. Gloucester to Hexham. Addendum. Ecological Assessment Report. Report prepared for AGL, Gloucester NSW;
- Alison Hunt & Associates Pty Ltd 2010 Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Values Report. Report prepared for AGL, Gloucester NSW;
- Alison Hunt & Associates Pty Ltd 2011a Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Assessment. Report prepared for AGL, Gloucester NSW; and
- Alison Hunt & Associates Pty Ltd 2011b Gloucester Coal Seam Gas Project. Gloucester to Hexham. Targeted Threatened Species Surveys. Report prepared for AGL, Gloucester NSW.

The methods closely followed those used to assess the approved GGP and included:

- A review of available literature and databases to assist with the identification of site values especially in relation to threatened species, populations and endangered ecological communities;
- Field investigations to ascertain the current site condition and the presence or likely presence of threatened or protected species, populations or communities;
- An impact assessment to determine the likely effects of the proposed modification on the terrestrial and aquatic ecology with particular reference to threatened species, populations and / or ecological communities;

- Review of existing requirements within the project approval for the protection and management of biodiversity and evaluate their effectiveness to incorporate and address the proposed modification; and
- Preparation of any additional recommendations to ameliorate and mitigate any impacts.

2.2 Literature Review and Database Searches

Available literature and database records pertaining to the site and locality (i.e. within a 5 km buffer of the Seaham, Brandy Hill, Millers Forest and Tomago sections) were reviewed. A full list of reference materials is provided in Section 8 and include:

- Office of Environment & Heritage (OEH) – Threatened species database records (accessed September 2013);
- Department of the Environment – Online protected matters search tool for Matters of National Environmental Significance (accessed September 2013).

2.3 Site Assessments

Assessments were undertaken to determine the current ecological values of the 100 m wide assessment corridor associated with the proposed pipeline corridor realignments. The level of assessment varied along each section however, the level of assessment was in line with that undertaken for the EA (AECOM 2009) and given the minor nature of the modification was considered to provide adequate certainty in regards to assessing likely impacts.

- The entire Seaham section was surveyed as well as a broader area at its western end, to accommodate potential locations for the MLV facility. The current preferred location for the MLV facility is within the 100 m wide corridor shown on Figure 1. Accordingly, the assessment for this area is for construction and operation of the pipeline within this modified alignment, including anticipated ancillary activities and facilities such as the MLV facility, all of which will be contained in the 30 m wide ROW;
- The entire Brandy Hill section was surveyed;
- Field-based assessments of the approved pipeline alignment through Millers Forest were undertaken in 2009 (AECOM 2009) and in 2011 (LandPartners 2011) for the TransGrid powerline alignment. Given this recent information, the disturbed nature of the area and the minor change proposed (realignment 50 m east of the approved alignment) it was considered that a desktop assessment of this section would provide adequate certainty in regards to the likely impacts along this section; and
- The Tomago section was surveyed as far east as the Hunter River. The remaining Tomago section between the Hunter River and the NGSF will either be under-bored using HDD techniques (i.e. no surface disturbance) or is within an existing cleared utility easement leading from the Pacific Highway to the NGSF.

Assessments were undertaken on 25 - 26 September 2013, by two ecologists.

The weather during the field-based assessments was fine and hot (maximum temperatures of 31.4 ^{o}C and 36.4 ^{o}C, respectively) with wind gust from the west north-west at 87 km / hr on 26 September 2013 (BOM 2013).

The areas were assessed through walking the modified pipeline corridor alignment and undertaking general habitat assessments, confirming previous vegetation mapping of the areas and noting the dominant flora species and the degree of disturbance. Detailed fauna studies (e.g. trapping) were not undertaken. This approach was considered an adequate level of assessment given that all sections of the modified pipeline alignment passed through land which had been substantially altered through agricultural practices over many years.

Specific activities undertaken are described in the following sections.

2.3.1 General Habitat Description

Habitat descriptions were recorded along the modified pipeline corridor alignment. Details recorded included vegetation type (including dominant canopy, shrub and ground cover species), soil type and topography, and these data were used in determining the presence of EEC and likely occurrence of threatened species.

2.3.2 Vegetation Assessment

General

Rapid vegetation assessments (RVA) were used to characterise the flora and vegetation types in areas that did not support native vegetation. Notes were made on the dominant plant species within each strata, including canopy, subcanopy, shrubs and groundcover, and the condition of the site. Specimens unidentifiable in the field were retained for later identification.

Vegetation Mapping

Previous vegetation mapping for the area was reviewed and included the mapping prepared by:

- Lower Hunter and Central Coast (LHCC) Region vegetation mapping, which covers the southern section of the proposed pipeline corridor (NPWS 2000);
- Forest Ecosystem Classification and Mapping of the Upper and Lower North East Comprehensive Regional Assessment (CRA) regions (NPWS 1999); and
- The Native Vegetation of New South Wales and the ACT (Keith 2004);
- AECOM 2009 Gloucester Coal Seam Gas Project. Ecological Assessment. Gloucester to Hexham. Report prepared for AGL, Gloucester NSW;
- Alison Hunt & Associates Pty Ltd 2009 Gloucester Coal Seam Gas Project. Gloucester to Hexham. Addendum. Ecological Assessment Report. Report prepared for AGL, Gloucester NSW;
- Alison Hunt & Associates Pty Ltd 2011a Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Assessment. Report prepared for AGL, Gloucester NSW; and

- Cockerill A, Harrington S & Bangel T 2013 EPBC Act Listed Ecological Communities Mapping in the Lower Hunter. Report funded by the SEWPaC. Parsons Brinckerhoff, Canberra.

Where previous mapping existed the mapping was ground-verified during this assessment and further details on the dominant species within each community recorded. Where the modified pipeline corridor alignment traversed unmapped native vegetation detailed records were taken and the communities mapped.

Floristic Sampling Plots

A floristic inventory of species within sampling plots was undertaken where aerial photograph interpretation and previous mapping of the site indicated that an EEC may be present. Plots (0.04 ha, generally 20 m x 20 m) were placed arbitrarily within homogenous stands of vegetation to avoid edge effects. All vascular plants present within each quadrat were recorded and a cover abundance ranking assigned to each species, using a modified Braun-Blanquet cover abundance ranking. Rankings included 1 = few individuals (< 1% cover); 2 = many individuals (< 5% cover); 3 = 5 – 25% cover; 4 = 26 – 50% cover; 5 = 51 – 75% cover; 6 = 76 – 100% cover. Structural data including estimated height, percentage cover, dominant species as well as the level of weed invasion, soil type and signs of disturbance were collected.

Any specimens unidentifiable in the field were retained for later identification.

Verifying the Presence of Endangered Ecological Communities

The presence of an EEC was verified by integrating data from each of the plots and RVAs together with aerial photograph interpretation and topographic maps to identify areas of similar species and structure. These were compared to the key characteristics detailed in *NSW Scientific Committee Final Determinations* for likely EEC, *Hunter, Central & Lower North Coast Vegetation Classification and Mapping project* (Somerville 2009a&b) and *NSW Vegetation Type Database* (OEH 2012) and included structural composition of the community, diagnostic species, elevation, soil type and hydrological requirements.

Vegetation Community Boundary Mapping

The boundaries of vegetation communities were marked using a Global Positioning System (GPS) and / or recorded directly onto aerial photographs. These data were downloaded to a Geographic Information System (GIS) and the boundaries of each community, including any EECs were mapped onto an aerial photograph (refer Figures 1, 2 and 4).

Threatened or Significant Flora

In addition to the ecological work as part of the original AECOM (2009) EA, targeted flora surveys were undertaken along the approved pipeline alignment (including within the vicinity of the minor modification areas) during November 2010 (Alison Hunt & Associates Pty Ltd 2011), which provided additional information on the presence of and potential for pipeline-related impacts to species listed under the TSC Act and EPBC Act. Targeted surveys focussed on species which are immobile as adults and are likely to be found in small and distinct clusters, as it was considered that these species

have the greatest potential to be impacted as a consequence of the project. The list of targeted species was compiled in consultation with DECCW (now OEH) and these included:

- *Asperula asthenes* (Trailing Woodruff);
- *Galium australe* (Tangled Bedstraw);
- *Callistemon linearifolius* (Netted Bottle Brush);
- *Cryptostylis hunteriana* (Leafless Tongue Orchid);
- *Cynanchum elegans* (White-flowered Wax Plant);
- *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea);
- *Persicaria elatior* (Tall Knotweed);
- *Pomaderris queenslandica* (Scant Pomaderris);
- *Rhizanthella slateri* (Eastern Australian Underground Orchid); and
- *Tetratheca juncea* (Black-eyed Susan).

These species were again targeted along the modified pipeline corridor alignment in any areas of potential habitat. Potential habitat was determined through consideration of vegetation type and condition, and the occurrence of habitat across the locality and review of literature and database records. Consideration was also given to detecting the presence of regionally significant species and those species listed as Rare or Threatened Australian Plants (RoTAP). Regionally significant flora are those which are uncommon, have narrow habitat requirements, are restricted to the LGAs or are close to the limit of their distribution in the area.

In general species were targeted through random meander surveys (Cropper 1993) along sections of the modified pipeline corridor alignment which supported suitable habitat for the targeted species (excluding *Rhizanthella slateri*). Random meander surveys are considered to be a more appropriate technique for the detection of rare species than quantitative vegetation techniques as these favour dominant species. Targeted surveys for *Rhizanthella slateri* are undertaken by raking litter from the base of Eucalypts along a number of 200 m transects within woodland communities. Potential habitat was not located along the modified pipeline corridor alignments due to lack of intact woodland communities, especially those with leaf litter and debris at the base of the trees.

2.3.3 Fauna

General

Habitat assessments were used to assess the likelihood of the presence of fauna and comprised an assessment of the nature and condition of habitats, specific resources and features of relevance for native fauna. In addition, indirect evidence of fauna (e.g. scats, feathers, fur, tracks, dens, nests, scratches, chew marks and owl wash) was recorded. Incidental records of fauna were also made during the course of the assessment.

Threatened or Significant Fauna

The likelihood of threatened species listed under the TSC Act and / or EPBC Act occurring across the assessed areas of the modified pipeline corridor alignment was determined through consideration of vegetation type and condition, the occurrence of suitable habitat across the locality and its condition, and review of literature and database records. A precautionary approach was taken that if habitat was present for a threatened species then it was considered that the threatened species could potentially use this resource and assessments of significance were undertaken accordingly.

2.3.4 Aquatic Habitat Assessment

An assessment of aquatic habitats was undertaken for watercourses and drainage lines traversed by the modified pipeline corridor alignment. A number of features were noted at each crossing and these included topography, water level, riparian vegetation, stream width, instream features, apparent water quality and riparian zone condition.

Strahler (1952) and Fairfull & Witheridge (2003) classifications were used to broadly categorise waterways traversed by the modified pipeline alignments:

- Strahler stream ordering process provides a measure of complexity and the potential for fish habitat. 1st order streams are often the least complex due to their position at the headwaters, 2nd order streams are where the two flow paths of order 1 join and so on to 4th order streams which are generally very large and permanent waterways; and
- Fairfull & Witheridge (2003) classification system which describes the characteristics of each waterway class (Table 1).

Table 1 Classification of fish habitat in NSW waterways

Classification	Characteristics of Waterway Type
Class 1 – Major fish habitat	Major permanently or intermittently flowing waterway (e.g. river or major creek); habitat of a threatened fish species or 'critical habitat'
Class 2 – Moderate fish habitat	Named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.
Class 3 – Minimal fish habitat	Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.
Class 4 – Unlikely fish habitat	Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools after rain events (e.g. dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

2.3.5 Impact Assessment

The impact assessment was undertaken in accordance with the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DEC 2005) as per the Director-General's requirements but is also consistent with the 2007 guidelines (DECC 2007). This approach is consistent with the previous assessments (AECOM 2009 and Alison Hunt & Associates 2009). Assessments of Significance were undertaken for those threatened species, populations and communities known, or with potential to occur, within the modified pipeline corridor alignments.

An assessment was also undertaken of the impacts of the project on ecological communities, populations and species listed under the EPBC Act using the Significant Impact Criteria detailed in the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (Department of the Environment 2013).

2.3.6 Limitations

This assessment was aimed at providing an overall assessment of the ecological values of the modified pipeline corridor alignment with particular emphasis on the likely occurrence of threatened species, populations and communities. In line with the original AECOM (2009) EA, this assessment was largely based on predictive modelling using habitat surrogates to determine the likely presence of fauna.

This approach was considered to be sufficient to determine ecological values and impacts given that:

- The proposed pipeline corridor realignments are minor and mostly traverse land which has been substantially altered through agricultural practices over many years, including clearing, draining, cropping and grazing; and
- A relatively large body of background information is available for the area.

3 RESULTS

This report describes the ecological values of the Seaham, Brandy Hill, Millers Forest and Tomago sections. AECOM (2009) and Alison Hunt & Associates Pty Ltd (2009) provide a broader ecological analysis of the GGP project and its environmental setting, and consequently should be read in conjunction with this report.

The abundance and diversity of species across the site reflected the landscape and history of disturbance, including slope, elevation and drainage. A list of flora species recorded along each of the modified pipeline corridor alignments is provided at Appendix A.

3.1 Seaham

The modified pipeline corridor alignment at Seaham will be realigned up to 100 m to the north along a 650 m section, the majority of which will be within cleared areas within and adjacent to the TransGrid transmission line easement. The proposed location of the MLV facility is also located within the Seaham section, in a cleared and recently grazed area just to the north of the transmission line easement at the western end of the modified alignment. This section of the pipeline corridor alignment is located on a property owned by AGL, the southern parts of which will be set aside to provide biodiversity offsets for the GGP. The proposed pipeline corridor re-alignment does not encroach on land proposed to be protected as a biodiversity offset for the GGP.

3.1.1 Vegetation

Past Mapping

Vegetation along the Seaham section has previously been mapped as *Hunter Valley Moist Forest, Hunter Valley Dry Rainforest* and *Seaham Spotted Gum Iron Bark Forest* (NPWS 2000) and *SE 71 Ironbark* (NPWS 1999). Ground-verification by Alison Hunt & Associates Pty Ltd (2011) mapped the area as *Cleared* with *Ironbark - Spotted Gum Woodland* in vegetated areas to the south.

Current Condition

The approved pipeline corridor alignment traversed Ironbark - Spotted Gum Woodland which occurs to the south of the proposed pipeline corridor re-alignment (Figure 1). The proposed corridor re-alignment to the north avoids most of this woodland area and instead traverses predominantly cleared areas within and adjacent to a transmission line easement which is regularly slashed as a part of TransGrid's maintenance program for their transmission line (Plate 1). The cleared easement mainly supports agricultural grasses (e.g. Kikuyu (*Pennisetum clandestinum*) and Couch (*Cynodon dactylon*) and weeds (e.g. Fireweed (*Senecio madagascariensis*), Whisky Grass (*Andropogon virginicus*), Paddys Lucerne (*Sida rhombifolia*) and Lantana (*Lantana camara*)).

The small areas of Ironbark - Spotted Gum Woodland which occur within the 100 m corridor are dominated by *Eucalyptus crebra* with *Corymbia maculata* scattered throughout. On occasion other ironbarks also occur, including *E. fribrosa.* The shrub layer is almost absent although scattered occurrences of *Acrotriche divaricata*, *Acacia falcata* and *Acacia falciformis* occur. The grassy

groundcover is dominated by *Austrodanthonia monticola, Themeda australis, Echinopogon ovatus, Microlaena stipoides* and *Cymbopogon refractus. Dianella revoluta revoluta, Juncus continuus* and *Lomandra filiformis* also occur in the ground layer.

Pockets of early regrowth of native species occur in depressions and these are largely dominated by *Acacia falcata*, Sword Wattle (*Acacia gladiiformis*), Green Wattle (*Acacia irrorata*), Sticky Hop-bush (*Dodonaea viscosa* subsp*. angustifolia*) with Wattle Mat-rush (*Lomandra filiformis*), Many-flowered Mat-rush (*Lomandra multiflora* subsp*. multiflora*) and Blady Grass (*Imperata cylindrica*) dominating the understorey. The most substantial of these regrowth areas occurs around a dry drainage line (Watercourse No. 141).

There are scattered occurrences of regrowth species such as *Eucalyptus amplifolia* subsp*. amplifolia* and *Eucalyptus crebra* at the western end, near the proposed location for the MLV facility, which suggest that this area may have supported a floodplain forest before clearing. However the understorey is now dominated by pasture species.

Plate 1 View west along the modified alignment at Seaham

Noxious Weeds

Plants recorded along this section that have been declared as noxious weeds under the *Noxious Weeds Act 1993* (NW Act) in the Port Stephens LGA are listed in Table 2.

Table 2 Noxious weeds recorded along the modified alignment at Seaham

Botanic Name	Common Name	Noxious Weed Control Class
Lantana camara	Lantana	4
Source: DPI 2013		

The control requirements for this class are:

- **Class 4 - Locally Controlled Weeds**: 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. Legal requirements are that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local authority.

3.1.2 Fauna Habitat

An assessment undertaken by Alison Hunt & Associates Pty Ltd (2011) to determine the ecological values across the proposed Seaham biodiversity offset site recorded 115 fauna species across the 160 ha including 22 mammals, 84 avifauna, 3 reptiles and 6 amphibians. Ten of these species are listed as threatened under the TSC Act and / or EPBC Act. Such a diversity of fauna is largely due to the diverse vegetation communities across the southern sections of the property, proposed to be used as biodiversity offsets, and their connectivity with the adjoining Wallaroo National Park.

Habitat for fauna along the modified pipeline corridor alignment, which is mostly cleared, is more limited than across the remainder of the site. Nonetheless, the scattered trees and regenerating stands would provide habitat for some woodland birds and microchiropteran bats are likely to forage through this area.

3.1.3 Aquatic Habitat

The modified pipeline corridor alignment crosses five dry unnamed drainage lines (Figure 1) (Table 3), all of which were crossed by the approved pipeline corridor. These ephemeral drainage lines do not support aquatic vegetation and instead they are generally vegetated by Kikuyu and Blady Grass. Their condition is poor due to clearing, weeds and bare ground. These drainage lines are unlikely to provide fish habitat (i.e. Class 4 waterways) and all are considered to be headwaters (Strahler Stream Order 1).

Table 3 Watercourses traversed by the modified pipeline alignment at Seaham

Identification Number	Description	Stream Order/ Waterway Classification	Overall Condition
138	Unnamed watercourse. Headwater. Ephemeral dry v-shaped gully approximately 1 m wide. Steep sided. No recognisable riparian vegetation due to the infrequency of water flow.	Strahler 1 / Class 4	Poor
139	Unnamed watercourse. Headwater. Ephemeral dry u-shaped gully approximately 0.5 m wide. No recognisable riparian vegetation due to the infrequency of water flow.	Strahler 1 / Class 4	Poor

Identification Number	Description	Stream Order/ Waterway Classification	Overall Condition
140	Unnamed watercourse. Headwater. Ephemeral dry v-shaped gully approximately 1.5 m wide. No recognisable riparian vegetation due to the infrequency of water flow although the gully area supports regrowth Acacia.	Strahler 1 / Class 4	Poor
141	Unnamed watercourse. Headwater. Ephemeral dry v-shaped gully approximately 1.5 m wide. No recognisable riparian vegetation due to the infrequency of water flow although the gully area supports regrowth Acacia.	Strahler 1 / Class 4	Poor
142	Unnamed watercourse. Headwater. Ephemeral dry shallow depression. No recognisable riparian vegetation due to the infrequency of water flow although the gully area supports regrowth Acacia.	Strahler 1 / Class 4	Poor
Note: Identification Numbers = AECOM (2009) EA. Stream Order = Strahler (1952), Waterway Classification = Fairfull & Wetheridge (2003)			

3.1.4 Summary of Key Ecological Features

- This property supports an array of intact vegetation communities and is contiguous with larger tracts of vegetation, including in the Wallaroo National Park. None of these areas would be disturbed by this proposal; and
- The modified pipeline alignment does not support features of conservation significance.

3.2 Brandy Hill

The Brandy Hill modified pipeline corridor alignment commences approximately 270 m south of the intersection of Brandy Hill Drive and Clarence Town Road. The approved pipeline corridor alignment followed the Brandy Hill Drive road reserve before heading slightly west through Redgum Forest and then crossing largely cleared grazing paddocks to the south. The proposed modified pipeline corridor alignment instead heads directly south along the edge of the Redgum Forest and down to mainly cleared paddocks where it runs up to around 335 m west of the approved pipeline corridor and follows Barties Creek, a constructed drainage channel, before re-joining the approved corridor.

3.2.1 Vegetation

Past Mapping

Vegetation within the 100 m wide corridor area has previously been mapped as *SE 71 Ironbark* and *SE 134 South Coast Shrubby Grey Gum* by NPWS (1999). Ground-verification by Alison Hunt &

Associates Pty Ltd (2009) confirmed that the area largely supports Kikuyu dominated paddocks used for cattle grazing with small patches of Redgum Forest which is representative of EEC listed under the TSC Act.

Current Condition

The northern most section of the Brandy Hill modified pipeline corridor alignment traverses the eastern edge of a modified remnant of Redgum Forest which meets the criteria for *Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions*, an EEC listed under the TSC Act (Plate 2) (Figure 2). Within the 100 m wide corridor this vegetation is dominated by mature Spotted Gum (*Corymbia maculata*), Forest Red Gum (*Eucalyptus tereticornis*), Grey Gum (*Eucalyptus punctata)*, Grey Box (*Eucalyptus moluccana*) and Narrow-leaved Ironbark (*Eucalyptus crebra).* The majority of trees are large and mature but shrubs and groundcover characteristic of this EEC are largely absent due to clearing and grazing over many years. The modified pipeline corridor alignment heads directly south from the Brandy Hill Drive road reserve and has been designed to traverse an area devoid of large trees.

Plate 2 Redgum Forest EEC showing reduced ROW

Note: Clearing will comprise two adult trees and smaller regrowth

The modified pipeline corridor alignment follows a fence line further south and traverses a patch of Swamp Oak trees (KP76.5) which is representative of *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*, an EEC listed under the TSC Act. It then traverses a patch of *Hunter Lowland Redgum Forest* (KP 76.7) (Plate 3) which occurs as an approximately 3.2 ha patch of remnant vegetation. This patch is dominated by Forest Red Gum with Flax-leaved Paperbark (*Melaleuca linariifolia*), Swamp Mahogany (*Eucalyptus robusta*) and Grey Gum also occurring. The understorey is comprised of Tall Sedge (Carex appressa), Water Pepper (*Persicaria hydropiper*), *Cyperus eragrostis,* Streaked Arrowgrass (*Triglochin striata*), Native Carrot (*Daucus glochidiatus*) and Common Silkpod (*Parsonsia straminea*).

To the east of this remnant patch is an existing cleared corridor (approximately 10 m wide) adjacent to a fence line and to the east of the corridor a number of regrowth trees also occur.

Plate 3 Modified pipeline corridor adjacent to *Hunter Lowland Redgum Forest* EEC at KP 76.7

The remaining Brandy Hill modified pipeline corridor alignment follows a fence line and Barties Creek (represented by a constructed drainage channel) where it traverses low-lying agricultural paddocks and has been designed to avoid paddock trees, soaks and remnant clumps of vegetation. The uneven surface of these paddocks suggest that they are regularly harrowed making it unlikely that they would retain an intact soil seedbank from previous native vegetation communities. It traverses a regrowth patch of Swamp Oak Forest at approximately KP 77.5 and a planted windbreak comprised of Swamp Oak further south (KP 79.1). Before re-joining the approved pipeline corridor alignment it passes through a small patch of degraded Swamp Oak trees (KP 80.8) at its southern end (Plate 4).

Plate 4 Swamp Oak Forest at the south end of Brandy Hill section

Noxious Weeds

Plants recorded along this section that have been declared as noxious weeds under the NW Act in the Port Stephens LGA are listed in Table 4.

Table 4 Noxious weeds recorded along the modified pipeline alignment corridor at Brandy Hill

Botanic Name	Common Name	Noxious Weed Control Class	WONS
Lantana camara	Lantana	4	
Rubus fruiticosus	Blackberry	4	✓
Source: DPI 2013. Note: WONS = Weed of National Significance			

The control requirements for this class are:

- **Class 4 - Locally Controlled Weeds**: 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. Legal requirements are that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local authority.

Blackberry is also listed as a Weed of National Significance (Weeds in Australia 2013) and the plans and controls associated with this listing should also be implemented for control of this weed.

3.2.2 Fauna Habitat

Fauna habitat along the Brandy Hill section is limited to open paddocks, dry open woodland and patches of Swamp Oak Forest. Open dry woodland habitat is provided by the two remnant patches of Redgum Forest (EEC). Habitat includes open canopy, large woody debris, tree hollows, clumped sedges and the occasional stag tree. A range of native fauna including macropods, microchiropteran bats, some arboreal mammals and woodland birds could potentially utilise these areas. Hollows were evident in some of the larger Eucalypt trees and these could provide habitat suitable for hollow-dependent birds, possums, gliders and microchiropteran bats.

The two patches of Redgum Forest (EEC) and the nearby Swamp Oak patch have been mapped as 'Marginal Koala Habitat' in the Western Management Unit of the *Port Stephens Council Comprehensive Koala Plan of Management* (CKPoM) (Port Stephens Council 2002) and this is discussed further in Section 4.5.

The open drainage channel (Barties Creek) also provides habitat for aquatic fauna, amphibians and water-dependant birds although this is limited by the lack of riparian vegetation and the restricted occurrence of macrophytes. A swarm of approximately 49 individuals of the Black Kite (*Milvus migrans*) and a Spotted Harrier (*Circus assimilis*) were recorded foraging around a large farm dam situated along a drainage depression approximately 350 m east of the proposed modified pipeline corridor alignment. The Spotted Harrier is listed as Vulnerable under the TSC Act. Other incidental

recordings of birds along this modified section included the Australian Wood Duck (*Chenonetta jubata*) and Australian Raven (*Corvus coronoides*).

3.2.3 Aquatic Habitat

This section of the modified pipeline corridor alignment does not cross any discernible drainage lines or creeks. It does run adjacent to Barties Creek for approximately 2 km (Plate 5). This creek is essentially a constructed irrigation channel which does not support riparian vegetation and only very minor and isolated occurrences of aquatic plants. It is unlikely to provide important aquatic habitat for aquatic fauna or flora due to the simplicity of habitat and apparent low water quality.

Plate 5 Barties Creek adjacent to the modified alignment

3.2.4 Summary of Key Ecological Features

- *Hunter Lowland Redgum Forest* – EEC;
- *Swamp Oak Floodplain Forest* – EEC; and
- EEC remnants also mapped as 'Marginal Koala Habitat' under the *Port Stephens Council CKPoM* (Port Stephens Council 2002).

3.3 Millers Forest

An approximately 2.5 km long section of pipeline corridor at Millers Forest is proposed to be realigned around 50 m to the east to avoid the recently constructed TransGrid transmission line (Figure 3).

3.3.1 Vegetation

Past Mapping

Vegetation along this section of the modified pipeline corridor alignment has previously been mapped as *Cleared* (AECOM 2009) and described in LandPartners (2011) as *Exotic Grasslands*.

Present Condition

Aerial photograph interpretation (API) and the recent study undertaken by LandPartners (2011) indicate that the 100 m wide corridor alignment traverses agricultural pastures which are currently used for grazing and cropping. An open irrigation channel is located to the west of the modified pipeline corridor alignment. A line of trees occur around 87 km, however these were not noted by either AECOM (2009) or LandPartners (2011) and hence are likely to be a part of a planted windbreak. The surfaces of most of the paddocks appear uneven suggesting that they have been harrowed making it unlikely that they would retain an intact soil seedbank from previous native vegetation communities. Instead the paddocks would be dominated by agricultural pasture species as well as agricultural weeds, some of which may be declared as Noxious under the NW Act.

3.3.2 Fauna Habitat

Fauna habitat would be limited along the Millers Forest section due to the paucity of native vegetation and the highly modified nature of the paddocks. It is likely that this section would be overflown by birds and possibly microchiropteran bats as they move between remnant patches of vegetation.

3.3.3 Aquatic environments

The modified pipeline corridor alignment passes through low-lying paddocks on the Hunter River floodplain, many of which appear to be drained using constructed earthen drainage channels. These areas are largely devoid of vegetation other than low growing pasture grasses. As per the approved pipeline corridor alignment the modified pipeline corridor alignment crosses two watercourses, described as *undefined ephemeral drainage lines in cleared paddocks* (AECOM 2009) and these are *168 Unnamed watercourse* and *169 Unnamed watercourse* (Table 5).

Table 5 Waterways traversed by the modified pipeline corridor alignment at Millers Forest

Identification Number	Description	Stream Order/ Waterway Classification	Overall Condition
168	Unnamed watercourse. Undefined ephemeral drainage line in cleared paddock.	Strahler 1 / Class 4	Poor
169	Unnamed watercourse. Undefined ephemeral drainage line in cleared paddock. (EA incorrectly identified this as Scotch Creek)	Strahler 1 / Class 4	Poor
Note: Source AECOM (2009). Stream Order = Strahler Stream Order Strahler (1952), Waterway Classification = Fairfull & Wetheridge (2003).			

3.2.4 Summary of Key Ecological Features

- The 100 m wide corridor is located in an area likely to be devoid of ecological features of conservation significance.

3.4 Tomago

This section of the modified pipeline corridor alignment deviates from the previously assessed and approved pipeline corridor at Woodberry Road. For some of its length it runs parallel to the previously approved pipeline corridor before veering to the east and heading towards Tomago. The modified pipeline corridor alignment traverses several landscape types which include cleared paddocks, the Hunter River and the edge of a SEPP 14 Coastal Wetland. HDD would be used to pass under the Hunter River and SEPP 14 wetlands before traversing a cleared easement to the proposed TRS. To achieve the key outcomes of the HDD (i.e. avoiding a patch of Swamp Oak Forest, the Hunter River and SEPP 14 wetlands) a wider corridor will be required under the Hunter River and to accommodate additional activities, including a temporary laydown area and an area for pipe stringing activities (Figure 4). These activities will include installing a gravel access track which will be rehabilitated following completion of activities, and placing the pipeline on rollers prior to laying in order to limit ground disturbance.

3.3.1 Vegetation

Past Mapping

Vegetation within the locality has previously been mapped as *Freshwater Wetland Complex* by LHCCREMS (NPWS 2000) and *Ironbark* and *South Coast Tallowwood-Blue Gum* by NPWS (1999). Ground-verification by AECOM (2009) and Alison Hunt & Associates Pty Ltd (2009) confirmed that the locality largely supports Kikuyu dominated paddocks used for cattle grazing with small patches of Swamp Oak forest, which are representative of an EEC listed under the TSC Act.

Present Condition

From Woodberry Road the modified pipeline corridor alignment traverses Kikuyu dominated pastures adjacent to a drainage channel which is a tributary of Francis Greenway Creek, and traverses an area mapped by AECOM (2009) as *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions* (an EEC) (Plate 6) (Figure 4). It crosses the drainage channel before its confluence with Francis Greenway Creek and continues on through agricultural pastures which are currently used for grazing and cropping. The uneven surface of these paddocks suggest that they are regularly harrowed making it unlikely that they would retain an intact soil seedbank from previous native vegetation communities. Instead the paddocks are dominated by agricultural species (e.g. Kikuyu, Couch, Perennial Ryegrass (*Lolium perenne*), White Clover (*Trifolium repens*)) as well as agricultural weeds (e.g. Scotch Thistle (*Onopordum acanthium)*, Fireweed (*Senecio madagascariensis*)) and in damp areas Sharp Rush (*Juncus acutus*) forms dense hemispherical tussocks.

Plate 6 View south east along the Tomago section

At approximately KP 91.5, the modified pipeline corridor alignment passes through a stand of Swamp Oak Forest which is dominated by Swamp Oak with a grassy (e.g. Kikuyu and Couch) and weedy (e.g. Fireweed, Lamb's Tongues (*Plantago lanceolata*) and Sharp Rush understorey. This area is used as a camp by stock. This degraded patch is representative of the *Swamp Oak Floodplain Forest* listed as an EEC under the TSC Act (Plate 7).

Plate 7 Swamp Oak Floodplain Forest (EEC) at KP 91.5

Closer to the Hunter River a larger patch of *Swamp Oak Floodplain Forest* occurs which is dominated by both Swamp Oak and Prickly-leaved Tea Tree (*Melaleuca styphelioides*). This area is also used as a camp by stock and a native understorey is largely absent.

The vegetation of the riparian zone of the Hunter River is a Mangrove Forest dominated by the Grey Mangrove (*Avicennia marina* subsp. *australasica*) with Sharp Rush located in damp areas just back from the top of bank. Mangrove Forests are protected under the FM Act.

The eastern bank of the Hunter River supports a wetland community up to the Pacific Highway which would be avoided by using HDD. The modified pipeline corridor alignment then traverses a cleared easement with no native vegetation (Katie Whiting, EMM pers. comm.) before arriving at the tie-in point of the realigned Tomago section with the Newcastle Gas Storage Facility (Coffey 2011 EA).

Noxious Weeds

One plant recorded along this section has been declared as a noxious weed under the NW Act in the Maitland LGA and this is listed in Table 6. This species was recorded on the banks of the drainage channel which is a tributary of Francis Greenway Creek.

Table 6 Noxious weed recorded along the modified alignment at Tomago

Botanic Name	Common Name	Noxious Weed Control Class
Carthamus glaucus	Glaucous Starthistle	5
Source: DPI 2013. Note: WONS = Weed of National Significance		

The control requirements for this class are:

- **Class 5 - Restricted Plants**: 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. Legal requirements are that the requirements in the NW Act for a notifiable weed must be complied with.

3.3.2 Fauna Habitat

Fauna habitat is limited along the Tomago section due to the paucity of native vegetation and the highly modified nature of the paddocks. A number of birds were incidentally recorded on the day of assessment and these included Brown Gerygone (*Gerygone mouki*), Australian Reed Warbler (*Acrocephalus australis*), White-faced Heron (*Egretta novaehollandiae*), White-faced Heron (*Ardea pacifica*), Cattle Egret (*Ardea ibis*), Australian Magpie (*Cracticus tibicen*) and Superb Fairy-wren (*Malurus cyaneus*).

However, within the locality (i.e. within 5 km) there are significant resources for a range of fauna due largely to the wetland complex associated with the Hunter River Estuary, including the Hunter Wetlands National Park and Hunter Estuary Wetlands Ramsar site. These areas support significant fauna habitat including:

- SEPP14 Wetlands;
- Tidal creeks;
- Threatened species habitat listed under the TSC Act and EPBC Act;
- Migratory wader habitat (many of which are protected under the EPBC Act);
- Mangrove forests (protected under the FM Act); and
- Coastal Saltmarsh (EEC listed under the FM Act) areas within the wetlands and in the locality.

3.3.3 Aquatic environments

The modified pipeline corridor alignment passes through low-lying paddocks on the Hunter River floodplain, many of which appear to be drained using constructed earthen drainage channels. These areas are largely devoid of vegetation other than low growing pasture grasses and hence would not provide good quality fauna habitat (Figure 4).

The modified pipeline corridor alignment crosses a tributary of Francis Greenway Creek (Watercourse Identification No. 171) (Plate 8) around 70 m upstream of its confluence with Francis Greenway Creek (Table 7). The tributary is a constructed earthen drainage channel lacking riparian vegetation. It is heavily impacted by cattle pugging, increased nutrients and Glaucous Starthistle (*Carthamus glaucus*) infestations.

Plate 8 Tributary of Francis Greenway Creek (Identification No. 171)

The Hunter River is a large and important river system in the Hunter region. The modified pipeline corridor alignment would pass under a small section of SEPP 14 Wetland and the Hunter River using HDD, upstream of the approved two crossings that it is replacing.

Table 7 Waterways traversed by the modified pipeline corridor alignment at Tomago

Identification Number	Description	Stream Order/ Waterway Classification	Overall Condition
171	Unnamed tributary of Francis Greenway Creek. Ephemeral soggy u-shaped gully approximately 2 m wide. Steep sided. No recognisable riparian vegetation due to realignment and clearing. Badly degraded by stock through nutrient inputs and pugging.	Strahler 1 / Class 4	Extremely poor
	Hunter River. Large and important resource in the Hunter Valley.	Strahler 4 / Class 1	Good
Note: Stream Order = Strahler (1952), Waterway Classification = Fairfull & Wetheridge (2003)			

3.3.4 Summary of Key Ecological Features

- Swamp Oak Floodplain Forest mapped at several locations along the modified pipeline corridor alignment;
- Mangrove communities protected under the FM Act;
- Riparian area and aquatic habitat of the Hunter River;
- Internationally recognised migratory wader habitat within the locality; and
- Hunter Wetlands National Park is located downstream of the crossing point of the Hunter River north arm

4 CONSERVATION SIGNIFICANCE

The site and locality (i.e. 5 km buffer around the modified pipeline corridor alignment) support a number of features listed under the TSC Act, FM Act and EPBC Act which are considered to be of conservation significance and these are outlined below.

4.1 *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

Matters of National Environmental Significance known, or predicted to occur within the locality (i.e. 5 km) (online protected matters search tool, accessed September 2013) (Department of the Environment 2013b) are described below.

4.1.1 Wetlands of International Importance (RAMSAR)

The Hunter Estuary Wetlands Ramsar site is located more than 6.5 km downstream of the modified pipeline corridor alignment crossing point of the Hunter River.

4.1.2 Communities

Two critically endangered communities are predicted to occur within the locality: *Lowland Rainforest of Subtropical Australia* and *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* (Department of Environment 2013b). The modified pipeline alignments do not traverse any rainforest vegetation communities and neither of these communities have been mapped as occurring along the modified pipeline corridor alignment by Cockerill *et al*.(2013) and consequently this EEC is unlikely to occur along or adjacent to the route.

Hunter Valley Remnant Woodlands / Open Forests ecological community has been nominated for listing under the EPBC Act. This community is a composite of a number of ecological communities that occur within the Hunter Valley. A single listing is being sought for these communities due to the small area that they currently occupy (Cockerill *et al*. 2013). It is likely that remnant native vegetation communities at Seaham (e.g. the Ironbark – Spotted Gum Woodland) and Brandy Hill (e.g. the mapped Hunter Lowland Redgum Forest) would all form part of this community if the listing is successful at some time in the future. Currently, no further consideration under the EPBC Act currently applies to these communities.

4.1.3 Populations

There are no populations listed under the EPBC Act known or predicted to occur along the modified pipeline corridor alignments.

4.1.4 Species

Predictive modelling indicates that 55 threatened fauna and flora species and 34 migratory / marine species listed under the EPBC Act have the potential to occur within the locality of the modified pipeline corridor alignments (Department of Environment 2013b). This is largely due to the Tomago

section being located within the locality of the Hunter Estuary Wetlands which provides habitat for greater than 200 bird species which either live in or migrate through the Hunter estuaries.

Marginal habitat is located along the modified pipeline alignments for only seven species and these are listed in Table 8Table 8 and detailed in Appendix B. During this assessment the Cattle Egret (*Ardea ibis*) was recorded along the Tomago section. This species is listed as a Migratory species under the EPBC Act. In addition, five EPBC Act listed species have been recorded across the Seaham property: the White-throated Needletail (*Hirundapus caudacutus*), Rainbow Bee-eater (*Merops ornatus*), Satin Flycatcher (*Myiagra cyanoleuca*), Rufous Fantail (*Rhipidura rufifrons*) and the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Alison Hunt & Associates Pty Ltd 2011). All of these species could potentially overfly or occasionally forage within the Ironbark – Spotted Gum Woodland located within and adjacent to the 100 m wide assessment corridor at Seaham.

Table 8 Threatened EEC and species listed under the TSC and EPBC Acts which were assessed

Common Name	Scientific Name	Conservation Status
EEC		
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions		EEC-TSC
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		EEC-TSC
Woodland Birds		
Little Lorikeet	*Glossopsitta pusilla*	V-TSC
Swift Parrot	*Lathamus discolor*	E-EPBC, Mar-EPBC, E-TSC
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V-TSC
Raptor		
Spotted Harrier	*Circus assimilis*	V-TSC
Migratory Birds (solely)		
Great Egret	*Ardea alba*	M-EPBC, Mar-EPBC
Cattle Egret	*Ardea ibis*	M-EPBC, Mar-EPBC
White-throated Needletail	*Hirundapus caudacutus*	M-EPBC, Mar-EPBC
Rainbow Bee-eater	*Merops ornatus*	M-EPBC, Mar-EPBC
Arboreal Mammal		
Koala	*Phascolarctos cinereus*	V-EPBC, V-TSC
Megachiropteran Bat		
Grey-headed Flying-fox	*Pteropus poliocephalus*	V-EPBC, V-TSC
Microchiropteran Bat		
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V-TSC

Note: EPBC = *Environment Protection & Biodiversity Act 1999*, TSC Act = *Threatened Species Conservation Act 1995*, EEC = endangered ecological community, V = Vulnerable, E = Endangered, M = Migratory, Mar = Marine.

4.2 NSW *Threatened Species Conservation Act 1995*

4.2.1 Communities

Twelve EECs listed under the TSC Act are known, or are predicted, to occur within the Karuah-Manning subregion of the Hunter-Central Rivers Catchment Management Authority (CMA) and these are listed Appendix B. Two of these were recorded along the modified pipeline corridor alignment (Table 8) and these are discussed below.

Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions is an open forest which characterises the gentle slopes of depressions and drainage flats on the Hunter Valley floor. It is characterised by the canopy tree species, Forest Red Gum and Grey Gum with other frequently occurring canopy species such as Sydney Red Gum (*Angophora costata*), Spotted Gum, Narrow-leaved Ironbark and Grey Box. The mid-storey is open and characterised by sparse shrubs such as Coffee Bush (*Breynia oblongifolia*), Prickly Beard-heath (*Leucopogon juniperinus*), Gorse Bitter Pea (*Daviesia ulicifolia*) and Winged Broom-pea (*Jacksonia scoparia)*. The ground cover typically comprises grasses and herbs (OEH 2012).

The modified pipeline corridor alignment traverses a patch of *Hunter Lowland Redgum Forest* near the northern extent of the Brandy Hill section and traverses a second patch approximately 500 m further south. The remnant EEC at the northern extent of Brandy Hill has been degraded through years of grazing resulting in the removal of the majority of native shrub and groundcover species, although mature trees remain. The proposed modification reduces the area of this EEC to be cleared from its current approved extent.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which Swamp Oak is the dominant species. Other trees including *Acmena smithii*, *Glochidion* spp. and *Melaleuca* spp. may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford (OEH 2012).

This community was recorded along the floodplains of the Brandy Hill and Tomago sections. Whilst this community would have been widespread in the past it now occurs as scattered, or regrowth remnants that are in general degraded through clearing, weed invasion and through use by stock.

4.2.2 Populations

There are four endangered populations listed under the TSC Act that are known from the Karuah-Manning subregion of the Hunter-Central Rivers CMA (Appendix B). None of these are considered likely to occur along the modified pipeline corridor alignments.

4.2.3 Species

Thirty-one flora species are known from the Karuah-Manning subregion of the Hunter-Central Rivers CMA. As part of the Targeted Threatened Species Surveys undertaken in 2010 (Alison Hunt & Associates Pty Ltd 2011) this list was refined to 10 species in discussions with OEH (Steve Lewer, pers. com. 2010) as being those with some potential to occur along the approved pipeline route. This group of 10 species was also targeted for this assessment of the proposed modification as these were

considered to be the species with the most potential to occur along the modified pipeline corridor alignments. Their preferred habitat and likelihood of occurrence is detailed in Appendix B.

None of these species were recorded along the modified pipeline corridor alignment as their preferred habitat was not present (e.g. *Rhizanthella slateri*) or because they did not occur (e.g. *Pomaderris queenslandica*) although it was ideal survey conditions. Consequently, none of these species are considered further in this report.

Fifty-four fauna species listed under the TSC Act are also known from the Karuah-Manning subregion of the Hunter-Central Rivers CMA. The habitat requirements for each of these species, and the likelihood of their occurrence along the modified pipeline corridor alignments is provided at Appendix B. Whilst it is acknowledged that a number of these species would occur in the broader area only four bird species and three mammal species were considered to have at least some potential to occur along the modified pipeline corridor alignments and these are listed in Table 8.

4.3 NSW *Fisheries Management Act 1994*

All marine vegetation is protected under the FM Act, including seagrass, mangroves and seaweed due to their importance as species-rich habitats which provide shelter to numerous species of fish and invertebrates, especially as juveniles. The Grey Mangrove occurs along the banks of the Hunter River. These will be avoided using HDD techniques.

4.4 RoTAP Species

Twenty *Rare or Threatened Australian Plants* (RoTAP) are listed as occurring within the Port Stephens and Maitland LGAs (Botanic Gardens Trust 2013). None of these species were recorded along the modified pipeline corridor alignments. All of these species are also listed as threatened under the TSC Act and hence those species for which potential habitat occurs have been considered in accordance with the Threatened Species Assessment Guidelines: the Assessment of Significance (DEC 2005 & DECC 2007.

4.5 Corridors and Connectivity

The modified pipeline corridor alignments predominantly traverse cleared agricultural paddocks. Construction of the pipeline through these areas would cause minor and temporary disruption to connectivity across these open landscapes as the pipeline trench would be backfilled and the current level of habitat restored in the paddock areas. The Seaham section would decrease the opportunity for fragmentation as the approved pipeline corridor alignment traversed Ironbark-Spotted Gum Woodland which would have required clearing for construction. The modified pipeline corridor alignment has been moved to areas that have already been cleared for agricultural activities and the powerline easement making further clearing unnecessary as native vegetation would be avoided. Similarly, at Brandy Hill the approved pipeline corridor alignment traversed the remnant EEC woodland. The modified pipeline corridor alignment has been re-routed closer to the edge of the community which would assist in maintaining connectivity for fauna and flora. Where the modified pipeline alignment traverses Swamp Oak Floodplain Forest the ROW would be reduced to 15 m further reducing the opportunity for disruption to connectivity. The Millers Forest section traverses agricultural paddocks and disruption to connectivity for flora and fauna is not expected. The Tomago section does traverse a degraded patch of Swamp Oak Floodplain Forest (EEC) and this would cause

minor disruption to this community although this is likely to be minimal trees would not be removed for construction.

4.6 Provisions for the Protection of Koala

Whilst the provisions of *State Environmental Planning Policy 44 - Koala Habitat Protection* (SEPP 44) do not apply to Part 3A projects, this ecological assessment has considered Koala habitat consistent with the requirements of this SEPP and with reference to the Port Stephens Council CKPoM (Port Stephens Council 2002). Port Stephens is listed as an LGA subject to the provisions of SEPP 44 and is known to support a Koala population. A number of Koala records are known from the locality and occur close to the proposed modified pipeline corridor alignment at Brandy Hill. Two species of Koala feed trees listed on Schedule 2 of SEPP 44, i.e. Forest Red Gum and Grey Gum, were recorded along or directly adjacent to the Brandy Hill section. For an area to be considered as potential Core Koala Habitat, Schedule 2 tree species must occur at densities greater than 15%. Grey Gum does not occur at densities greater 15%. However, Forest Red Gum does occur at greater than 15% in the remnant patches of *Hunter Lowland Redgum Forest* at Brandy Hill and this area could be considered to be potential core habitat for Koalas.

The proposed modified pipeline corridor alignment along the Brandy Hill section traverses the *Western Management Unit* of the Port Stephens Council CKPoM (Port Stephens Council 2002). The remnant patches of Hunter Lowland Redgum Forest and Swamp Oak Forest which occur at the northern end of the Brandy Hill sections have been mapped as *Marginal Koala Habitat.* Marginal Koala Habitat is defined as *all forested areas which are neither Preferred nor Supplementary Koala Habitat*. Whilst the Redgum Forest at Brandy Hill could provide foraging habitat for this species, the Swamp Oak Forest patches would be most likely to provide shelter and stepping-stone habitat as this species moves through the landscape.

5 IMPACT ASSESSMENT

The minor modifications of the pipeline corridor alignment at Seaham, Brandy Hill, Millers Forest and Tomago would minimise clearing of vegetation and reduce other environmental impacts, and would allow the pipeline to connect directly into AGL's NGSF at Tomago. While the modifications are minor there is the potential for some impacts as a consequence of construction and operation of these sections of pipeline and these are discussed below. These are generally consistent with those identified and assessed for the approved pipeline corridor alignment.

5.1 Construction and Operational Disturbances

Table 9 outlines the main disturbances to ecosystems that are likely to occur along the modified pipeline corridor alignment and are consistent with those of the approved GGP, described and assessed in the AECOM (2009) EA. Construction activity will be confined to the modified pipeline corridor alignment. As for the approved pipeline, the pipeline within the modified alignments requires a construction ROW of approximately 25 - 30 m wide plus temporary work space within the 100 m wide assessment corridor and slightly wider at the south-eastern end of the Tomago section. Although a 25 – 30 m construction ROW is required for the majority of the pipeline length, in some environmentally sensitive areas this would be reduced to 15 m wide.

Table 9 Disturbances associated with the modified pipeline corridor alignments

Proposed Activity	Disturbance
Site preparation	Clearance of vegetation for a width of 25 - 30 m with cleared vegetation stockpiled on the non-working side of the ROW. Width of ROW would be reduced to a minimum of 15 m in areas of significant conservation value, such as EECs.
	Removal of topsoil to a depth of 100 to 150 mm to be stockpiled adjacent to the cleared vegetation on the non-working side of the ROW.
Preparation of access tracks	Grading and improvement of access tracks for heavy vehicle access, maximum 4 m disturbance width.
Digging of trench	A trench would be dug to a sufficient depth to allow a minimum cover of 750 mm over the top of the pipe, with subsoil stockpiled separate to topsoil in the non-working side of the ROW.
	Operational noise of trenching and other machinery and associated activities.
Additional working and lay down areas	These are would be set aside for storage of equipment and vehicles. These would be located within already cleared paddock areas and trees would not be removed.

Proposed Activity	Disturbance
Additional laydown and pipe stringing activity areas would be required at the south-eastern end of the Tomago section.	These additional areas would be required to achieve the key outcomes associated with the HDD (i.e. avoiding Swamp Oak Floodplain Forest, Hunter River and SEPP 14 wetlands). They would be located within already cleared paddock areas and trees would not be removed.
Note: ROW = right-of-way	

5.2 Direct Impacts

There are a number of direct impacts predicted to occur within the modified pipeline corridor alignment and these are discussed below. These are consistent with the impacts identified and assessed for the approved pipeline corridor.

5.2.1 Vegetation Clearing

The modified pipeline corridor alignment has been designed to avoid remnant native vegetation, paddock trees and riparian areas where possible and the vast majority of the modified alignments traverse cleared landscapes along the Seaham, Brandy Hill, Millers Forest and Tomago sections.

Clearing of 0.34 ha native vegetation would be required along the modified sections (Table 10). Overall, the modified pipeline alignments would reduce native vegetation clearing from that required for the approved pipeline alignment from 2.03 ha to 0.34 ha resulting in the retention of an additional 1.69 ha.

Table 10 Clearing of native vegetation along modified pipeline corridor alignments with reference to relevant approved sections

Native Vegetation Community	Clearing Required		Difference (ha)
	Approved Pipeline Corridor Alignment (ha)	Modified Pipeline Corridor Alignment (ha)	
Spotted Gum – Ironbark Woodland	1.80	-	↓ 1.80
Hunter Lowland Redgum Forest (EEC)	0.23	0.09	↓ 0.14
Swamp Oak Floodplain Forest (EEC)	-	0.25	↑ 0.25
Total	**2.03**	**0.34**	↓ **1.69**
Note: Based on assumptions listed in Table 10. EEC = endangered ecological community under the TSC Act			

The approved pipeline alignment at Seaham traverses a Spotted Gum – Ironbark Woodland and would have resulted in the clearing of approximately 1.80 ha of this community. The modified pipeline corridor alignment largely follows an already cleared TransGrid powerline alignment with scattered occurrences of Spotted Gum – Ironbark Woodland occurring within the 100 m wide assessment corridor. The modified alignment would traverse already cleared areas and the scattered occurrences of woodland would be avoided (Table 10 & 11) (Figure 1).

At Brandy Hill the modified pipeline corridor alignment reduces impacts on the *Hunter Lowland Redgum Forest* (EEC) compared to the approved alignment (Alison Hunt & Associates Pty Ltd 2009) (Table 10 & 11) (Figure 2). Along this section the modified pipeline corridor alignment has been designed to traverse cleared areas between stands of trees thereby reducing vegetation removal to 2 mature trees and 6 saplings. In addition the ROW would be reduced to 15 m through this area. Overall the areas of clearing of this EEC would be reduced by approximately 0.14 ha from 0.23 ha to 0.09 ha. A patch of *Hunter Lowland Redgum Forest* (EEC) located further south (Figure 2) would not be directly impacted as the modified pipeline corridor alignment will traverse an already cleared corridor along a fence line. The ROW would be reduced to 15 m along this patch.

The Brandy Hill 100 m wide assessment corridor includes three remnant patches of *Swamp Oak Floodplain Forest* (EEC) and a windbreak of planted Swamp Oak. The most northerly patch of Swamp Oak Forest would be avoided. Removal of some trees associated with the windbreak would be required. Some clearing through the degraded patches of Swamp Oak Forest which occur at KP 79.1 and KP 80.8 would be required although trees would be avoided where possible.

The Millers Forest section appears to consist entirely of agricultural paddocks and removal of native vegetation communities is not expected (Figure 3).

At Tomago the assessment corridor traverses degraded and isolated remnant patches of the *Swamp Oak Floodplain Forest* between KP 91.5 and the western side of the Hunter River. Some vegetation clearance from the patch at KP 91.5 would be required. However, there would be no trees removed from the *Swamp Oak Floodplain Forest* within the expanded assessment corridor along this section and the patch which occurs at KP 92 would be avoided altogether through HDD techniques (Table 10 & 11) (Figure 4).

The combined total loss of Swamp Oak Floodplain Forest expected at the Brandy Hill and Tomago sections is approximately 0.25 ha.

Drainage line crossings would be located at areas that lack riparian vegetation and the Hunter River and SEPP 14 wetlands would be underbored using HDD techniques, thereby avoiding impacts associated with clearing of native vegetation and the fringing Mangrove community along the Hunter River.

Table 11 ROW required through vegetation types recorded along each section

Realigned Section	Vegetation Type within the Assessment Corridor	ROW Required for Construction
Seaham	Ironbark-Spotted Gum Woodland	Avoided
	Non-native vegetation type. Agricultural paddocks.	30 m ROW
Brandy Hill	Hunter Lowland Redgum Forest EEC (KP 76)	15 m ROW
	Swamp Oak Floodplain Forest EEC (KP 76.5)	Avoided
	Hunter Lowland Redgum Forest EEC KP 76.7	Reduced to 25 m^2
	Swamp Oak Floodplain Forest EEC (KP 77.5)	Avoided
	Swamp Oak planted windbreak (KP 79.1)	30 m ROW
	Swamp Oak Floodplain Forest (KP 80.8)	15 m ROW
	Non-native vegetation type. Agricultural paddocks.	30 m ROW
Millers Forest	Non-native vegetation type. Agricultural paddocks.	30 m ROW
Tomago	Swamp Oak Floodplain Forest (KP 89.3)	Avoided
	Swamp Oak Floodplain Forest (KP 91.5)	15 m ROW
	Swamp Oak Floodplain Forest (KP 92)	Avoided
	Mangrove Forest	Avoided by HDD

5.2.2 Loss of Fauna Habitat

Fauna habitat along the four sections is generally limited to open paddocks, dry open woodland and patches of Swamp Oak Forest with wetlands and the Hunter River at the eastern end of Tomago. There will be minor clearing of native vegetation communities (i.e. 0.34 ha) and this will in general consist of a small number of trees with no understorey. Removal of hollow-bearing or stag trees from within the woodland areas would be avoided where possible.

There will be minimal removal of Marginal Koala Habitat identified in Port Stephens Council CKPoM (i.e. 0.09 ha potential foraging and shelter habitat) although disruption to this habitat is unlikely to cause substantial impacts on this species (refer to Appendix C and D for assessments of this species under the TSC and EPBC Acts).

5.2.3 Impacts on Aquatic Habitat

The modified pipeline corridor alignments have been located so as to minimise the potential for impacts on aquatic habitats, especially the Hunter River, as only one Hunter River crossing is now proposed instead of the two approved. The proposed modification also avoids a wetland area and reduces disturbance to acid sulfate soils in the Tomago section minimising the risk to adjacent wetlands and waterways. HDD of the Hunter River would be initiated approximately 500 m east of the Hunter River with the exit point approximately 250 west of the Hunter River. Consequently, there are unlikely to be direct impacts on the aquatic habitats of the Hunter River, fringing mangrove forest or wetlands and downstream habitats such as the Hunter Wetlands National Park would be protected.

Trenching of the ephemeral drainage lines along the Seaham, Millers Forest and Tomago sections are likely to have few impacts on aquatic habitats as none support riparian vegetation or instream macrophytes and none are likely to provide fish habitat.

Without mitigation there is the potential for impacts on the constructed irrigation channel (Barties Creek) adjacent to the modified pipeline corridor alignment at Brandy Hill. These can be appropriately managed by the erosion and sediment controls described in the AECOM (2009) EA, and which AGL has committed to implementing for the GGP. Impacts associated with erosion and sedimentation as a consequence of construction would be negligible providing that erosion and sedimentation management measures are implemented, especially as the landscape along this section of the modified pipeline corridor alignment is flat thereby reducing the likelihood of gullying or sheet erosion after rainfall.

5.3 Indirect Impacts

Indirect impacts on biodiversity during construction and operation are possible and these are discussed below.

5.3.1 Changes to Water Quality

The modified pipeline corridor alignment would reduce the potential for impacts on water quality during and following construction when compared to the approved alignment due to:

- A reduction in the number of crossings of the Hunter River from the approved two crossings to the proposed one;
- Reduction in the disturbance of acid sulfate soils in the vicinity of the Hunter River; and
- An overall reduction in the clearing of native vegetation along the alignment.

5.3.2 Edge Effects

Edge effects associated with the clearance of vegetation and the maintenance of a track for vehicular access would be reduced along the Seaham section as the clearing of approximately 1.80 ha of Spotted Gum – Ironbark Woodland would be avoided by following existing cleared areas within and adjacent to the power line easement. At Brandy Hill the modified pipeline corridor alignment follows an already cleared area along the edge of a patch of *Hunter Lowland Redgum Forest* avoiding substantial clearing and an increase in edge effects. Similarly, the eastern end of the Tomago section follows an existing cleared easement to the NGSF reducing the opportunity for an increase in edge effects over existing conditions. However, the potential for edge effects would be marginally increased at the Brandy Hill and Tomago sections where the pipeline traverses small remnant patches of Swamp Oak Forest.

5.3.3 Disturbance of fauna

Disturbance of fauna during construction could occur through an increase in noise and activity levels across the site, including increased traffic. The potential for disturbance to fauna is unlikely to differ from that of the approved pipeline corridor alignment.

5.4 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

5.4.1 Wetlands of International Importance (RAMSAR)

The Hunter Estuary Wetlands Ramsar site is located more than 6.5 km downstream of the modified pipeline corridor alignment crossing point of the Hunter River. The Hunter River and associated wetlands would be under-bored using HDD techniques, and therefore impacts on these downstream resources are not expected.

5.4.2 Communities

The modified pipeline corridor alignments do not support the two critically endangered communities: *Lowland Rainforest of Subtropical Australia* and *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* predicted to occur within the locality (Department of Environment 2013b). Therefore, impacts on endangered communities listed under the EPBC Act are unlikely to occur.

5.4.3 Populations

There are no populations listed under the EPBC Act known or predicted to occur along the modified pipeline corridor alignments and hence impacts on populations listed under the EPBC Act are unlikely to occur.

5.4.4 Species

Marginal habitat is located along the modified pipeline alignments for seven species listed under the EPBC Act. An assessment of the impacts of the modified pipeline corridor alignments on these species has been undertaken using the Significant Impact Criteria detailed in *Matters of National Environmental – Significant Impact Guidelines 1.1* (Department of the Environment 2013). Details of this assessment are contained at Appendix C and the outcomes briefly outlined below.

Species considered included:

- Swift Parrot (*Lathamus discolor*);
- Great Egret (*Ardea alba*);
- Cattle Egret (*Ardea ibis*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Rainbow Bee-eater (*Merops ornatus*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*); and
- Koala (*Phascolarctos cinereus*).

It was concluded that with the implementation of mitigation measures and environmental management already required as part of the project approval for the four realigned sections, the proposed modification would be unlikely to significantly impact any Commonwealth-listed species as:

- In general, the modified pipeline corridor alignments have been located so as to avoid areas of high biodiversity which would be most likely to provide habitat to listed species and endangered ecological communities;
- In unavoidable areas of high conservation status the pipeline has largely been aligned to follow cleared areas between trees, resulting in minimal tree clearing and impact in the form of habitat removal and fragmentation; and
- Potential impacts could be managed and mitigated with environmental management already required as part of the project approval.

5.5 NSW *Environmental Planning and Assessment Act 1979*

An assessment of the impacts of the proposed modification on species, populations and ecological communities listed under Schedules 1, 1A and 2 of the TSC Act was undertaken in accordance with the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DEC 2005 & DECC 2007). Details of this assessment are provided at Appendix D and the outcomes briefly outlined below.

The species, populations and ecological communities addressed included:

Endangered Ecological Communities

- *Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions;* and
- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*

Woodland Birds

- Gang-gang Cockatoo *(Callocephalon fimbriatum);*
- Swift Parrot *(Lathamus discolor);*
- Little Lorikeet *(*Glossopsitta pusilla);

Raptors

- Spotted Harrier *(Circus assimilis);*

Arboreal Mammals

- Koala *(Phascolarctos cinereus).*

Microchiropteran Bats

- Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris);*

Megachiropteran Bat

- Grey-headed Flying-fox *(Pteropus poliocephalus).*

Conclusion

It was concluded that with the implementation of mitigation measures and environmental management already required as part of the project approval, the proposed modification would be unlikely to significantly impact any species or EEC along the modified pipeline corridor alignment and within the locality as:

- In general, the proposed modified pipeline corridor alignments have been located so as to avoid areas of high biodiversity which would be most likely to provide habitat for listed species and endangered ecological communities;
- The modified pipeline corridor alignments would result in less clearing of the *Hunter Lowland Redgum Forest* (EEC) (reduced by 0.14 ha) with only a marginal increase in the clearing of degraded *Swamp Oak Floodplain Forest* (EEC) (i.e. 0.25 ha);
- In unavoidable areas of high conservation status (e.g. EEC and paddock trees) the pipeline has largely been aligned to follow cleared areas between trees, resulting in minimal tree clearing and impact in the form of habitat removal and fragmentation; and
- Potential impacts could be managed and mitigated with environmental management already required under the project approval.

5.6 NSW *Fisheries Management Act 1994*

The mangroves located along the Hunter River foreshore are protected under the FM Act. Underboring of the Hunter River would be initiated approximately 500 m east of the Hunter River with the exit point approximately 250 west of the Hunter River. Therefore the Hunter River and the mangroves would be protected from direct impacts.

5.6 Threatening Processes

Key threatening processes (KTP) listed under the TSC Act / EPBC Act which may be relevant to this proposal includes *Clearing of native vegetation / land clearance* and *Predation by the European Red Fox*. The modified pipeline corridor alignments would not increase the risk of these KTP occurring above that of the approved alignment, and instead an overall reduction in the clearing of native vegetation would accrue through the retention of an additional 1.69 ha of vegetation.

5.7 Corridors and Connectivity

It is unlikely that the modified pipeline corridor alignment would substantially disrupt large scale corridors and fragment connectivity as the proposed modified pipeline corridor alignment generally traverses introduced pastures and the ROW required for construction is narrow. It may marginally disrupt fine-scale movement corridors for less mobile species but this would largely be over a very short time frame as backfilling of the trench would take place directly after laying the pipe.

The modified pipeline corridor alignment would be unlikely to increase the disturbance to corridors and connectivity over that associated with the approved pipeline corridor alignment.

5.8 Cumulative Impacts

Construction and operation of the proposed modified pipeline alignments is not likely to substantially increase cumulative impacts. The modified pipeline corridor alignments are predominately within cleared paddocks and only relatively small amounts of native vegetation would be removed and these are along the edges of existing areas of disturbance. Therefore, it is considered that the scale of the impact of the modified pipeline corridor alignment is small and impacts associated with construction and operation are predicted to be relatively minor and manageable.

The modified pipeline corridor alignment would be unlikely to increase cumulative impacts over that associated with the approved pipeline corridor alignment.

6 MITIGATION RECOMMENDATIONS

The current ecological condition and biodiversity along the modified pipeline corridor alignments would be protected and maintained by implementing the mitigation and environmental management measures already required as part of the project approval.

6.1 Sensitive Ecological Receptors

Recommendations and mitigation measures specific to each of the ecological features identified in the proposed modification areas are listed in Table 12, along with the relevant project approval condition. These can be incorporated into the relevant requirements under the project approval and management plans for the protection of biodiversity for the approved GGP including those measures detailed in Chapter 25 of the AECOM (2009) EA.

Measures outlined in the EA (AECOM 2009) provide for the minimisation of native vegetation clearance in the selection of the final pipeline alignment. Examples include:

- Utilising existing clearings and reducing the width of the ROW when crossing watercourses;
- When transecting native vegetation, utilising cleared areas and reducing the width of the ROW wherever feasible; and
- Using HDD techniques to avoid disturbance to hydrology, riparian vegetation and threatened species when crossing permanent streams.

Further, the existing project approval requires the preparation of a Flora and Fauna Management Plan (Condition 7.3(a)) comprising of the following relevant aspects

- Detailed mapping of the final alignment identifying sensitive areas to be avoided and / or managed;
- Measures for minimising and managing impacts to native vegetation important habitat features;
- Measures to minimise disturbance of riparian and in-stream habitat;
- Construction practices to avoid direct interaction/injury to fauna; and
- Measures for progressive rehabilitation during construction.

Condition 7.3(b) requires the preparation of a Watercourse Crossing Management Strategy to manage the construction impacts of the pipeline waterway crossings including:

- Baseline surveys of each water crossing to identify habitat sensitivity and watercourse integrity;
- Design details of each watercourse crossing;
- Site specific mitigation measures to be implemented to minimise disturbance during construction; and

- Rehabilitation requirements to stabilise bank structure and rehabilitate affected riparian vegetation including performance and completion criteria (based on baseline surveys) and monitoring requirements.

Of particular importance will be the need to minimise changes to natural flow regimes of rivers, streams, floodplains and wetlands, as much of the southern section of the modified pipeline route traverses low lying floodplains of the Hunter River.

Table 12 Key ecological features and recommendations

Key Ecological Features	Recommendation / Management	Relevant Project Approval Condition
Seaham		
Native vegetation adjacent to pipeline route	Implement sedimentation and erosion controls.	3.2 and 7.3 (c)
	Undertake follow up weed control.	7.3 (a)
Drainage lines	Ensure that sedimentation and erosion controls are in place before and during trenching of drainage lines (Identification No. 138-141).	3.2 and 7.3 (c)
Brandy Hill		
Hunter Lowland Redgum Forest (EEC), Swamp Oak Floodplain Forest (EEC) and 'Marginal" habitat for Koala mapped under the Port Stephens Council CKPoM.	Where clearing of EECs and Koala habitat is required, the ROW will be minimised to 15 m wide, and clearing of trees avoided where feasible.	7.3 (a)
	Implement sedimentation and erosion controls.	3.2 and 7.3 (c)
	Undertake follow up weed control.	7.3 (a)
Adjacent Barties Creek (constructed channel)	Implement management measures to avoid indirect impacts through erosion and sedimentation, e.g. ensuring sediment fences are in place and regularly checked.	3.2 and 7.3 (c)
Millers Forest		
Drainage lines	Ensure that sedimentation and erosion controls are in place before trenching of drainage lines (Identification No. 168-169).	3.2 and 7.3 (c)
Tomago		
Swamp Oak Floodplain Forest (EEC)	Where clearing is required, the ROW will be minimised to 15 m wide and clearing of trees avoided where	7.3 (a)

Key Ecological Features	Recommendation / Management	Relevant Project Approval Condition
	feasible.	
	Implement sedimentation and erosion controls.	3.2 and 7.3 (c)
	Undertake follow up weed control.	7.3 (a)
Tributary of Francis Greenway Creek	Implement sedimentation and erosion controls prior to and during trenching.	3.2, 7.3 (b) and 7.3 (c)
Hunter River	HDD entry and exit points will be set back from the riparian areas and avoid the Mangrove Forest and Swamp Oak Forest (EEC) at KP 92.	3.3, 7.3 (a), 7.3 (b) and 7.3 (c)

6.2 Biodiversity Offsets

An Ecological Values Study (Alison Hunt & Associates Pty Ltd 2010) was undertaken in 2009, with the intention of providing a preliminary assessment of the ecological values of a site identified at Seaham as a potential biodiversity offset for the GGP. That study identified sections of the site as having the potential to provide valuable offsets. Discussions with OEH confirmed the site's potential and subsequently detailed flora and fauna surveys were undertaken to provide more specific information on the natural assets that could provide valuable compensatory offsets.

The Seaham property (approximately 160 ha) was shown to share many of the values of the adjacent Wallaroo National Park, including its close location to the Williams River, a wooded area in a largely cleared landscape and a wide diversity of vegetation associations within its boundaries. Specifically, the site supports features of conservation value including:

- Intact vegetation types;
- An array of vegetation communities;
- Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast bioregions a Vulnerable Ecological Community listed under the TSC Act;
- An array of fauna and or fauna habitat;
- Contiguous with larger tracts of vegetation;
- Provides a corridor to enhance movement through the landscape; and
- Supports species listed as threatened under State and Commonwealth legislation.

The Biobanking assessment methodology was used to quantify impacts of the GGP and the potential offsets provided by the Seaham property. OEH acknowledged the applicability of this site to providing biodiversity offsets especially as this site supports important diversity in terms of vegetation communities and habitats in a largely cleared landscape.

Given that the proposed pipeline corridor realignments are minor and that there would be an overall reduction in the clearing of native vegetation as a consequence of these modifications, it is considered that impacts could be adequately integrated into the current biodiversity offset package being developed for the currently approved GGP.

7 CONCLUSIONS

The modified pipeline corridor alignments would decrease the clearing of native vegetation over that of the approved pipeline corridor alignment by approximately 1.69 ha and this is comprised of the retention of 1.80 ha of Spotted Gum – Ironbark Woodland at Seaham and a reduction of clearing through the *Hunter Lowland Redgum Forest* EEC at Brandy Hill from 0.23 to 0.09 ha. The modified alignment would impact on *Swamp Oak Floodplain Forest* EEC at Brandy Hill and Tomago where it would traverse three small degraded remnant / regrowth patches resulting in the removal of 0.25 ha. *Swamp Oak Floodplain Forest* had not previously been impacted by the approved pipeline corridor alignment. The modified pipeline corridor alignments would also reduce the number of crossings of the Hunter River from the currently approved two to one, thereby limiting the potential for impacts on this important resource. It would also reduce disturbance of acid sulfate soils and direct impacts on wetlands.

Construction and operation of the proposed modified pipeline alignments is not likely to substantially increase cumulative impacts within the locality. The modified pipeline alignments are likely to reduce cumulative impacts over those associated with the approved pipeline corridor alignment due to the reduction in clearing of native vegetation types.

Impact assessments for those species, populations and communities listed under the TSC Act, concluded that significant impacts are unlikely given the altered nature of the modified pipeline corridor alignments provided that environmental management measures already contained within the project approval are implemented. Similarly, it was concluded that matters of NES listed under the Commonwealth EPBC Act would not be significantly impacted provided management and mitigation measures already contained within the project approval are implemented. Consequently this proposal is unlikely to be considered a controlled action under the EPBC Act.

8 REFERENCE MATERIALS

AECOM 2009 **Gloucester Coal Seam Gas Project. Ecological Assessment. Gloucester to Hexham.** Report prepared for Lucas Energy, Gloucester NSW.

Alison Hunt & Associates Pty Ltd 2009 **Gloucester Coal Seam Gas Project. Gloucester to Hexham. Addendum. Ecological Assessment Report**. Prepared for AGL, Gloucester NSW.

Alison Hunt & Associates Pty Ltd 2010 **Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Values Report.** Prepared for AGL, Gloucester NSW.

Alison Hunt & Associates Pty Ltd 2011a **Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Assessment.** Prepared for AGL, Gloucester NSW.

Alison Hunt & Associates Pty Ltd 2011b **Gloucester Coal Seam Gas Project. Seaham Property. Potential Land Acquisition. Ecological Assessment.** Prepared for AGL, Gloucester NSW.

Alison Hunt & Associates Pty Ltd 2009 **Gloucester Coal Seam Gas Project. Gloucester to Hexham. Targeted Threatened Species Surveys**. Prepared for AGL, Gloucester NSW.

Botanic Gardens Trust 2013 **PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (version 2)**. http://plantnet.rbgsyd.nsw.gov.au. Accessed 18 June 2008.

Cockerill A, Harrington S & Bangel T 2013 **EPBC Act Listed Ecological Communities Mapping in the Lower Hunter.** Report funded by the Department of Sustainability, Environment, Water, Population, and Communities through the Sustainable Regional Development Program. Parsons Brinckerhoff, Canberra.

Coffey Natural Systems 2011 **Newcastle Gas Storage Facility – Environmental Assessment**. Prepared for AGL Energy Limited.

DECC 2007 **Threatened Species Assessment Guidelines: The Assessment of Significance.** NSW Department of Environment and Climate Change, Hurstville**.**

DECC 2008b **Recovery Plan for the Koala (*Phascolarctos cinereus*).**. NSW Department of Environment and Climate Change, Hurstville.

Department of the Environment 2013a **Matters of National Environmental Significance**. **Significant Impact Guidelines 1.1. Environmental Protection & Biodiversity Conservation Act 1999.** Accessed Online http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf

Department of the Environment 2013b **Protected Matters Search Tool – Matters of National Environmental Significance.** Accessed online September 2013.

Department of the Environment 2013c **Register of Critical Habitat.** Accessed online September 2013.

DPI 2013 **Protected Species Geographic Region Search** Department of Primary Industries. Online http://pas.dpi.nsw.gov.au/Species/Species_byRegion.aspx

DPI 2013 **Noxious Weed Declarations.** Department of Primary Industries. Online http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed

Fairfull S & Witheridge G 2003 **Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.** NSW Fisheries, Cronulla. 16 pp.

Keith D. 2002 **A Compilation map of Native Vegetation for NSW**. NSW National Parks and Wildlife Service, Hurstville.

Keith D 2004 **Ocean shores to desert dunes: The Native Vegetation of New South Wales and the ACT.** NSW Department of Environment and Conservation, Hurstville.

NPWS 1999 **Forest Ecosystem Classification and Mapping of the Upper and Lower North East Comprehensive Regional Assessment (CRA) regions.** CRA Unit, Northern Zone National Parks and Wildlife Service.

NPWS 2000 **Vegetation Survey, Classification and Mapping - Lower Hunter and Central Coast Region.** Undertaken for the Lower Hunter and Central Coast Regional Environment Management Strategy by NSW National Parks and Wildlife Service, Hurstville, NSW.

NSW Scientific Committee 2003 **Final Determination: Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast bioregions - endangered ecological community listing.** Department of Environment and Climate Change, Hurstville.

NSW Scientific Committee 2004 ***Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*** Department of Environment and Climate Change, Hurstville.

OEH 2012 **Threatened Species Profiles.** NSW Office of Environment & Heritage, Hurstville. http://www.threatenedspecies.environment.nsw.gov.au/index.aspx

OEH 2013 **Threatened Species Database Records**. NSW Department of Environment and Climate Change, Hurstville.

Pizzey G & Knight F 2001 **The Field Guide to the Birds of Australia.** Harper Collins Publishers Pty Ltd, Sydney.

Port Stephens Council 2002 **Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) – June 2002**. Prepared by Port Stephens Council with the Australian Koala Foundation.

Robinson L 2003 **Field Guide to the Native Plants of Sydney.** Kangaroo Press, Pymble.

Somerville M 2009a **Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 1: Vegetation classification technical report.** Report prepared by HCCREMS / Hunter Councils Environment Division for Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.

Somerville M 2009b **Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 2: Vegetation community profiles.** Report prepared by HCCREMS / Hunter Councils Environment Division for Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.

Strahler AN 1952 **Dynamic basis of geomorphology**. Geological Society of America Bulletin 63: 923–938.

Swift Parrot Recovery Team 2001 **Swift Parrot Recovery Plan.** Department of Primary Industries, Water and Environment, Hobart.

Department of the Environment 2013 **Protected Matters Search Tool – Matters of National Environmental Significance.** Accessed online September 2013.

Department of the Environment 2013 **Register of Critical Habitat.** Accessed online September 2013.

Weeds in Australia 2013 **Weeds of National Significance (WONS).** Australian Government, Canberra. Online http://www.weeds.gov.au/weeds/lists/wons.html

APPENDIX A

List of flora species recorded along the modified pipeline corridor alignments

AGL MODIFIED PIPELINE ALIGNMENTS								
25 - 26 September 2013								
Note:								
CL = Cleared landscapes								
HLRF = Hunter Lowland Redgum Forest (EEC)								
SOFF = Swamp Oak Floodplain Forest (EEC)								
* = introduced species								
			Seaham	**Brandy Hill**			**Tomago**	
Family	**Botanical Name**	**Common Name**	**CL**	**HLRF**	**SOFF**	**CL**	**SOFF**	**CL**
MAGNOLIOPSIDA (Flowering Plants)								
Dicotyledons								
Apiaceae	*Centella asiatica*	Indian Pennywort	x					
	Daucus glochidiatus	Native Carrot	x	x			x	
Apocynaceae	*Parsonsia straminea*	Common Silkpod		x				
Asteraceae	*Bidens pilosa**	Cobblers Pegs	x		x	x		
	*Carthamus glaucus**	Glaucous Starthistle						x
	*Cotula coronopifolia**	Water Buttons				x		x
	*Onopordum acanthium**	Scotch Thistle			x	x	x	x
	Senecio madagascariensis *	Fireweed	x		x	x	x	x
	Solenogyne bellioides		x					
Campanulaceae	*Wahlenbergia gracilis*	Sprawling Bluebell	x			x		
Caryophyllaceae	*Stellaria media*	Chickweed			x		x	x
Casuarinaceae	*Allocasuarina glauca*	Swamp Oak			x		x	
	Allocasuarina torulosa	Forest Oak	x					
Convolvulaceae	*Dichondra repens*	Kidney Weed	x					
Ericaceae-	*Leucopogon juniperinus*	Prickly Beard-heath	x	x				
Styphelioideae								
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	x					
Fabaceae-	*Bossiaea scortechinii*							
Faboideae	*Glycine microphylla*	Small-leaf Glycine	x					
	Glycine tabacina		x	x				
	Hardenbergia violacea	Purple Coral Pea	x					
	Trifolium repens	White Clover				x		x
	Vicia sativa	Common Vetch				x	x	

AGL MODIFIED PIPELINE ALIGNMENTS

25 - 26 September 2013

Note:

CL = Cleared landscapes

HLRF = Hunter Lowland Redgum Forest (EEC)

SOFF = Swamp Oak Floodplain Forest (EEC)

* = introduced species

			Seaham	Brandy Hill			Tomago	
Family	**Botanical Name**	**Common Name**	**CL**	**HLRF**	**SOFF**	**CL**	**SOFF**	**CL**
Fabaceae-	*Acacia brownii*	Heath Wattle	x					
Mimosoideae	*Acacia falcata*		x					
	Acacia filicifolia	Fern-leaved Wattle	x					
	Acacia gladiiformis	Sword Wattle	x					
	Acacia irrorata	Green Wattle	x					
Gentianaceae	*Schenkia spicata*	Spike Centaury	x	x		x		
Goodeniaceae	*Goodenia hederacea*	Forest Goodenia	x					
Lobeliaceae	*Pratia purpurascens*	Whiteroot	x					
Malvaceae	*Sida rhombifolia* *	Paddy's Lucerne	x		x	x	x	x
Myrsinaceae	*Anagallis arvensis* *	Scarlet Pimpernel	x		x	x		x
Myrtaceae	*Corymbia maculata*	Spotted Gum	x	x				
	Eucalyptus agglomerata	Blue-leaved Stringybark						
	Eucalyptus amplifolia subsp. *amplifolia*	Cabbage Gum		x				
	Eucalyptus crebra	Narrow-leaved Ironbark	x	x				
	Eucalyptus moluccana	Grey Box		x				
	Eucalyptus punctata	Grey Gum		x				
	Eucalyptus tereticornis	Forest Red Gum		x				
	Eucalyptus umbra	Broad-leaved White Mahogany	x					
	Melaleuca linariifolia	Flax-leaved Paperbark		x				
	Melaleuca styphelioides	Prickly-leaved Tea Tree					x	
Oxalidaceae	*Oxalis perennans* *		x					x
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues	x	x		x	x	x
Polygalaceae	*Acetosella vulgaris*	Sheep Sorrel				x	x	
	Persicaria hydropiper	Water Pepper		x		x		
Proteaceae	*Persoonia levis*	Broad-leaved Geebung	x					
	Persoonia linearis	Narrow-leaved Geebung	x					

AGL MODIFIED PIPELINE ALIGNMENTS

25 - 26 September 2013

Note:

CL = Cleared landscapes

HLRF = Hunter Lowland Redgum Forest (EEC)

SOFF = Swamp Oak Floodplain Forest (EEC)

***** = introduced species

			Seaham	Brandy Hill			Tomago	
Family	**Botanical Name**	**Common Name**	**CL**	**HLRF**	**SOFF**	**CL**	**SOFF**	**CL**
Rubiaceae	*Morinda jasminoides*	Sweet Morinda						
	Opercularia hispida	Hairy Stinkweed				x		x
Sapindaceae	*Dodonaea viscosa* subsp. *angustifolia*	Sticky Hop-bush	x					
Solanaceae	*Solanum linnaeanum**	Apple of Sodom		x		x		
Verbenaceae	*Lantana camara* *	Lantana	x	x				
	*Verbena bonariensis**	Purpletop	x			x		
Monocotyledons								
Cyperaceae	*Carex appressa*	Tall Sedge				x		
	Schoenus apogon	Common Bog-rush				x		x
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	x					
Hemerocallidaceae	*Dianella caerulea* var. *caerulea*	Blue Flax-lily	x					
Juncaceae	*Juncus acutus**	Sharp Rush				x	x	x
	Juncus kraussii	Sea Rush				x	x	x
Juncaginaceae	*Triglochin striata*	Streaked Arrowgrass		x				
Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush	x					
Orchidaceae	*Microtis* sp.		x					
Poaceae	*Andropogon virginicus* *	Whisky Grass	x			x		
	Aristida vagans	Threeawn Speargrass	x					
	Briza minor *	Shivery Grass	x	x		x	x	x
	Cynodon dactylon	Couch	x	x	x	x		x
	Echinopogon ovatus	Forest Hedgehog Grass	x					
	Imperata cylindrica	Blady Grass	x					
	Pennisetum clandestinum	Kikuyu Grass	x			x	x	x
	Phragmites australis	Common Reed						x
	Themeda australis	Kangaroo Grass	x					
	Cymbopogon refractus	Barbed Wire Grass	x					

AGL MODIFIED PIPELINE ALIGNMENTS								
25 - 26 September 2013								
Note:								
CL = Cleared landscapes								
HLRF = Hunter Lowland Redgum Forest (EEC)								
SOFF = Swamp Oak Floodplain Forest (EEC)								
* = introduced species								
			Seaham	**Brandy Hill**			**Tomago**	
Family	**Botanical Name**	**Common Name**	**CL**	**HLRF**	**SOFF**	**CL**	**SOFF**	**CL**
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass	x					
	Paspalum dilatatum	Paspalum		x				
	Lolium perenne	Perennial Ryegrass				x		x
	Microlaena stipoides	Weeping Grass	x					
	Stenotaphrum secundatum *	Buffalo Grass		x				
FILICOPSIDA (Ferns)								
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	x					
	Adiantum hispidulum var. *hispidulum*	Rough Maidenhair						
	Cheilanthes sieberi subsp. *sieberi*		x					
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	x			x		x

APPENDIX B

Threatened communities, population and species recorded or predicted to occur within the locality of the modified pipeline corridor alignments

Endangered ecological communities known from the locality of the modified pipeline alignments

Vegetation Community	Conservation Status	Description	Likely Occurrence Along Modified Pipeline Alignments
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC V-EPBC	Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea and frequently found as a zone on the landward side of mangrove stands. Characteristically a treeless community with dominant plants including Sea Rush, Samphire, Marine Couch and Swamp Weed.	Not recorded at western crossing point of the Hunter River (Tomago). Unlikely to occur.
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC	Coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes Dominated by herbaceous plants with very few woody species.	Previously mapped at Tomago. Ground-verification confirmed the presence of Swamp Oak Floodplain Forest. Unlikely to occur.
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	**EEC-TSC**	Open forest on gentle slopes of depressions and drainage flats on the Hunter Valley floor. The most common canopy tree species are Forest Red Gum and Grey Gum and subdominants of Smooth-barked Apple, Spotted Gum, Narrow-leaved Ironbark and Grey Box. The mid-storey is characterised by sparse shrubs such as *Breynia oblongifolia, Leucopogon juniperinus, Daviesia ulicifolia* and *Jacksonia scoparia* with ground cover typically grasses and herbs.	**Two remnant patches recorded along the Brandy Hill section.** **Recorded.**
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC CEEC-EPBC	A closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. The plant species of this community are predominantly rainforest species. Scattered emergent sclerophyllous species may also be present.	Modified alignments do not traverse rainforest communities. Unlikely to occur.

Vegetation Community	Conservation Status	Description	Likely Occurrence Along Modified Pipeline Alignments
Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion	EEC-TSC	Open forest dominated by Spotted Gum and Broad-leaved Ironbark with occasional Grey Gum and Narrow-leaved Ironbark. Understorey comprises tall shrubs and the understorey is diverse.	Ironbark-Spotted Gum communities at Seaham likely to be representative of Seaham Spotted Gum Ironbark Forest due to species composition and not the EEC. Unlikely to occur.
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	EEC-TSC CEEC-EPBC	Lowland Rainforest has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes including palms, vines and vascular epiphytes.	Modified alignments do not traverse rainforest communities. Unlikely to occur.
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	EEC-TSC CEEC-EPBC	Typically have a dense canopy, which blocks most light from reaching the ground, creating cool, moist conditions within. Lowland Rainforest on Floodplain supports a rich diversity of plants and animals.	Modified alignments do not traverse rainforest communities. Unlikely to occur.
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC	Found on the river flats of the coastal floodplains and has dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus *Eucalyptus*; the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses.	Modified alignments do not traverse Eucalypt forests with the characteristics of this EEC. Unlikely to occur.
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	EEC-TSC	It has a tall open tree layer of eucalypts, angophoras, melaleucas and bloodwoods, the most widespread and abundant dominant trees include *Eucalyptus tereticornis*, *E.*	Modified alignments do not traverse Eucalypt forests with the

Vegetation Community	Conservation Status	Description	Likely Occurrence Along Modified Pipeline Alignments
		siderophloia. A layer of small tress may be present as well as scattered shrubs with abundant forbs, scramblers and grasses.	characteristics of this EEC. Unlikely to occur.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	**EEC-TSC**	**This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which Swamp Oak is the dominant species northwards from Bermagui.**	**This community recorded as isolated degraded remnants at Brandy Hill and Tomago.** **Recorded.**
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC	A swamp community which has an open to dense tree layer of Eucalypts and paperbarks including swamp mahogany, *Melaleuca quinquenervia.*	Modified alignments do not traverse Eucalypt forests with the characteristics of this EEC. Unlikely to occur.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	EEC-TSC	A complex of vegetation types largely restricted to freshwater swamps in coastal areas vegetated with sedges and aquatic plants.	Treeless wetland areas were not recorded along the modified alignments. Unlikely to occur.
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC-TSC	*Themeda australis* is the dominant species in the Themeda Grassland on seacliffs and coastal headlands.	Modified alignments do not traverse seacliffs or coastal headlands or areas of Themeda australis grasslands. Unlikely to occur.

Note: **BOLD** = recorded or with potential to occur. EPBC = Environment Protection & Biodiversity Act 1999, TSC Act = *Threatened Species Conservation Act 1995*, CEEC = critically endangered ecological community, EEC = endangered ecological community, V = Vulnerable. **Source**: OEH 2012, Botanic Gardens Trust 2013,

Endangered populations known from the Karuah-Manning subregion of the Hunter-Central Rivers CMA

Vegetation Community	Conservation Status	Description	Likely Occurrence Along Modified Pipeline Alignments
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	EP-TSC	Occur in a predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities. Population is of significant conservation value as the last known population in northern coastal NSW.	All records on the east of the Hunter River. Closest record is 15 km to the east of the eastern side of the Hunter River. Unlikely to occur.
Koala, Hawks Nest and Tea Gardens population	EP-TSC	Population known from and in the immediate vicinity of the towns of Hawks Nest and Tea Gardens in the Great Lakes LGA.	Modified pipeline alignments outside of range. Unlikely to occur.
Cymbidium canaliculatum population in the Hunter Catchment	EP-TSC	Large epiphytic orchid commonly occurring within *Eucalyptus albens* woodland typically in a single clump between 2 and 6 m above ground level. Less commonly found on *E. dawsonii, E. crebra, E. moluccana, Angophora floribunda, Acacia salicina*.	Modified pipeline alignment does not traverse dry Eucalypt woodlands dominated by *E. albens*. Unlikely to occur.
Rhizanthella slateri population in the Great Lakes LGA	EP-TSC	The Eastern Australian Underground Orchid is known to occur in sclerophyll forest. The population in the Great Lakes LGA occurs at the known northern limit of the species' range and is disjunct from other known populations of the species.	Modified pipeline alignments outside of range. Unlikely to occur.
Note: TSC Act = *Threatened Species Conservation Act 1995*. EP = Endangered Population. **Source**: DEC 2012, Botanic Gardens Trust 2013,			

Targeted threatened flora, known or predicted to occur within the locality of the modified pipeline alignment

Botanical Name / Common Name	Conservation Rating	Habitat Requirements / Survey Timing	Potential Habitat Along Modified Pipeline Alignments
Asperula asthenes Trailing Woodruff	V-EPBC V-TSC ROTAP 3VC-	A low, trailing perennial herb which grows in damp soils often along river banks. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. This species can be detected all year but is best when flowering in spring. Found in damp areas, soaks and creeks (including ephemeral streams) and riparian areas.	Potential habitat marginal due to past and ongoing landuse. Not recorded during targeted surveys. Unlikely to occur.
Galium australe Tangled Bedstraw	V-TSC	Tangled Bedstraw is widespread in Victoria and is also found in South Australia and Tasmania. Once regarded as presumed extinct in NSW, this species is now known from the Towamba Valley near Bega, Lake Yarrunga near Kangaroo Valley, Cullendulla Creek Nature Reserve near Batemans Bay, Conjola National Park, Swan Lake near Swanhaven, and the Big Hole in Deua National Park. It was recorded historically from the Clyde River near Batemans Bay and the Mongarlowe area near Braidwood. The species also occurs beside Lake Windemere in the ACT at Jervis Bay. In NSW Tangled Bedstraw has been found in moist gullies of tall forest, *Eucalyptus tereticornis* forest, coastal Banksia shrubland, and *Allocasuarina nana* heathland. Most flowering collections have been made in late spring to early autumn. Found in Swamp Oak swamp forest of the coastal lowlands of the North Coast, Swamp Oak swamp forest of the coastal lowlands of the North Coast Water bodies, rivers, lakes, streams (not wetlands).	Potential habitat marginal due to past and ongoing landuse. Not recorded during targeted surveys. Unlikely to occur.
Callistemon linearifolius Netted Bottle Brush	V-TSC ROTAP 2RCi	Grows in dry sclerophyll forest on the coast and adjacent ranges and is recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. In Lower Hunter National Park near Cessnock, this species occurs in the understorey of Spotted Gum / Ironbark forest, often within dense stands of *Melaleuca nodosa.* This species can be detected all year but is best when flowering in spring and summer.	Modified alignment does not traverse suitable habitat. Unlikely to occur.

Botanical Name / Common Name	Conservation Rating	Habitat Requirements / Survey Timing	Potential Habitat Along Modified Pipeline Alignments
Cryptostylis hunteriana Leafless Tongue Orchid	V-EPBC V-TSC ROTAP 3VC-	Does not have a particularly well defined habitat preference although it is known from swampy heath environments and dry sclerophyll grassy woodlands, mostly in coastal areas. There are no past records within a 5 km buffer of the modified alignments. This species can only be detected when in flower between November and February although it is known to flower during November on the Central Coast. May not flower every year depending on climatic conditions. Found in Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin, Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin, Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner and River Oak riparian woodland of the North Coast and northern Sydney Basin.	Potential habitat marginal due to past and ongoing landuse. Not recorded during targeted surveys. Unlikely to occur.
Cynanchum elegans White-flowered Wax Plant	E-EPBC E-TSC	A climber or twiner with a highly variable form. The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree – Coastal Banksia coastal scrub; Forest Red Gum aligned open forest and woodland; Spotted Gum aligned open forest and woodland; and Bracelet Honeymyrtle scrub to open scrub. Easiest to identify when in flower. Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific. Found in Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin, Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin.	Potential habitat marginal due to past and ongoing landuse. Not recorded during targeted surveys. Unlikely to occur.
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea	E-TSC V-EPBC	Distributed sporadically within the central NSW coastal region from south of Sydney to the lower Hunter. It occurs in a range of vegetation types from heath and shrubby woodland to open forest. It generally grows in sandy or light clay soils, usually over thin shales. It often occurs in open, slightly disturbed sites such as along tracks and infrastructure easements. Recorded by AECOM 2009 near to Wallaroo National Park, Seaham. This species is best identified when in flower between July and December.	Recorded 3 km north of the Seaham section. Potential habitat but not recorded during targeted surveys.

Botanical Name / Common Name	Conservation Rating	Habitat Requirements / Survey Timing	Potential Habitat Along Modified Pipeline Alignments
Persicaria elatior Tall Knotweed	V-EPBC V-TSC ROTAP-3V	Grows in damp sites, especially beside streams and lakes and occasionally in swamp forest. Possible *Persicaria* recorded at FL20 by AECOM 2009. The pipeline has been moved to the west approximately 2 km. Flowers are required for identification. Flowering occurs during summer and autumn. Found in Swamp Oak forest of the central Hunter Valley, Sydney Basin, *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin, Water bodies, rivers, lakes, streams (not wetlands).	Potential habitat marginal due to past and ongoing landuse. Not recorded during targeted surveys. Unlikely to occur.
Pomaderris queenslandica Scant Pomaderris	E-TSC	Grows in moist eucalypt forest or sheltered woodlands with a shrubby understory, and occasionally along creeks. Scant Pomaderris is widely scattered but not common in north-east NSW but is known from several locations on the NSW north coast. This species can be identified all year but is best when flowering during spring and summer.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Rhizanthella slateri Eastern Australian Underground Orchid	V-TSC ROTAP-3KC-	Habitat requirements are not well understood but it is known to grow in sclerophyll forest in shallow to deep loams with a reasonably deep layer of organic litter although little else is known about the habitat of this species. Highly cryptic as it grows almost entirely below soil and is therefore rarely identifiable. Believed to flower between September and November.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Tetratheca juncea Black-eyed Susan	V-EPBC V-TSC ROTAP-3VCa	Grows in sandy, occasionally swampy heath and in dry sclerophyll forest; mostly in coastal districts. *Tetratheca juncea* is confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. This species is cryptic, and is only detectable when in flower generally from July to December but may be irregular due to prevailing climatic conditions.	Modified alignment does not traverse suitable habitat. Unlikely to occur.

Note: TSC Act = *Threatened Species Conservation Act 1995*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*, V = Vulnerable, E = Endangered; ROTAP = Rare or Threatened Australian Plants. **Source**: OEH 2013, PlantNet 2013.

Threatened fauna recorded or with the potential to occur along the modified pipeline alignments

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Amphibians				
Crinia tinnula	Wallum Froglet	V-TSC	Live in permanent swamps and bogs with some free water and open vegetation usually associated with acidic swamps on coastal sand plains.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Litoria aurea	Green & Golden Bell Frog	V-EPBC E-TSC	Marshes, dams and stream-sides particularly those containing *Typha* or *Eleocharis*. Need waterbodies unshaded, free of predatory fish and that have a grassy area nearby.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Avifauna				
Anseranas semipalmata	Magpie Goose	V-TSC	Wetlands usually < 1 m deep with dense growth of rushes and sedges. Wetlands associated with floodplains of rivers and large shallow wetlands formed by run off.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Botaurus poiciloptilus	Australasian Bittern	V-TSC E-EPBC	Emergent vegetation in freshwater and brackish wetlands. Forage in wetlands, tussocky wet paddocks and drains.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Burhinus grallarius	Bush Stone-curlew	E-TSC	Open forests and woodlands with sparse grassy ground layer and fallen timber – nocturnal, especially active on moonlit nights.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Callocephalon fimbriatum	**Gang-gang Cockatoo**	**V-TSC**	**Summer - found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Winter - lower**	**Potential summer foraging habitat at Brandy Hill.**

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
			altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.	
Calyptorhynchus lathami	Glossy Black-cockatoo	V-TSC	Inhabits open forest and woodlands. Feeds on Black She-oak, Forest She-oak or Drooping She-oak. Roosts in large tree hollows.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.
Charadrius mongolus	Lesser Sand-plover	V-TSC	Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Circus assimilis	**Spotted Harrier**	**V-TSC**	**Occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.**	**Recorded foraging at a farm dam at Brandy Hill approximately 350 m from the modified alignment.**
Climacteris picumnus victoria	Brown Treecreeper (eastern subspecies)	V-TSC	Eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands, such as the Hunter Valley and Clarence Valley.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Daphoenositta chrysoptera	Varied Sittella	V-TSC	Sedentary bird that occupies eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked species with dead branches, mallee and *Acacia* woodland. Agricultural land is noted as a potential barrier to movement for this sp.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Ephippiorhynchus asiaticus	Black-necked Stork	E-TSC	Permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ephippiorhynchus asiaticus	Black-necked Stork	E-TSC	Permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Epthianura albifrons	White-fronted Chat	V-TSC	Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Glossopsitta pusilla	**Little Lorikeet**	**V-TSC**	**This species forages mostly within open eucalypt forest and woodland, but also uses Melaleuca and Angophora as food resources. It is known to forage in isolated vegetation such as roadsides, even in single trees in open areas. This species is often observed travelling in flocks of other lorikeet species. Small entrance hollows (3 cm) in smooth-barked eucalypts are often used for nesting, but also riparian species such as *Allocasuarina*.**	**This species could potentially forage across the Brandy Hill Redgum Forest community.**

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Haematopus longirostris	Pied Oystercatcher	E-TSC	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Haemotopus fuliginosis	Sooty Oystercatcher	V-TSC	Found around the entire Australian coast, including offshore islands. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Hieraaetus morphnoides	Little Eagle	V-TSC	Occurs in a variety of timbered habitats – eucalypt forest, woodland and open woodland, as well as acacia or Sheoak woodlands and inland riparian woodlands.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Irediparra gallinacea	Comb-crested Jacana	V-TSC	Occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north).	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ixobrychus flavicollis	Black Bittern	V-TSC	Forested, freshwater and saline wetlands. Breeding along watercourses.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Lathamus discolor	**Swift Parrot**	**E-EPBC** **Mar-EPBC** **E-TSC**	**Migrates to the Australian SE mainland between March & October. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, & White Box. Commonly used lerp infested trees include Grey Box, Grey Box and Blackbutt.**	**This species could potentially forage across the Brandy Hill Redgum Forest community.**
Lophoictinia isura	Square-tailed Kite	V-TSC	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Neophema pulchella	Turquoise Parrot	V-TSC	Lives on edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends majority of day on ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ninox connivens	Barking Owl	V-TSC	Breeds in HBT >20 cm diameter. Forages throughout woodlands, grassy woodlands, forests and into grasslands (250 m).	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ninox strenua	Powerful Owl	V-TSC	A range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Roosts in dense vegetation comprising species: Turpentine, Black She-oak, Blackwood, Rough-barked Apple, Cherry Ballart and a number of eucalypt species.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Oxyura australis	Blue-billed Duck	V-TSC	Occurs in deep permanent water bodies (wetlands or swamps) with dense aquatic vegetation. This species is partly migratory for breeding and wintering.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Pandion cristatus (haliaetus)	Eastern Osprey	V-TSC M–EPBC Mar-EPBC	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Petroica boodang	Scarlet Robin	V-TSC	Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V-TSC	Found in drier open forest, scrubby woodlands, road reserves, farmland and sometimes urbanised areas.	Not recorded across the modified alignments. Unlikely to occur.
Ptilinopus magnificus	Wompoo Fruit-Dove	V-TSC	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ptilinopus superbus	Superb Fruit-Dove	V-TSC	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Pyrrholaemus saggitatus	Speckled Warbler	V-TSC	Species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. Wide range of Eucalyptus dominated communities that have a grassy	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
			understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	Unlikely to occur.
Rostratula australis	Australian Painted Snipe	M-EPBC Mar-EPBC V-TSC	Prefers fringes of swamps, dams and nearby marshy areas with a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation. Forages nocturnally.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Stictonetta naevosa	Freckled Duck	V-TSC	Permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Tyto longimembris	Eastern Grass Owl	V-TSC	Grass Owls are found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Tyto novaehollandiae	Masked Owl	V-TSC	Lives in dry eucalypt forests and woodlands. Pair's home-range of 500 to 1000 ha. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Anthochaera phrygia	Regent Honeyeater	CE-EPBC M-EPBC E-TSC	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands	Modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
			with a significantly high abundance of bird species. Should have large numbers of mature trees, high canopy cover and abundance of mistletoes.	
Migratory and Marine Birds (solely)				
Apus pacificus	Fork-tailed Swift	M-EPBC Mar-EPBC	Overfly marine area. Summer migrant to Australia. Overflies open country from semi-deserts to coasts and sometimes over forests and cities.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Ardea alba	**Great Egret**	**M-EPBC** **Mar-EPBC**	**Overfly marine area. Found in shallows of rivers, estuaries, tidal mudflats, freshwater wetlands, sewage ponds, irrigation areas and larger dams.**	**Recorded at Tomago.**
Ardea ibis	**Cattle Egret**	**M-EPBC** **Mar-EPBC**	**Overfly marine area. Found in stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats and drains.**	**Potential habitat available at Tomago.**
Calidris acuminate	Sharp-tailed Sandpiper	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia where it feeds in coastal areas and inland wetlands.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Calidris ferruginea	Curlew Sandpiper	M-EPBC Mar-EPBC	Summer migrant to coastal Australia where it can be found in coastal areas, inland, mudflats and often at saltworks.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Gallinago hardwickii	Latham's Snipe	M-EPBC Mar-EPBC	Summer migrant to coastal Australia where it feeds on soft wet ground or shallow water with tussocks and woodland, saltmarshes and mangrove fringes.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Haliaeetus leucogaster	White-bellied Sea-Eagle	M-EPBC Mar-EPBC	Found in coastal areas, on islands, estuaries, inlets, large rivers, inland lakes and reservoirs where they forage over water. Builds huge nests of sticks.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Hirundapus caudacutus	**White-throated Needletail**	**M-EPBC** **Mar-EPBC**	**Feeds on flying insects, such as termites, ants, beetles and flies. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts.**	**Could overfly the modified alignments.**
Limosa lapponica	Bar-tailed Godwit	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia. Found in intertidal flats and sandbanks.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Merops ornatus	**Rainbow Bee-eater**	**M-EPBC** **Mar-EPBC**	**Summer breeding migrant to south-east Australia. Found in open woodlands with sandy, loamy soil, sandridges, sandpits, riverbanks, cliffs, mangroves, rainforest and woodland.**	**Recorded at Seaham property in 2010. Potential habitat also at Brandy Hill and Tomago.**
Monarcha melanopsis	Black-faced Monarch	M-EPBC	Summer breeding migrant to coastal south-eastern Australia. Found in rainforests, nearby eucalypt	Potential habitat in Hunter Estuary wetlands. Modified

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
		Mar-EPBC	woodlands and mangroves.	alignment does not traverse suitable habitat. Unlikely to occur.
Myiagra cyanoleuca	Satin Flycatcher	M-EPBC Mar-EPBC	Summer breeding migrant to the south of its range on the south eastern Australian coast. Can be found in wetter denser forests, often at high elevations.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.
Numenius madagascariensis	Eastern Curlew	M-EPBC Mar-EPBC	Common migrant to coastal areas during summer. In estuaries, tidal mudflats, sandspits, saltmarshes, mangroves and occasionally fresh or brackish lakes, bare grasslands near water.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Numenius phaeopus	Whimbrel	M-EPBC Mar-EPBC	Summer migrant to coastal Australia. Found in coastal estuaries, mudflats and mangroves.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Pluvialis fulva	Pacific Golden Plover	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia. Found in estuaries, mudflats, saltmarshes, mangroves, rocky reefs and shallow open inland swamps, sewage ponds and paddocks.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Rhipidura rufifrons	Rufous Fantail	M-EPBC Mar-EPBC	Breeding migrant to south-eastern Australia during July to December. Prefers wetter eucalypt forests, gullies, coastal scrub, watercourses and rainforests where it feeds on insects.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Mammals				
Cercartetus nanus	Eastern Pygmy-possum	V-TSC	Rainforest, sclerophyll forest and woodland to heath – but heath and woodland preferred. Forages on banksias, eucalypts and bottlebrushes.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Chalinolobus dwyeri	Large-eared Pied Bat	V-EPBC V-TSC	Roosts - caves (near their entrances), crevices in cliffs, derelict mines and in the disused, bottle-shaped mud nests of the Fairy Martin frequenting low to mid-elevation dry open forest and woodland close to these features.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Dasyurus maculatus	Spotted-tailed Quoll	E-EPBC V-TSC	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V-TSC	Prefers moist habitats with trees >20 m. Roosts in HBT or under bark or in buildings.	Recorded at Seaham property in 2010 but modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Kerivoula papuensis	Golden-tipped Bat	V-TSC	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. Roost mainly in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests, also in tree hollows, dense foliage and epiphytes; located in rainforest gullies on small first- and second-order streams.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Miniopterus australis	Little Bentwing-bat	V-TSC	Found in well-timbered areas including rainforest, wet and dry sclerophyll forests, Melalecua swamps and coastal forests. Roosts in caves.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V-TSC	Roosting – caves, derelict mines, stormwater tunnels, buildings. Forages over and within forested areas.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Mormopterus norfolkensis	Eastern Freetail-bat	V-TSC	Dry sclerophyll forest and woodland. Roosts - hollows and under bark or man-made structures.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Myotis macropus	Southern Myotis	V-TSC	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, HBTs, stormwater channels, buildings, under bridges. Forages over streams and pools catching insects and small fish by raking their feet across the water surface.	Potential habitat in Hunter Estuary wetlands. Modified alignment does not traverse suitable habitat. Unlikely to occur.
Petaurus australis	Yellow-bellied Glider	V-TSC	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soil.	Modified alignment does not traverse suitable habitat. Unlikely to occur.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Petaurus norfolcensis	Squirrel Glider	V-TSC	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or *Acacia* midstorey. Require abundant tree hollows for refuge and nest sites.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Phascogale tapoatafa	Brush-tailed Phascogale	V-TSC	Dry sclerophyll open forest with sparse groundcover. Also heath, swamps, rainforest and wet sclerophyll forest.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Phascolarctos cinereus	**Koala**	**V-TSC**	**Eucalypt woodlands and forests. Has preferred feed tree species.**	**Redgum Forest at Brandy Hill mapped as Marginal Koala Habitat.** **Habitat present.**
Potorous tridactylus tridactylus	Long-nosed Potoroo	V-TSC V-EPBC	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V-EPBC** **V-TSC**	**Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps.**	**Could potentially forage across the Brandy Hill section on occasion.**
Saccolaimus flaviventris	**Yellow-bellied Sheathtail-bat**	**V-TSC**	**Roosts singly or in groups of up to six, in HBTs and buildings. Will use mammal burrows. Forages in most habitats across areas with and without trees. Appears to defend an aerial territory.**	**Could potentially forage across the Seaham and Brandy Hill sections.**

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Potential to Occur Along Modified Pipeline Alignments
Scoteanax rueppellii	Greater Broad-nosed Bat	V-TSC	Woodland, moist and dry eucalypt forest and rainforest but prefers tall wet forest. Roosts - tree hollows but also buildings.	Modified alignment does not traverse suitable habitat. Unlikely to occur.
Vespadelus troughtoni	Eastern Cave Bat	V-TSC	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with western limit around Warrumbungle Range. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings in groups. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Modified alignment does not traverse suitable habitat. Unlikely to occur.

Note*:* TSC Act = *Threatened Species Conservation Act 1995*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*, V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory, Mar = Marine; HBT = Hollow-bearing tree. **BOLD** = indicates recorded or potential habitat across the modified sections. Source: Botanic Gardens Trust 2013, OEH 2012, NPWS 1999.

APPENDIX C

ASSESSMENT UNDER THE EPBC ACT

APPENDIX C

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

There is minimal removal of native vegetation and disturbance to fauna habitat required along modified pipeline corridor alignment. However, these resources may provide habitat for some species listed under the EPBC Act and some adjacent areas have the potential to support a number of species listed under the EPBC Act. The criteria detailed in the *Matters of National Environmental Significance. Significant Impact Guidelines 1.1* (Department of the Environment 2013) were used to assess the significance of likely impacts as a consequence of the modified pipeline corridor alignment and this assessment is detailed below.

Significant Impact Criteria for Endangered Species

Endangered species assessed include:

- Swift Parrot (*Lathamus discolor*).

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

- Lead to a long-term decrease in the size of a population;

  The modified pipeline corridor alignments have been chosen to avoid areas of intact biodiversity that are most likely to provide habitat for threatened species. There would be some trees removed on the edges of the Hunter Lowland Redgum Forest and some of these could provide habitat for endangered species in the form of foraging, feed trees and structural habitat. However, impacts are unlikely to be substantial given the available surrounding habitat and consequently it is considered that there is unlikely to be a real chance or possibility that this proposal would decrease the size of a population of either of these species.

- Reduce the area of occupancy of the species;

  A total of approximately 0.34 ha of native vegetation would be removed for construction of these modified pipeline corridor alignments. This is a relatively small amount of vegetation and higher quality resources for these species are available in the adjacent areas of intact vegetation. Consequently, it is unlikely to have a real chance or possibility of reducing the area of occupancy of this species to such an extent as to impact on any endangered species.

- Fragment an existing population into two or more populations;

  The majority of the modified pipeline corridor alignments traverse introduced pastures through long established agricultural lands and consequently the locality is currently heavily fragmented. It is unlikely that this proposal would fragment an existing important population into two or more populations as the pipeline trench would be backfilled and only a relatively small amount of vegetation would be cleared and consequently there would be few barriers to movement, especially for mobile species.

- Adversely affect habitat critical to the survival of a species;

  Habitat has not been identified as critical habitat within the recovery plan for this species or listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (Department of Environment 2013).

- Disrupt the breeding cycle of a population;

  Disruption of the breeding cycle of a population is not anticipated as movement corridors are unlikely to be disrupted within the locality and breeding habitat of any species is unlikely to be substantially altered.

- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

  The modified pipeline corridor alignments have largely been chosen to avoid areas of intact biodiversity that are most likely to provide habitat for endangered species. There would be a relatively small amount (a total of approximately 0.34 ha) of marginal potential habitat removed and this would include removal of two mature and six immature trees along the edges of already cleared vegetation. However, a decrease in the quality of the habitat available along the modified alignments is unlikely to be substantial given the current highly modified nature of the modified pipeline corridor alignment.

- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

  The nature of the proposal is such that it is possible that weed species could further spread or invade along the cleared ROW or within the region and this could over time further degrade habitat. Weed management will be addressed in the Construction Environmental Management Plan and Operational Environmental Management Plan so as to minimise the risk of invasive species establishment.

- Introduce disease that may cause the species to decline; or

  Disease has not been identified as a threat to either of these endangered species and this proposal is unlikely to introduce or spread disease through these species.

- Interfere with the recovery of the species.

  There are no key habitat sites that would be disrupted by this proposal and consequently it is unlikely to interfere with the recovery of the species.

Conclusion

It is unlikely that any endangered species listed under the EPBC Act would be significantly impacted by modified pipeline corridor alignment as:

- The modified pipeline corridor alignments were selected to, where possible, avoid areas of biodiversity and reduce clearing which would be likely to provide habitat for endangered species. The modified alignments would result in less woodland being cleared than along the currently approved pipeline corridor alignment; and
- Potential impacts could be managed and mitigated.

Significant Impact Criteria for Vulnerable Species

Vulnerable species assessed include:

- Grey-headed Flying-fox (*Pteropus poliocephalus*); and
- Koala (*Phascolarctos cinereus*).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of a species;

  The modified pipeline corridor alignments have been chosen to avoid areas of intact biodiversity that are most likely to provide habitat for threatened species. Additionally, the nature of the proposal is such that all activities would be undertaken within a narrow ROW with many of the current levels of habitat restored on completion of laying of the pipeline. Consequently, it is unlikely that this proposal would lead to a long-term decrease in the size of an important population of a species.

- Reduce the area of occupancy of an important population;

  The vast majority of the modified pipeline corridor alignments traverse introduced pastures but also some woodland. On completion of laying of the pipeline, the pipeline trench would be backfilled and the current level of habitat restored in the paddock areas. Clearing within areas of native vegetation would be minimised to a total of 0.34 ha resulting in less clearing than that associated with the approved pipeline corridor alignment. Therefore, it is unlikely that modified pipeline corridor alignments would substantially reduce the area of occupancy of an important population.

- Fragment an existing important population into two or more populations;

  The majority of the modified pipeline corridor alignment traverses introduced pastures through long established agricultural lands and consequently the locality is currently heavily fragmented. It is unlikely that this proposal would further substantially fragment an existing important population into two or more populations but clearing would be minimised where possible to reduce the risk of this occurring.

- Adversely affect habitat critical to the survival of a species;

  Habitat has not been identified as critical habitat within the recovery plan for these species or listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (Department of the Environment 2013).

- Disrupt the breeding cycle of an important population;

  Disruption of the breeding cycle of an important population is not anticipated as movement corridors are unlikely to be substantially disrupted within the locality and the breeding habitat of species is unlikely to be substantially altered.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

  The modified pipeline corridor alignments have been chosen to avoid areas of intact biodiversity that are most likely to provide habitat for threatened species. However, this proposal does require clearing of around 0.34 ha of degraded native vegetation although this occurs along the edges of already fragmented habitat. Higher quality habitat is available within the locality. Consequently, it is unlikely that the modified pipeline corridor alignments would lead to a reduction in quality of habitat to the extent that a species is likely to decline.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

  The nature of the modified pipeline corridor alignment is such that it is possible that weed species could further spread or invade along the cleared ROW. Weed management would be addressed in the Construction Environmental Management Plan and Operational Environmental Management Plan.

- Introduce disease that may cause the species to decline; or

  Disease has not been identified as a threat to either of these endangered species and this proposal is unlikely to introduce or spread disease through these species.

- Interfere substantially with the recovery of the species.

  It is unlikely that the modified pipeline corridor alignment would interfere substantially with the recovery of any species as the proposed development traverses modified landscapes and any disruption to species is likely to be relatively minor.

Conclusion

It is unlikely that any vulnerable species listed under the EPBC Act would be significantly impacted by this modified pipeline corridor alignment as:

- The modified pipeline corridor alignments were selected to, where possible, avoid areas of biodiversity and reduce clearing which would be likely to provide habitat for endangered species. The modified alignments would result in less woodland being cleared than along the currently approved pipeline alignment; and
- Potential impacts could be managed and mitigated.

Significant Impact Criteria for Migratory / Marine Species

Species listed as migratory / marine that were assessed:

- Great Egret (*Ardea alba*);
- Cattle Egret (Ardea ibis);
- White-throated Needletail (*Hirundapus caudacutus*);
- Swift Parrot (*Lathamus discolor*); and
- Rainbow Bee-eater (*Merops ornatus*).

An action is likely to have a significant impact on a migratory or marine species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

  To avoid impacts on migratory populations the proposed modified pipeline corridor alignments would require only minimal clearing of woodland habitat and associated open foraging grasslands. HDD will be used to cross under substantial waterways (e.g. Hunter River) and wetland areas. Consequently, it is unlikely that this proposal would modify, destroy or isolate area of important habitat for migratory bird populations.

- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

  It is possible that this proposal could exacerbate existing weed invasions through disturbance. Weed management will be addressed in the Construction Environmental Management Plan and Operational Environmental Management Plan so as to minimise the risk of invasive species establishment.

- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

  To avoid disruption to the lifecycle of migratory bird populations the modified pipeline alignments will adhere to environmental management regimes to protect these habitats against indirect impacts associated with construction and operation. Consequently, it is unlikely that this proposal would modify, destroy or isolate area of important habitat for migratory bird populations.

Conclusion

It is unlikely that any migratory species listed under the EPBC Act would be significantly impacted by the modified pipeline corridor alignment as:

- The modified pipeline corridor alignment was selected so as to avoid areas of biodiversity which would be likely to provide habitat for vulnerable species; and
- Potential impacts could be managed and mitigated, through HDD measures to protect off site habitat in nearby wetlands.

APPENDIX D

ASSESSMENT OF SIGNIFICANCE UNDER THE EP&A ACT

APPENDIX D

Assessment of Significance

Background

An assessment of the impacts of this proposal on species, populations and ecological communities listed under Schedules 1, 1A and 2 of the TSC Act was undertaken. Although the proposal would be assessed under Part 3A of the EP&A Act, Assessments of Significance were undertaken to determine the significance of impacts of the proposal on endangered ecological communities and populations, and threatened species listed on Schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act). Assessments have been undertaken for guilds of species which have similar habitat requirements.

Endangered Ecological Communities

- *Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions; and*
- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*

Woodland Birds

- Gang-gang Cockatoo *(Callocephalon fimbriatum)*
- Swift Parrot *(Lathamus discolor)*
- Little Lorikeet *(Glossopsitta pusilla*)

Raptors

- Spotted Harrier (*Circus assimilis*)

Arboreal Mammals

- Koala (*Phascolarctos cinereus*)

Microchiropteran Bats

- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);

Megachiropteran Bat

- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Endangered Ecological Community

Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions

This vegetation community is listed as an endangered ecological community (EEC) under the TSC Act. It is an open forest which characterises the gentle slopes of depressions and drainage flats on the Hunter Valley floor. It has been recorded from the local government areas of Maitland, Cessnock and Port Stephens (in the Sydney Basin Bioregion) and Muswellbrook and Singleton (in the NSW North Coast Bioregion) but may occur elsewhere in these bioregions (NSW Scientific Committee 2003). Currently only a small area (less than 2% of total) of *Hunter Lowland Redgum Forest in the*

Sydney Basin and NSW North Coast Bioregions is included in NPWS estate in the Lower Hunter (Wereketa) National Park. Modelling shows that much of the pre-1750 extent of the community has been cleared. Only about 27% (less than 500 ha) of the original distribution survives and this is highly fragmented. Although much of the clearing occurred early in European settlement, clearing still continues at a high rate. Between 1988 and 2001 approximately 2,380 ha were approved for clearing. In addition to clearing and fragmentation other threats include grazing, weed invasion, altered fire frequency and, locally, rubbish dumping (NSW Scientific Committee 2003).

The approved pipeline corridor required the clearing of 0.23 ha of the *Hunter Lowland Redgum Forest*. The modified pipeline corridor alignment would reduce the clearing of this community to 0.09 ha resulting in retention of 0.14 ha of this community over the approved alignment.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

This vegetation community is listed as an EEC under the TSC Act. It is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which Swamp Oak is the dominant species. Other trees including *Acmena smithii*, *Glochidion* spp. and *Melaleuca* spp. may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford (OEH 2012).

A total of 0.25 ha of this community would be cleared. There was no clearing of the EEC required along the approved alignment

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

Not a threatened species.

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

Not an endangered population.

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

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

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

At Brandy Hill the modified pipeline corridor alignment reduces impacts on the *Hunter Lowland Redgum Forest* EEC compared to the approved alignment. Along this section the modified alignment has been designed to traverse cleared areas between stands of trees thereby reducing the vegetation removal. Overall the areas of clearing from this EEC would be reduced by approximately 0.14 ha from 0.230 ha to 0.09 ha. The patch of *Hunter Lowland Redgum Forest*

(EEC) located further south would not be directly impacted by this proposal as the pipeline will traverse an already cleared alignment along a fence line.

Three small patches of *Swamp Oak Floodplain Forest* EEC would be directly impacted by this proposal. Along the Brandy Hill section the modified alignment would traverse a small patch of regrowth and a patch of degraded remnant near to the southern extent. At Tomago the modified pipeline corridor alignment also passes through an isolated remnant patch of this EEC. The cumulative clearing across these three remnants would total 0.25 ha.

These impacts are unlikely to have an adverse effect on the extent of either of the EEC such that its local occurrence is likely to be placed at risk of extinction. Nor would it be likely to substantially and adversely modify the composition as the shrub and groundlayer are missing in both communities and the removal of trees would be minimised. Indirect effects on the remnant patch would be controlled through fencing, the installation of sedimentation fences and the control of weeds.

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

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

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

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

A 0.14 ha area, along the eastern boundary of a patch of remnant *Hunter Lowland Redgum Forest* would be removed for the proposed modification, thereby minimising fragmentation. The three small isolated patches of *Swamp Oak Floodplain Forest* EEC that would be traversed by this pipeline would be marginally fragmented although this is likely to be minimal given that the removal of trees would largely be avoided. The long-term survival of both the Hunter Lowland Redgum Forest and Swamp Oak Forest are unlikely to be affected as impacts are predicted to be relatively minor.

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

Critical habitat has not been declared for either EEC.

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

There are priority action statements (PAS) proposed to help recover both of these EEC (OEH 2012). This proposal is unlikely to impede the implementation of any of these as direct impacts would be minor and the remainder would be protected through the implementation of a Construction Environmental Management Plan.

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

Of the 31 key threatening processes identified in NSW one is of relevance to this proposal and this is:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal in the form of two adult and six immature trees. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

This modified pipeline corridor alignment would result in the removal of a 0.09 ha area of *Hunter Lowland Redgum Forest* which is a reduced area over that currently approved (i.e. a gain of 0.23 ha). A total of 0.25 ha of *Swamp Oak Floodplain Forest* would be removed for this proposal. This community occurs in three small and isolated patches which are highly degraded and modified through clearing and grazing. Consequently minor clearing of these is unlikely to result in significant impacts on this community and it is unlikely that either community would be placed at risk of local extinction by this proposal. The implementation of mitigation measures included in the project approval would mitigate against indirect impacts on the remaining *Hunter Lowland Redgum Forest* and *Swamp Oak Floodplain Forest* which occurs adjacent to the modified pipeline corridor alignment.

Woodland Birds

Species information: OEH 2012 (Threatened Species Profiles), Pizzey and Knight 2001.

Swift Parrot (*Lathamus discolor*) is listed as Endangered under the TSC Act and EPBC Act, The Swift Parrot migrates to the Australian South East mainland between March and October to feed on winter flowering species such as Swamp Mahogany, Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). They commonly use lerp infested trees including Grey Box (*E. macrocarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*).

Gang-gang Cockatoo (*Callocephalon fimbriatum*) is listed as Vulnerable under the TSC Act. In summer it is found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter it moves to lower altitudes in drier more open eucalypt forests and woodlands, and is often found in urban areas.

Little Lorikeet (*Glossopsitta pusilla)* is listed as Vulnerable under the TSC Act. This species forages mostly within open eucalypt forest and woodland, but also uses *Melaleuca* and *Angophora* as food resources. It is known to forage in isolated vegetation such as roadsides, even in single trees in open areas. This species is often observed travelling in flocks of other lorikeet species. Small entrance hollows (3 cm) in smooth-barked eucalypts are often used for nesting, but also riparian species such as *Allocasuarina*.

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

The modified pipeline alignments would reduce the clearing of woodland likely to provide habitat for these species by 1.80 ha at Seaham and 0.14 ha at Brandy Hill from the pipeline alignment that is currently approved. The reduction in clearing of these habitats has the potential to improve the outcomes for these species over that associated with the approved pipeline alignment.

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

Not an endangered population.

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

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

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

Not an endangered ecological community.

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

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

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

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

The removal of up to 0.09 ha of woodland at Brandy Hill, which may form foraging habitat for these species, may marginally reduce the amount of foraging habitat available. However, it is unlikely to substantially impact foraging resources for these species as significant resources occur nearby. It is unlikely that habitat connectivity for any of the woodland bird species would be disturbed as these species are mobile and construction for the ROW would require removal of a relatively narrow strip of vegetation, the majority of which are introduced grasslands. Furthermore, current disturbance regimes are not likely to be substantially altered from existing levels as the modified pipeline alignment largely traverses agricultural land and previously cleared woodland habitat.

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

Critical habitat has not been declared for any of these species.

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

PAS have been prepared for all species. The proposed modification would not be inconsistent with any of the PAS as this proposal decreases the amount of clearing required.

A national Swift Parrot (*Lathamus discolor*) Recovery Plan 2001-2005 has been prepared by the Swift Parrot Recovery Team (Swift Parrot Recovery Team 2001). Of the six objectives, *Objective 3 Reduce the incidence of collision*, is the most relevant to this proposal. To ensure that this objective is met within this context, speed limits should be enforced across of the work sites to lessen the risk of death or injury of any birds from collision with vehicles or machinery. There are also 10 PAS designed to help this species recover (OEH 2012) and this proposal would also be in alignment with the envisaged outcomes of these.

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

Of the 31 key threatening processes identified in NSW one is of relevance to this proposal and this is:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

It is considered unlikely that this proposal would result in significant impacts on these species as disturbance to any potential foraging habitat would be relatively minimal due to the limited number of trees that will require removal and given that the modified pipeline corridor alignment would result in less removal woodland vegetation over that of the currently approved project. The implementation of mitigation measures included in the project approval would mitigate against indirect impacts on the remaining vegetation and ensure that creeklines are protected and conserved.

Raptor

Spotted Harrier (*Circus assimilis*) is listed as Vulnerable under the TSC Act. It occurs in grassy open woodland including Acacia and Mallee remnants, inland riparian woodland, grassland and shrub-steppe. It is often found in native grassland but can also occur in agricultural land, foraging over open spaces.

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

This species was recorded foraging around a farm dam approximately 350 m from the modified pipeline alignment at the southern end of the Brandy Hill Section. It is possible that this species could overfly and forage adjacent to the modified pipeline corridor alignment. Given that the vegetation removal would be along a relatively narrow (i.e. maximum of 30 m) linear alignment it is unlikely that this would adversely affect the life cycle of this species to such an extent that a local population could be placed at risk of extinction

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

Not an endangered population.

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

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

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

Not an endangered ecological community.

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

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

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

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

The removal or modification of vegetation which may form foraging habitat for this species would only very marginally reduce the amount of foraging habitat available and this would only be impacted during construction. Re-establishment of pasture would be undertaken on completion of construction of the pipeline.

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

Critical habitat has not been declared for this species.

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

PAS have been prepared for the Spotted Harrier. Provided that clearing of creek lines and wetland areas is kept to a minimum, the proposed development would not be inconsistent with any of the PAS, especially as no roosting habitat would be removed.

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

Of the 31 key threatening processes identified in NSW one is of relevance to this proposal and this is:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal in the form of two adult and six immature trees. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

This proposal is unlikely to have a significant impact on foraging or roosting resources of the Spotted Harrier as the modified pipeline alignment has been designed with the goal of minimising vegetation removal as a key requirement. The implementation of the environmental management measures during construction and operation detailed in the project approval would ensure that remaining vegetation is protected and the potential for indirect impacts managed.

Arboreal Mammals

Species information: OEH 2012 (Threatened Species Profiles)

Koala (*Phascolarctos cinereus*) is listed as Vulnerable under the TSC Act and EPBC Act. The Koala is patchily distributed in NSW. Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. Koala were not recorded along the modified pipeline alignment although it is known from the area and woodland at Brandy Hill has been mapped as 'Marginal Koala Habitat' in the Western Management Unit of the *Port Stephens Council CKPoM* (Port Stephens Council 2002).

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

Around 0.09 ha of woodland would be cleared at Brandy Hill along the edges of a *Hunter Lowland Redgum Forest* remnant patch which contains *Eucalyptus tereticornis* and *Eucalyptus punctata* which are preferred feed trees of this species. The modified pipeline alignment would result in less potential habitat being removed for this species (reduction of approximately 0.14 ha) than would occur with the currently approved pipeline alignment. Removal of this amount of potential foraging habitat on the edge of cleared and disturbed habitat is unlikely to result in a viable local population of this species being placed at risk of extinction.

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

Not an endangered population.

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

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

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

Not an endangered ecological community.

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

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

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

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

The removal of up to 0.09 ha of woodland at Brandy Hill, which may form foraging habitat for this species, may slightly reduce the amount of foraging habitat available. However, this is unlikely to substantially impact foraging resources for these species as resources occur nearby. It is unlikely that habitat connectivity for the Koala would be disturbed as these species are mobile and construction for the ROW would require removal of just 15 m of vegetation, the majority of which is introduced grasslands. Furthermore, current disturbance regimes are not likely to be substantially altered from existing levels as the modified pipeline corridor alignment would traverse agricultural land and cleared forest.

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

Critical habitat has not been declared for the Koala.

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

A recovery plan has been prepared for the Koala (DECC 2008b). It details seven objectives to assist with the recovery of the species. The proposal is not inconsistent with the stated outcomes of these objectives especially given that areas which have been mapped as 'Marginal' Koala Habitat. The habitat at Brandy Hill is marginal as much of it is already fragmented and isolated from larger tracts of wilderness.

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

Of the 31 key threatening processes identified in NSW one is of relevance to this proposal and this is:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal in the form of six immature trees. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

It is considered unlikely that this proposal would result in significant impacts on the Koala as disturbance to any potential foraging habitat would be relatively minimal and the modified pipeline corridor alignment would not result in further fragmentation as it would traverse the edge of the Brandy Hill remnant woodland. The implementation of the environmental management measures

during construction and operation detailed in the project approval would ensure that remaining vegetation and creeklines are protected and conserved and that as many large trees as possible are retained.

Microchiropteran Bats

Species information: OEH 2012 (Threatened Species Profiles)

Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) is listed as Vulnerable under the TSC Act. It roosts singly or in groups of up to six, in hollow-bearing trees and buildings but will use mammal burrows. It forages in most habitats across areas with and without trees and appears to defend an aerial territory.

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

The modified pipeline alignments traverse mostly cleared agricultural paddocks. Construction of the pipeline may result in the temporary disturbance of foraging habitat along the ROW. However, at completion of construction habitat would be re-established and hence any potential impacts would be both minor and temporary. Removal of this amount of potential habitat on the edge of cleared and disturbed habitat is unlikely to result in a viable local population of this species being placed at risk of extinction.

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

Not an endangered population.

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

- **I. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **II. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

Not an endangered ecological community.

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

- **I. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **II. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **III. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

The temporary disturbance of a ROW along the modified pipeline corridor alignments is unlikely to remove important habitat for this species. It is also unlikely that habitat connectivity for this species of microchiropteran bat would be disturbed as these species are highly mobile and construction for the ROW would only require removal of 30 m of vegetation, the majority of which is introduced grasslands. Furthermore, current disturbance regimes are not likely to be substantially altered from existing levels as the amended pipeline route traverse agricultural land and cleared forest.

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

Critical habitat has not been declared for this species.

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

There are currently no recovery plans or threat abatements plans which have been prepared for any of the Yellow-bellied Sheathtail-bat. However, PAS have been issued to help recover this species (OEH 2012). Of importance is the requirement to ensure the largest hollow-bearing trees, including dead trees and paddock trees are given highest priority for retention during land assessments. The modified pipeline alignment would provide this protection.

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

Of the 31 key threatening processes identified in NSW one is of relevance to this proposal and this is:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal in the form of six immature trees. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

It is considered unlikely that this proposal would result in significant impacts on this species as disturbance to any potential foraging and / or roosting habitat would be relatively minor. The implementation of environmental management measures during construction and operation detailed in the project approval would ensure that remaining vegetation and creeklines are protected and conserved.

Megachiropteran Bat

Species information: OEH 2012 (Threatened Species Profiles)

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as vulnerable under the TSC Act and EPBC Act. It roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of

rainforest trees and vines in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.

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

The modified pipeline corridor alignments provide potential foraging habitat for the Grey-headed Flying-fox but do not contain a camp site, and consequently it is unlikely that this proposal would adversely affect the life cycle of this species as no breeding habitat would be removed or modified. The area of vegetation to be removed is relatively small and furthermore, foraging habitat of equal quality is located nearby. Consequently it is unlikely that the proposed vegetation clearance would result in isolation of habitat as the Grey-headed Flying-fox is highly mobile. Therefore it is unlikely that the proposal would place a local population of this species at risk of extinction.

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

Not an endangered population.

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

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

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

Not an endangered ecological community.

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

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

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

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

Although the modified pipeline corridor alignments are likely to provide foraging habitat from time to time, the removal of some of this habitat would not substantially further fragment or isolate habitat for this species as habitat is already patchily distributed and any removal would be relatively minor along a narrow linear alignment. Furthermore the modified alignments do not provide breeding habitat for this species and therefore removal of some habitat is unlikely to interfere with the long-term survival of this species. The current disturbance regimes are not likely to be substantially altered from existing levels as the amended pipeline route traverse agricultural land and degraded woodland.

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

Critical habitat has not been declared for this species.

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

OEH has not prepared a recovery plan or threat abatement plan for this species. However, 10 PAS have been developed (OEH 2012). Of particular relevance to this proposal is the retention of foraging resources over the species range. Whilst this proposal would remove a small amount of foraging habitat it is unlikely to significantly impact the recovery of this species due to the higher quality resources available in the locality. Consequently, this proposal is unlikely to impede the implementation of any of these priority actions.

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

Of the 31 key threatening processes identified in NSW one is of relevance:

- Clearing of Native Vegetation. A 0.09 ha area of *Hunter Lowland Redgum Forest* would be removed as a part of this proposal in the form of six immature trees. A further 0.25 ha of Swamp Oak Floodplain Forest would be removed / altered.

Conclusion

This proposal would not impact on any known breeding habitat for this species and it is unlikely to have a significant impact on foraging resources given that resources of equal or higher quality are available within the locality. The implementation of environmental management measures during construction and operation detailed in the project approval would ensure that adjacent vegetation and creeklines are protected and conserved.

Alison Hunt and Associates Pty Ltd
8 Duncan Street Arncliffe NSW 2205
T 02 9599 0402
E alison@ahecology.com
W www.ahecology.com

ABN 76 233 543 751