APPENDIX G LANDSCAPE AND VISUAL ASSESSMENT ADDENDUM

Hills of Gold Wind Farm SSD-9679

Second Addendum to Landscape and Visual Impact Assessment

moir landscape architecture

Prepared for: ERM

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Issue	Submission	Date of Issue	Author	Approved by
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Moir Landscape Architecture Pty Ltd,
Studio 1, 88 Fern Street, PO Box 111, Islington NSW 2296
Ph.(02) 4965 3500 Fax.(02) 4965 3555 admin@moirla.com.au
www.moirla.com.au ACN: 097 558 908 ABN: 48 097 558 908

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1.0 Introduction

1.1 Purpose of this Report

The purpose of this report is to provide additional information relevant to the Landscape and Visual Impact Assessment (LVIA) undertaken for the Hills of Gold Wind Farm (SSD-9679) (referred to here after as '2020 LVIA'). In November 2021, further amendments were proposed to the layout in the Addendum to Landscape and Visual Impact Assessment for the Hills of Gold Wind Farm (referred to here after as '2021 LVIA Addendum') as a response to the community submissions in relation to Landscape and Visual Impacts received during the public exhibition period and subsequent feedback from the Department of Planning and Environment (DPE).

This report supplements and updates the Landscape and Visual Assessment, and contains further assessment of the impacts of proposed alterations to the Project. This report:

- Provides an assessment of the proposed alterations to the Project layout which have been undertaken to assist in making positive changes to the Project. **Section 2.0** provides an overview of the proposed amendments to the Project Layout and outlines any amendments to the findings of the Landscape and Visual Impact Assessment.
- Provides an assessment of potential visual impacts arising from ancillary infrastructure. **Sections 5.0 and 8.0** provides an overview of proposed amendments to ancillary infrastructure such as access tracks for transmission line construction, access tracks for Project construction, blade laydowns, internal pads, ancillary infrastructure and transport swept path. The potential visual impacts arising from these amendments are also discussed in these sections.
- Provides an overview and assessment of potential visual impacts of alternate transport routes and additional hardstand areas to ancillary infrastructure in **Sections 4.0 and 5.0**.
- Discusses the potential landscape and visual impacts that arises from widening of the easement dedicated to the transmission line and power poles in **Section 6.0** and **Appendix B**.
- Provides further assessment of the potential visual impact resulting from changes to the Project Layout;
- Provides additional assessments in response to the proposal for a new quarry which will be located within the extents of Hanging Rock State Forest;
- Provides an assessment of additional optionality for transmission towers and poles;
- Specific concerns related to the change of easement widths and the DPE's requests for further assessment of specific issues.

1.0 Introduction

1.2 Overview of Project Amendments

Since the submission of the EIS (i.e., 2020 LVIA) and the first addendum to the proposed Hills of Gold Wind Farm Project (i.e., 2021 LVIA Addendum), there have been nine (9) key amendments to the Project relevant to landscape and visual impacts.

Amendment 1: Amendments to Turbine Layout

This includes:

a. Removal of one (1) wind turbine generator (WTG41);

b. 20 turbines (WTGs 2, 3, 4, 10, 11, 32, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 64, 70) are to be relocated within 350 m of the previous location.

These amendments further reduce biodiversity impacts. As a result of the removal and relocation of these turbines, the impact is generally similar to the results of the assessment carried out in the 2021 LVIA Addendum. Minor impacts were identified for NAD_49 and this is discussed in **Section 2.0** of this report.

Amendment 2: Access tracks for transmission line construction

Impacts of the proposed transmission line have been discussed in 2020 LVIA. An assessment of potential impacts of access tracks for construction of the transmission line have been included in this report (see **Section 3.0**).

Amendment 3: Assessment of alternate transport route to the Project Area from Nundle via Crawney Road.

Alternate routes have been proposed to provide connection between the Project Area via Crawney Road from Nundle. Assessment of potential visual impacts associated with these options have been discussed in **Section 4.0**.

Amendment 4: Additional hardstand areas for ancillary infrastructure

An optional location has been proposed for ancillary infrastructure which includes the Substation / Batching / O & M Facility / BESS. An assessment of impacts arising from additional hardstand areas that cater to these facilities has been included (see **Section 5.0**).

Amendment 5: Assessment of impacts of revised easement for transmission line

The transmission line (TL) easement has been increased to a total width of 90 m. This easement is associated with the TL route between the turbines and the proposed optional BESS/Substation area on the western side of the Project (see **Section 6.0**). The total width includes an easement of 60 m for the 330 kV transmission line (with transmission towers) and a 30 m easement for the 33 kV power line (with transmission poles).

Amendment 6: Morrisons Gap Road Upgrade

An minor upgrade to Morrisons Gap Road has been proposed. The area for upgrade has been reduced and new transport-upgraded areas have been added. The previously proposed retaining walls on Morrisons Gap Road have been removed as per Tamworth Regional Council's feedback. Assessments related to potential visual impacts of this upgrade are included in **Section 7.0**.

Amendment 7: Amendments to Ancillary Infrastructure

Assessment of ancillary infrastructure including access tracks, blade laydowns, internal pads, ancillary infrastructure and transport swept paths (see **Section 8.0**).

Amendment 8: Assessment of Potential Visual Impacts of Optional Quarry Operations

This includes a summary of the visual impact and recommended mitigation measures for an optional quarry proposed 9 km north of the Project Area. Overview of potential visual impacts on surrounding receptors (including residences, the township of Nundle and other public viewing locations) and recommendations for mitigation have been included in **Appendix A.**

Amendment 9: Assessment of optionality of transmission towers

Additional assessment for optionality of transmission towers for the 330kV transmission line has been discussed in **Appendix B** to this addendum. Photomontages from two dwellings have been included in the assessment to demonstrate the potential visual impact and assist in assessments for two options for the transmission line - option 1 includes double circuit steel towers and option 2 includes double circuit steel poles.

2.0 Amendments to Turbine Layout

2.1 Overview of Amendments to Turbine Layout

Amendments have been made to the Project layout as a response to feedback from DPE and BCS. **Figure 1** illustrates the changes in Project layout which include the removal of one (1) turbine and relocation of WTGs 2, 3, 4, 10, 11, 32, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 64, 70 within 350m of previous location. **Table 1** enlists the variation in distance to nearest turbine for dwellings that are impacted by these amendments. **Figure 1** shows a comparison between the 2021 LVIA Addendum layout and the amended layout. **Figures 2-5** illustrate the visual magnitude, multiple wind turbine tool, and shadow flicker assessments for the amended layout. A comparison of the zone of visual influence (ZVI) assessments for the 2021 LVIA Addendum layout and the new layout has been presented in **Figure 6** and **Figure 7**.

2.1.1 Removal of one (1) turbine WTG41

The proposed layout includes removal of one (1) turbine, i.e., WTG 41 (see **Figure 1**). Turbine WTG 41 has been removed to reduce biodiversity impacts as well as to reduce visual impacts, resulting in benefits to receptors to the south of the Project.

2.1.2 Relocation of 10 turbines within 100 m of the previous location

A total of 10 WTGs have been relocated within the 100 m of the previous location. These include WTGs 2, 3, 4, 32, 35, 36, 39, 40, 64, 70 (see **Figure 1**). Minor amendments have been made to the position of turbines within the proposed hardstand areas. The impact of relocation of these turbines will be minor and it is likely that the potential visual impacts on all dwellings will be similar to the impacts identified in 2021 LVIA Addendum.

2.1.3 Relocation of 10 turbines within 350 m of the previous location

The proposed layout also includes relocation of 10 WTGs within the 350 m of the previous location. These include WTGs 10, 11, 37, 38, 42, 43, 44, 45, 46, 47 (see **Figure 1**). Amendments have been made to the layout as result of removal of WTG 41 and to further reduce the impacts on biodiversity. It is likely that relocation of these turbines will not impact the potential visual impacts that were identified in 2021 LVIA Addendum.

2.2 Overview and Results of Preliminary Assessment Tool 1: Visual Magnitude for Amended Layout

Application of the Visual Magnitude Tool to the amended Project layout provided the following results for non-associated dwellings (refer **Figure 2**):

- 15 dwellings have been identified within 3100 metres of a proposed wind turbine location (within the black line of visual magnitude).
- 13 dwellings were identified within 3100 - 4550 metres of a proposed wind turbine (between the black and blue lines of visual magnitude).

Table 1 details the variation in distance to nearest turbine for various non-associated dwellings.

2.3 Overview and Results of Preliminary Assessment Tool 2: Multiple Wind Turbine Tool for Amended Layout

When applied to the amended Project layout, the 2D Multiple Wind Turbine Tool identified that six (6) non-associated dwellings will have views of turbines in more than two (2) 60° sectors (see **Figure 3**). Of the six (6) dwellings identified, further assessment determined that topography would screen views to turbines, thus reducing the number of turbines visible to two (2) or three (3) 60° sectors (refer to **Table 2**) which is deemed acceptable in accordance with the *Wind Energy: Visual Assessment Bulletin December 2016* (the Bulletin).

Dwelling ID:	Distance to nearest turbine (2021 LVIA Addendum Layout)	Distance to nearest turbine (Updated 2022 Layout)	Variation in distance
NAD_49	6.26 km (WTG 6)	6.26 km (WTG 6)	Nil
NAD_21	3.29 km (WTG 2)	3.38 km (WTG 2)	+ 90 m
NAD_41	4.74 km (WTG 10)	4.77 km (WTG 10)	+ 30 m
NAD_8	1.08 km (WTG 70)	1.16 km (WTG 70)	+ 80 m
NAD_7	1.74 km (WTG 70)	1.83 km (WTG 70)	+ 90 m

Table 1. Variation in distance to nearest turbine for dwellings impacted by the amendment

2.0 Amendments to Turbine Layout

2.4 Overview and Results of Shadow Flicker Assessment

The Bulletin states: *the shadow flicker caused by certain sun angles in relation to the rotation of wind turbine blades on dwellings will be limited to 30 hours per year, and may require mitigation methods such as amend siting and design of turbines to minimise the amount of shadow flicker.*

One (1) non-associated dwelling [NAD_8] has the potential to experience shadow flicker slightly more than 30 hours per year. Similar results were identified in the 2020 LVIA. The assessment is based on a worst case scenario considering topography alone. NAD_8 is surrounded by dense vegetation which would be likely to reduce any potentially unacceptable limits of shadow flicker effects.

In addition to the impact on residences, shadow flicker has the potential to cause annoyance to road users. The shadow flicker assessment identified that a small extent of Crawney Pass Road which passes through the National Park may experience shadow flicker. However, it should be noted that dense vegetation of the National Park will help limit the potential to experience shadow flicker.

2.5 Overview of Zone of Visual Influence (ZVI) and Summary of Potential Visual Impacts

The potential visual impacts are likely to be similar to those identified in the 2021 LVIA Addendum. To illustrate the magnitude of change in the visual impact, **Figure 6** and **Figure 7** were prepared to illustrate the ZVI models for both turbine layouts to provide a comparison of visibility. The ZVI calculation is prepared based on topography alone to represent visibility in a bare-ground scenario, i.e, a landscape without vegetation or structures.

The amended layout presents results similar to the 2021 LVIA Addendum. The ZVI for the amended layout indicates that highest level of visibility is likely to be experienced from lands around the Peel River / Head of Peel Road. The landform character around Head of Peel Road allows visibility of most number of turbines.

The level of visibility around other areas such as the northern end of Morrisons Gap Road, parts of Crawney Road and areas near Nundle are likely to have limited visibility of the Project. Receptors within and around the township of Nundle are likely to experience low visual impacts. These results are similar to those identified in the 2021 LVIA Addendum.

Although the ZVI indicates that the potential visibility of turbines has slightly increased for dwelling NAD_49, the overall visual impacts on the dwelling are likely to be similar to those identified in the 2021 LVIA Addendum. A comparison between the previous layout and the amended layout indicates that there is no change in the distance between NAD_49 and the nearest turbine (WTG 6) (refer to **Table 1**). Application of the multiple wind turbine tool also indicates that views of the Project are likely to be available in one (1) 60 degree sector, which is deemed acceptable in accordance with the Bulletin. Views of the Project are likely to be available in the southeast and aerial imagery indicates that the dwelling is surrounded by scattered vegetation which will help limit views of the amended Project layout. The potential visual impacts for this dwelling are, therefore, likely to remain low.

Review of the minor amendments to the Project layout has concluded the relocation of 20 turbines would not result in substantial increase in visual impacts. In particular, the minor turbine relocations will not increase the shadow flicker hours from any non-involved dwelling. **Table 2** details the potential visual impacts on non-associated dwellings within the black and blue lines of visual magnitude. The results of the assessment summarise that the potential visual impact ratings for these dwellings are likely to be similar to those identified for the 2021 LVIA Addendum layout.

2.0 Amendments to Turbine Layout

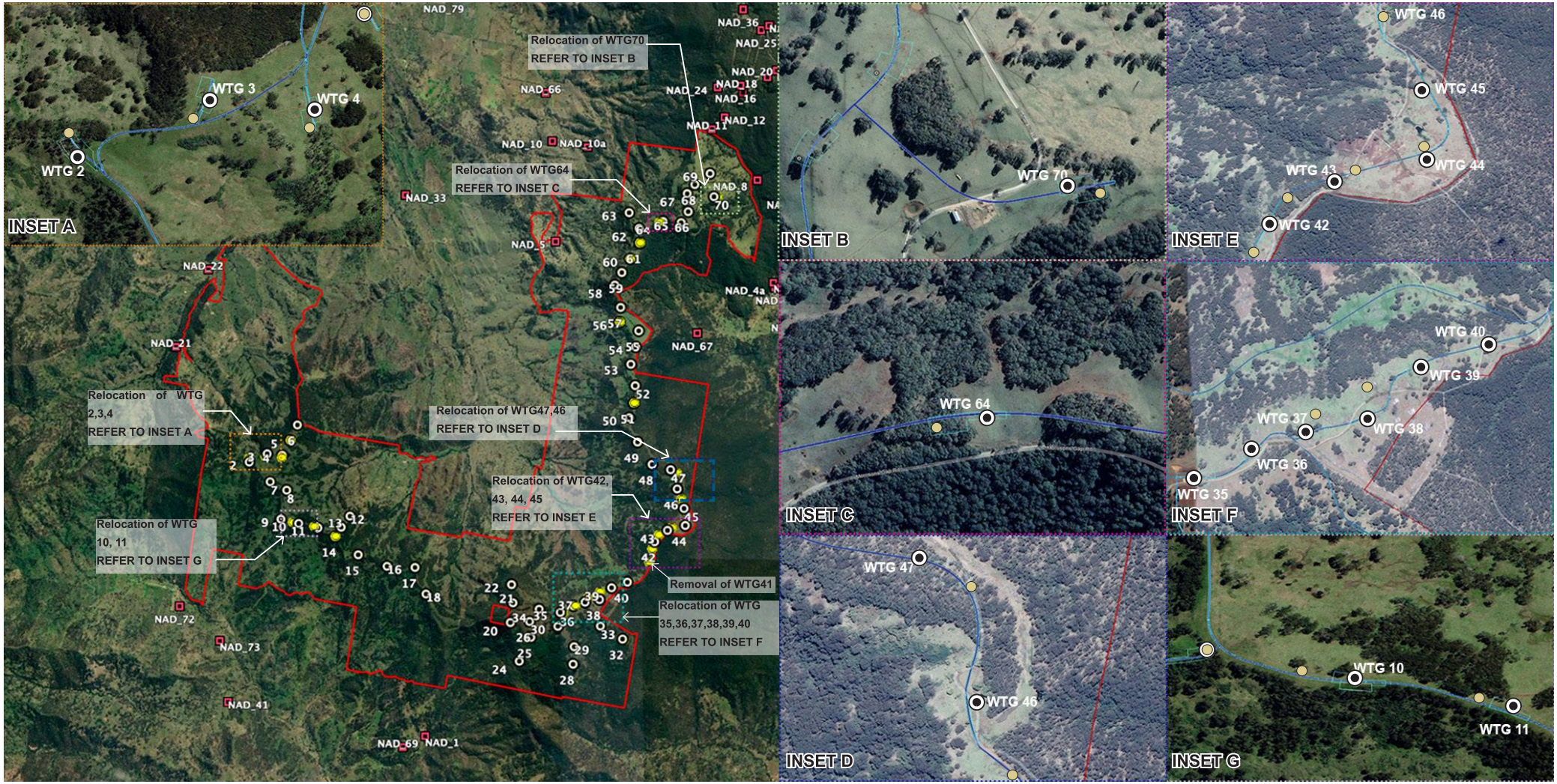
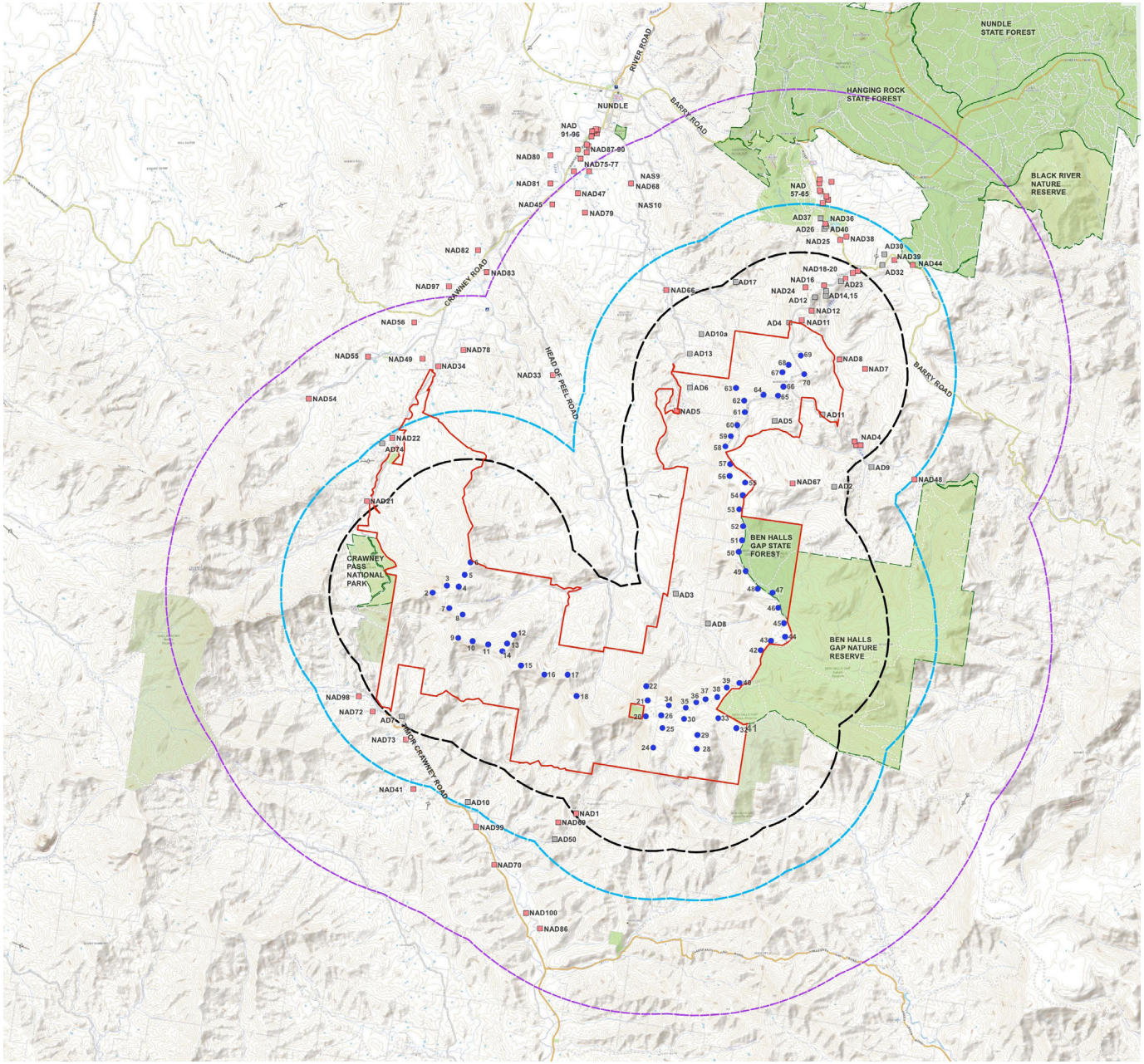


Figure 1. Turbine Layout Amendments *(Map Source: Google Earth 2019)*

2.0 Amendments to Turbine Layout



Visual Magnitude

Hills of Gold Wind Farm (Amended Layout)

LEGEND

- Project boundary
- 25 Proposed Turbine Location (amended layout)
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- Associated dwellings
- Non associated dwellings
- Nature Reserve
- State Forest
- Main Road
- Minor Road

Note:

Preliminary Assessment Tool 1: Visual Magnitude is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing turbines.

N

0 2 4 6 8 10km

Figure 2. Preliminary Assessment Tool 1 - Visual Magnitude *(Map Source: Six Maps 2013)*

2.0 Amendments to Turbine Layout

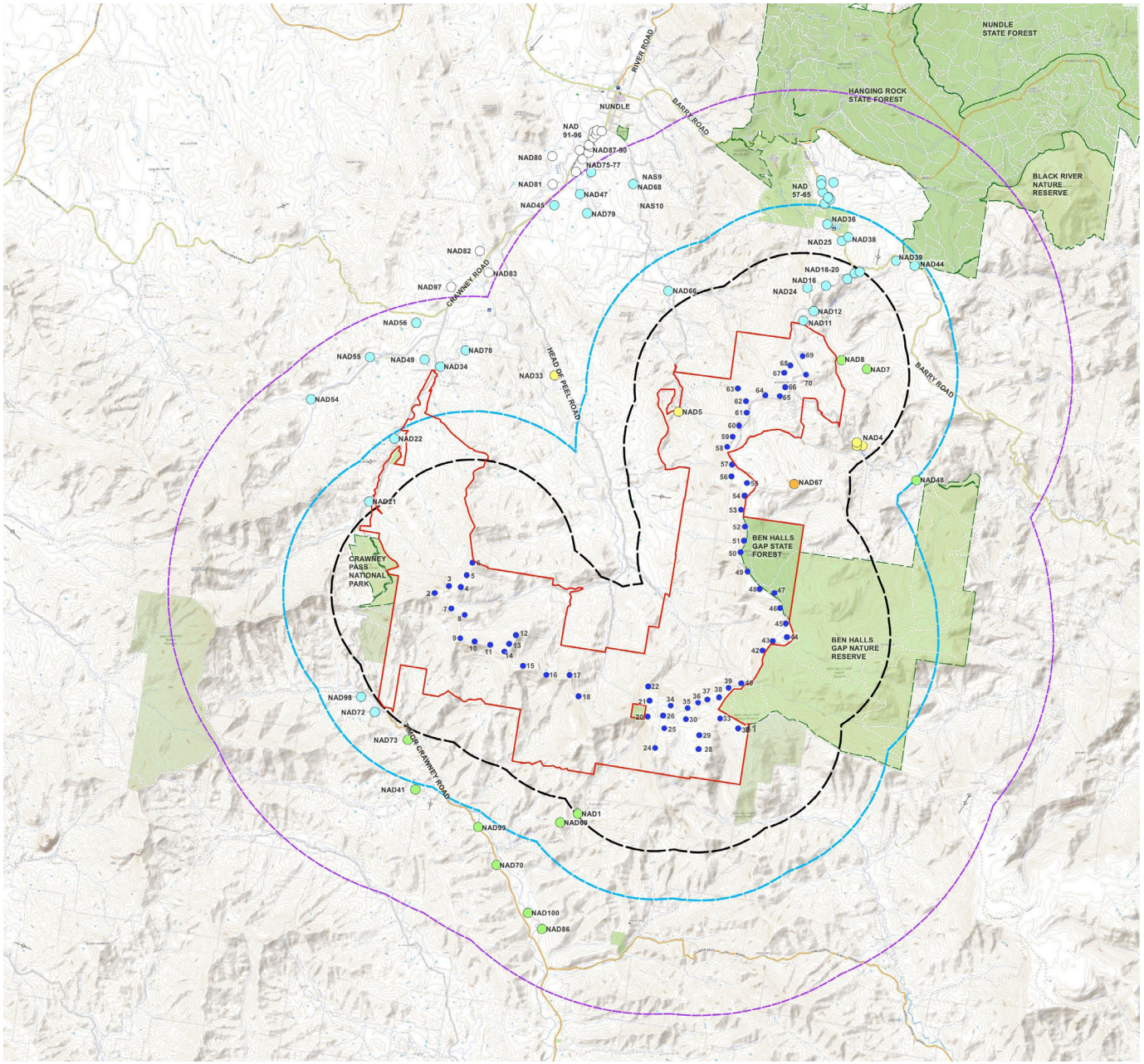


Figure 3. Preliminary Assessment Tool 2 - Multiple Wind Turbine Tool *(Map Source: Six Maps 2013)*

Multiple Wind Turbine Tool

Hills of Gold Wind Farm (Amended Layout)

LEGEND

- Project boundary
- 25 Proposed Turbine Location (amended layout)
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- Nature Reserve
- State Forest
- Main Road
- Minor Road

MWTT Results for Non-associated Dwellings

- Dwellings or viewpoints in excess of 8,000 m
- One (1) 60º Sector (60º)
- Up to two (2) 60º Sectors (120º)
- Up to three (3) 60º Sectors (180º)
- Up to four (4) 60º Sectors (240º)
- Up to five (5) 60º Sectors (300º)
- Up to six (6) 60º Sectors (360º)

Note:

Preliminary Assessment Tool 2: Multiple Wind Turbine Tool is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing multiple turbines.

N

0 2 4 6 8 10km

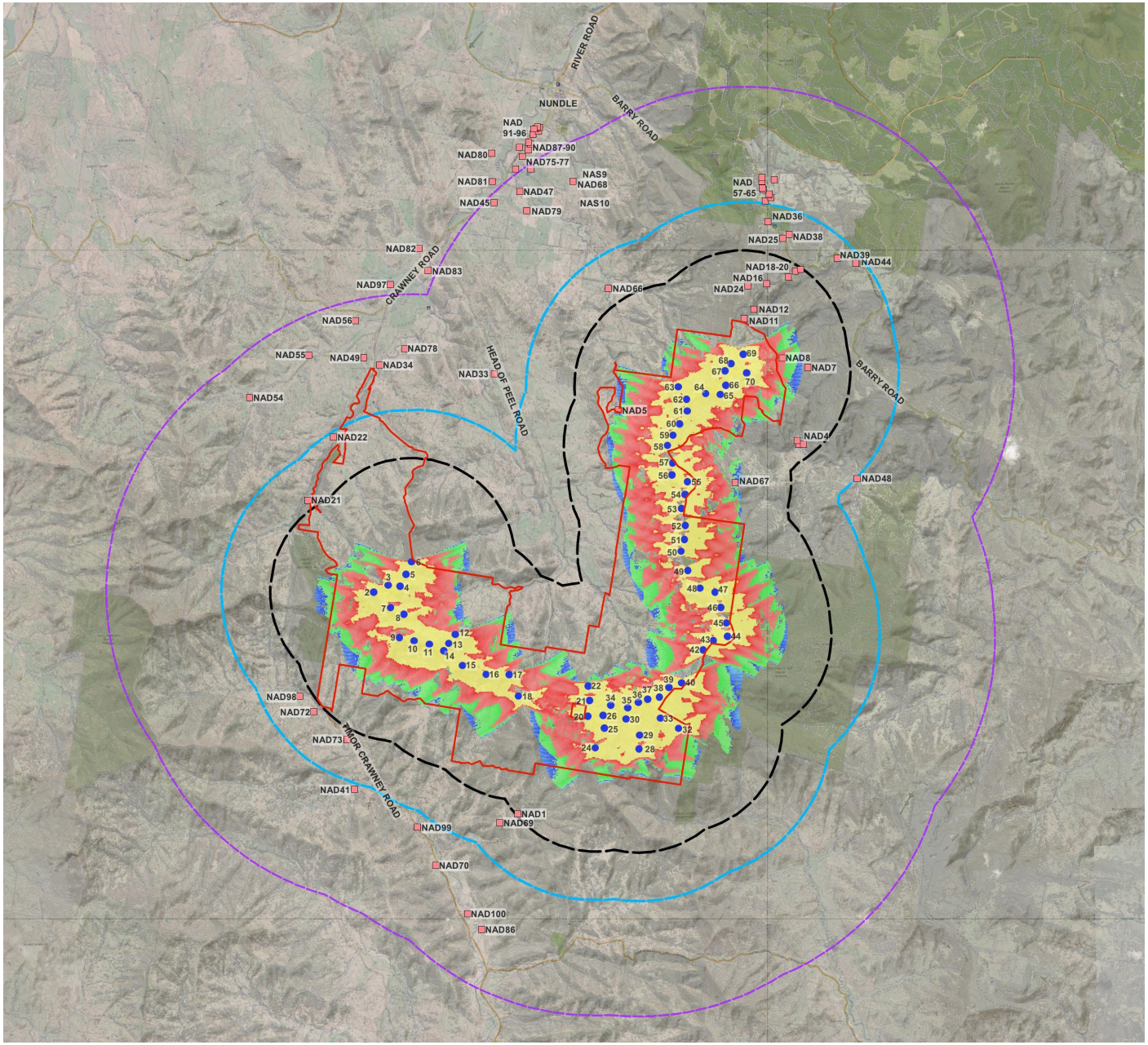


Figure 4. Shadow Flicker Assessment Diagram - Amended Layout *(Map Source: ESRI Imagery 2022)*

Shadow Flicker Assessment

Hills of Gold Wind Farm (Amended Layout)

LEGEND

- Project boundary
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- Proposed Turbine Location (amended layout)
- Non associated dwellings
- Nature Reserve
- State Forest

Number of hours per year:

- 0
- <10 hours
- 10 - <30 hours
- 30 - <100 hours
- 100 - 2000 hours

Assumptions for shadow calculations:

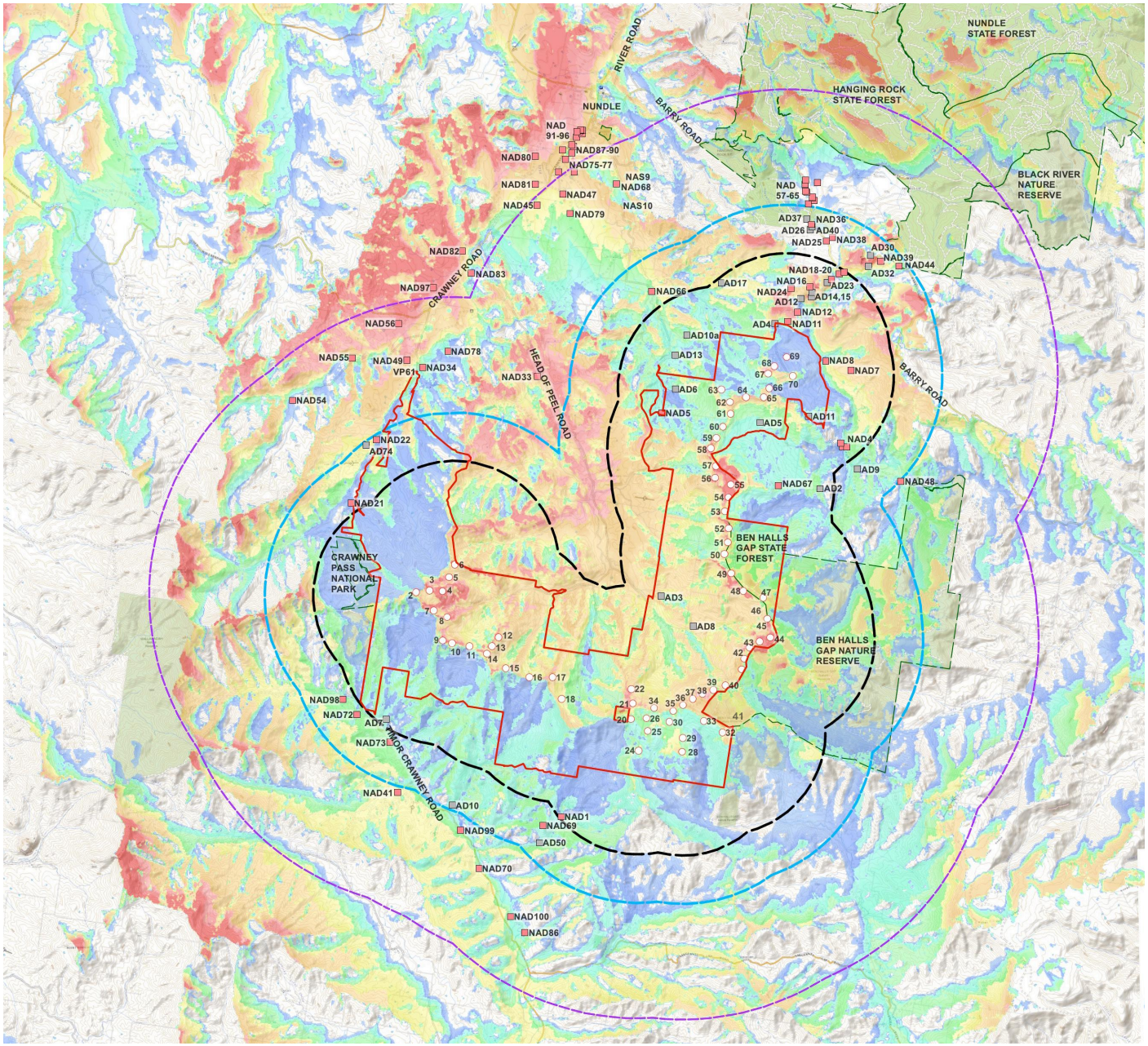
A ZVI calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. The calculated times are “worst case” given by the following assumptions:

- The sun is shining all the day, from sunrise to sunset.
- The rotor plane is always perpendicular to the line from the WTG to the sun.
- The WTG is always operating.

N

0 2 4 6 8 10km

2.0 Amendments to Turbine Layout



Zone of Visual Influence
Blade Tip Height 230 m
Hills of Gold Wind Farm (Previous Layout)

LEGEND

- Project boundary
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- 25 Proposed Turbine Location (previous layout)
- Associated dwellings
- Non associated dwellings
- Nature Reserve
- State Forest

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1-9
- 10-19
- 20-29
- 30-39
- 40-54
- 55-65

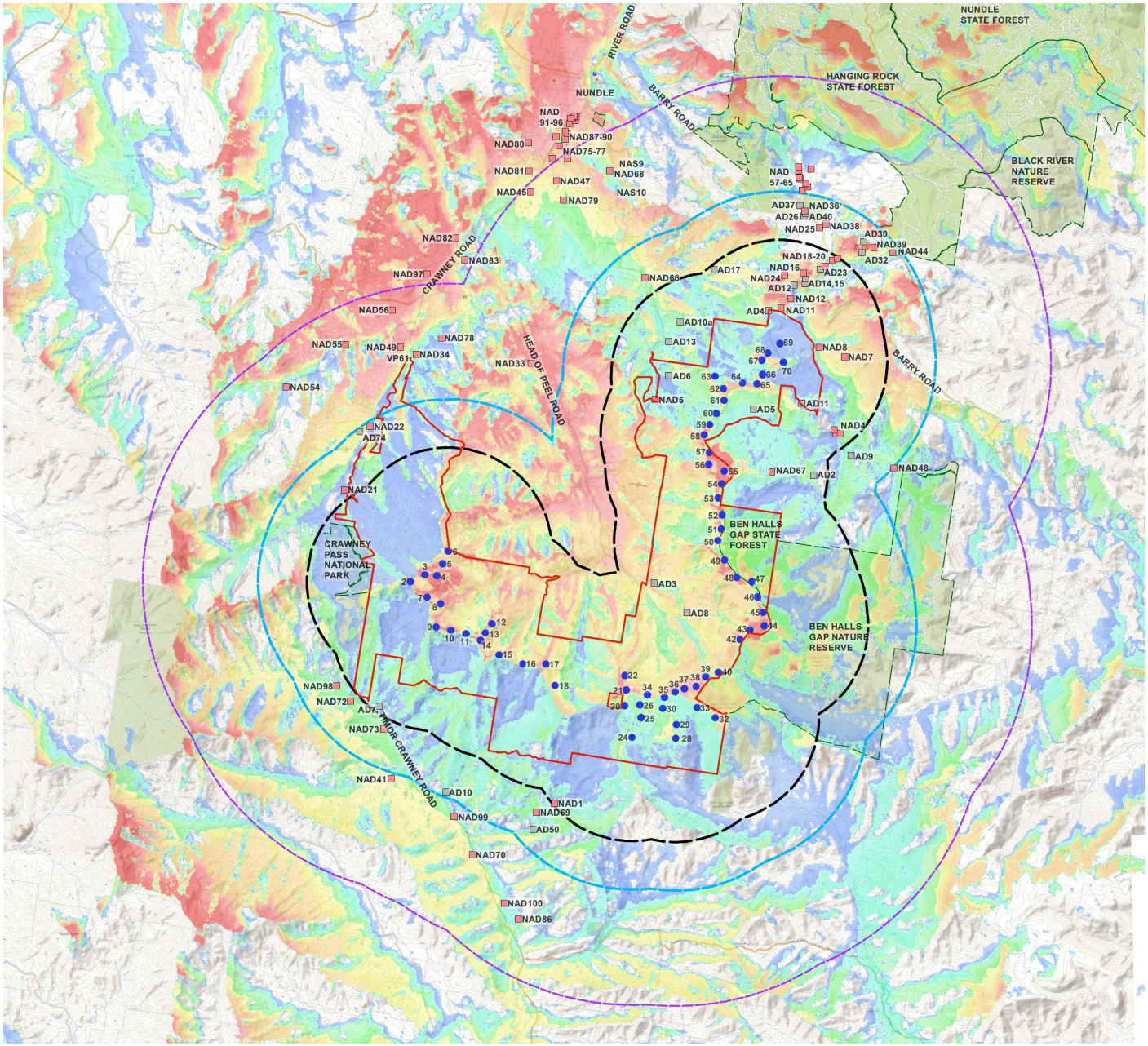
Note:

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 2 4 6 8 10km

Figure 5. Zone of Visual Influence - Layout proposed in 2021 LVIA Addendum *(Map Source: Six Maps 2013)*



Zone of Visual Influence
Blade Tip Height 230 m
Hills of Gold Wind Farm (Amended Layout)

LEGEND

- Project boundary
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- Proposed Turbine Location (amended layout)
- Associated dwellings
- Non associated dwellings
- Nature Reserve
- State Forest

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1-9
- 10-19
- 20-29
- 30-39
- 40-54
- 55-64

Note:

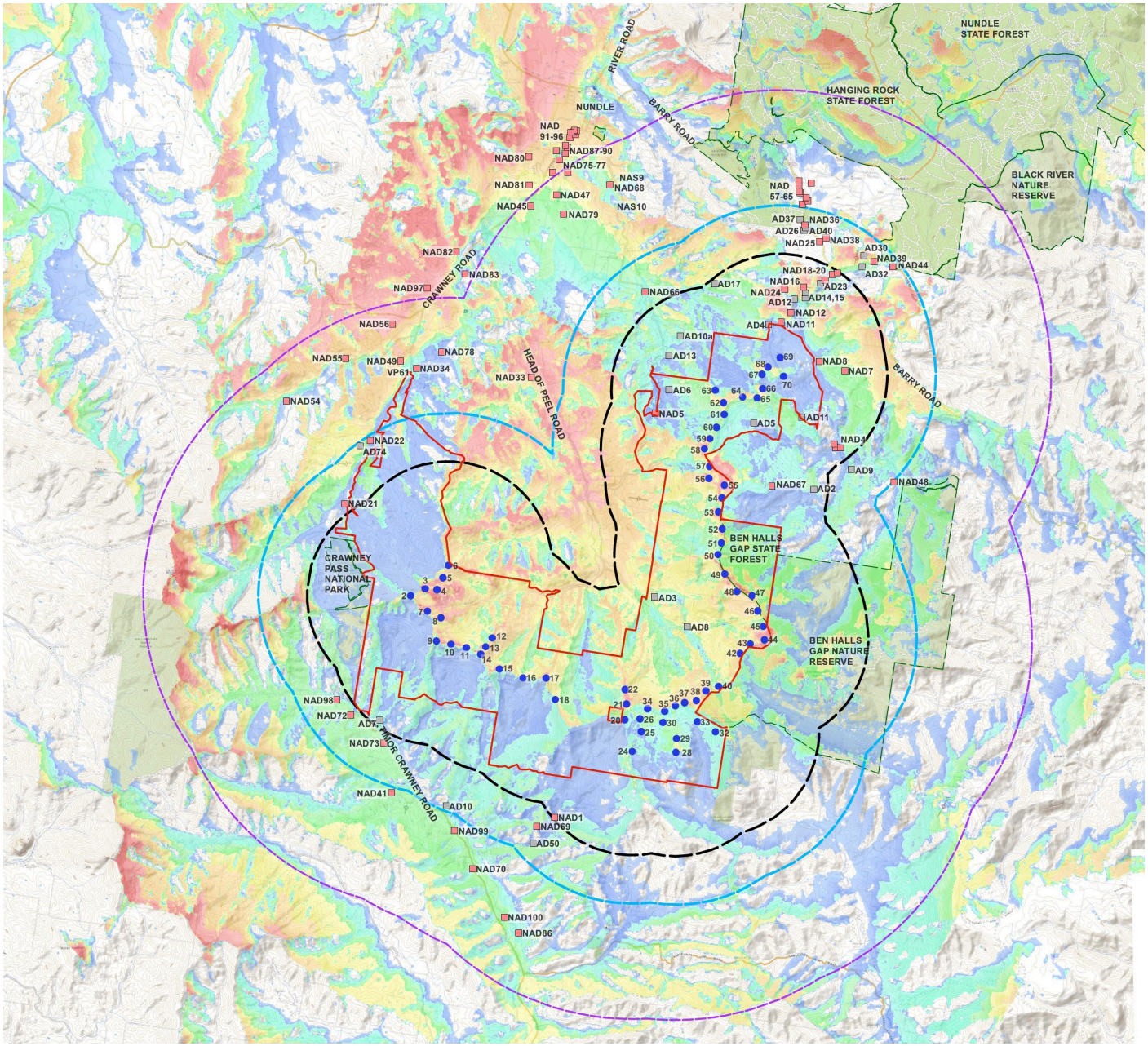
The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 2 4 6 8 10km

Figure 6. Zone of Visual Influence - Amended Layout *(Map Source: Six Maps 2013)*

2.0 Amendments to Turbine Layout



Zone of Visual Influence
Hub Height 150 m
Hills of Gold Wind Farm (Amended Layout)

LEGEND

- Project boundary
- 3100 m from proposed turbine (black line of visual magnitude)
- 4550 m from proposed turbine (black line of visual magnitude)
- 8000 m from proposed turbine (black line of visual magnitude)
- Proposed Turbine Location (amended layout)
- Associated dwellings
- Non associated dwellings
- Nature Reserve
- State Forest

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1-9
- 10-19
- 20-29
- 30-39
- 40-54
- 55-64

Note:

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 2 4 6 8 10km

Figure 7. Zone of Visual Influence - Amended Layout *(Map Source: Six Maps 2013)*

Overview of Dwelling Assessment for Amended Layout - Dwellings within black line (3100m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings within 3100m (Black line of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)**	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Visual Impact Rating for amended Layout:**	**Summary of Assessment:**
NAD 1	*Mountain View Road*	**3.05**	**2**	**1**	10 turbines *5 at hub* *5 at blade tip*	Low	Negligible	Negligible	Visual impact rating for amended layout similar to result identified in 2021 LVIA Addendum.
NAD 4A	*Shearers Road*	**2.65**	**3**	**2**	8 turbines *3 at hub* *5 at blade tip*	Nil - Low	Nil - Low	Nil - Low	No variation in impact rating.
NAD 4B	*Shearers Road*	**2.73**	**3**	**2**	9 turbines *2 at hub* *7 at blade tip*	Nil - Low	Nil - Low	Nil - Low	
NAD 4C	*Shearers Road*	**2.52**	**3**	**0**	0	Nil - Low	Nil - Low	Nil - Low	
NAD 5	*Nundle Creek Road*	**1.79**	**3**	**1**	12 turbines *9 at hub* *2 at blade tip*	Moderate	Low	Low	Visual impact rating for amended layout similar to result identified in 2021 LVIA Addendum.
NAD 7	*Morrisons Gap Road*	**1.83**	**2**	**2**	25 turbines *24 at hub* *1 at blade tip*	Low	Low	Low	No variation in impact rating.
NAD 8	*Morrisons Gap Road*	**1.15**	**2**	**2**	10 turbines *4 at hub* *6 at blade tip*	Low	Low	Low	Two (2) additional turbines visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD 10	*Nundle Creek Road*	**2.73**	**2**	**1**	18 turbines *16 at hub* *2 at blade tip*	Moderate	Moderate	Moderate	Minor reduction in number of visible turbines. No variation in impact rating.
NAD_10A	*Nundle Creek Road*	**1.93**	**2**	**2**	16 turbines *14 at hub* *2 at blade tip*	High	High	High	One (1) additional turbine visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD 11	*Morrisons Gap Road*	1.07	**1**	**1**	19 turbines *15 at hub* *4 at blade tip*	Low	Low	Low	Minor reduction in number of visible turbines. No variation in impact rating.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located within 3100 metres of nearest turbine

Overview of Dwelling Assessment for Amended Layout- Dwellings within black line (3100m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings within 3100m (Black line of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment) ***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Visual Impact Rating for amended Layout:**	**Summary of Assessment:**
NAD 12	*Morrisons Gap Road*	**1.38**	**1**	**1**	21 turbines *21 at hub*	Low	Low	Low	No variation in impact rating.
AD 12	*Morrisons Gap Road*	**1.80**	**1**	**1**	12 turbines *8 at hub* *4 at blade tip*	Nil - Low	Nil - Low	Nil - Low	Minor reduction in number of visible turbines. No variation in impact rating.
AD 14	*Morrisons Gap Road*	**1.94**	**1**	**1**	20 turbines *20 at hub*	Nil - Low	Nil - Low	Nil - Low	No variation in impact rating.
NAD 15	*Morrisons Gap Road*	**2.08**	**1**	**1**	20 turbines *20 at hub*	Nil - Low	Nil - Low	Nil - Low	No variation in impact rating.
NAD 16	*Morrisons Gap Road*	**2.22**	**1**	**1**	19 turbines *18 at hub* *1 at blade tip*	Nil - Low	Nil - Low	Nil - Low	No variation in impact rating.
AD 17 (formerly NAD_17)	*Nundle Creek Road*	**2.96**	**1**	**1**	16 turbines *15 at hub* *1 at blade tip*	Moderate	Moderate	Moderate	One (1) additional turbine visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD 18	*Morrisons Gap Road*	**2.68**	**1**	**1**	18 turbines *18 at hub*	Moderate	Moderate	Moderate	Two (2) additional turbines visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD 19	*Morrisons Gap Road*	**2.94**	**1**	**1**	1 turbine *1 at blade tip*	Moderate	Nil - Low	Nil - Low	Significant reduction in number of visible turbines. Visual impact rating reduced.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located within 3100 metres of nearest turbine

Overview of Dwelling Assessment for Amended Layout - Dwellings within black line (3100m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings within 3100m (Black line of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Visual Impact Rating for amended Layout:**	**Summary of Assessment:**
NAD 20	*Morrisons Gap Road*	**3.06**	**1**	**1**	16 turbines *14 at hub* *2 at blade tip*	Low	Low	Low	Three (3) additional turbines visible at tip height. Consider screen planting. No variation in impact rating.
AD 23	*Morrisons Gap Road*	**2.54**	**1**	**1**	17 turbines *15 at hub* *2 at blade tip*	Moderate	Moderate	Moderate	No variation in impact rating.
NAD 67	*Morrisons Gap Road*	**1.42**	**4**	**1**	13 turbines *11 at hub* *2 at blade tip*	Moderate	Moderate	Moderate	Three (3) additional turbines visible at tip height. No variation in impact rating.
NAD 69	*Mountain View Road*	**3.62**	**2**	**2**	28 turbines *24 at hub* *4 at blade tip*	High	Moderate	Moderate	Visual impact rating for amended layout similar to result identified in 2021 LVIA Addendum.
NAD 24 (DA Location)	*Morrisons Gap Road*	**2.06**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located within 3100 metres of nearest turbine

Overview of Dwelling Assessment for Amended Layout - Dwellings within black and blue lines (3100 - 4550m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings between 3100 - 4550m (Black and Blue lines of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Revised Visual Impact Rating (For Current Layout):**	**Summary of Assessment:**
NAD_03	*Shearers Road*	**3.45**	**2**	**2**	15 turbines *8 at hub* *7 at blade tip*	Low	Low	Low	Two (2) additional turbines visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD_21	*Crawney Road*	**3.38**	**1**	**1**	6 turbines *5 at hub* *1 at blade tip*	Low	Low	Low	Minor reduction in number of visible turbines. No variation in impact rating.
NAD_22	*Crawney Road*	4.41	1	1	8 turbines *5 at hub* *3 at blade tip*	Moderate	Moderate	Moderate	No variation in impact rating.
NAD_25	*Barry Road*	**3.67**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
AD_26	*Barry Road*	**3.88**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
AD_30 (formerly NAD_30)	*Barry Road*	**3.95**	**1**	**1**	14 turbines *14 at hub*	Low	Low	Low	Reduction in number of visible turbines. No variation in impact rating.
NAD_32	*Barry Road*	**3.66**	**1**	**1**	16 turbines *16 at hub*	Low	Low	Low	Two (2) additional turbines visible at tip height. Consider screen planting. No variation in impact rating.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located between 3100 - 4550 metres of nearest turbine

Overview of Dwelling Assessment for Amended Layout- Dwellings within black and blue lines (3100 - 4550m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings between 3100 - 4550m (Black and Blue lines of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Revised Visual Impact Rating (For Current Layout):**	**Summary of Assessment:**
NAD_34	*Crawney Road*	**4.40**	**1**	**0**	7 turbines *6 at hub* *1 at tip*	Not assessed	Low	Low	Visual impact rating for amended layout similar to result identified in 2021 LVIA Addendum.
NAD_35	*Barry Road*	**4.08**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
NAD_36	*Barry Road*	**4.04**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
AD_37	*Barry Road*	**4.18**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
NAD_38	*Barry Road*	**3.84**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
NAD_39	*Barry Road*	**4.02**	**1**	**1**	14 turbines *14 at hub*	Low	Low	Low	Reduction in number of visible turbines. No variation in impact rating.
AD_40	*Barry Road*	**3.97**	**1**	**0**	0	***Nil***	***Nil***	***Nil***	No variation in impact rating.
NAD_44	*Barry Road*	**4.32**	**1**	**1**	13 turbines *13 at hub*	Nil - Low	Nil - Low	Nil - Low	Two (2) additional turbines visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD_48	*Shearers Road*	**4.95**	**2**	**2**	22 turbines *17 at hub* *5 at blade tip*	Nil - Low	Nil - Low	Nil - Low	Additional turbines visible at tip height based on topography alone. Existing vegetation likely to screen views. No variation in impact rating.
AD_50	*Mountain View Road*	**4.04**	**2**	**1**	11 turbines *8 at hub* *3 at blade tip*	Nil - Low	Nil - Low	Nil - Low	Two (2) additional turbines visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.
NAD_66	*Nundle Creek Road*	**3.61**	**1**	**1**	20 turbines *17 at hub* *3 at blade tip*	Moderate	Moderate	Moderate	No variation in impact rating.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located between 3100 - 4550 metres of nearest turbine

Overview of Dwelling Assessment for Amended Layout - Dwellings within black and blue lines (3100 - 4550m)

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings between 3100 - 4550m (Black and Blue lines of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Revised Visual Impact Rating (For Current Layout):**	**Summary of Assessment:**
NAD_72	*Timor Crawney Road*	**3.39**	**2**	**1**	16 turbines *15 at hub* *1 at blade tip*	Moderate	Low	Low	Reduction in number of visible turbines. No variation in impact rating.
NAD_73	*Timor Crawney Road*	**3.44**	**2**	**2**	24 turbines *22 at hub* *2 at blade tip*	Moderate	Low	Low	Reduction in number of visible turbines. No variation in impact rating.
AD_74	*Crawney Road*	**4.45**	**1**	**1**	8 turbines *5 at hub* *3 at blade tip*	Moderate	Moderate	Moderate	One (1) additional turbine visible at tip height. Existing vegetation likely to screen most views. No variation in impact rating.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located between 3100 - 4550 metres of nearest turbine

Overview of Dwelling Assessment for Current Layout: Non-associated Dwellings between 3100 - 4550m (Black and Blue lines of Visual Magnitude)									
ID	**Location**	**Distance to nearest WTG (km)**	**Number of 60º Sectors (Based on 2D Assessment)**	**Number of 60º Sectors (Based on 3D Assessment)***	**Number of Visible WTGs (*Based on topography alone)**	**Visual Impact Rating (For 2020 LVIA Layout):**	**Visual Impact Rating (For 2021 LVIA Addendum Layout):**	**Revised Visual Impact Rating (For Current Layout):**	**Summary of Assessment:**
NAD_33	*Head of Peel Road*	**5.50**	**3**	**3**	29 turbines *29 at hub*	Moderate	Moderate	Moderate	Minor reduction in number of visible turbines. No variation in impact rating.
NAD_49	*Crawney Road*	**6.26**	**1**	**1**	7 turbines *6 at hub* *1 at tip*	Not assessed	Not assessed	Low	Assessed impact rating is low due to distance of Project and existing screening elements. Dwelling is surrounded by scattered vegetation.

Based on an assessment of topography alone. Screening factors such as vegetation are likely to reduce potential visibility of the proposed turbines.

Table 2: Overview of non-associated dwellings located beyond 4550 metres of nearest turbine

3.0 Assessment of Access Tracks for Transmission Line

3.1 Overview of Transmission Line

2020 LVIA outlines that an external 330 kV single circuit overhead transmission line will connect the on site substation to the existing 330 kV transmission line network that runs to the north west of the Project. Further amendments have been made and the width of the easement has been increased for the eastern section of the easement which will connect the Project to the electrical network. The amended easement will include a 33 kV power line along with the proposed 330 kV transmission line and the width of the easement has been revised and increased to 90 m. Further assessment of the potential visual impacts arising from this alteration of the easement for the transmission line have been included in **Section 6.0** and **Appendix B**. To facilitate construction of these transmission lines, access tracks have been proposed as shown in **Figure 8**.

3.2 Assessment of Access Tracks for Transmission Line Construction

Figure 8 shows the layout of access tracks that will facilitate construction of the transmission line. Majority of these tracks emerge from existing roads such as Woodleys Road, Basin Creek Road, Crawney Road and private roads on nearby farm lots.

The proposed access tracks have been sited to reduce potential vegetation loss and limit earth work requirements. The access road network has been aligned with existing farm access tracks and have been sited to follow the existing course of undulations. Some of the proposed access tracks emerge from Crawney Road and Old Wallabadah Road.

The proposed access tracks are likely to be viewed as an extension of the existing network of farm roads. It is, therefore, likely that the tracks will be viewed as a part of the existing landscape character and therefore the potential visual impact will be low.

3.0 Assessment of Access Tracks for Transmission Line

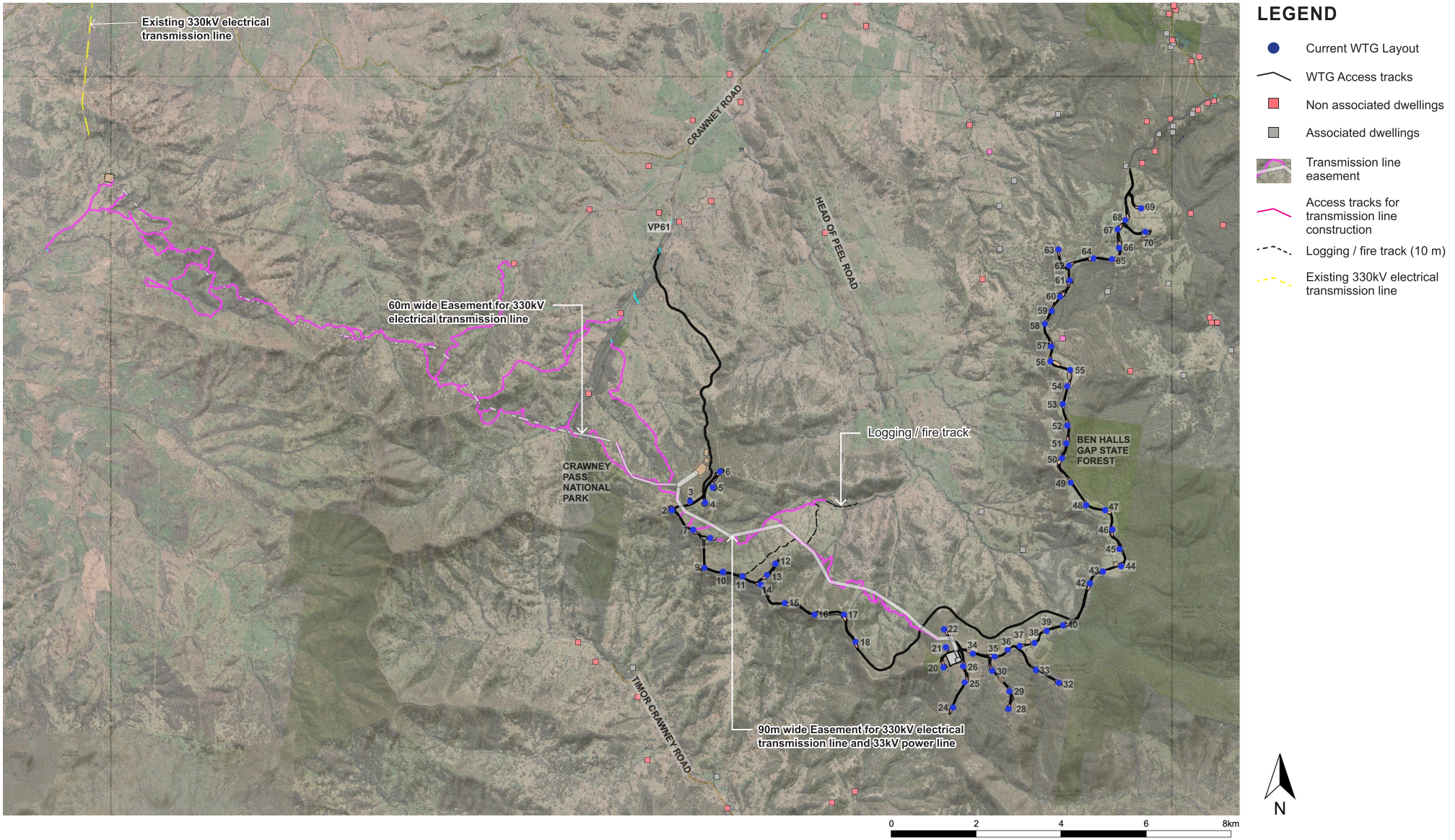


Figure 8. Assessment of access tracks for construction of transmission line (*Map Source: Google Earth 2019*)

4.0 Assessment of Alternate Transport Route to Project Area

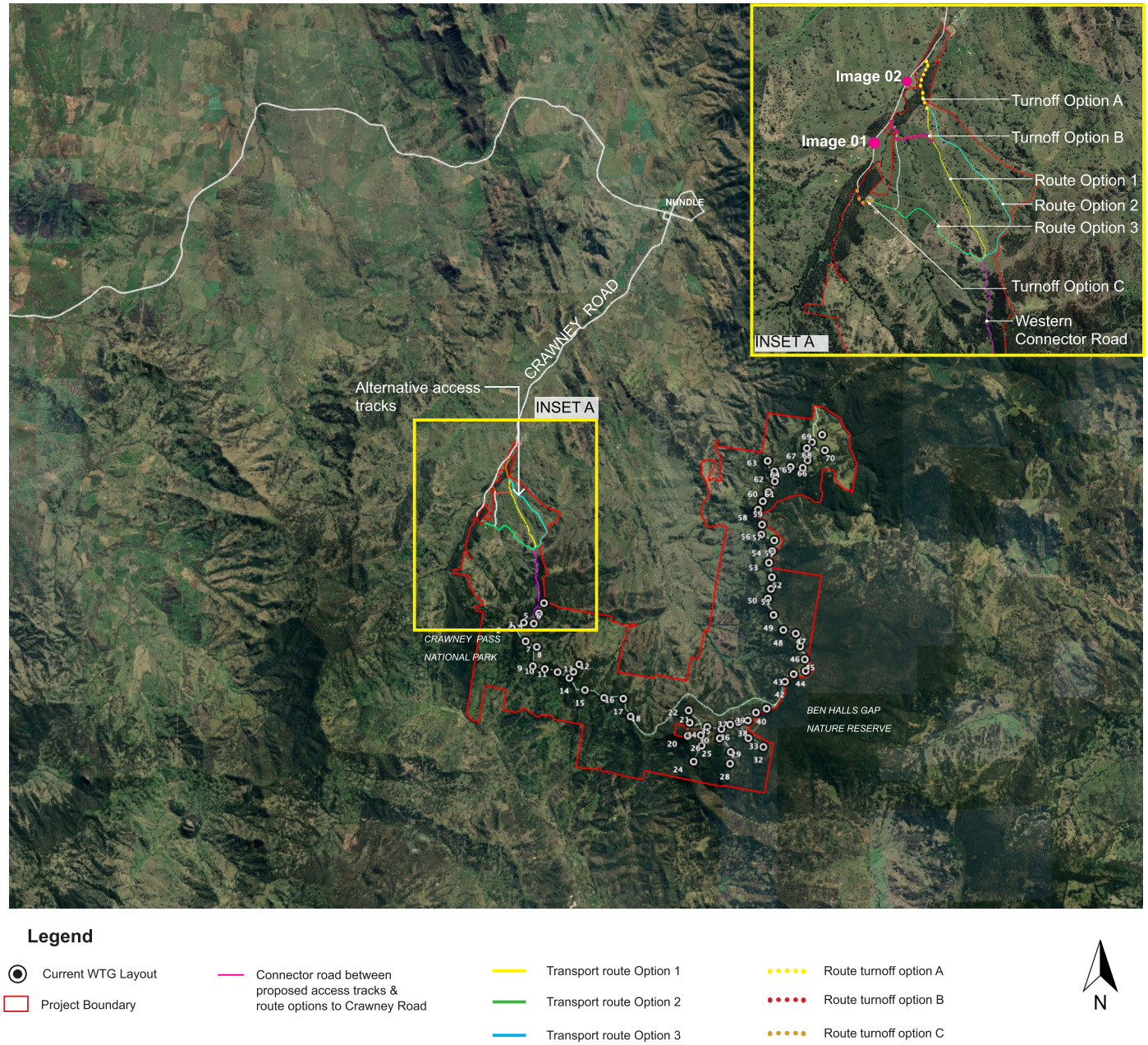


Figure 9. Assessment of alternate transport route to Project Area from Nundle via Crawney Road (*Map Source: Google Earth 2019*)

4.0 Assessment of Alternate Transport Route to Project Area

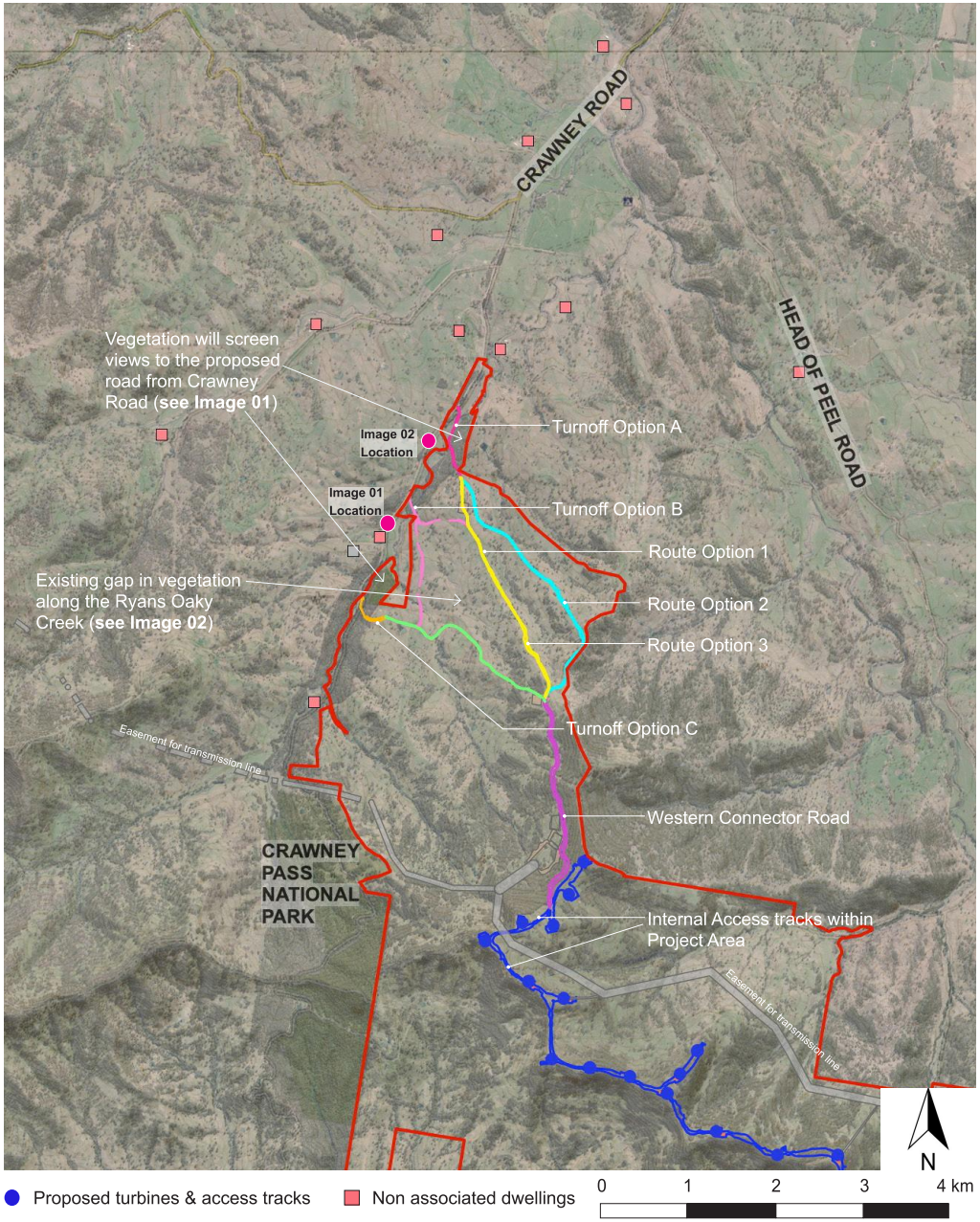


Figure 10. Assessment of potential impacts of alternate transport route Options (western access) (*Map Source: ESRI Imagery 2022*)

4.1 Overview of Alternate Transport Routes to Project Area from Nundle via Crawney Road

Crawney Road would serve as the main connector between Nundle and the Project Area for Oversize and/or Overmass (OSOM) vehicles. Access for general construction activities will also be via Barry Road and Morrisons Gap Road. Three (3) optional routes are proposed to provide a connection between Crawney Road and the Project Area access tracks as shown in **Figure 9** and **Figure 10**.

All three route options are situated on an undulating terrain and are surrounded by scattered vegetation. Route options 1 and 2 generally run north - south and option 3 generally runs east - west. Option 1 provides the shortest connection between Crawney Road and the Project Area.

4.2 Assessment of Potential Visual Impacts of Alternate Transport Routes

The existing landscape character around the potential routes is generally defined by an undulating terrain with vegetation scattered across large paddocks. Vegetation along Crawney Road is generally thick and dense. The canopy cover helps limit views within the road corridor. **Images 01** and **02** show the existing character of Crawney Road.

An assessment based on topography alone suggests that certain parts of all route options that are closer to the proposed western connector road are likely to be visible along Crawney Road because of their elevated position. However, existing vegetation patches will filter most views towards the alternative routes (Refer to **Image 01**). All road turnoff options are likely to be screened by existing roadside vegetation along Crawney Road (Refer to **Image 02**). Route options 2 and 3 are likely to cause minimal visual impacts because majority of the views towards these routes are screened by existing vegetation. The elevated position of route option 1 will, however, allow partial views of this route.

Majority of the views from Crawney Road are likely to be screened by existing vegetation and it is likely that very few parts of Crawney Road will allow views of the alternative routes. Considering that the proposed routes will serve as access routes that will facilitate maintenance and construction, their character is likely to be similar to existing low use farm roads in the area. The potential visual impacts are, therefore, likely to be low.

4.0 Assessment of Alternate Transport Route to Project Area

Image 01. View from Crawney Road near NAD_22 looking east - potential visibility of route options

Image 02. View from Crawney Road near NAD_21 looking east

5.0 Assessment of Additional Hardstand Areas for Ancillary Infrastructure

5.1 Assessments of Additional Hardstand Areas for Optional Substation / Batching / O&M Facility / BESS

The 2020 LVIA highlighted potential visual impacts of the Substation/Batching/O & M Facility/BESS that were proposed at the top of the Head of the Peel Road. The optional location proposed for ancillary infrastructure is situated on the western side of the Project to minimise biodiversity impacts. This report discusses the impacts arising from additional hardstand areas for the optional Substation / Batching / O & M Facility / BESS proposed on the northwestern side of the Project near WTGs 4,5,6,7 (see **Figure 11**).

As per the assessment in the 2020 LVIA, the batching and laydown areas serve temporary use during construction. Any change to their location would result in temporary visual impacts. **Figure 11, Inset A** indicates that the proposed ancillary infrastructure elements will be surrounded by a vegetated ridgeline which will limit views for all receptors on the southern and eastern sides of the Project. The location nominated for the infrastructure is also likely to have lesser impacts on existing biodiversity.

In order to identify visual impacts on surrounding dwellings and public viewing locations, a viewshed map has been prepared (refer to **Figure 12**). This assessment is based on topography alone and does not consider the impacts of screening elements such as vegetation and structures. Patches of dense vegetation have been identified between various viewing locations and the proposed ancillary infrastructure. The following results were obtained from the viewshed map:

- Ancillary infrastructure elements are likely to be visible on the north western side of the Project. The assessment identified that non-associated dwellings NAD_22, NAD_49 and NAD_56 are likely to be impacted. The impact on all other receptors will be negligible since their views will be predominantly screened by topography and vegetation.

- It is likely that motorists travelling southwards along Crawney Road will have intermittent views of the infrastructure. The road is predominantly characterised by dense patches of roadside vegetation which will help limit views of the facility.

Overview of potential visual impacts on NAD_22, NAD_49 and NAD_56:

Figures 13-14 show the existing character of the above mentioned dwellings. Aerial imagery indicates that dwellings NAD_22 and NAD_49 are likely to have limited views to the south because of the existing vegetation and structures that surround these dwellings. Dwelling NAD_56, on the other hand, is surrounded by scattered vegetation. Views of the infrastructure, however, will be distant. It is likely that there would be no variation to the visual impact of ancillary infrastructure (both temporary and permanent) and inclusion of additional hardstand areas.

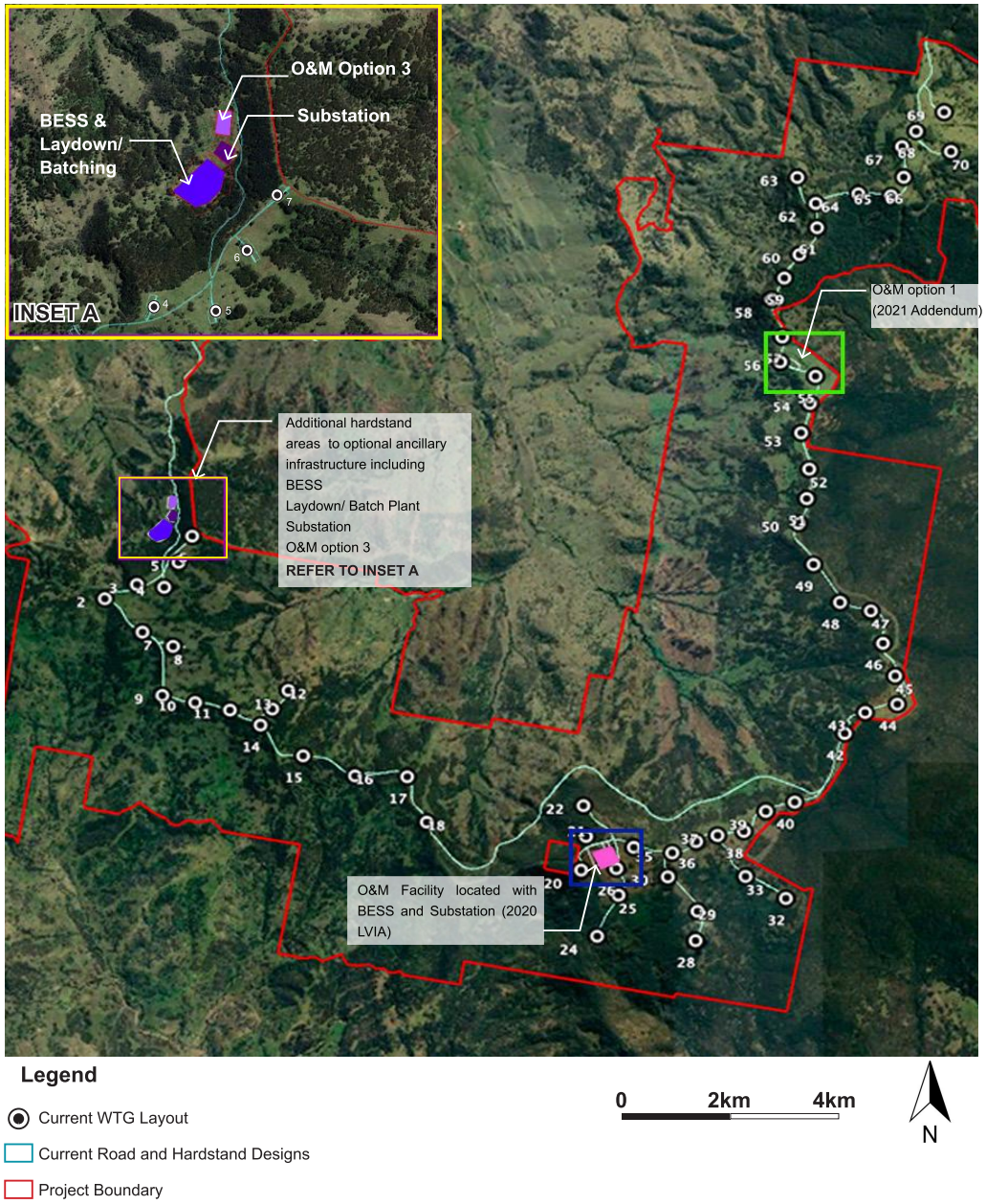


Figure 11. Amendments to Ancillary Infrastructure - Relocation of Substation/Batching/O & M Facility/BESS *(Map Source: Google Earth 2019)*

5.0 Assessment of Additional Hardstand Areas for Ancillary Infrastructure

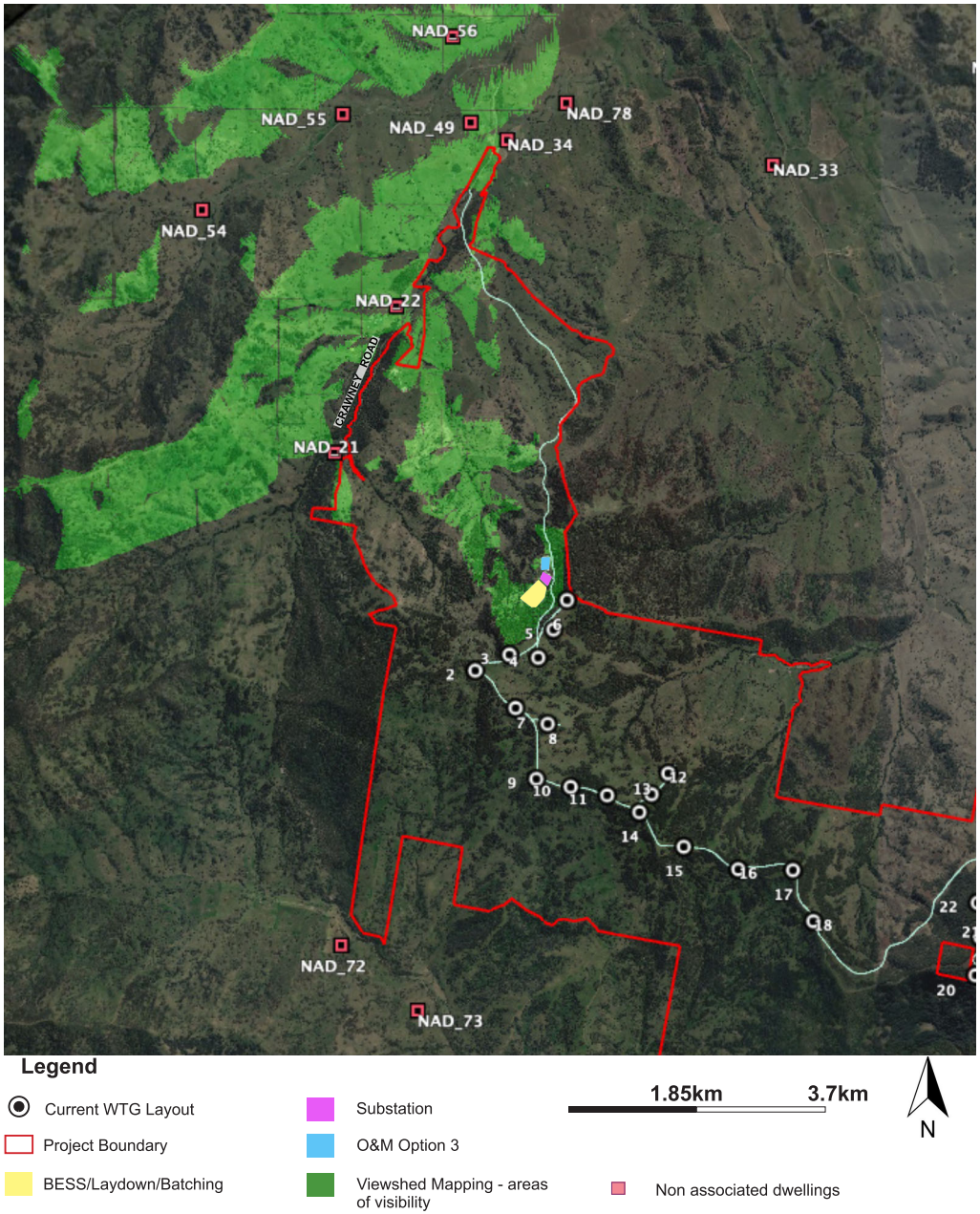


Figure 12. Viewshed map showing the impacts of optional Substation/Batching/O & M Facility/BESS *(Map Source: Google Earth 2019)*

Figure 13. Character of Dwelling NAD_22 *(Map Source: Google Earth 2019)*

Figure 14. Character of Dwelling NAD_49 *(Map Source: Google Earth 2019)*

Figure 15. Character of Dwelling NAD_56 *(Map Source: Google Earth 2019)*

6.0 Amendments to Easement for Transmission Line

6.1 Overview of Easement for Transmission Line

2020 LVIA discussed the potential visual impacts associated with a 60 m wide cleared easement for the construction of a 330 kV transmission line (TL) for connecting the Project to the overall electricity grid. Based on further feedback from DPE and Construction Contractors, the TL easement width has been reconsidered.

The width of the eastern section of the easement which connects the optional western BESS/Substation/ Batching area/O&M Facility and the current on site substation location has been increased to 90 m. It is proposed that the easement will accommodate a 330 kV electrical TL (with up to 50 m high transmission towers or poles) and 33 kV power line (up to 20 m high transmission poles). Two options are being considered for the 330kV transmission line - option 1 proposes double circuit steel towers and option 2 proposes double circuit steel poles. A comparison of the potential visual impacts of both options has been discussed in **Appendix B**.

6.2 Overview of Potential Visual Impacts

Figure 16 shows the course of the TL easement with the widened eastern section and the potential for visibility of the revised easement. The assessment considers topography alone and does not account for intervening elements such as vegetation and structures. The following provides an overview of potential visual impacts of the widened transmission easement:

- It is likely that receptors closer to the proposed TL will view only parts of the TL. Greater extents of the TL, especially the eastern section, are likely to be visible in the north east. It should be noted that the TL has been sited on an undulating terrain which is densely vegetated. Existing screening factors will play an important role in limiting views of certain extents of the TL.

- The ZVI depicts that receptors on the southern side are likely to have limited views of the widened easement due to the undulating topographic character. Receptors located along Crawney Road and Mountain View Road are likely to have low visibility due to the existing topographic character. Further, existing vegetation along the ridgeline will reduce visibility of the proposed TL.

- Receptors located on the northern side of the eastern section are likely to have higher visibility of the TL but it is likely that they will be able to view only certain stretches of the easement and TL. Further investigations that illustrate potential visibility from two representative dwellings have been included in **Appendix B**.

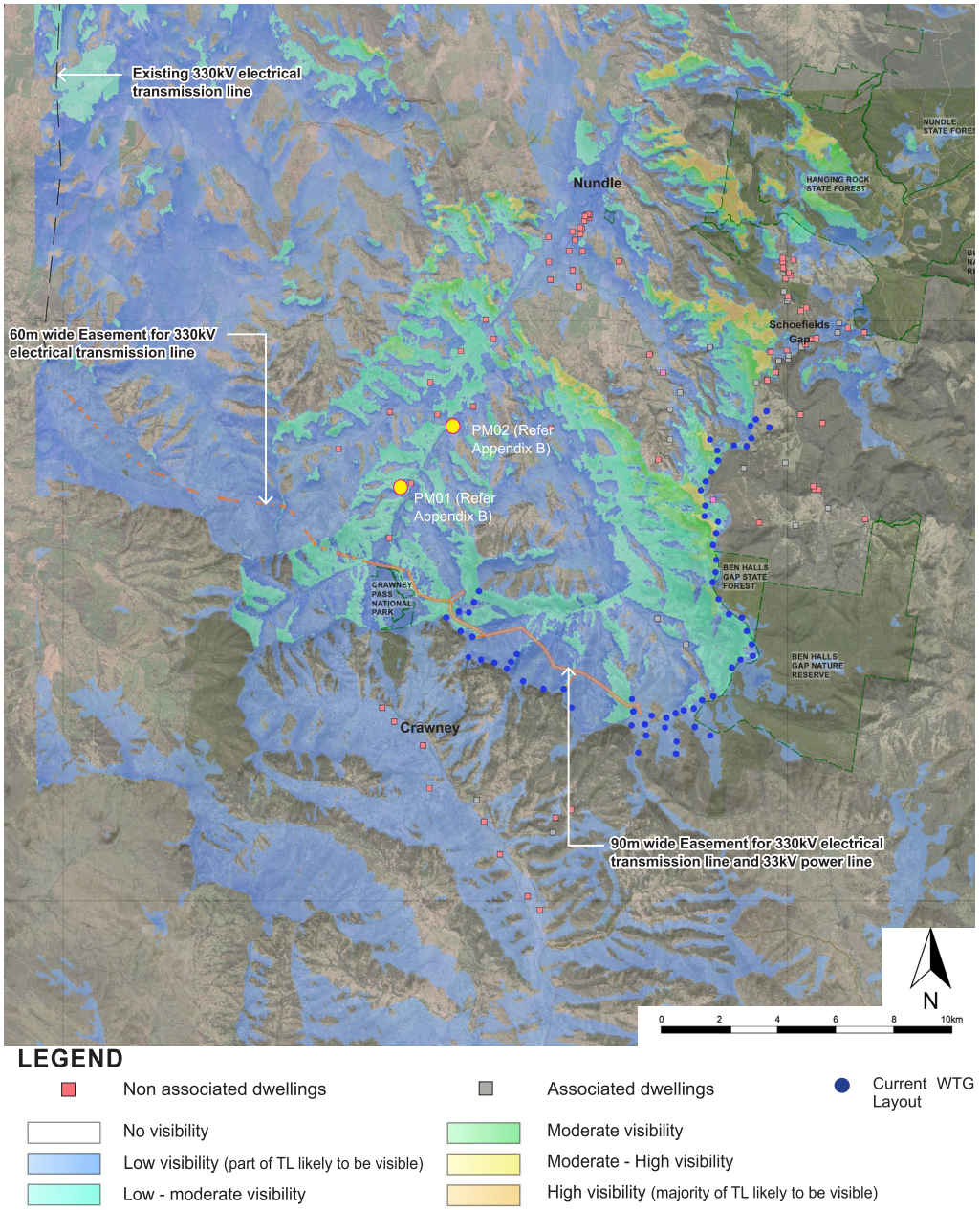


Figure 16. Zone of Visual Influence - Proposed transmission line (*Map Source: ESRI Imagery 2022*)

6.0 Amendments to Easement for Transmission Line

- Greater extents of the TL are likely to be visible along Crawney Road because of its lower elevation. An assessment based on topography alone identifies that the eastern section that connects to the optional BESS/Substation is likely to be visible along most parts of the road. The existing character of roadside vegetation on Crawney Road will, however, help limit views along this route.

- Highest visibility of the TL is likely to occur on the north eastern side of the Project on the fringes of Schoefields Gap. These areas are located approximately 13 km north east of the proposed TL, and therefore, views of the TL will be distant. The potential impact on the broader landscape and visual character will be limited due to the distance between the receptors and the TL.

6.3 Summary of Variation in Potential Visual Impacts

The 2020 LVIA identified that clearing existing vegetation for the passage of the transmission line would be noticeable to motorists travelling along Crawney Road and it is unlikely that the transmission line would be visible from Crawney National Park. The revised width of this easement will connect the optional BESS / Substation which is located on the eastern side of Crawney National Park. Impacts on locations within Crawney National Park will, therefore, remain the same.

Motorists travelling along Crawney Road will be able to view only certain parts of the widened easement. This impact, however, is likely to be intermittent because of the existing dense roadside vegetation along Crawney Road.

The ZVI depicts that views of majority of the widened transmission line will be areas located approximately 13 km to the north east. Receptors in proximity to the TL easement will have limited views. Further investigations were carried out by preparing two representative photomontages from AD_ 74 and NAD_76 to assess the illustrate the potential visibility of the widened easement for the TL. The findings included in **Appendix B** illustrate that there would be minor variation to the potential visual impacts caused by the widening of the transmission easement. It is, therefore, likely that widening the easement will have greater impacts on biodiversity values than the potential visual impacts that were identified in 2020 LVIA.

7.0 Morrisons Gap Road Upgrade

7.1 Overview of Morrisons Gap Road

Morrisons Gap Road is a low use road that emerges from Barry Road on the north eastern side of the Project Area. The road is characterised by dense patches of roadside vegetation and generally has an undulating character.

The area to be upgraded has been reduced and new transport-upgraded areas have been added. The upgrades will not include the previously proposed retaining walls as a response to Tamworth Regional Council's feedback. **Figure 17** depicts the areas that are proposed to be upgraded. Reduction of areas to be upgraded are likely to minimise impacts on the surrounding vegetation. This, in turn, will help screen views associated with the upgrade.

Due to a reduction in upgrade area and scope of work, the potential visual impacts are likely to be low. **Images 03 and 0**4 show the existing character of Morrisons Gap Road and the likely impacts of the upgrade.

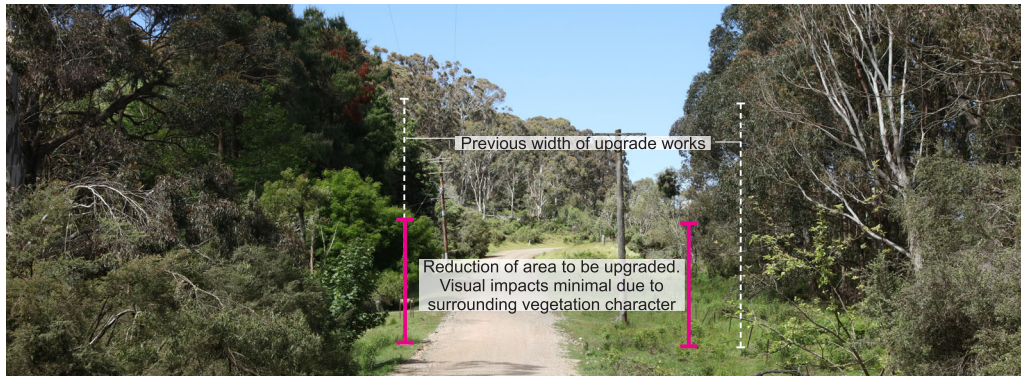


Image 03. View of Morrisons Gap Road near NAD_15

Image 04. View of Morrisons Gap Road

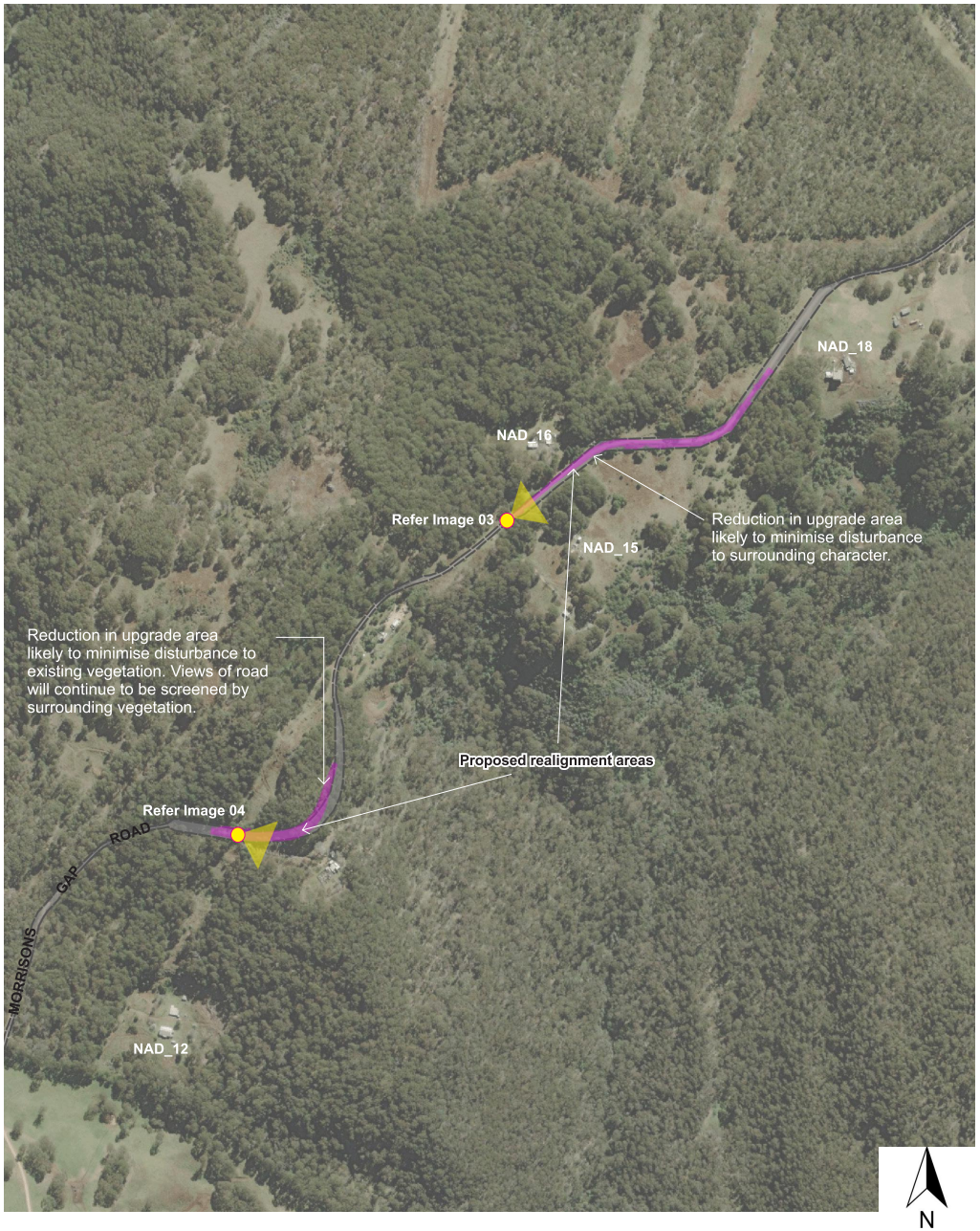


Figure 17. Morrisons Gap Road Upgrade (Not to scale, *Map Source: ESRI Imagery 2022*)

8.0 Amendments to Ancillary Infrastructure

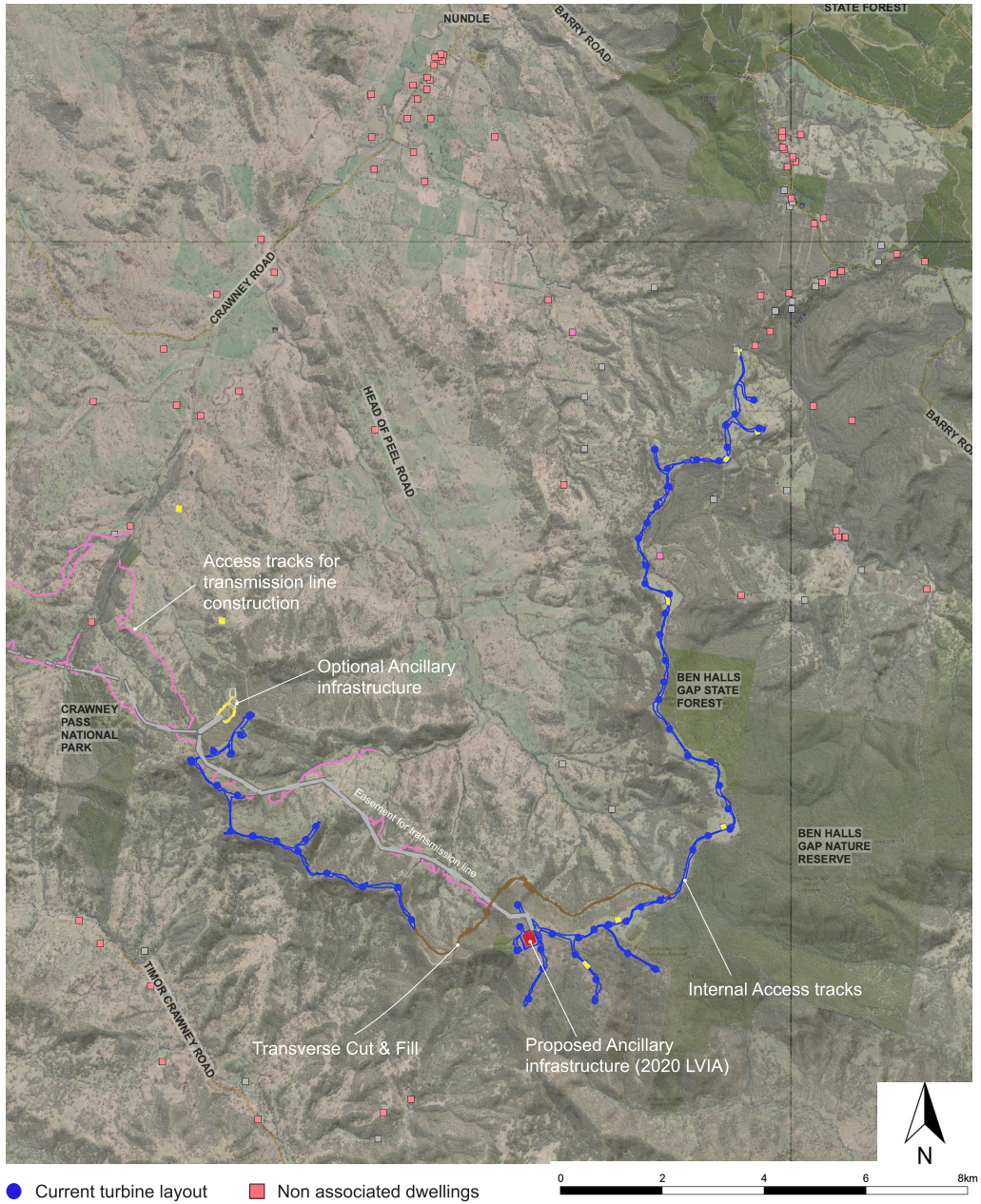


Figure 18. Assessment of potential impacts of ancillary infrastructure
(*Map Source: ESRI Imagery 2022*)

8.1 Assessment of Potential Visual Impacts of Ancillary Infrastructure

Ancillary infrastructure such as access tracks, blade laydowns, internal pads, ancillary infrastructure and transport swept paths are proposed as a part of the construction works required for the Project. The layout of these elements have been altered slightly. The following provides an overview of the likely impacts generated by ancillary infrastructure:

- The potential visual impacts associated with access tracks for transmission line construction have been discussed in **Section 3.0**. The impacts of these as well as access tracks for wind turbine construction are likely to be low. Further, the access tracks align with existing farm roads/routes, and therefore, the impact on existing character will be low.

- Blade laydowns, internal pads and transport swept path will not cause any variation to the potential visual impacts discussed in the 2020 LVIA. Any visual impacts associated with these elements will be low or negligible.

- Potential visual impacts associated with optional ancillary infrastructure such as batching/laydown areas have been discussed in **Section 5.0**. The potential visual impacts associated with these elements are likely to occur during construction phase. The visibility of these elements will, however, be limited (as discussed in **Section 5.1** and **Figure 11**).

Although views towards ancillary infrastructure and access tracks may be available during the construction and operation phase, the impacts are likely to be limited by existing vegetation around various dwellings and public viewing locations such as Crawney Road. The distance of various receptors and the existing landscape character allow limited views of ancillary infrastructure, and therefore, visual impacts are likely to be low or negligible.

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Appendix A

Potential Visual Impacts of Optional Quarry Operations

Appendix A. Assessment of Optional Quarry

Overview of Quarry Layout and Features

The construction and operation of the Optional Verden Road Quarry Expansion is proposed as a part of the Project. The quarry would have an extraction limit of up to 500,000 tonnes per annum. It is estimated that the Project may need approximately 700,000 – 800,000 tonnes of quarry materials in total. Key features of the quarry are summarised as follows:

- Quarry operations would be confined to the Project area within Lot 132 DP754099.
- Two areas for quarrying activities are identified as follows (Refer to **Figure A**):

  - The 'western operations area', which is focussed on the existing FCNSW quarry operations area. This site has an area of approximately 13.2 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. This would be the primary area for the production of quarry materials.

  - A satellite quarrying area, the 'eastern operations area', located on the hill immediately to the east of the 'western quarry'. This site has an area of approximately 9.9 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. This area would only be used should the quarry materials demand from the Project exceed anticipated extraction from the western extraction area (either in total demand quantity and/or rate of demand). To summarise, it would provide a back-up option for the production of quarry materials if required.

The proposed works include stockpiling, processing and overburden /topsoil storage areas. Mobile equipment will be used to crush and process extracted rock. Temporary administration and facilities (mobile self-contained units), and surface water management infrastructure will be located within the extents of the quarry development areas.

Transport of all material from the quarry site will be directly to the entrance of the quarry via Verden Road and Forest Way (FCNSW controlled roads), then via the proposed construction transport routes for the Project, i.e., Barry Road and Morrisons Gap Road, or Barry Road and Crawney Road. These roads, therefore, are considered as important receptor locations for the assessment of potential visual impacts.

Overview of Potential Visual Impact on Surrounding Receptors

Potential Visual Impacts on Nearby Residences

The western and eastern operations are proposed within the extents of Hanging Rock State Forest (S.F.). The existing character of this forest is defined by dense plantation forestry lands that provide for recreational and agricultural production activity.

Viewshed maps shown in **Inset A and B** highlight the areas that are likely to be impacted by the eastern and western operations. The assessment is based on topography alone (as a worst case scenario). **Inset A** shows that receptor R03 is located in proximity of areas that are likely to be impacted by the eastern operations. **Inset B** shows that no receptors are likely to be impacted by the western operations. It is, therefore, likely that none of the receptors will be able to view the quarry operations due to the topographical changes. Furthermore, the existing vegetation character of Hanging Rock State Forest will inhibit views of all operations (including transport routes).

Potential Visual Impacts on Nundle Village

It is likely that none of the quarry operations will be visible in Nundle. The existing topographical character and distance between the proposed quarry site and the village will contribute towards limiting all views of the operations.

Potential Visual Impacts on Public Viewing locations

Public viewing locations such as Verden Road, Forest Way, Barry Road, Crawney Road and Morrisons Gap Road carry moderate to light traffic. Viewshed mapping for both operations shows that certain stretches of Verden Road are likely to view the quarry operations in **Inset A & B**. Certain parts of Forest Way, Barry Road and Morrisons Gap Road may also experience potential visual impacts of the quarry. Crawney Road is not likely to be visually impacted by the quarry operations.

This assessment is based on the existing topographic character alone. Consideration of intervening elements such as vegetation results in the minimisation of potential visual impacts. The dense vegetation character of Hanging Rock S.F. and Nundle S.F. helps in limiting all views directed towards the quarry operations.

The potential visual impacts of the quarry operations on surrounding public and private receptors are, therefore, likely to be very low or negligible.

Appendix A. Assessment of Optional Quarry

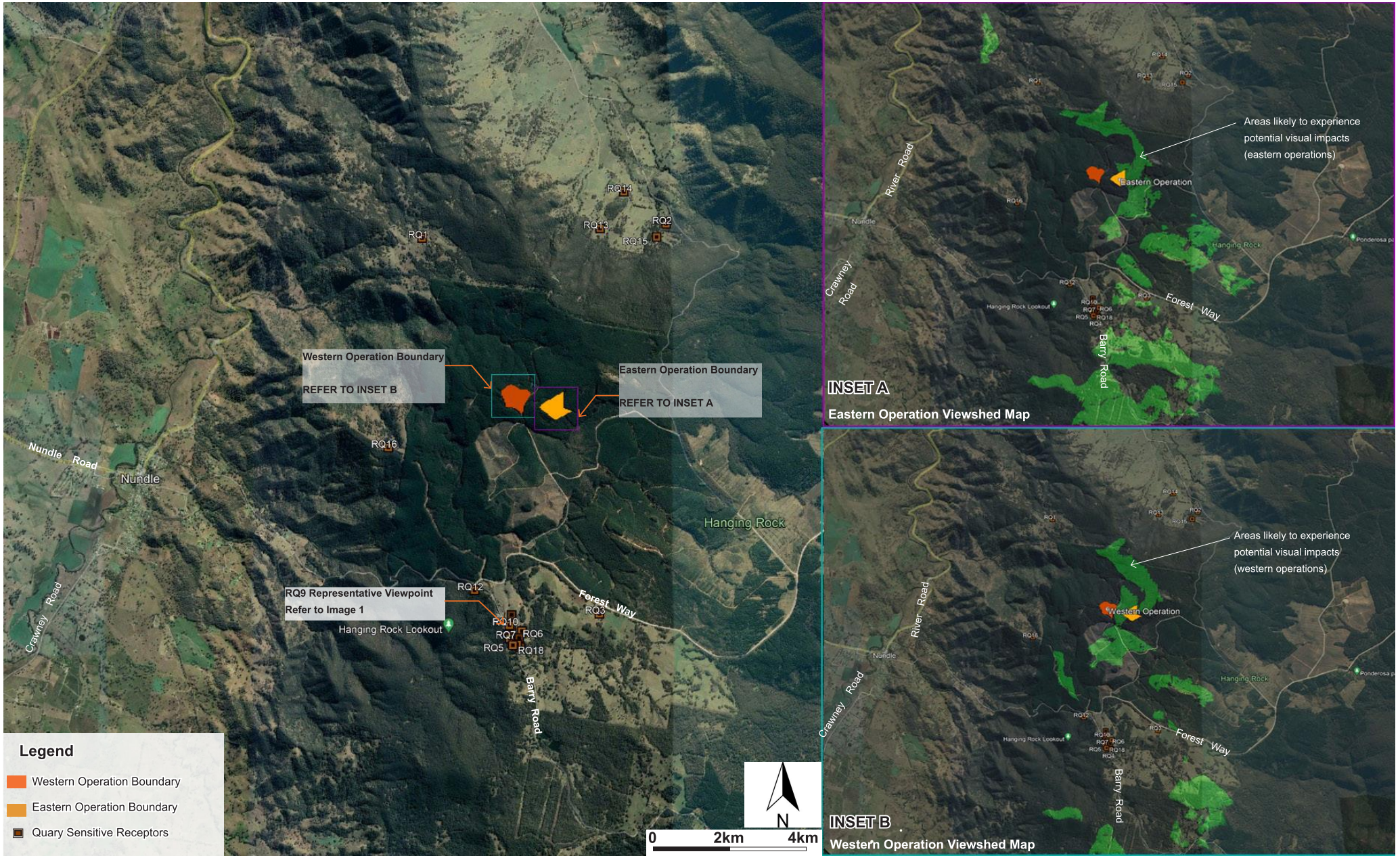

Figure A. Quarry Assessment - Location and viewshed mapping (*Source: Google Earth 2019*)

Appendix A. Assessment of Optional Quarry

Image 05. View to the Quarry from Barry Road (Representative of RQ9)

Summary and Preliminary Landscape Rehabilitation Principles

With all visual impact assessments, it is not the question of visibility of a proposal, but instead, the impact on the broader landscape character that is of concern. The impacts of quarry operations are likely to be low from a visual perspective as assessed in this appendix. The region's undulating character and the existing vegetation character of Nundle S.F. and Hanging Rock S.F. will help limit visibility of the quarry operations.

A small scale quarry which is currently used and operated by FCNSW has been identified at the proposed quarry site. The area is highly disturbed but the impacts of larger operations on the localised landscape character could be potentially significant. It is likely that mining and processing activities proposed as a part of the Project will cause the removal of existing vegetation that is dedicated as plantation forestry. For areas of the site that FCNSW determines to be rehabilitated following the Project, the following principles can be adopted as a strategy to rehabilitate the landscape. The measures are recommended in accordance with the *Leading Practice Sustainable Development Program for the Mining Industry* Handbook (Commonwealth of Australia, 2016):

- Mine voids can be potentially reinstated through landform re-construction, soil amelioration (physical and chemical), and revegetation strategies (biological amelioration). Techniques that cater to restoration of soil capabilities require detailed investigations as the Project progresses.
- Vegetation required for removal to accommodate the Project should be replaced with local plant material wherever possible. Introduced vegetation should also reflect the existing character. Establishment of a plant growth medium that is capable of supporting vegetation cover is the key to successful biological amelioration.
- It is recommended that rehabilitation monitoring measures follow the *ICMM's Good Practice Guidance for Mining and Biodiversity* (ICMM, 2006). These guidelines establish directions for documentation procedures, data collection, record-keeping for plant establishment and performance indicators for the rehabilitation and restoration process.

The speed of revegetation and restoration of soil character will be dependent on the strategies employed in the post-operations phase. It is recommended that detailed investigations are carried out in the earlier phases of the Project for the implementation of a successful rehabilitation program.

Appendix B

Assessment of Optionality of Transmission Towers

Appendix B. Assessment of Optionality of Transmission Towers

Overview of Transmission Line (TL) Easement

The width of the eastern section of the TL easement has been increased to 90 m. It is proposed that this section of the TL will connect the proposed on site substation and the optional location for ancillary infrastructure. It is proposed that the easement will accommodate a 330 kV electrical TL and 33 kV power line. Two options are presented for the proposed 330kV TL:

- Option 1 includes a double circuit steel tower structure, typically 50 m high and spaced up to 100 - 900 m apart (as outlined in 2020 LVIA).

- Option 2 for the 330kV TL includes a double circuit steel pole, typically 60 m high and spaced up to 100 - 900 m apart.

The 33 kV power line would typically include power poles with a maximum height of 20 m.

Assessment of Potential Visual Impacts

A 90 m wide easement would be required to accommodate the transmission towers/poles and power lines. This would require clearing of vegetation for an additional 30m for the eastern section of the TL. **Figure B.1.1.2 and B.1.2.2** represent potential views from dwellings AD_74 and NAD_34 with the proposed double circuit steel towers. **Figure B.2.1.2 and B.2.2.2** represent potential views from dwellings AD_74 and NAD_34 with the proposed double circuit steel poles.

Potential Visual Impacts of Option 1: 50 m high double circuit steel transmission towers

Views from dwelling AD_74 are open and directed towards the ridgeline associated with the Project. The surrounding topographic character is undulating and dense stands of vegetation are visible in the middle ground. **Figure B.1.1.2** illustrates the potential visibility of the widened transmission easement and the originally proposed course of the TL (as per 2020 LVIA). Due to the elevated position of the dwelling, views of the optional ancillary infrastructure and proposed transmission easement will be available. These views, however, will be distant and partially screened by existing vegetation. The widening of the originally proposed easement will have minor impacts on the existing visual character because of the distance between the receptor and the TL.

Existing views from dwelling NAD_34 are generally contained by the surrounding topographic character and scattered stands of vegetation. However, views of the ridgeline associated with the Project and Crawney National Park are visible in the distant background. It is likely that a very minor portion of the

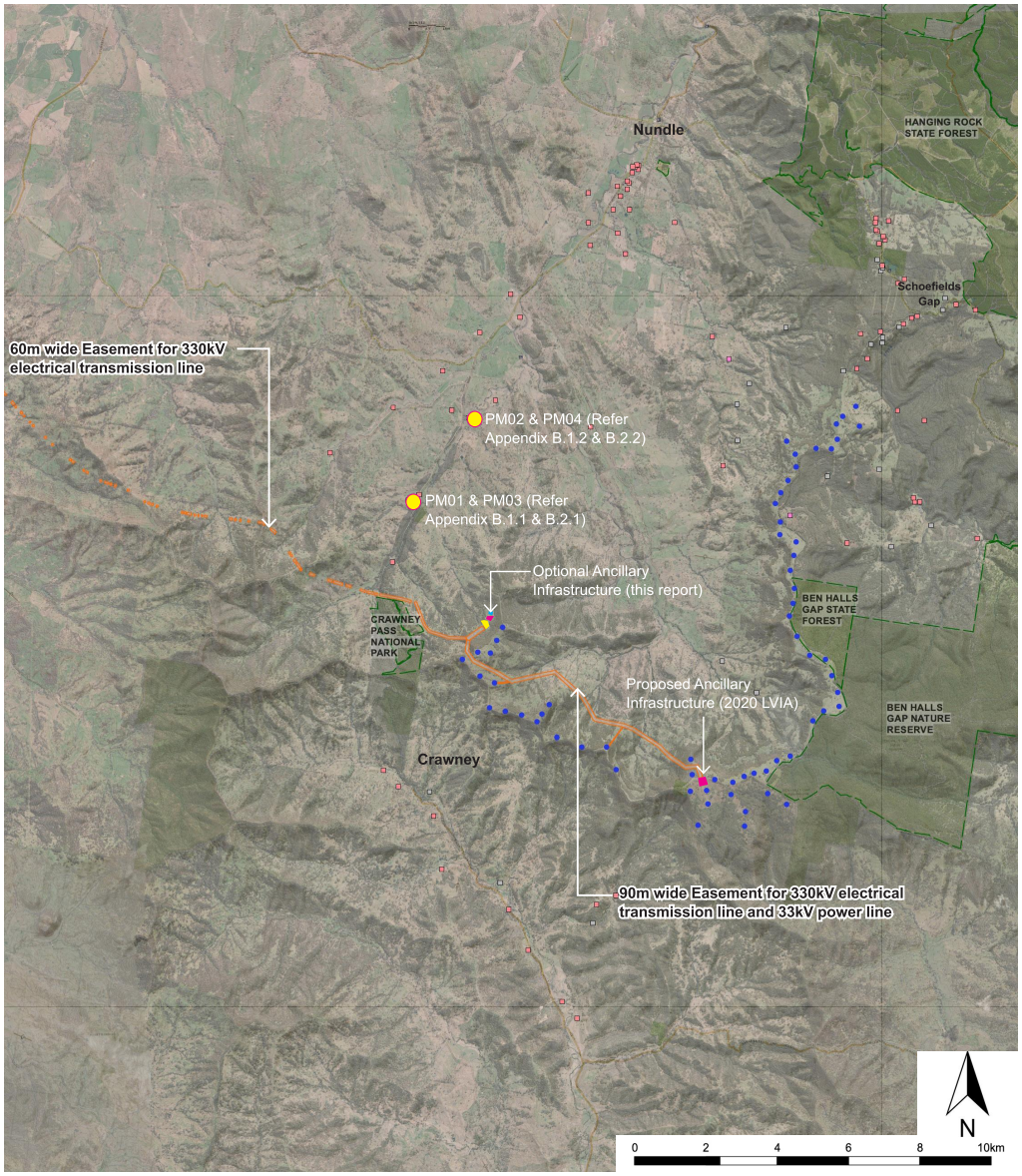

Figure B. Proposed transmission line (*Map Source: ESRI Imagery 2022*)

proposed widened easement will be visible. The proposed western part of the easement (60m wide) will be visible in the distance. **Figure B.1.2.2** indicates that majority of the views towards the easement will be either distant or screened by an existing undulation that limits views towards the proposed optional location for ancillary infrastructure. Existing vegetation in the foreground will also help limit views. The potential visual impact of the proposed transmission line is, therefore, likely to remain unaltered.

The overall impact of 50 m high double circuit steel transmission towers is likely to be low on the existing visual character. Majority of the views towards the easement will be limited by existing undulations and dense vegetation. Views of the transmission infrastructure will be distant. It is recommended that subtle materials are utilised in order to limit glint and allow the infrastructure to blend with the existing landscape character.

Potential Visual Impacts of Option 2: 60 m high double circuit steel transmission poles

Figure B.2.1.2 illustrates the potential visibility of the widened transmission easement with 60m high double circuit steel transmission poles from AD_74. Due to the elevated position and distance of the dwelling, minimal views of the optional ancillary infrastructure and proposed transmission easement will be available. Option 2 proposes 60m high transmission poles for the 90 m wide easement, and it is likely that the poles will have greater opportunities for visibility than the 50 m high double steel circuit transmission towers. The glint and reflection caused by steel pole structures is, however, likely to be lower than steel tower structures. The overall potential visual impacts for option 2 will continue to remain low.

Figure B.2.2.2 indicates that majority of the views from NAD_34 towards the easement will be either distant or screened by an existing undulation. Existing vegetation in the foreground will also help limit views of the TL. The potential visual impact of the proposed transmission line is, therefore, likely to remain unaltered. It is unlikely that the 60 m high transmission poles will be visually distinct at this location because of the large distance between the TL and the receptor.

Summary of Assessment of Variation in Potential Visual Impacts

The 60 m high double circuit steel transmission poles are likely to be visible more than the 50 m high steel transmission towers due to the height difference between the two options. However, it should be noted that the structure and design of steel transmission poles would cause lower glint and reflectivity as compared to steel transmission towers because the towers are wider and have a larger cage-like structure that would cause higher reflectivity.

The impact of both options on the existing visual character is generally low. Although the transmission poles are higher than the towers and are likely to be more visible than the towers, the level of glint and reflectivity will be lower than that of the towers. This is because the design of steel poles is vertical with lesser surface area, whereas steel towers have a ‘bulkier’ cage-like structure that is visually prominent. The distance between the TL and the receptors will allow distant and fleeting views for both options. Views from public viewing locations are also likely to be limited by existing vegetation. It is recommended that subtle materials are utilised in order to limit glint and reflectivity caused by the infrastructure associated with the TL.

As discussed in **Section 6.0**, the potential visibility of the transmission line is limited for receptors located in the immediate vicinity of the easement. The assessment concluded that it is likely that majority of the TL will be visible in areas that are located 13 km away. This assessment is based on topography alone and does not consider the impact of screening vegetation and structures.

The following provides a summary of the assessment:

- It is likely that only the most elevated parts of the transmission easement will be visible from the nearest receptor (AD_74). Views of the cleared vegetation and transmission lines and poles will be visible from the dwelling. There will be very minor variation to the potential visual impacts that were assessed in 2020 LVIA. Impacts on biodiversity values, however, are likely to increase for the widened easement.

- It is likely that there will be very distant and minimal views of the easement from dwelling NAD_34. Views are likely to be unclear and the overall impact on the existing landscape character is assessed to be very low or negligible. No variation was identified to the potential visual impacts identified in 2020 LVIA.

Recommendations for Mitigation of Residual Visual Impacts

With visual impact assessments, it is not the question of visibility of a proposal, but in fact the impact on the broader landscape character that is of concern. The impacts generated by the proposed transmission line can be mitigated through additional planting at the receptor locations, if required. Impact on the broader visual character will be low with minor changes to existing views from most dwellings and public viewing locations. It is recommended that the material for poles and towers for the transmission lines should blend with the existing landscape character and glint should be avoided wherever possible.

Appendix B.1.1 Assessment of Optionality of Transmission Towers - Option 1 (Steel Towers)

Figure B.1.1.1. Existing View from AD_74 (looking south)

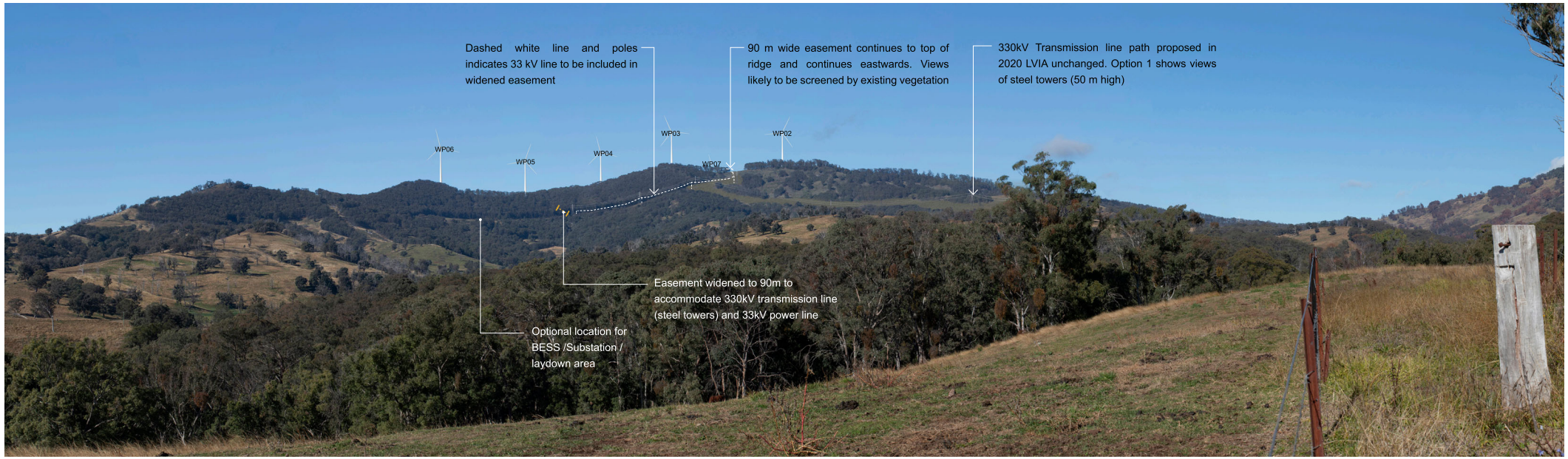

Figure B.1.1.2. Transmission Line (Option 1) Photomontage PM01 (Representative of AD_74)

Note: The photomontage demonstrates location and course of power lines for representation purposes only. The proposed power lines will be of subtle colour and will blend with the existing landscape.

Appendix B.1.2 Assessment of Optionality of Transmission Towers - Option 1 (Steel Towers)

Figure B.1.2.1. Existing View from NAD_34 (looking south)

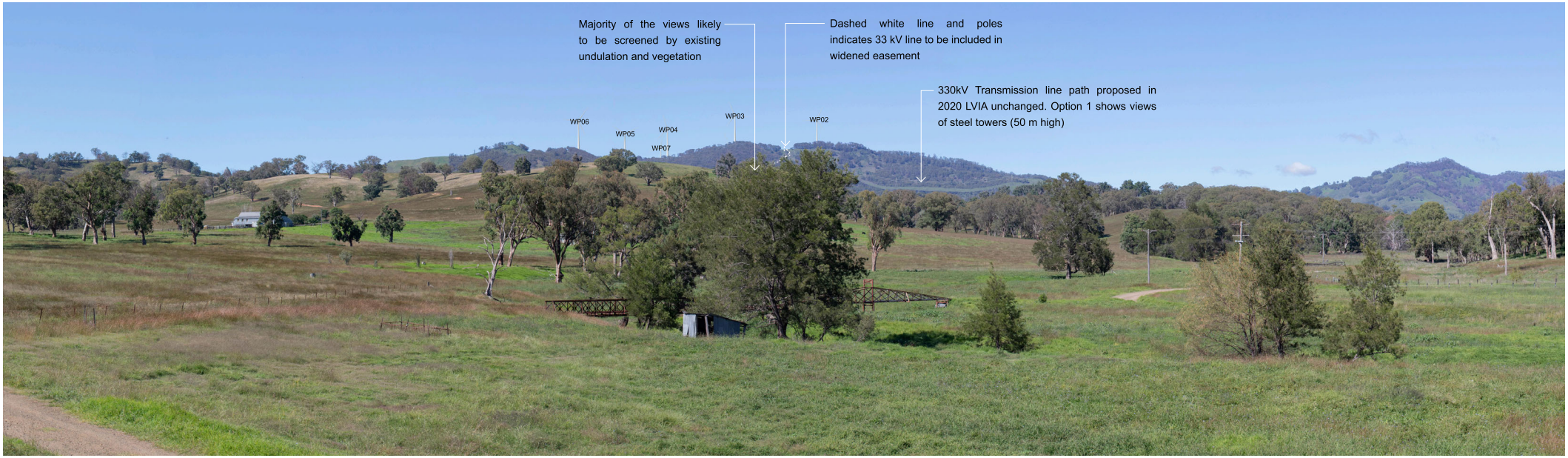

Figure B.1.2.2. Transmission Line (Option 1) Photomontage PM02 (Representative of NAD_34)

Note: The photomontage demonstrates location and course of power lines for representation purposes only. The proposed power lines will be of subtle colour and will blend with the existing landscape.

Appendix B.2.1 Assessment of Optionality of Transmission Towers - Option 2 (Steel Pole)

Figure B.2.1.1. Existing View from AD_74 (looking south)

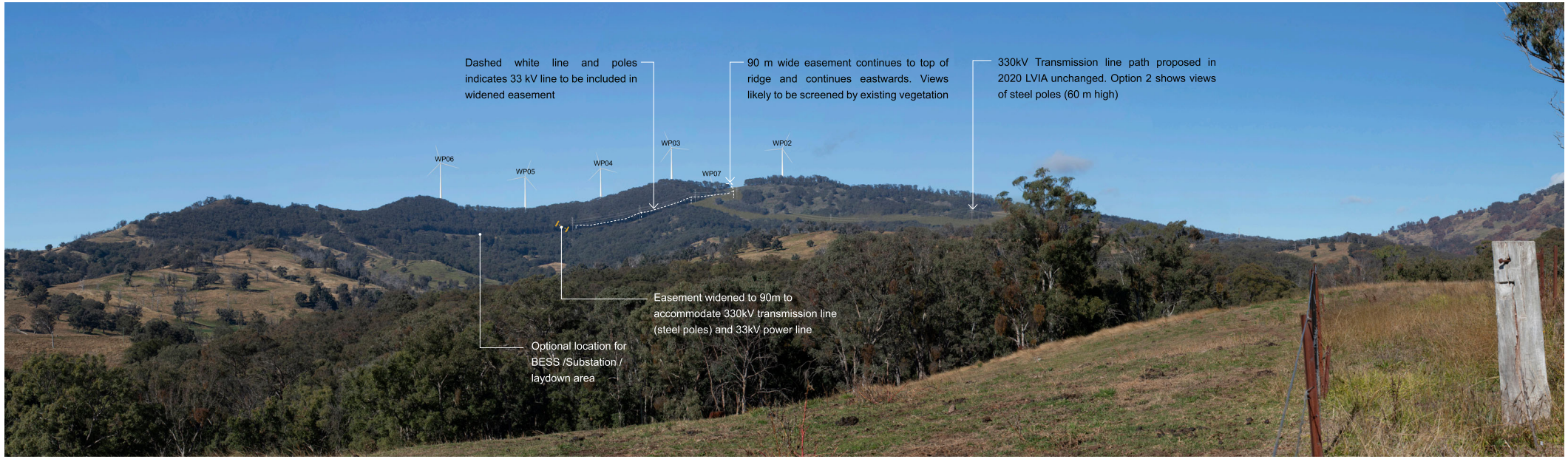

Figure B.2.1.2. Transmission Line (Option 2) Photomontage PM03 (Representative of AD_74)

Note: The photomontage demonstrates location and course of power lines for representation purposes only. The proposed power lines will be of subtle colour and will blend with the existing landscape.

Appendix B.2.2 Assessment of Optionality of Transmission Towers - Option 2 (Steel Pole)

Figure B.2.2.1. Existing View from NAD_34 (looking south)

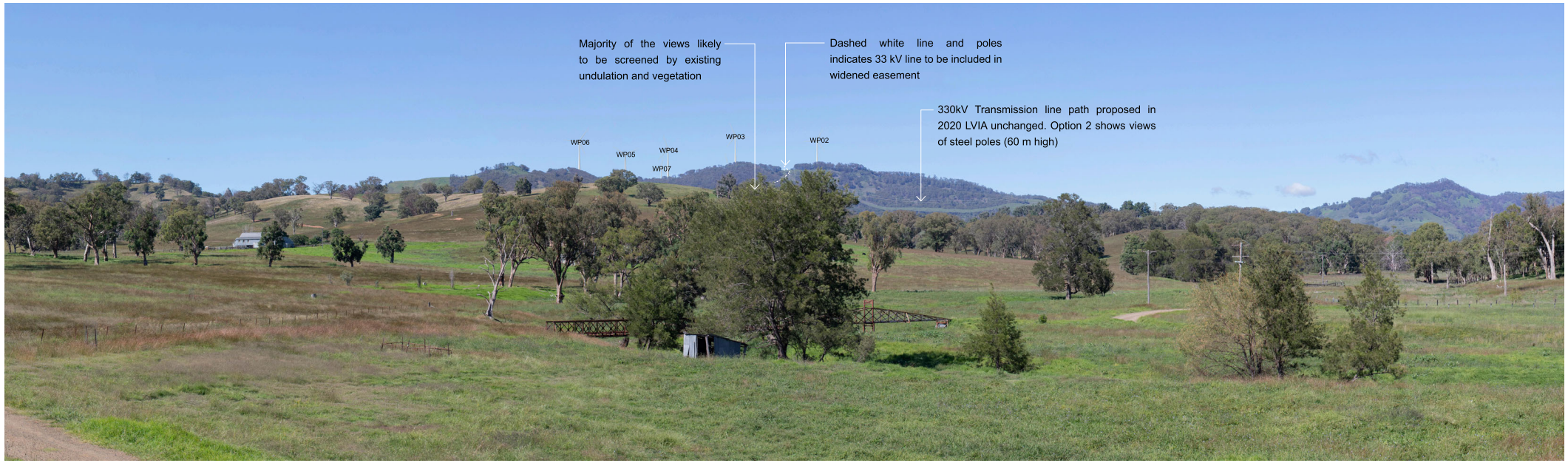

Figure B.2.2.2. Transmission Line (Option 2) Photomontage PM04 (Representative of NAD_34)

Note: The photomontage demonstrates location and course of power lines for representation purposes only. The proposed power lines will be of subtle colour and will blend with the existing landscape.