APPENDIX E BIOSIS TECHNICAL NOTE

24 January 2023

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Dear Meredith

Hills of Gold Wind Farm Biodiversity Development Assessment Report – Technical note addendum

Project no. 34963

Hills of Gold Wind Farm (the Proponent, previously Wind Energy Partners), a 100% owned subsidiary of ENGIE Australia, proposes to develop a wind farm (64 turbines) on the ridgeline between Hanging Rock and Crawney Pass, approximately 60 kilometres south-east of Tamworth (the project). The project is State Significant Development and will be assessed under Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

Following a review of the Biodiversity Assessment Report (BDAR) submitted by Biosis on the 26 October 2022, the Department of Primary Industries (DPI) is seeking additional information to ensures that development complies with the requirements of the Fisheries Management Act 1994 (FM Act), which includes the following;

- That all water crossing (including temporary and permanent access tracks) are constructed in accordance with *DPI Policies and Guidelines for Fish Habitat Conservation and Management* (Fairfull 2013); and '*Why Do Fish Need to Cross the Road?*' – *Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge 2003).
- That impacts to threatened species of fish including the; Eel Tailed Catfish *Tandanus tandanus* (Endangered Population, FM Act) and Southern Purple Spotted Gudgeon *Gudgeon Mogurnda adspersa* (Endangered, FM Act) have been considered and mitigated.

The information provided in this technical note BDAR addendum outlines the potential for the above species to occur within the project area, the potential for impacts to each species as a result of the project, and an assessment of the significance of any potential impacts in accordance with Part 7A of the FM Act.

Further to the above, the transport haul route assessed in the BDAR, which requires a range of upgrades to transport large/heavy project components from the Port of Newcastle to the project site, has undergone two minor refinements. These refinements have resulted in no additional impact to biodiversity values, occurring on roadside verges supporting non-native vegetation. As these changes have resulted in no additional biodiversity impacts, they are included in this addendum technical note to show the consent authority each has been considered in terms of biodiversity impacts, but due to the scale of the changes are not considered to warrant revision of the project's very large and complex BDAR document.

Assessment of potential impacts to Eel Tailed Catfish and Southern Purple Spotted Gudgeon

Impacts are expected to occur to a number of waterways within the project area as a result of proposed development. Impacts will occur within the wind farm corridor high on the ridgeline, along the transmission line between the wind farm and the grid connection (both generally impacting on first and second order streams only), and along the transport haul. While the majority of the waterways within the development footprint are first order streams located high in the catchments, several larger and higher order streams providing higher quality fish habitat are also likely to be impacted to some degree. These impacts to potential fish habitat are expected to occur as a result of waterway crossing upgrades as part of crossing strengthening required for upgrades along the transport haul route between Port Newcastle and the project area.

There are a number of locations that require upgrades of creek crossings along the transport haul route. In these locations there is an existing crossing structure that is likely to require upgrading to allow for the safe transport of turbine and other infrastructure components, generally to raise the vertical clearance of the crossing to allow clearance of long elements such as turbine blades.

Where there is an existing bridge that has been identified for upgrades, the works will generally include additional strengthening to accommodate additional weight or widening. This may involve new foundations, piers and carriageway with these works resulting in minimal impacts to the existing waterway channel. A similar approach will be adopted for any existing culverts that are required to be strengthened. It is possible that a new waterway crossing will be required across Wombramurra Creek, south of Nundle.

Based on indicative threatened species distribution mapping (DPI 2023), both Southern Purple Spotted Gudgeon and the Eel-Tailed Catfish have the potential to occur within the project area, including in large watercourses such as Peel River, Wombramura Creek and Nundle Creek (Figure 1 and Figure 2). As impacts to bed and bank, vegetation clearing and water crossing upgrades are expected to occur within the known catchments for these two species, an Assessment of Significance has been prepared in accordance with Part 7A of the FM Act.

Southern Purple Spotted Gudgeon *Mogurnda adspersa*

The Southern Purple Spotted Gudgeon is listed as Endangered under the FM Act 1994, with the species facing a very high risk of extinction in New South Wales (Fisheries Scientific Committee 2008). The Southern Purple Spotted Gudgeon is a small robust fish. This species inhabits slow flowing sections of rivers and creeks with adequate vegetation cover and large woody debris or rocky substrate suitable for spawning (Murray-Darling Basin Authority 2007). Two Southern Purple Spotted Gudgeon populations are described in NSW; an eastern population found in coastal catchments north of the Clarence River, and a western population found throughout Murray-Darling Basin, however the species has experienced substantial reductions in distribution and abundance since the 1980's. Remnant populations of this species are now restricted to the Macquarie, Gwydir and Border River catchments (DPI 2017).

Indicative distribution mapping suggest that the Sothern Purple Spotted Gudgeon may occur throughout the project area in two separated populations. The indicative extent of the western population includes the watercourses around Nundle, within the Namoi Catchment area, with the indicative extent of the eastern population is found in the Hunter Catchment area, between Maitland and Aberdeen (DPI 2023). Around Nundle, the Sothern Purple Spotted Gudgeon is predicted to have the potential to occur within both major waterways including Peel River, Wombramura Creek and Nundle Creek, as well as unnamed tributaries (Figure 1 and Figure 2), some of which are likely to require crossing upgrade works.

Table 1 Southern Purple Spotted Gudgeon, Endangered species - Assessment of Significance

Factors of assessment	Likelihood of significant impact	Justification
(1) 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	Unlikely	Impacts to in-stream aquatic habitat and fish community connectivity within the broader river systems relevant to the project are considered unlikely to be substantial due to the linear and localised nature of the project (where it crosses watercourses), which primarily occurs along existing road corridors or within cleared farmland. Impacts to waterways containing potential habitat for Purple Spotted Gudgoen along this linear corridor are expected to be temporary and relatively minor at each crossing. Impacts are generally associated with upgrades to existing crossing structures, however one new crossing may be required at Wombramurra Creek. Mitigation measures have been designed to minimise the impacts of erosion, sedimentation, changes in flow regimes and blockage of fish passage, and further degradation of the waterways. Where temporary works are required to occur within or in proximity to a waterway; particularly along class 1 or class 2 waterway, development will be undertaken in accordance with best practise standards. Impacts to fish passage will be minimised by undertaking in-stream works during no flow periods where practicable. Construction works across the bed of a waterway will be staged to minimise the total disturbance at any given time and to allow the full bypassing of stream flows around the works to maintain fish passage (Fairfull & Witheridge 2003). In-stream habitat features (trees, large boulders and snags) will be temporality relocated to an area outside of the impact area, sedimentation fencing/ matting will be installed, and revegetation of impacted areas will occur. As such, interruption to breeding, blockage of movement, or negative impacts to genetic diversity for this species is unlikely to occur as a result of the proposed works. As such, the project is not anticipated to result in any substantial adverse effects on the life cycle of Southern Purple Spotted Gudgeon such that a viable local population of the species is likely to be placed at risk of extinction.
(2) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the	Not applicable	Southern Purple Spotted Gudgeon is listed as an endangered species not as an endangered population.

Factors of assessment	Likelihood of significant impact	Justification
species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction		
(3) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**	Not applicable	Southern Purple Spotted Gudgeon is listed as an endangered species not as an endangered or critically endangered community.
(4) 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**	Unlikely	Impacts to in-stream aquatic habitat and fish community connectivity within the broader river system are largely avoided due to the linear nature of the disturbance. However, the project is expected to require upgrades to existing creek crossings at a number of locations, and potential installation of a new crossing at Wombramurra Creek. To facilitate these upgrades installation of new foundations, piers and culverts are likely to be required, which has the potential to lead to short-term increases in sedimentation, vegetation removal, in-stream bed disturbance and temporary impacts to fish movement. In addition to the crossings, some minor vegetation removal within riparian corridor areas is also expected to occur. All upgrades, and potential newly constructed crossings, will ensure best practice standards outlined in *Why Do Fish Need to Cross the Road?' Fish Passage Requirements for Waterway*

Factors of assessment	Likelihood of significant impact	Justification
(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		*Crossings* (Fairfull & Witheridge 2003) are applied, in order to minimise impacts to the existing waterway channel and fish passage. Where river crossing upgrades are required, works will be undertaken in a manner minimise any barriers to fish movement, via implementation of best practice mitigation measures outlined below. As the works are unlikely to restrict fish movement on more than a temporary basis, works are unlikely to lead to the fragmentation of a population, or fragmentation/isolation of habitats. While the majority of waterways potentially impacted by the project are low quality first and second order streams, several including, Wombramurra Creek, Middlebrook Creek and Back Creek constitute Key Fish Habitat. While these waterways have the potential to provide important habitat for this species, given the temporary nature of the works, the localised impacts at each waterway, and the mitigation measures implemented (maintenance of fish passage corridors, revegetation of riparian areas, maintenance of in-stream habitat features and sedimentation controls), impacts to habitat for this species, where it meets an existing roadway, are unlikely to be substantial. Therefore it is not expected that the project will result in the removal, modification, fragmentation or isolation of habitat such that it would affect the long-term survival of Southern Purple Spotted Gudgeon in the locality.
(5) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	Unlikely	No areas of critical habitat have been declared for the Southern Purple Spotted Gudgeon on the register of critical habitat. Several waterways mapped as Key Fish Habitat occur within the project area (DPI 2023) and may be impacted by the proposed works, however impacts Key Fish Habitatare expected to be temporary and localised in nature and are unlikely reduce connectivity across the broader locality. Works are proposed to largely constitute waterway crossing upgrades along existing infrastructure, in areas already subject to impact, with the project potentially requiring the construction of one new waterway crossing. Where waterway crossing upgrades or construction occur, all crossings will be designed and constructed in accordance with best practice measures to minimise impacts to fish habitats and movement. Impacts to all in-stream habitat features including large boulders, trees and snags will be minimised were possible. If in stream habitat cannot be avoided, habitat features will be

Factors of assessment	Likelihood of significant impact	Justification
		moved into an area of similarly suitable habitat adjacent to the impact area, whenever practicable. It is expected that a number of crossing upgrades will occur within areas of Key Fish Habitat, all works will be designed to minimise impacts to areas of habitat which may be critical to the survival of the Southern Purple Spotted Gudgeon.
(6) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Not applicable	To date no recovery plan has been developed for the Southern Purple Spotted Gudgeon, although a number of recovery actions to assist this species are outlined in the Priorities Action Statement for the Southern Purple Spotted Gudgeon (DPI 2022). While the works will not assist in achieving any specific objective or recovery action, they will not result in or exacerbate the threatening processes described by the Fisheries Scientific Committee (2008).
(7) 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	Unlikely	The works have the potential to result in the relatively minor operation of, or increase the impacts of, the following key threatening processes: • Degradation of native riparian vegetation along NSW water courses. • Removal of large woody debris from NSW rivers and streams. • Installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams Commitments have been made to specifically protect against the permanent removal of habitat associated with large woody debris and boulders, in addition to commitments to protect the integrity of riparian zones including the reinstatement of bank form, implementation of erosion and sediment controls and protection of native riparian vegetation. All upgraded and constructed in-stream structures will be developed to the highest standard to optimise / maintain the ease of fish movement through the project area.

Conclusion:

Taking into consideration all factors of assessment, it is unlikely that the project works will results in a significant impact Purple Spotted Gudgoen as;

- In-stream works will largely occur along areas already subject to impacts associated with existing roadways. All new upgrades and development will be constructed in accordance with best practice methods for optimising fish passage, preserving habitat and minimising impacts to flow regimes.
- Works are unlikely to lead to the fragmentation or isolation of a local population as fish passage will not be blocked more than temporarily, if at all.
- Where impacts are expected to occur within areas of Key Fish Habitat, impacts will be localised and mitigation measures will be implemented.

Factors of assessment	Likelihood of significant impact	Justification
• The works are not expected to negatively impact the recovery of this species, nor does it conflict with the aims of the Priority Action Statement for the Southern Purple Spotted Gudgeon. • The integrity of riparian zones will be maintained by reinstatement of bank form, implementation of erosion and sediment controls and revegetation of native riparian vegetation.		

Eel-Tailed Catfish *Tandanus tandanus* Murray-Darling Basin population

Eel-Tailed Catfish is listed as Endangered Population under the FM Act, with the population facing a very high risk of extinction in NSW (Fisheries Scientific Committee 2008). Once highly abundant and widespread throughout the Murray-Darling River System in NSW, Queensland, Victoria and South Australia, Eel-Tailed Catfish populations in NSW have significantly declined since the 1970s, and the species is no longer common in many areas. Carp, thermal pollution and seasonal flow reversal are considered to be the major contributors to this species decline. The Eel-Tailed Catfish is present in most catchments south of the Hunter as far as the Shoalhaven catchment on the southern NSW coast, but some or all of these populations are believed to be translocated populations of mainly unknown origin (Rourke & Gilligan 2010).

The Eel Tailed Catfish is a non-migratory, benthic (bottom dwelling) species. It is relatively sedentary and adults typically only move within a 5 kilometre range. They are generally more active at night compared with during the day. They can be found in a diverse range of freshwater environments including rivers, creeks, lakes, billabongs and lagoons. They prefer clear, sluggish or still waters, but can also be found in flowing streams with turbid waters. Substrates range from mud to gravel and rock (DPI 2018).

Indicative distribution mapping suggest that the Eel Tailed Catfish may occur within the most western portion of the project area, in the Namoi Catchment between Murrurundi and Nundle (DPI 2023). The Eel Tailed Catfish is predicted to have the potential to occur within several major waterways which transect the project area including the; Peel River, Wombramura Creek and Nundle Creek (Figure 1 and Figure 2).

Table 2 Eel-Tailed Catfish in the Murray Darling Basin, Endangered Population - Assessment of Significance

Factors of assessment	Likelihood of significant impact	Justification
(1) 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 applicable	The Eel-Tailed Catfish population in the Murray Darling Basin is listed as an endangered population not a threatened species.
(2) 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	Unlikely	Impacts to in-stream aquatic habitat and fish community connectivity within the broader river systems relevant to the project are considered unlikely to be substantial due to the linear and localised nature of the project (where it crosses watercourses), which primarily occurs along existing road corridors or within cleared farmland.

Factors of assessment	Likelihood of significant impact	Justification
endangered population such that a viable local population of the species is likely to be placed at risk of extinction		Impacts to waterways containing potential habitat for Eel-Tailed Catfish along this linear corridor are expected to be temporary and relatively minor at each crossing. Impacts are generally associated with upgrades to existing crossing structures, however one new crossing may be required at Wombramurra Creek. Mitigation measures have been designed to minimise the impacts of erosion, sedimentation, changes in flow regimes and blockage of fish passage. Where temporary works are required to occur within or in proximity to a waterway; particularly along class 1 or class 2 waterway, development will be undertaken in accordance with best practise standards. Impacts to fish passage will be minimised by undertaking in-stream works during no flow periods where practicable. Construction works across the bed of a waterway will be staged to minimise the total disturbance at any given time and to allow the full bypassing of stream flows around the works to maintain fish passage (Fairfull & Witheridge 2003).. In-stream habitat features (trees, large boulders and snags) will be temporality relocated to an area outside of the impact area, sedimentation fencing/ matting will be installed, and revegetation of impacted areas will occur. As such, interruption to breeding, blockage of movement, or negative impacts to genetic diversity for this species is unlikely to occur as a result of the proposed works. As such the project works are not anticipated to result in any substantial adverse effect on the life cycle of Eel-Tailed Catfish such that a viable local population of the species is likely to be placed at risk of extinction
(3) 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**	Not applicable	The Eel-Tailed Catfish population in the Murray Darling Basin is listed as an endangered population not an endangered or critically endangered community.

Factors of assessment	Likelihood of significant impact	Justification
occurrence is likely to be placed at risk of extinction		
(4) 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**	Unlikely	Impacts to in-stream aquatic habitat and fish community connectivity within the broader river system are largely avoided due to the linear nature of the disturbance. However, the project is expected to require upgrades to existing creek crossings at a number of locations, and potential installation of a new crossing at Wombramurra Creek. To facilitate these upgrades installation of new foundations, piers and culverts are likely to be required, which has the potential to lead to short-term increases in sedimentation, vegetation removal, in-stream bed disturbance and temporary impacts to fish movement. In addition to the crossings, some minor vegetation removal within riparian corridor areas is also expected to occur. All upgrades, and potential newly constructed crossings, will ensure best practice standards outlined in *Why Do Fish Need to Cross the Road?' Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge 2003) are applied, in order to minimise impacts to the existing waterway channel and fish passage. Where river crossing upgrades are required, works will be undertaken in a manner minimise any barriers to fish movement, via implementation of best practice mitigation measures outlined below. As the works are unlikely to restrict fish movement on more than a temporary basis, works are unlikely to lead to the fragmentation of a population, or fragmentation/isolation of habitats. While the majority of waterways potentially impacted by the project are low quality first and second order streams, several including, Wombramurra Creek, Middlebrook Creek and Back Creek constitute Key Fish Habitat. While these waterways have the potential to provide important habitat for this species, given the temporary nature of the works, the localised impacts at each waterway, and the mitigation measures implemented (maintenance of fish passage corridors, revegetation of riparian areas, maintenance of in-stream habitat features and sedimentation controls), impacts to habitat for this species, where it meets and existing roadway, are unlikely to be substantial. Key Fish Habitat Therefore it is not expected that the project will result in the removal, modification, fragmentation or isolation of habitat such that it would affect the long-term survival of the Eel-Tailed Catfish population in the Murray Darling Basin.
(5) whether the action proposed is likely to have an	Unlikely	No areas of critical habitat have been declared for the Eel-Tailed Catfish population on the register of critical habitat.

Factors of assessment	Likelihood of significant impact	Justification
adverse effect on critical habitat (either directly or indirectly)		Several waterways mapped as Key Fish Habitat occur within the project area (DPI 2023) and may be impacted by the proposed works, however impacts are expected to be temporary and localised in nature and are unlikely reduce connectivity across the broader locality. Works are proposed to largely constitute waterway crossing upgrades along existing infrastructure, in areas already subject to impact, with the project potentially requiring the construction of one new waterway crossing. Where waterway crossing upgrades or construction occur, all crossings will be designed and constructed in accordance with best practice measures to minimise impacts to fish habitats and movement. Impacts to all in-stream habitat features including large boulders, trees and snags will be minimised were possible. If in stream habitat cannot be avoided, habitat features will be moved into an area of similarly suitable habitat adjacent to the impact area, whenever practicable. It is expected that a number of crossing upgrades will occur within areas of Key Fish Habitat, all works will be designed to minimise impacts to areas of habitat which may be critical to the survival of the Eel-Tailed Catfish population in the Murray Darling Basin. Key Fish HabitatKey Fish Habitat Key Fish Habitat
(6) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Not applicable	To date no recovery plan has been developed for the Eel-Tailed Catfish population in the Murray Darling Basin, although a number of recovery actions to assist this population are outlined in the Priorities Action Statement for the Murray-Darling population of Eel Tailed Catfish(DPI 2022b) While the Project works do not assist in achieving any specific objective or recovery action detailed within the recovery actions, they will not result in or exacerbate the threatening processes described by the Fisheries Scientific Committee (2008).
(7) 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	Unlikely	The works have the potential to result in the relatively minor operation of, or increase the impacts of, the following key threatening processes: • Degradation of native riparian vegetation along NSW water courses. • Removal of large woody debris from NSW rivers and streams. • Installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams Commitments have been made to specifically protect against the permanent removal of habitat associated with large woody debris and boulders, in addition to commitments to protect the integrity of riparian zones including the reinstatement of bank form, implementation of erosion and sediment controls

Factors of assessment	Likelihood of significant impact	Justification
		and protection of native riparian vegetation. All upgraded and constructed in-stream structures will be developed to the highest standard to optimise / maintain the ease of fish movement through the project area

Conclusion

Taking into consideration all factors of assessment, it is unlikely that the project will results in a significant impact Eel-Tailed Catfish population in the Murray Darling Basin as;

- In-stream works will largely occur along areas already subject to impacts associated with existing roadways. All new upgrades and development will be constructed in accordance with best practice methods for maximising fish movement.
- Works are unlikely to lead to the fragmentation or isolation of a local population as fish passage will not be blocked more than temporarily, if at all.
- Where impacts are expected to occur within areas of Key Fish Habitat, impacts will be localised and mitigation measures will be implemented.
- The works are not expected to negatively impact the recovery of this species, nor does it conflict with the aims of the Priority Action Statement for the Eel-Tailed Catfish population in the Murray Darling Basin (DPI 2022b).
- The integrity of riparian zones will be maintained by reinstatement of bank form, implementation of erosion and sediment controls and revegetation of native riparian vegetation.

FM Act Assessment of Significance conclusion and mitigation measures

Based on the information provided in Table 1 and Table 2 above, it is not expected that the project will result in a significant impact to native aquatic species, including the threatened Eel-Tailed Catfish and Southern Purple Spotted Gudgeon. This conclusion is based on the nature of the project's impacts being highly localised in nature, being largely restricted to upgrades of existing road crossings over already degraded aquatic habitats providing limited habitat values for the subject species, the temporary nature of the works, the lack of habitat fragmentation, and the best practice crossing design and associated impact mitigation measures to be implemented.

Mitigation measures implemented to ensure potential impacts to native aquatic species, including Eel-Tailed Catfish and Southern Purple Spotted Gudgeon and their habitats, will be in accordance with those outlined in Fairfull (2013), and include:

- Where practicable, all waterway crossing works will be undertaken during no, or low flow conditions.
- Flow diversion measures will be installed where construction waterway crossings during no flow conditions is not feasible. Flow diversion measures may include pumps to ensure that water can be moved from one side of trench to the other, screened inlets to prevent the entrapment of aquatic fauna and outlet structures that are designed to avoid scouring of the channel. DPI Fisheries must be consulted with regards to any measures that will result in temporary obstructions to fish passage, including coffer dams, flow diversion structures and access tracks.
- Minimising the amount of time between initial ground disturbance and reshaping back to a stable landform, including the amount of time the watercourse is blocked or diverted.

- Installation and maintenance of erosion and sedimentation controls before, during and as long as necessary after the construction works to prevent sediment and turbid water from entering the waterways.
- Implementing bank stabilisation measures during construction and rehabilitation phases. Watercourses will be reinstated such that bank stability at the crossing location is the same or better than prior to construction. Stabilising materials such as rock armouring, hydro mulch, jute matting or other suitable geotextile materials will be applied to watercourse banks where necessary.
- Rehabilitation and revegetation of temporary impacts to creek banks and riparian corridors, and offsetting of all permanent impacts to riparian vegetation.
- Minimisation of impacts to instream habitat, including large woody debris or boulders will be temporarily relocated during construction and returned to the watercourse during reinstatement.
- The design and construction of waterway crossing will be in accordance with the national guidelines '*Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*' (Fairfull and Witheridge 2003).

Minor changes to transport haul route assessed in the BDAR

As outlined above, two minor refinements have been made to the transport haul route assessed in the BDAR. These refinements have resulted in no additional impact to biodiversity values, and include:

- Increased hardstand at the intersection of Kayuga Road and Wybong Road, Muswellbrook from a total disturbance area of 1300 square meters to 2900 square meters to allow for a wider swept path of long turbine components.
- Minor road and intersection widening on Oakenville Street, Herron Street North, Innes Street and Jenkins Street, Nundle in response to Transport for NSW comments.

Kayuga Road and Wybong Road, Muswellbrook

The screenshots below illustrate the cleared and disturbed nature of the vegetation on the northern side of Kayuga Road where the additional impact area is likely to occur. This area does not support native vegetation, nor does it support habitat for threatened species, of any more signficance than low quality potential forage habitat for aerial species.

Inclusion of this area within the transport haul route footprint is considered to have no additional impact to biodiversity values, and furthermore it is likely to meet the definition of Category 1 – Exempt Land under the *Local Land Service Act 2013.*

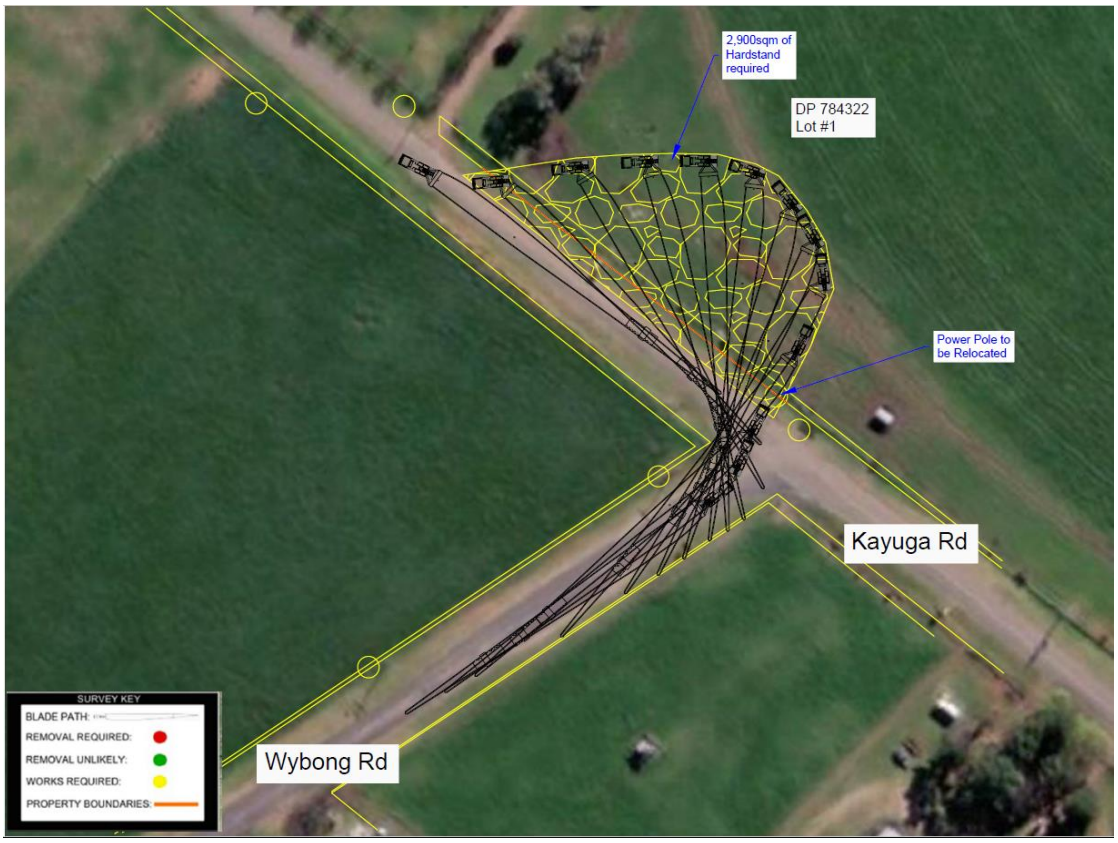

Plate 1 **Project design drawings illustrating the area of additional impact on the northern side of Kayuga Road**

Plate 2 **Screenshot illustrating transport footprint included in BDAR (black outline), previously mapped exotic grassland vegetation (orange polygons), and additional impact area on the northern side of Kayuga Road (red outline).**

Plate 3 **Google Street View screenshot illustrating the on-ground nature of the vegetation on the northern side of Kauyga Road, taken from the western end of the newly impacted area facing south-east.**

Plate 4 **Google Street View screenshot illustrating the on-ground nature of the vegetation on the northern side of Kauyga Road, taken from close to the intersection with Wybong Road (visible on the right-hand side of the image).**

Oakenville Street, Herron Street North, Innes Street and Jenkins Street, Nundle

The screenshots below illustrate the largely non-native vegetation present within the area between (and surrounding) the Oakenville Street, Herron Street North, Innes Street and Jenkins Street intersections in Nundle, where minor road and intersection widening is planned. Road works are required to ensure safety, and sufficient passing space is maintained for heavy vehicle traffic during construction of the wind farm.

It should be noted that the row of trees on the eastern side of Herron Street North have been mapped as conforming to PCT 559 *Blakelys Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion*, and equivalent to the BC Act listed Critically Endangered Ecological Community White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland), however no impacts will occur to this native vegetation.

Road widening designs, as illustrated in Plate 5 below, require a 1 meter widening on the eastern side of Herron Street North, which will be entirely located in the existing gravel shoulder of the roadway (Plate 7 and Plate 8), and will not extend into (or impact upon) the adjacent mapped PCT 599 / Box Gum Woodland native vegetation.

All remaining impacts, not part of the transport haul route currently assessed in the BDAR, will occur in areas supporting vegetation previously mapped as Exotic Grassland or Planted Urban Vegetation (which includes exotic species such as Willows). These additionally impacted area do not support native vegetation, nor do they support habitat for threatened species, of any more significance than low quality potential forage habitat for aerial species.

Inclusion of these area within the transport haul route footprint is considered to have no additional impact to biodiversity values.

Plate 5 **Project design drawings illustrating the areas of additional impact (peach coloured polygons) around Oakenville Street, Herron Street North, Innes Street and Jenkins Street, including the 1 metre width extension on the eastern side of Herron Street North.**

Plate 6 **Screenshot illustrating transport footprint included in BDAR (black outline), and previously mapped exotic grassland vegetation (blue polygons), planted urban vegetation (pink polygons), PCT 599 Box Gum Woodland (red strip and trees to the east) surrounding the areas of additional impact.**

Plate 7 **Photo taken from the centreline of Herron Street North illustrating the existing gravel shoulder and the generally disturbed nature of the road verge vegetation.**

Plate 8 **Google Street View screenshot further illustrating the existing gravel shoulder and the generally disturbed nature of the road verge vegetation along Herron Street North.**

References

Fisheries Scientific Committee 2008. Fisheries Scientific Committee FINAL DETERMINATION Mogurnda adspersa - Purple spotted gudgeon.

DPI 2017. Southern Purple Spotted Gudgeon – Mogurnda adspersa.

DPI 2018. Protecting Eel-Tailed Catfish in Western NSW – a guide for fishers and land managers.

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Appendix A. Figures

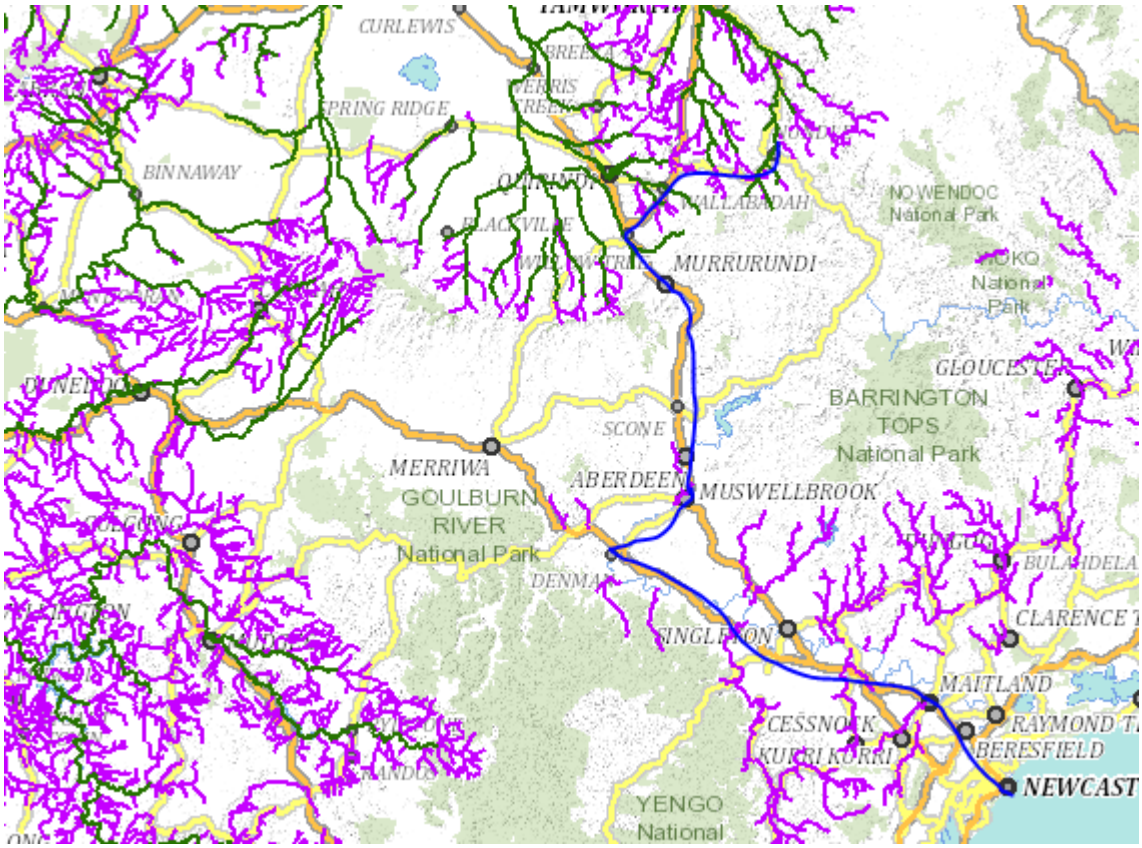

Figure 1 **Threatened species indicative distribution map for Southern Purple Spotted Gudgen (purple) and Eel Tailed Catfish (green) (DPI 2023) along the transport haul route (blue)**

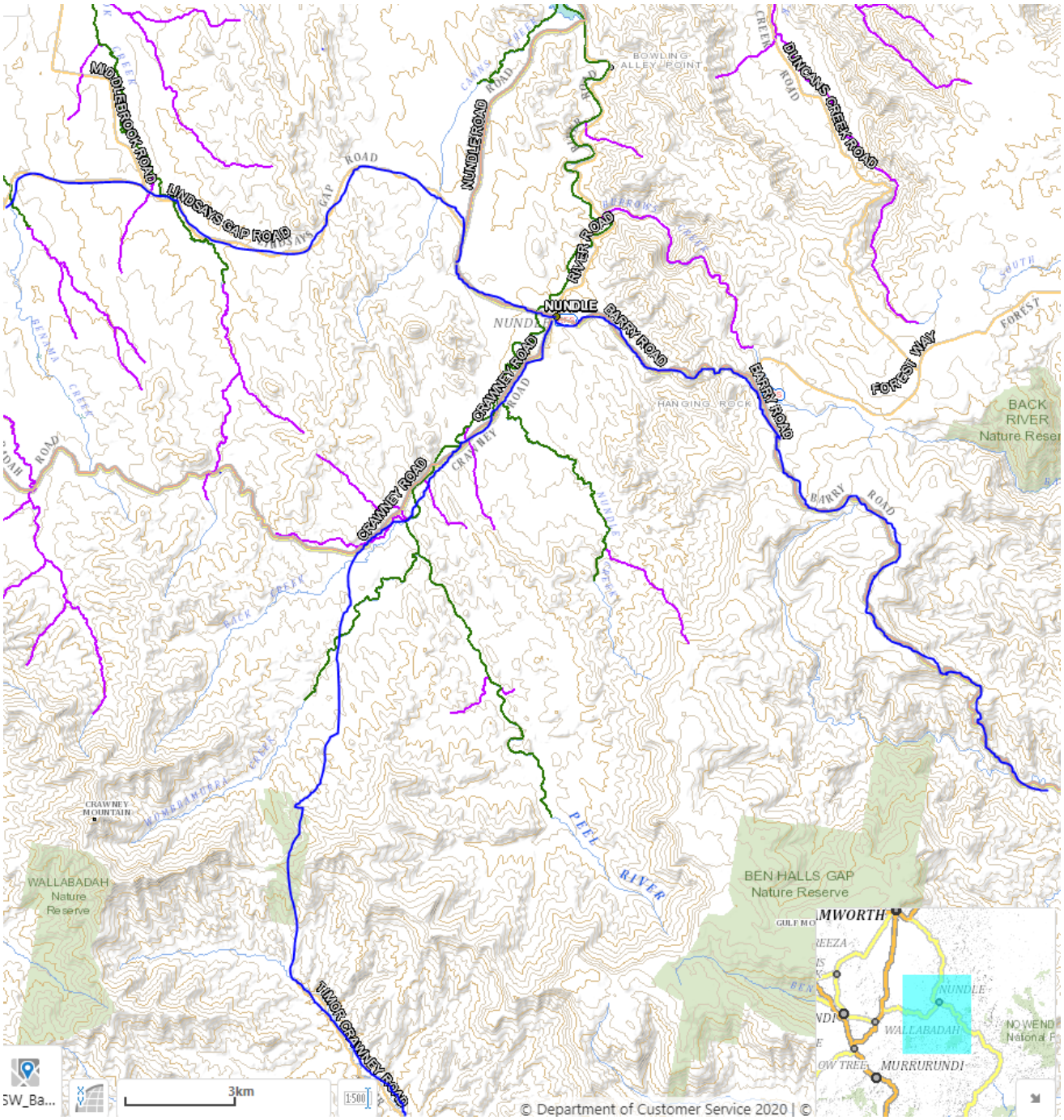

Figure 2 **Threatened species indicative distribution map for Southern Purple Spotted Gudgeon (purple) and Eel-Tailed Catfish (green) (DPI 2023) within the transport haul route and wind farm project areas.**