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Glen Innes Wind Farm Native Vegetation Offset Strategy

Glen Innes Wind Power

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1. Background

The NSW Department of Planning in its letter of 6th April 2009 has requested additional information regarding the extent of the flora and fauna impacts of the proposed Glen Innes Wind Farm and the management of those impacts particularly in relation to the development of an offset strategy. The Department's letter requested the following information:

- Mapping of individual vegetation communities (superimposed on the project footprint)
- Quantification of the area of each community to be impacted
- Provision of an offset strategy

In response, the proponent has provided the following items in this document:

- a review of the project footprint (Section 2 and Table 1 below)
- overview of flora for the region and the project area (Section 3 and Figures)
- review of the impacted communities supported by photographic review of impacted areas; turbine sites, access routes and substation site in conjunction with the ecological specialist's description of the flora of the respective sites (Section 4)
- map showing areas where remnant woodland may be impacted
- Proponent's offset strategy in Section 5

The Native Vegetation Offset Strategy has been prepared for the proponent by Aurecon and Kevin Mills and Associates. This strategy has been adopted by Glen Innes Wind Farm.

2. Footprint of Glen Innes Wind Farm project components

Table 1 is a slightly modified version of Table 3.2 of the Environmental Assessment (EA) and shows the extent of the areas to be disturbed by the project earthworks. Table 1 excludes the optional items (batch plant and quarry) that were included in Table 3.2 of the EA as the Project Application is not seeking approval for these elements.

Overall, the project could occupy about 18.2 hectares of land including access tracks, turbines sites and hardstands and the substation site. All turbine sites and the substation site avoid woodland vegetation.

A large part (60%) of the project's impact area is for the access tracks that are predominantly located within areas of pasture. The installation of access tracks has potential for their position to be adjusted to avoid sensitive areas such as woodland vegetation and rock outcrops. Underground cables will require trenching along linear routes and in most cases can similarly be adjusted to avoid sensitive areas. Additionally the routes for underground cables will be restored once the cables have been installed.

All of the potentially impacted areas for the 27 turbine array, the substation and access tracks have been assessed by Kevin Mills and Associates (KMA). Full details are provided in Appendix F of the Environmental Assessment. Extracts of KMA notes on flora and fauna characteristics are also provided with relevant site photographs in Section 4 of this document.

Table 1 - Footprint of the project components and approximate area of disturbance

Project component	Approximate Dimensions	Estimated Area (hectare)	
		Long Term	Temporary
Turbine footings (27)	Each 18 by 18 metres	0.9	0
Turbine assembly hard-stand areas	Each 50 by 50 metres	5.7	0
Substation	80 by 50 metres	0.4	0
Facilities and auxiliary services building	10 by 20 metres	Included with substation	
New access tracks	8 metres wide by 14 km	11.2	1.5
33,000 volt underground cables	1 to 2m wide by 20 km	0	2.6
Underground ground connection	Less than 0.5 kilometres	0	0.1
Temporary construction facilities			
Site office	40 by 100 metres	0	0.4
Site Laydown area (near Turbine 8 site)	60 by 150 metres	0	0.9
Totals (hectares)		18.2	5.5

Note: Parts of the cable routes will have more than one circuit.

The total cleared area for the long term project impact is 18.2 hectares which predominantly involves cleared land that is currently used as pasture. An area of about 5.5 hectares will also be subject to a temporary impact during the construction stage. The largest impact is associated with development of access tracks. An allowance of up to 8 metres width has been used to calculate the area but the tracks may be reduced to 5 metres following construction.

An area of 50 by 50 metres is generally required for hardstands at turbine sites. One or more sites that are potentially constrained (such as Turbine site 11) may utilise a lesser area but would require double handling of turbine components during the turbine erection phase.

Only a small portion of the project area involves clearing of woodland vegetation. These areas are:

- Access from TSR to substation site and overhead line - clearing of 5 to 10 trees
- Access T9 to T10B – clearing of up to two trees
- Access T11B to T11 – clearing of 5 to 10 trees
- Access T13 to T13B - clearing of up to 4 trees
- Access T14B to T15 – clearing of 2 to 5 trees that may include several small wattles
- Access to T20B – clearing of up to two trees
- Access to T10 – clearing of up to 15 trees

Up to 50 trees may need to be cleared over a relatively small areal extent. The actual number will be identified in conjunction with development of the final project design which will be undertaken on site in conjunction with an ecological specialist and the contractor. The actual impacted area and/or number of trees removed could be used to determine the extent of the offset area. The offset area may need to incorporate a larger area and/or greater number of trees than is likely to be impacted by the project. Only a small area of rock outcrop will be impacted. Use of excavated rock to form hardstand batters could result in a net increase in areas that would be suitable for rock outcrop community.

3. Flora as described in report of Kevin Mills and Associates

3.1 Regional overview

The remnant native vegetation on the Waterloo Range indicates that large stands of Ribbon Gum *Eucalyptus viminalis* Woodland/Forest once occurred on the basalt of the slopes and ridges, while Yellow Box *Eucalyptus melliodora* Woodland/Forest covered the alluvium on the broad valley floors. Mountain Gum *Eucalyptus dalrympleana* and New England Peppermint *Eucalyptus neo-anglica* were scattered throughout the area.

The structure of the original vegetation would have ranged from open woodland to woodland and open forest with, perhaps, areas of savannah woodland in the valleys. The understorey would have been grassland composed of species such as Red-leg Grass *Bothriochloa macra*, Tussock Grass *Poa sieberiana*, Kangaroo Grass *Themeda australis*, Spear-grasses *Austrostipa spp.*, Wallaby Grasses *Austrodanthonia spp.* and Weeping Grass *Microlaena stipoides*, with patches of shrubs on steep rocky sites.

The native vegetation of the Glen Innes area has apparently never been studied in great detail. Benson and Ashby (2000) described the vegetation of the Guyra 1:100,000 topographic map sheet, but their study extended only as far north as Ben Lomond, which is about 30 kilometres to the south of Glen Innes.

Additional details are provided in Appendix F of the Environmental Assessment.

3.2 Vegetation of the Project Area – General Description modified from KMA Report

Most of the project area was cleared many years ago; however, the area is still well treed with stands of remnant Ribbon Gum Woodland/Forest. The area was cleared to create grazing land, so there are large areas of grassland that is a mixture of native grassland, native pasture and exotic grassland.

The vegetation communities identified by KMA for the project area have been listed below in Table 2. The definitions used in KMA's Report are indicated to be in common use and to be generally well accepted by environmental scientists, (e.g. Rehwinkel 1997). The terms are listed below with respective descriptions.

Grassland: Vegetation dominated by grasses and forbs (herbaceous plants other than grasses, sedges and rushes), with less than 10% tree and shrub cover.

Native Grassland: Grassland with more than 50% of vegetation cover composed of indigenous species. More than 50% of the species are native. The minimum vegetation cover, alive or dead, is more than 10%.

Native Pasture: Grassland containing native and introduced species, where introduced species occupy more than 50% but less than 75% of both cover and species present where pasture species have been mechanically sown.

Exotic Grassland: Grassland in which more than 75% of species and cover are introduced.

Woodland: A vegetation community in which widely spaced and usually deep crowned trees dominate;

usually a treed community with less than 30% canopy cover.

Forest: Usually a treed community with more than 30% canopy cover.

Table 2 - Vegetation Communities of the Project Area

Community	Key Species	Occurrence
Woodland/Forest	<i>Eucalyptus viminalis</i> <i>Eucalyptus melliodora</i> <i>Eucalyptus dalrympleana</i> <i>Eucalyptus neo-anglica</i>	Woodland and forest occur throughout the project area, although large areas have been cleared. There are remnants on the hills and in the valleys, forming a mosaic pattern with the open grassland.
Rock Outcrop Scrub	<i>Jasminum suavissimum</i> <i>Scutellaria humilis</i> <i>Imperata cylindrical</i> <i>Clematis aristata</i>	A scrubby community occurs on some of the rock outcrops in the area, usually on ridges. This community has sometimes persisted, even though the trees have been removed.
Native Grassland – Native Pasture	<i>Poa sieberiana</i> <i>Austrostipa spp.</i> <i>Microlaena stipoides</i> <i>Bothriochloa macra</i> <i>Austrodanthonia spp.</i>	Grassland with a predominance of native species covers large areas on the northern part of the Waterloo Range. Although native plant species diversity is low, the coverage (%) is usually high.
Exotic Grassland	<i>Phalaris aquatica</i> <i>Paspalum dilatatum</i> <i>Plantago lanceolata</i> <i>Cirsium vulgare</i>	Exotic grassland is common in the valleys and on the ridges in the southern part of the project area.

Figure 1 shows where the remaining stands of forest or woodland are located in the area around the proposed wind farm. An area of at least 500 metre wide encompassing the wind turbine locations has been shown in Figure 1. The trees elsewhere in the map area are very scattered across the paddocks.

The quality of the woodland in the project area varies greatly from one location to another. There are good quality stands with a native grassland understorey and a vigorous regeneration of eucalypts, and degraded stands with little native ground cover and virtually no regeneration.

Most of the grassland in the project area is a mixture of native grassland and native pasture. The condition of the native grassland is highly variable; the best sites have a high diversity and coverage of native plant species and a low number and coverage of exotic plant species.

The vegetation in the vicinity of the substation site, the proposed turbine sites and along the northern access routes has been described in Appendix F of the Environmental Assessment and relevant sections of the KMA report are provided in Section 4 in conjunction with photographs of the respective parts of the project area. A graphical presentation of the distribution of the respective communities is provided in Figure 1. Additional detail is also provided in figures for sub-areas of the project site.

4. Description of the component parts of the project area

To assist the Department of Planning's review of the impacts on flora and fauna for the project site, Table 3 indicates the areas where impacts on each of the identified communities could be expected. The actual impact areas for the final site design will need to be confirmed in consultation with an ecological specialist and the project contractor.

Table 3 – Project impact on Vegetation Communities of the Project Area

Location of project element	Estimated number of trees removed	Potential for impact on Rock Outcrop	General Pasture type, native or exotic	Comment as to pre-construction review process
Access via TSR	5 to 10	no	native beside existing road	Review by LH&PA (former RLPB) Overall low impact
Substation	0	no	native	Ecologist review
T1-T6	0	minor	native	Avoid rock outcrops or relocate
T7-T9	0	yes T8/T9	native	Relocate rocks T8/T9
T9 to T10B	Up to 2	no	native/exotic	Use rocks for track fill
T10B	0	yes	exotic	Relocate rocks as batter
T10B – T12B	0	south of T10B	native/exotic	Avoid rock outcrop
T11B-T12C	0	no	native/exotic	Avoid rocky knolls
T11 access	5 to 10	minor	exotic/native	Ecologist review
T14B-T13	0	no	exotic/native	Avoid trees
T13B	Up to 4	minor	native pasture	Ecologist/Relocate rocks
T14B-T15	2 to 5	no	native pasture	Ecologist review
T16B/T16C	0	no	exotic pasture	Hilltop is cleared exotic pasture
T17	0	no	exotic grassland	Ecologist review
T17-T19	0	minor	exotic grassland	Relocate rocks near T19
T18-T19	0	minor	exotic grassland	Relocate rocks
T20B access	Up to 2	minor	exotic grassland	Ecologist review
T20B-T22B	0	minor	exotic grassland	Relocate rocks T21
T10 access	15	yes	exotic grassland	Ecologist/Relocate rocks
TOTAL	Up to 50			

Figure 1, shows the approximate distribution of the respective vegetation communities based on the site survey undertaken by Kevin Mills and Associates. As far as possible the removal of trees has been avoided but this has not been possible at all locations and Table 3 includes an estimate of the number of trees that may need to be removed at the locations indicated in the Table and on Figure 1. The locations of the rock outcrop community are also shown in Figure 1 and wherever possible these areas will be avoided or the rock used to form rock outcrop at nearby locations. Additionally, at many turbine

sites it will be possible to use excavated rock for the batters of turbine hardstands thereby providing the opportunity for creating rocky habitat at the project site. The formation of the rock outcrop could be complemented by planting of native species associated with the rock outcrop areas.

As well as providing details of the distribution of the identified communities in Table 3 and in Figure 1, a set of representative photographs for respective parts of the project site is provided below together with descriptions of relevant flora for the various areas. The descriptions have been taken from the report prepared by Kevin Mills and Associates, July 2007.



Plate 1 – Cleared area adjacent Gwydir Highway and opposite Wattle Vale Residence that has been used by Glen Innes Severn Council for stockpiling materials for maintenance of the Gwydir Highway by Council on behalf of the Roads and Traffic Authority (RTA).

The gate at the left hand side of the photograph provides access to the site and also to the Wattle Vale Travelling Stock Route. The former alignment of the Gwydir Highway, see Plates 2 and 3 is within the Wattle Vale Travelling Stock Route.

The extensive cleared area provides a possible location for the Glen Innes Wind Farm construction site office. Once the wind farm is operational the site staff would be located at the substation at the northern end of the wind farm

The woodland around the former Gwydir Highway is shown in Plates 2 and 3 and is similar to that described in Section 4.2.7 of the KMA report (Appendix F of Environmental Assessment). It is dominated by Ribbon Gums *Eucalyptus viminalis* about 25 metres tall. Hickory Wattle *Acacia implexa*, Rough-barked Apple *Angophora floribunda* and Native Cherry *Exocarpos cupressiformis* are the other main tree species. There are numerous trees not far from the edge of the road and a few trees overhang the road.

The woodland has a grassy understorey and is subject to grazing under lease from RLPB. A few of the trees are old growth trees with a massive girth and hollows. The understorey is a mixture of native grassland and native pasture composed of native species such as Red-leg Grass *Bothriochloa macra*, Variable Glycine *Glycine tabacina*, Slender Tick-trefoil *Desmodium varians*, Kidney-weed *Dichondra repens* and Tall Ammobium *Ammobium alatum*, and introduced species such as Ribbed Plantain *Plantago lanceolata*, Flatweed *Hypochaeris radicata* and African Lovegrass *Eragrostis curvula*.

Access via the former Gwydir Highway alignment provides an existing cleared route. Several trees will need to be removed adjacent the former highway alignment to form the access to the wind farm and substation sites and this will occur in consultation with the officers of the Livestock Health and Pest Authorities (formerly the Rural Lands Protection Board)



Plate 2 – Eastern end of former Gwydir Highway alignment near entry for current Gwydir Highway
Existing wide easement enables required vehicle access – may need lopping of overhanging branches in places but these instances will have minor impact on the woodland vegetation.



Plate 3 – Western end of former Gwydir Highway alignment approaching the substation site locality. Access to the substation site and wind farm properties will require clearing of several trees on the left hand side of the road at a location where the clearing is minimised and agreed to by RLPB.



Plate 4 - Substation Site at northern end of wind farm site and near Wattle Vale Travelling Stock Route

Substation Site: The substation site, which is on cleared flat land, is covered by native grassland and native pasture.

The site is characterised by native grasses, particularly Corkscrew Speargrass *Austrostipa scabra* and Red-leg Grass *Bothriochloa macra*, as well as Tussock Grass *Poa sieberiana*, Kangaroo Grass *Themeda australis*, Wallaby Grasses *Austrodanthonia* spp. and Weeping Grass *Microlaena stipoides*. Forbs are uncommon, but include native Common Woodruff *Asperula conferta*, Swamp Dock *Rumex brownii* and Small Crumbweed *Chenopodium pumilio*, and exotics such as Spear Thistle *Cirsium vulgare* and Chilean Whitlow Wort *Paronychia brasiliiana*.

There are no trees on the substation site itself, but stands of trees occur around the site.



Plate 5 - Northern met mast site (M1) located between Turbine sites no. 1 and 2. The M1 mast is to be retained in its current position.

Northern turbine sites and access routes

The northern turbine sites, T1-T9, stretch from north to south along a ridge over a distance of about 3.5 kilometres. All of the northern turbine sites and the access routes between them are on cleared land.

T1-T5: The vegetation in the area from T1 to T5 is a mixture of native grassland and native pasture. The grassland is dominated by natives, but exotic plant species and patches of native pasture are common in some places.

The characteristic native grassland species in this part of the project area include Red-leg Grass *Bothriochloa macra*, Corkscrew Speargrass *Austrostipa scabra*, Tall Spear-grass *Austrostipa bigeniculata*, Wallaby Grass *Austrodanthonia racemosa*, Windmill Grass *Chloris truncata*, Couch Grass *Cynodon dactylon*, Bluebell *Wahlenbergia luteola*, Swamp Dock *Rumex brownii* and Stinging Nettle *Urtica incisa*. Native plant species diversity is low, but the coverage is generally high. The exotics include Spear Thistle *Cirsium vulgare*, Ribbed Plantain *Plantago lanceolata*, Fleabane *Conyza* sp. and Phalaris *Phalaris aquatica*.

Occasional Ribbon Gum *Eucalyptus viminalis* trees occur in the vicinity of T1-T5, along the access route

between the turbine sites and near the monitoring tower. The trees vary in height; some are tall and have occasional small hollows.

There are rock outcrops on some of the turbine sites, for example T2 and T4, and in several locations along the access route. Between T4 and T5, for example, there is a large outcrop of boulders on the western side of the fence. Large rock outcrops support more native plants because they cannot be slashed, seeded and fertilized, and domestic stock tend to avoid them.



Plate 6 - Looking south to Site T2 from near monitoring mast. Ross Hill can be seen in the distance.



Plate 7 – From Site T2 looking south to Site T3 beyond trees. The access route will be close to the ridgeline but the remnant trees can be easily avoided.



Plate 8 – From Site T3 to Site T4 on ridge line – No clearing of mature trees is required



Plate 9 Site T4 is in the distance on the ridge top – View is from north of Site T5. Access route will follow close to the ridgeline but will avoid mature trees. A small area of rocky outcrop is shown in foreground of photograph.



Plate 10 - From Site T5 looking south to Site T6 and Ross Hill – No clearing of mature trees is required.



Plate 11 - View from Site T6 towards Ross Hill and T7 site. No mature trees would be removed.

Turbines T6-T9: The vegetation in the T6-T9 area, including the access routes, is mostly a mixture of native grassland and native pasture. T6 is characterised by native grasses, for example Spear-grasses *Austrostipa* spp. and Red-leg Grass *Bothriochloa macra*, and non-natives such as Spear Thistle *Cirsium vulgare*.



Plate 12 - Turbine Site T7 between Trig Station and NPWS radio mast in the distance
On T7, native Spear-grasses *Austrostipa* spp. and Saffron Thistle *Carthamus lanatus* are also common. There are two Ribbon Gum *Eucalyptus viminalis* trees near T7 but on a slope that will not be disturbed.

T7, T8 and T9 are characterised by native species such as Couch Grass *Cynodon dactylon*, Red-leg Grass *Bothriochloa macra* and Stinging Nettle *Urtica incisa*, and exotics such as Phalaris *Phalaris aquatica*, Spear Thistle *Cirsium vulgare* and White Clover *Trifolium repens*.



Plate 13 View from location between T8 and T9 toward Ross Hill and T7 site on top of hill in distance
Turbine site T8 in foreground



Plate 14 View from Ross Hill to Turbine sites T8 (mid distance) and T9 at far end of large cleared area
The small rocky areas around T8 and T9 also support introduced Chilean Whitlow Wort *Paronychia brasiliensis* and Dwarf Mallow *Malva neglecta*.



Plate 15 View looking south along access route where it follows a saddle between Sites T9 and T10B



Plate 16 – Site T10B in foreground on cleared knoll supporting exotic grassland with a small rocky outcrop of scattered surface rocks. No woodland clearing is needed. Prominent exotic species include *Phalaris Phalaris* sp., Stinging Nettle *Urtica urens*, Chilean Whitlow Wort *Paronychia brasiliiana*, Clover *Trifolium* spp., and small herbs such as Wild Sage *Salvia verbenaca*, Crowfoot *Erodium* sp., and Red-flowered Mallow *Modiola caroliniana*. There are a few natives such as Corkscrew Speargrass *Austrostipa scabra*, Kidney-weed *Dichondra repens* and Swamp Dock *Rumex brownii*.



Plate 17 T11B – Large cleared area surrounded by mature trees – View towards knoll adjacent T12B

Site T11B supports exotic grassland that at the time of the survey was heavily grazed. Obvious exotics included Spear Thistle *Cirsium vulgare*, Stinging Nettle *Urtica urens*, Crowfoot *Erodium* sp. and Melilotus *Melilotus* sp., with the native Couch Grass *Cynodon dactylon* being quite common. Trees in the vicinity are Yellow Box *Eucalyptus melliodora* and Manna Gum *Eucalyptus viminalis*



Plate 18 - T11 in foreground of photo. A steep slope defines the edge of this constrained site.

T11 is on native pasture characterised by native Corkscrew Spear-grass *Austrostipa scabra*, Red-leg Grass *Bothriochloa macra*, Bluebell *Wahlenbergia luteola*, Burr-daisy *Calotis dentax*, Slender Tick-trefoil *Desmodium varians*, Oxalis *Oxalis exilis* and Stinging Nettle *Urtica incisa*, and introduced Chilean Whitlow Wort *Paronychia brasiliana* and Spear Thistle *Cirsium vulgare*. There are no trees on the turbine site but the full extent of the site is limited and to avoid impacting the adjacent vegetation, the hardstand will need to be smaller than would otherwise be the case. Dense Ribbon Gum *Eucalyptus viminalis* and Yellow Box *Eucalyptus melliodora* trees occur nearby, to the southeast, along the proposed access route. The understorey to the trees is composed mainly of exotics, although native pasture occurs in some places. There are few shrubs, except on steep ridges. An ecologist should be present when the route to the site is selected and to advise the limits of the hardstand area.



Plate 19 – Site T12B near Mast M4 and north of knoll. No woodland clearing is required at this site.

T12 (T12B & T12C): T12, which is in a patch of Ribbon Gum woodland near two rocky knolls, should be relocated to cleared land nearby. The area around the M4 monitoring tower would be more suitable. Here, the vegetation consists of closely grazed native pasture dominated by native Couch Grass *Cynodon dactylon*, with Common Woodruff *Asperula conferta*, Weeping Grass *Microlaena stipoides* and other natives, and introduced species such as Spear Thistle *Cirsium vulgare*, Feathertop *Pennisetum villosum* and Chilean Whitlow Wort *Paronychia brasiliana*.

T12B is the relocated position of T12, moved to the north near M4 because of steep topography and tree cover at the original site for T12.

T12C is an additional site to the south of the former T12. T12C is in a cleared heavily grazed area of exotic pasture.

The access route from T12C to T14B and subsequently T13 and T13B follows the ridgeline which is predominantly cleared grazing land with exotic grassland and scattered trees.



Plate 20 - T12C - An additional site T12C has also been sited south of the rocky knolls in a closely grazed paddock of exotic pasture.



Plate 21 - T14, T14B: The former T14 site is in woodland dominated by Yellow Box *Eucalyptus melliodora*. Manna Gum *Eucalyptus viminalis*, New England Peppermint *Eucalyptus nova-anglica* and Rough-barked Apple *Angophora floribunda* also occur in the woodland. The understorey contains occasional native shrubs of Tree Violet *Hymenanthera dentata* and Blackthorn *Bursaria spinosa*. The ground cover is a mixture of native pasture and exotic grassland; the characteristic natives include Couch Grass *Cynodon dactylon*, Red-leg Grass *Bothriochloa macra* and patches of Weeping Grass *Microlaena stipoides*, while Spear Thistle *Cirsium vulgare*, Chilean Whitlow Wort *Paronychia brasiliiana* and Paspalum *Paspalum dilatatum* are the main exotics. As a result of field investigations, T14 has been moved to the cleared land to the west, to location T14B. This area is a heavily grazed paddock dominated by exotic grassland.



Plate 22 - Site T13 is in a closely grazed paddock dominated by native Couch Grass *Cynodon dactylon*. Natives other than Couch Grass are rare, although Red-leg Grass *Bothriochloa macra*, Weeping Grass *Microlaena stipoides* and occasional Tree Violet *Hymenanthera dentata* shrubs are also present. The introduced species on the site include Spear Thistle *Cirsium vulgare*, Paspalum *Paspalum dilatatum* and White Clover *Trifolium repens*. Ribbon Gum *Eucalyptus viminalis* and Yellow Box *Eucalyptus melliodora* trees occur nearby.



Plate 23 – Site T13B: The site itself supports exotic grassland and some native pasture, dominated by Red-leg Grass *Bothriochloa macra*. Other plants noted were Stinging Nettle *Urtica urens*, Crowfoot *Erodium* sp. and the native Fuzzweed *Vitadina cuneata*. Trees occur on the slopes nearby; these are

Manna Gum *Eucalyptus viminalis*. Shrubs of Tree Violet *Hymenanthera dentata* occur here and there.

The initial access route assessed by KMA between former site T14 and T15 was described by KMA as following “an existing farm road through patches of woodland and scattered trees with an understorey of native grassland and native pasture. Exotic ground cover species dominate but natives are common; patches of Red-leg Grass *Bothriochloa macra* and Weeping Grass *Microlaena stipoides* occur here and there, especially near the trees”. This route will not be used.

The proposed access track route from the new T14B site to T15 site has been shifted slightly to the west to avoid the remnant woodland areas and follows the clearing beside a boundary fence line. It continues south down to the saddle where Hillside Road crosses Waterloo Range and then follows an existing farm track along the ridgeline.



Plate 24 – Site T15 was initially located as described by KMA being “on a mixture of native grassland and native pasture. The natives include Tussock Grass *Poa sieberiana*, Spear-grass *Austrostipa* sp., Wild Sorghum *Sorghum leiocladum*, Common Woodruff *Asperula conferta*, Bluebell *Wahlenbergia luteola*, Bidgee-widgee *Acaena novae-zelandiae*, Red-leg Grass *Bothriochloa macra*, Fuzzweed *Vittadinia cuneata*, Common Sedge *Carex inversa* and Slender Rat’s Tail Grass *Sporobolus creber*. Native tussocks are common. Paspalum *Paspalum dilatatum*, Ribbed Plantain *Plantago lanceolata*, White Clover *Trifolium repens* and Spear Thistle *Cirsium vulgare* are the main exotics. The trees in the vicinity of T15 are mainly Ribbon Gum *Eucalyptus viminalis* and Yellow Box *Eucalyptus melliodora*, with occasional Rough-barked Apple *Angophora floribunda* and Mountain Gum *Eucalyptus dalrympleana*”.

To avoid impacting remnant woodland, Site 15 has been moved south onto a broad flat area to the south of a stand of trees. The grassland is native pasture, dominated by tussocks of Poa Tussock *Poa sieberiana* and Red-leg Grass *Bothriochloa macra*. Typical exotics include Spear Thistle *Cirsium vulgare*, Clover *Trifolium* sp., Perennial Grass *Lolium* sp. and Ribbed Plantain *Plantago lanceolata*. The native Corkscrew Speargrass *Austrostipa scabra* also occurs.

The initially assessed access route from T15 to T17 follows an existing farm track through woodland dominated by Yellow Box *Eucalyptus melliodora*, and then heads east into the adjoining paddock where

there is relatively dense tree cover, mostly of Ribbon Gum *Eucalyptus viminalis* with an understorey of native pasture and exotic species. Some of the eucalypts are very large. Blackthorn *Bursaria spinosa*, a native shrub species, and Blackberry *Rubus fruticosus* are common in some places. Access from T15 to T17 now follows the existing track that leads over the hilltop where the T16B and 16C sites are located (in exotic pasture) and then down the southern side of the hilltop to T17.



Plate 25 – Site T16 is between sites T16B and T16C – No woodland clearing – exotic pasture
T16 was assessed by KMA as follows; “is a generally flat hilltop where one or possibly two turbines (T16B & T16C) could be sited. It is characterised by an exotic grassland composed largely of introduced species such as Phalaris *Phalaris aquatica*, Prairie Grass *Bromus cartharticus*, Chilean Whitlow Wort *Paronychia brasiliiana*, Buchan Weed *Hirschfeldia incana*, Spear Thistle *Cirsium vulgare* and Dwarf Mallow *Malva neglecta*. Natives such as Wheatgrass *Elymus scaber*, Wallaby Grass *Austrodanthonia racemosa*, Stinging Nettle *Urtica incisa* and Corkscrew Spear-grass *Austrostipa scabra* are also present. Ribbon Gum *Eucalyptus viminalis* trees occur nearby”.



Plate 26 – Site T17 is on exotic grassland dominated by White Clover *Trifolium repens*, Spear Thistle *Cirsium vulgare*, Perennial Ryegrass *Lolium perenne*, Paspalum *Paspalum dilatatum*, Prairie Grass *Bromus cartharticus*, *Brassica* sp. and Ribbed Plantain *Plantago lanceolata*. Natives are uncommon, but those present include Red-leg Grass *Bothriochloa macra*, Tussock Grass *Poa sieberiana*, Common Woodruff *Asperula conferta*, Bidgee-widgee *Acaena novae-zelandiae*, Austral Crane's-bill *Geranium solanderi* and Fuzzweed *Vittadinia cuneata*. The site is surrounded by tall Ribbon Gum *Eucalyptus viminalis* trees.



Plate 27 – Track between T17 on left and T19 on ridge on right hand side – View to the north.

The track from T17-T19 (Plate 27) crosses a valley with scattered Ribbon Gum *Eucalyptus viminalis*,

Rough-barked Apple *Angophora floribunda* and New England Peppermint *Eucalyptus neo-anglica* trees, although the latter is uncommon. The understory is exotic grassland characterised by natives such as Red-leg Grass *Bothriochloa macra* and Tussock Grass *Poa sieberiana*, and introduced species *Paspalum dilatatum*.



Plate 28 - T18 looking north – basalt capped ridge line – woodland on slopes either side of ridge

T18 is on a ridge, most of which has been cleared and is covered by exotic grassland. However, the turbine site is covered by thickets of native shrubs, Tree Violet *Hymenanthera dentata* and Blackthorn *Bursaria spinosa*, and is surrounded by many large dead trees. Ribbon Gum *Eucalyptus viminalis* woodland occurs nearby, down slope.

The steep sides of the ridge on which T18 and T19 are located are generally well treed and have a strong component of natives in the understory, especially shrubs such as Blackthorn *Bursaria spinosa* and Tree Violet *Hymenanthera dentata*. Blackwood *Acacia melanoxylon*, a small native tree, occurs here and there. Dead trees are common in this area.

The track from T19 to T18 crosses mainly exotic grassland; the native species found along the route include Red-leg Grass *Bothriochloa macra*, Windmill Grass *Chloris truncata*, Purslane *Portulaca oleracea*, Stinging Nettle *Urtica incisa* and Weeping Grass *Microlaena stipoides*.

The generally flat ridge where T18 and T19 are located has thin or absent soil cover in places and the basalt rock is exposed.



Plate 29 – Site T19 looking north to T18 – Cleared basalt capped ridgeline – mature trees bordering

Site T19 is on a knoll to the north of the monitoring tower. Part of the site is on a small rock outcrop supporting mainly native species such as Traveller's Joy *Clematis aristata*, Prickly Starwort *Stellaria pungens*, Bidgee-widgee *Acaena novae-zelandiae*, Sickle Fern *Pellaea falcata*, Scrambling Lily *Geitonoplesium cymosum*, Austral Crane's-bill *Geranium solanderi*, Sweet Jasmine *Jasminum suavissimum* and Dwarf Skullcap *Scutellaria humilis*. Blackberry *Rubus fruticosus* and Phalaris *Phalaris aquatica* also occur on this rocky site.

The rock outcrop is surrounded by exotic grassland, the characteristic species being Phalaris *Phalaris aquatica*, Paterson's Curse *Echium plantagineum*, Saffron Thistle *Carthamus lanatus*, Spear Thistle *Cirsium vulgare*, Prairie Grass *Bromus cartharticus*, Horehound *Marrubium vulgare*, Wireweed *Polygonum aviculare*, Dwarf Mallow *Malva neglecta* and Chilean Whitlow Wort *Paronychia brasiliana*. There are a few natives as well, for example Swamp Dock *Rumex brownii* and Stinging Nettle *Urtica incisa*.



Plate 30 – T10 – Cleared basalt capped ridge top – some clearing of trees required for access route

Site T10 is on the top of a knoll with steep rocky slopes. The site is covered by a patch of exotic grassland overgrown with *Phalaris aquatica*, Stinking Roger *Tagetes minuta*, Spear Thistle *Cirsium vulgare* and *Brassica* sp. Stinging Nettle *Urtica incisa* and Blackthorn *Bursaria spinosa* are the main natives; the latter grows in patches here and there. The site is on the edge of Ribbon Gum *Eucalyptus viminalis* woodland. There are many live and dead trees in the surrounding area.

The access route to T10 passes through trees at the foot of the knoll, mostly Ribbon Gums, and then up the side of the knoll. The trees have a shrubby understorey in some places. Turbine site T10 has been included in the assessment but presents a number of challenges in terms of access.



Plate 31 - Access route to T20B to T22B – steep grade but no woodland clearing is required



Plate 32 – Site T20B – One or two mature trees may need to be cleared for access

T20 - T22: The woodland in the vicinity of T20 and T21 is dominated by Ribbon Gum *Eucalyptus viminalis* and thickets of Blackthorn *Bursaria spinosa*. T20, however, is on a steep cleared slope covered by exotic grassland. Turbine site T20B has been located on top of the knoll in a cleared grassed area with surrounding large trees.

T21 and T22, and the access track from T21 to T22 are covered by an exotic grassland dominated by *Phalaris aquatica*. The introduced species on this site also include *Brassica* sp., Crowsfoot Grass *Eleusine indica*, Purpletop *Verbena bonariensis*, Perennial Ryegrass *Lolium perenne*, Curled Dock *Rumex crispus* and Spear Thistle *Cirsium vulgare*. Native species diversity and abundance are low. Stinging Nettle *Urtica incisa*, Common Sedge *Carex inversa* and Austral Crane's-bill *Geranium solanderi* are the main natives. There are about 10 dead trees near T22, on the eastern side of the hill.



Plate 33 - T21B – Exotic pasture. No woodland clearing is needed at this location



Plate 34 - T22B – No woodland clearing is needed at this site – Exotic grassland with considerable weed infestation.

5. Offset Strategy

This section of this document outlines the proponent's offset strategy for the proposed Glen Innes Wind Farm.

5.1 Options for Vegetation Offset Strategy

The possible options available for a native vegetation offset are listed below.

1. Have a formalised protection mechanism in place, such as a positive covenant to protect an area of remnant native vegetation. Management actions would be required to improve the condition of the remnant vegetation.
2. Funding conservation works for the Wattle Vale Travelling Stock Route (TSR) and fence off a part of the TSR. This would require agreement from Livestock Health and Pest Authorities (formerly the Rural Lands Protection Board) and as applicable the leaseholder.
3. Revegetation of key species at one or more locations on properties that form part of the project site.

Locations of potential areas that are considered as options for native vegetation offset are illustrated in Figure 7 and may serve a number of environmental management objectives, relating to flora protection, provision of fauna habitat, influencing flight-paths for avifauna and visual screening of project elements

A combination of the above measures may be adopted. The final Vegetation Offset package will be dependent upon the final design layout and agreements with affected landowners and / or the Livestock Health and Pest Authorities (LHPA), as well as advice provided by a relevant ecological specialist and approval of the Department of Planning.

5.2 Development of Offset Strategy in accordance with DECC Principles

The proponent has developed a biodiversity offset strategy that addresses the guiding principles published by DECC to achieve conservation outcomes in situations where a loss of biodiversity is expected. The following provides a review of these principles in relation to the project and its management.

5.2.1 Avoidance of impacts

The DECC requires that impacts must first be avoided by using prevention and mitigation measures. Offsets are then directed towards the remaining impacts for the potentially impacted communities. The potentially impacted communities for the Glen Innes Wind Farm are described by KMA as:

- Woodland/Forest
- Rock outcrop
- Native grassland/native pasture

The development of the project layout has incorporated a review of various layout options and the arrangement shown in the Environmental Assessment provides a minimal impact design for the potentially affected communities. Key avoidance and mitigation measures incorporated into the project are listed below.

The project arrangement based on the measures set out below will require clearing of a minimal area of remnant native woodland vegetation. While a greater area of native pasture-native grassland than remnant woodland will be impacted it is considered that native grassland-native pasture is regionally

more abundant than the native woodland and as such there is a greater focus on avoiding or offsetting the impact on the remnant woodland vegetation.

Specific layout design measures

The following design considerations will be adopted to minimise impacts on the site's ecological values, particularly woodland.

- Construction vehicles will access the site via the former Gwydir Highway alignment and will not use the Sinclair Lookout Road, as this would impact good quality remnant native vegetation.
- Old Gwydir Highway access uses existing road alignment and will only require removal of a few trees to gain access to the clear lands where the wind farm is located. It has been agreed with Rural Lands Protection Board (RLPB) now (LHPA) that any clearing will be done in consultation with RLPB (LHPA) to minimise impacts.
- An initial access road along Reddestone Creek valley involving several kilometres of new track length has been rejected in favour of a short section of track between T9 and T10B. The new track will require short sections of cut and fill civil work due to the grade involved but this is considered warranted to avoid the several kilometres of track that would have otherwise been required.
- In the event that construction vehicles access the site via Rose Hill Road it may be necessary to trim or clear some of the 12 Ribbon Gums overhanging the northern end of the road as well as impacting the grassy understorey and numerous dead trees in the area. Accordingly, the former Gwydir Highway alignment is the preferred site access for large construction vehicles
- The substation and Turbine 1 will be sited on cleared land and avoid the patches of remnant woodland at this location.
- The rock outcrop at the site of Turbine 2 will be relocated nearby to retain habitat for reptiles. Similarly where the access route disturbs rock outcrop at other locations that cannot be avoided the rock will be relocated and reptile habitat retained.
- The large old Kurrajong tree on the access route between Turbine 2 and Turbine 3 will be retained.
- The access route between Site T10B and Site T12B will be designed to avoid the scattered woodland remnants and rock outcrop scrub.
- Clearing for the access route to Turbine 11 and at the site of Turbine 11 will be constrained and guided by a suitably qualified ecologist.
- The micro siting of Turbines 14B and 13 will avoid the large scattered trees present at these locations.
- The route between Turbine 14B and Turbine 15 will follow the cleared corridor beside the fence line and where it crosses the westerly continuation of Hillside Road it will follow the existing farm track to the east of Turbine 15.
- Turbine 15 will be located in the cleared area to the west of the existing farm track and to the south of the stand of remnant woodland.
- Turbine 17 will be located in cleared land and not require clearing of the scattered woodland vegetation
- Both Turbines 18 and 19 will be located on cleared land that is mainly exotic pasture. Dead trees in close proximity to the turbines will be removed to avoid birds roosting close to the turbines.
- Clearing to gain access to Turbine 10 will be minimised by utilising an access route comprising the existing track and existing clearings on the upper slopes.
- Access to Turbines 20B, 21B and 22B will be from the northern end of the ridge which has been cleared and will avoid further clearing of remnant woodland.
- The dead trees near Turbine 22B on the eastern side of the hill should be removed.

General mitigation measures

In addition to the site specific measures identified above, the proponent will adopt the following measures that are of a more general nature to ensure that impacts on the site's ecological values are minimised.

- Clearing woodland will be avoided wherever possible. Where avoidance is not possible, clearing and lopping will be kept to the bare minimum to maximise conservation of the woodland.
- A soil and water management plan will be prepared for the project, in consultation with the Department of Planning and Department of Environment and Climate Change.
- An environmental representative will be appointed for the construction phase of the project, whose role will include ensuring that appropriate environmental safeguards are implemented and to ensure the mitigation measures set out here are implemented.
- To reduce the potential impact on birds of prey any dead trees near the turbines will be removed to avoid blade strike. It is proposed that the dead trees be used for on ground habitat.
- The exact location of the turbines and access tracks will be micro-sited in conjunction with the Environmental Representative during the construction phase of the project to avoid additional impacts on native vegetation, flora and fauna. All turbine sites will avoid the need to clear large mature trees.
- The Environmental Representative will ensure that barriers are erected around sensitive vegetation to be retained and that may be impacted by construction works at nearby turbine sites or access tracks
- Rock outcrops will be avoided where practicable. Where there is a need to disturb rock outcrop the disturbed rock will be relocated and similar rocky habitat reconstructed nearby. Where batters are constructed using rock then these will be left in this form to provide reptile habitat and locations where rocky scrub can develop
- Measures must be incorporated in the Project Environmental Management Plan to restrict the introduction of weeds to the wind farm site and for post construction weed control measures to be applied for all areas disturbed by the project.

5.2.2 All regulatory requirements to be met

The project is subject to the Minister's approval under Part 3A of the Act and all other environmental aspects have been addressed by the Environmental Assessment. Chapter 4 of the Environmental Assessment dealt with the statutory context while Chapter 8 dealt with heritage aspects.

5.2.3 Offsets not to reward poor performance

The offset is proposed as a means to enable a renewable energy project to be developed while incorporating conservation outcomes through maintenance of native vegetation at another nearby location. The offset is only proposed for those areas where it was not practicable to avoid the impact. Renewable energy development assists mitigation of greenhouse gas emissions that contribute to enhanced climate change which is defined as a 'key threatening process' under the TSC Act 1995.

5.2.4 Offsets to complement other government initiatives

The NSW government manages the Wattle Vale Travelling Stock Route (TSR) at the northern end of the Glen Innes Wind Farm. This provides a degree of protection to native woodland vegetation with stands of eucalypts lining the route of the former Gwydir Highway. However, grazing within the stock route has reduced the understorey. No other reserves for native vegetation are known within close proximity to the project site.

An option for the Offset Strategy that could provide an improved conservation outcome would be to fence part of the Travelling Stock Route including the remnant woodland beside the former Gwydir

Highway route to assist the regrowth of native groundcover and understorey vegetation. The parts of the TSR that have been cleared on the southern side of the TSR could continue to be used for grazing. The availability of that option would be subject to reaching agreement with LHPA and as applicable with the leaseholder.

5.2.5 Offsets underpinned by sound ecological principles

Identification of potential offset areas has required consideration of:

- potential access to suitable areas of land, either with project area, within Wattle Vale TSR or other sites distant from the project area;
- suitability of the land to form the offset (nature of communities supported by the offset area in relation to the communities impacted by the project, connectivity to other areas of the same community and risks posed to avifauna by increasing woodland areas in close proximity to turbine sites);
- extent of land required for each community as an offset for the project's impact;
- maintenance of the offset area.

The areas shown in Figure 7 that represent options for an offset area have been selected as potentially suitable and will need to be confirmed as being available with the relevant landholder or custodian. The selection of the options for offset area has given attention to the following considerations:

- increasing linkages to existing woodland areas
- providing fauna habitat
- creating woodland corridors that may influence avifauna to follow flight paths through lower elevation areas away from turbine sites
- provision of visual screening of any low level project elements that may be visible from surrounding lands
- selection of species for offset areas based on specialist advice

As indicated above, it will also be necessary determine the final offset location(s) in conjunction with landholders and specialist advice as to the suitability of the actual offset area and the impacts to be offset. These details will be incorporated in the Native Vegetation Offset Plan to be completed prior to commencement of construction. The Plan will also incorporate a program for management of the offset area including elements such as a weed control program.

5.2.6 Net improvement in biodiversity over time

It is considered that a net improvement in biodiversity will occur subject to the following being satisfied:

- the offset areas ensure improvement and protection of communities of the same type as the impacted communities or include plantings of relevant local native species propagated from the flora within the impacted area;
- the offset areas have a greater extent than the impacted areas;
- fencing of the offset areas is provided and a weed control program is implemented.

5.2.7 Offsets must be enduring

If the impacted areas are permanently affected then the offset area should be permanent. Establishment of improved quality of native vegetation at other locations will be protected by fencing and agreements with relevant stakeholders to address their continuity in time. The details of the agreements will be formalised in the Native Vegetation Offset Plan

With wind farm developments it is also possible that the wind farm equipment may be removed at the completion of its project life and the affected areas could be returned to their former pastoral use with the potential for the re-establishment of native pasture. It is considered more likely that the future requirement for renewable energy will be greater than at present and the most likely outcome at the end of project life would be for redevelopment of the site possibly with new equipment. This Strategy document does not commit to end of life outcomes apart from proposing that native pasture would be re-established if the wind farm equipment is removed and not redeveloped.

5.2.8 Offsets to be agreed prior to impact occurring

It is proposed that the proponent will complete negotiation with the relevant landowner or custodian and implement an agreement for maintenance of the offset area for the duration of the project. These details will be formalised in the Native Vegetation Offset Plan to be completed prior to construction commencing. It is the proponent's expectation that the project approval conditions will include this initiative as a condition of approval.

5.2.9 Offsets must be quantifiable

Any identified offset area for the woodland community will include an extent of the respective woodland community at another location that is at least of the same extent as the impacted woodland community.

The estimate of the proposed impact on woodland vegetation is removal of up to 50 woodland trees and it is proposed that the offset involve at least 200 trees being planted within the defined offset area(s). It is also proposed that the species used for plantings would be in the same proportion as for the trees that are removed. The actual offset will be defined in the Native Vegetation Offset Plan based on a review of the actual final layout determined for the project.

5.2.10 Offsets must be targeted

The offset woodland community is targeted toward similar vegetation to that for the impacted areas. The proposed offset area(s) address remnant woodland vegetation. Other areas that could have also been considered were rock outcrop community and native grassland-native pasture community.

In the case of the rock outcrop community this can be mostly avoided by the access track layout. However, where the rock outcrop community is impacted then any excavated rock can be relocated nearby to form suitable rock outcrop for re-establishment of the rock outcrop community.

The native grassland – native pasture community is present in parts of the project area but has been considered as less critical than the woodland vegetation as it is more widespread than the woodland. As such no areas have been identified as offset areas to address the impact on the native grassland-native pasture community. However, the offset areas for remnant woodland will include a range of species present in the native grassland – native pasture.

5.2.11 Offsets must be located appropriately

The offset areas will be located in the same geographic locality as the potential impacts and have similar ecological characteristics to the impacted areas of remnant woodland vegetation. Sites that would be suitable and have been identified as options for offsets are indicated below and shown on Figure 7.

- Improvements to biodiversity values of part of the Wattle Vale Travelling Stock Route
- In conjunction with above fencing of remnant woodland at northern end of Rose Hill property
- Lower elevations on Waterloo Range that provide interconnection of woodland on either side of the range and support potential avifauna flight paths away from turbine sites

- Northern end of ridge, 200 metres north of where Turbine 18 will be located but on bench below top of ridge or alternatively along the base of the slope where Turbines 18 and 19 are to be located
- On eastern slope below Turbine site 10 to provide visual screening of the T10 access track
- North western corner of Fletcher Land to south of T12C and east of T14B has been considered but not included on Figure 7.

5.2.12 Offsets must be supplementary

The proposed offsets will be additional to any existing provisions for biodiversity conservation. In the case of the Wattle Vale Travelling Stock Route this would mainly provide for re-establishment of the understorey but could include some increase in woodland tree species.

All other examples listed in section 5.2.11 would be directed to improving the extent and quality of woodland vegetation with a net gain compared to the situation prior to the wind farm development

5.2.13 Offsets and their actions must be enforceable

It is expected that the Project Approval conditions will include a requirement for the details of the proposed offset to be confirmed in an Offset Plan prior to the wind farm construction proceeding.

5.3 Process for offset implementation

This document provides details of the extent of the project impacts in relation to the communities identified by Kevin Mills and Associates and forms the basis for identifying the extent and nature of offset areas to be adopted for the project.

The progression of this Strategy into a specific Native Vegetation Offset Plan will depend on the nature of the Project Approval and its conditions, the final project design, the outcome of negotiations with respective landowners or in the case of the Wattle Vale Travelling Stock Route, the Livestock Health and Pest Authorities and ongoing consultation with the Department of Planning and Department of Environment and Climate Change as necessary to consolidate a practical and effective Native Vegetation Offset Plan.

The development of the native Vegetation Offset Plan will be completed prior to the commencement of construction and it is considered likely that a Project Approval condition will include this requirement.

The key components for the development of the Native Vegetation Offset Plan will be:

- Confirming the impact area and vegetation communities affected by the final design taking into account opportunities for avoidance or mitigation.
- Confirming the offset areas to be considered based on their suitability and availability and securing long term tenure.
- Provision of fencing and a maintenance program eg. weeding for the proposed offset area.
- Performance measures to ensure all areas of temporary disturbance for the project are effectively restored.

5.4 Conclusion

The Offset Strategy has been prepared in response to a request from the Department of Planning for its preparation in the context of the Department's review of the Project Application for the Glen Innes Wind Farm.

The Offset Strategy provides for the Glen Innes Wind Farm to proceed in a manner that results in a net improvement in biodiversity values at the locality and supports the benefits of the project from net savings of greenhouse gas emissions.

6. References

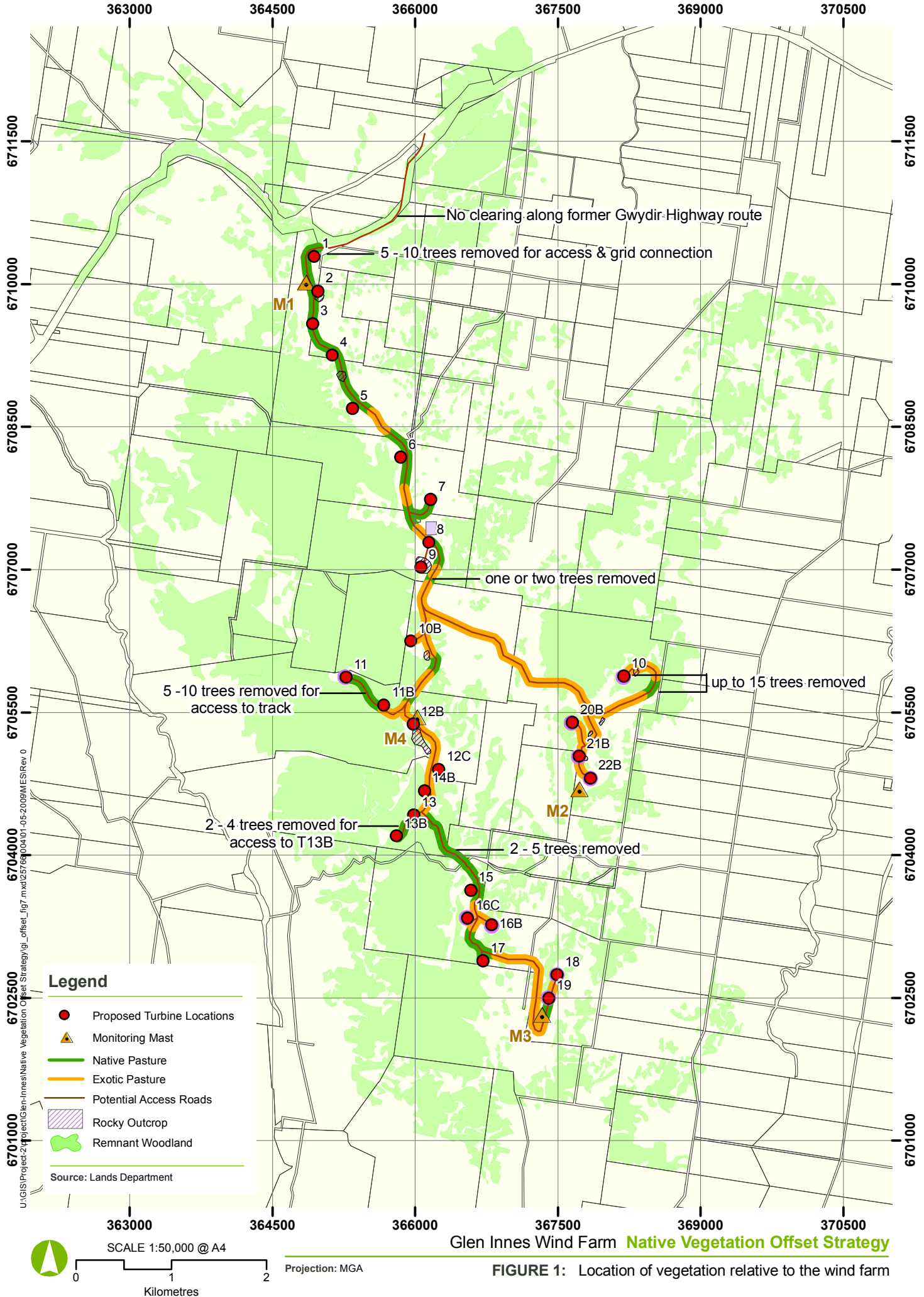
Kevin Mills and Associates Flora and Fauna Assessment Glen Innes Wind Farm – November 2007

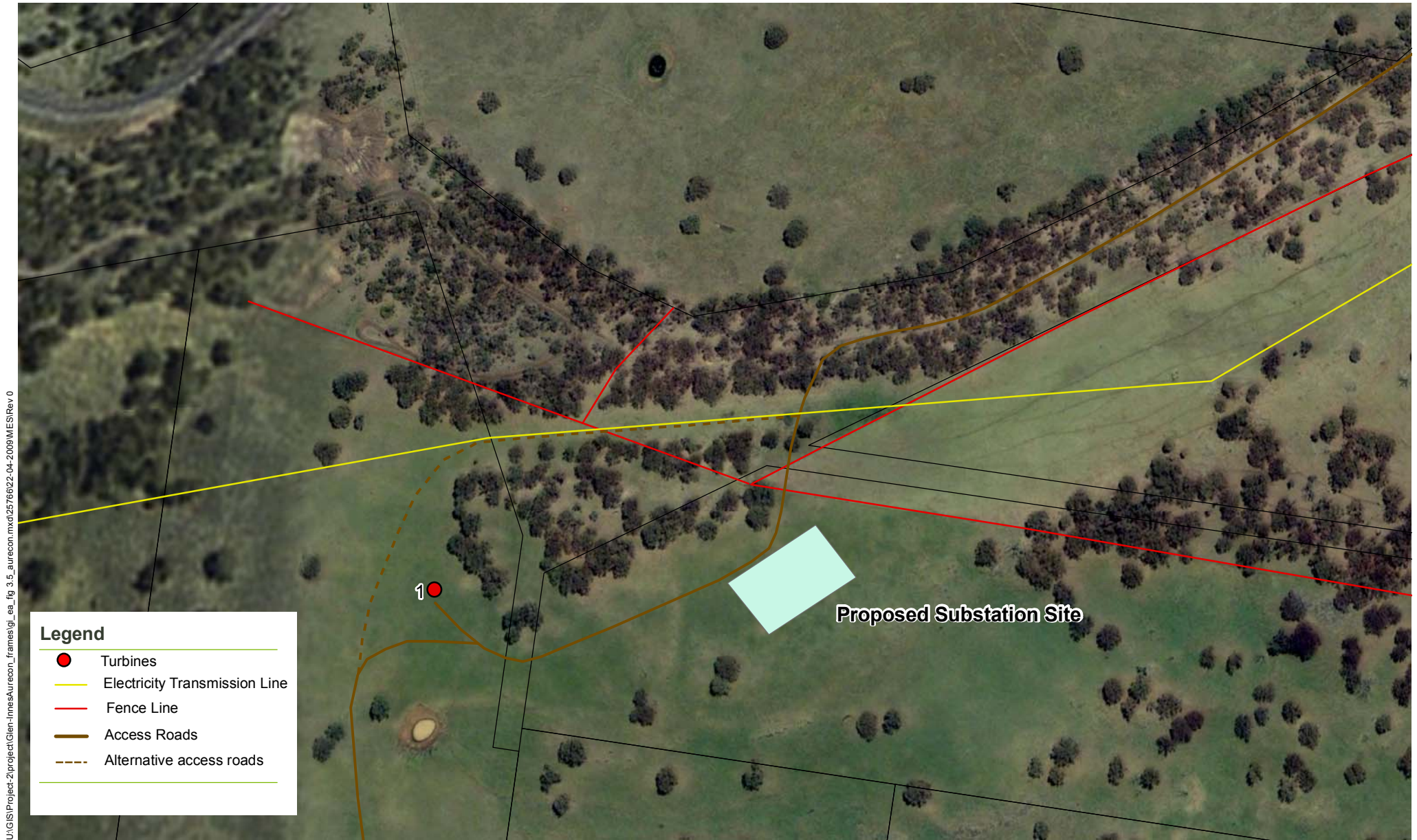
Department of Environment and Climate Change – Principles for the use of biodiversity offsets in NSW

Last updated, 21 October 2008

Downloaded from DECC website address as follows:

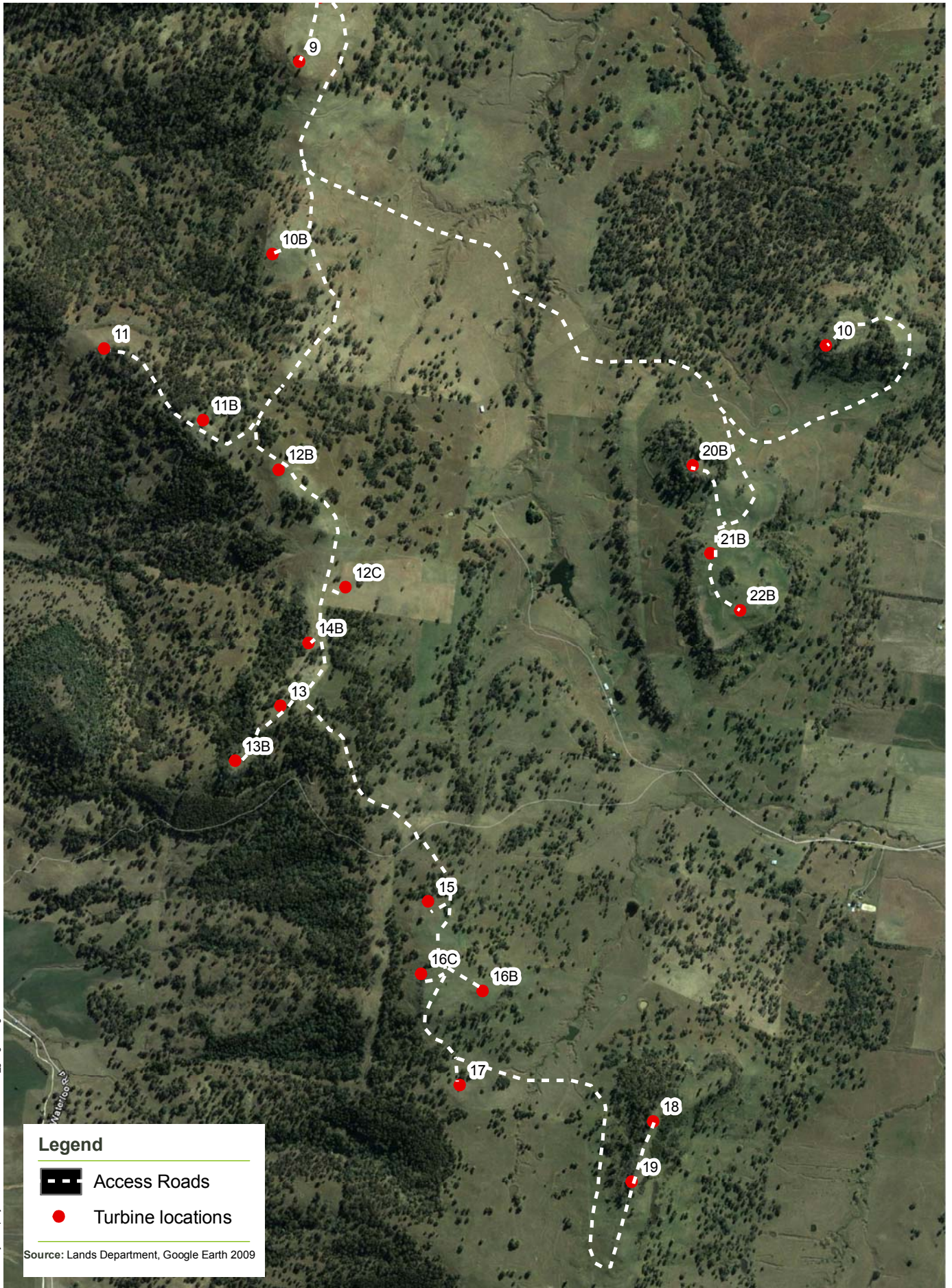
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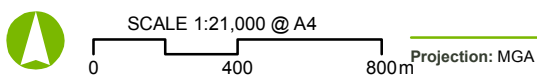


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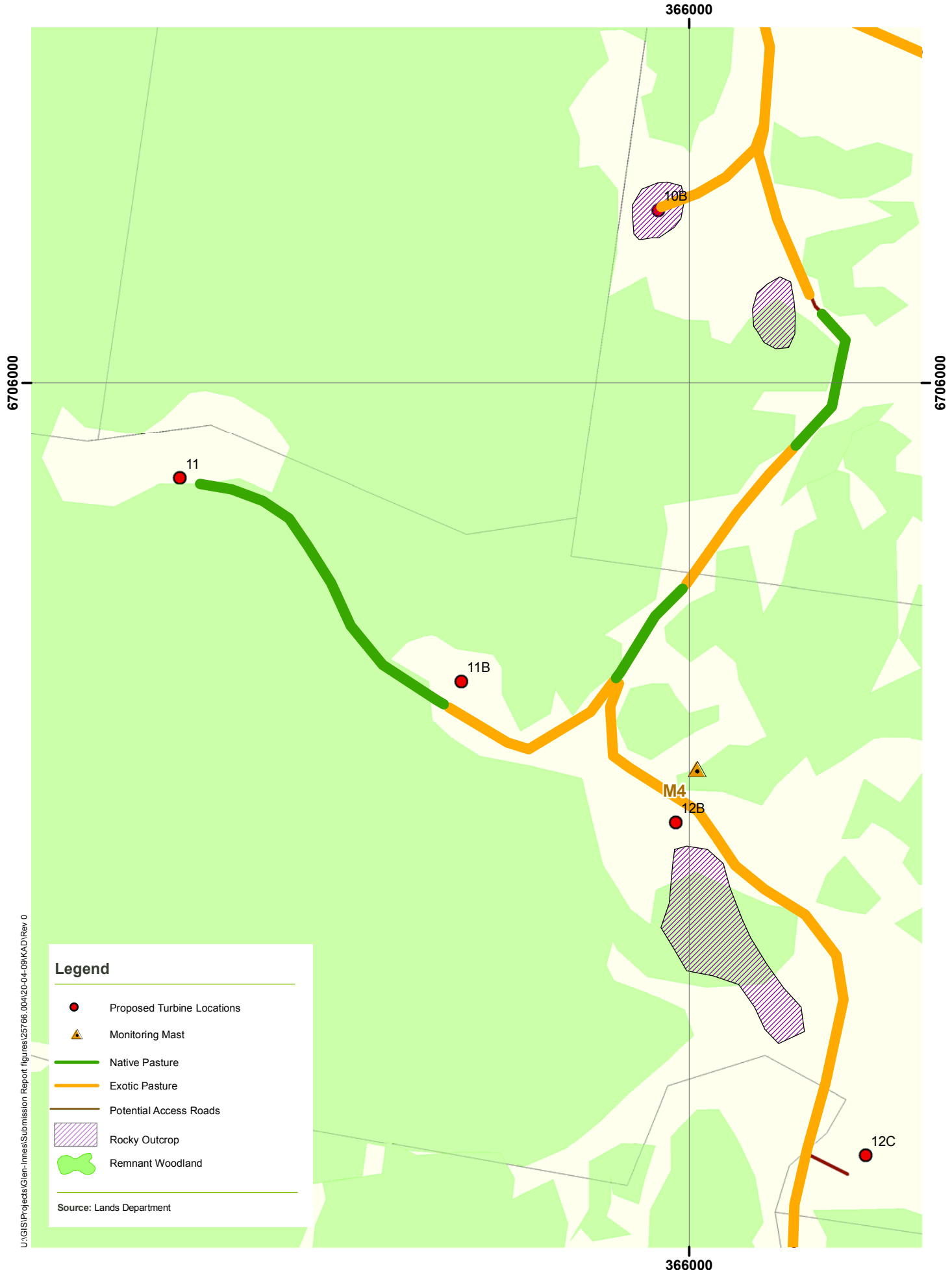


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Glen Innes Wind Farm **Native Vegetation Offset Strategy**

FIGURE 3: Turbines 9 to 22B and access tracks relative to woodland



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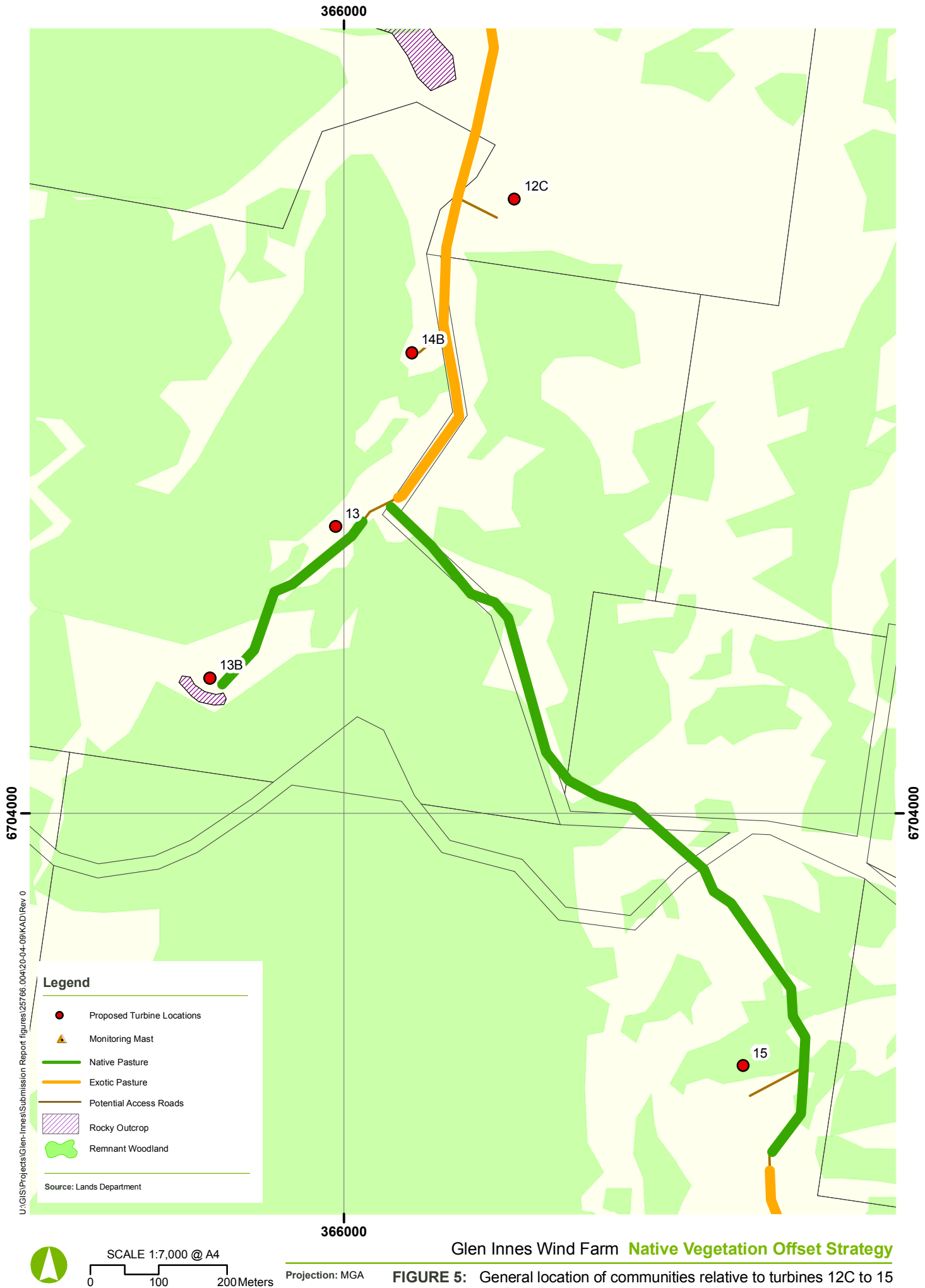


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Glen Innes Wind Farm **Native Vegetation Offset Strategy**

FIGURE 4: General location of communities relative to turbines 10B to 12C



Glen Innes Wind Farm **Native Vegetation Offset Strategy**

FIGURE 5: General location of communities relative to turbines 12C to 15



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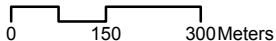
Legend

- Proposed Turbine Locations
- ▲ Monitoring Mast
- █ Native Pasture
- █ Exotic Pasture
- Potential Access Roads
- Rocky Outcrop
- █ Remnant Woodland

Source: Lands Department



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Glen Innes Wind Farm **Native Vegetation Offset Strategy**

FIGURE 6: General location of communities relative to turbines 10 to 22B

