

## Appendix H: Preliminary Road Investigation



# RYE PARK WINDFARM

## Preliminary Road Upgrade Investigation

Version 4, 3 April 2020

# Rye Park Windfarm

## Preliminary Road Upgrade Investigation

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## Table of Contents

|     |  |    |
|-----|--|----|
| 1.  | Introduction.....  | 1  |
| 1.1 | Background .....   | 1  |
| 1.2 | Scope and Objectives.....  | 1  |
| 1.3 | Route Options .....  | 1  |
| 2.  | Existing Road Conditions.....  | 3  |
| 2.1 | Jerrawa Road.....  | 3  |
| 2.2 | Coolalie Road .....  | 3  |
| 2.3 | Bushs Road/Days Road.....  | 3  |
| 2.4 | Rye Park-Dalton Road .....   | 3  |
| 2.5 | Grassy Creek Road.....   | 4  |
| 2.6 | Boorowa-Rye Park Road.....   | 4  |
| 2.7 | Trucking Yard Rd/Long Street.....  | 4  |
| 3.  | Road Standards.....  | 4  |
| 3.1 | Council Requirements.....  | 4  |
| 3.2 | Hilltops Council Workshops .....   | 6  |
| 3.3 | Pavement Design .....  | 6  |
| 4.  | Cost Estimation.....   | 8  |
| 4.1 | Road Construction.....   | 8  |
| 4.2 | Intersections.....   | 9  |
| 4.3 | Structures .....   | 9  |
| 4.4 | Land Acquisition.....  | 10 |
| 5.  | Road Assessment Outcomes.....  | 10 |
| 6.  | Assumptions.....   | 11 |
| 7.  | References.....  | 12 |
|     | Attachment A – Project Locality Plan.....                                | 13 |
|     | Attachment B – Current Access Route Options.....                         | 14 |
|     | Attachment C – Detailed Road Upgrade Schedule .....                      | 15 |
|     | Attachment D – Detailed Structure Upgrade Schedule.....                  | 16 |
|     | Attachment E – Detailed Intersection and Land Acquisition Schedules..... | 17 |
|     | Attachment F – Road Upgrade Cost Estimates.....                          | 18 |
|     | Attachment G – ULSC Pavement Design Calculations.....                    | 19 |
|     | Attachment H – Potential Land Acquisition Areas .....                    | 22 |

## 1. Introduction

### 1.1 Background

The Rye Park Wind Farm is an approved \$700 million development north of Yass and east of Boorowa near the village of Rye Park. The project area extends into the three Local Government Areas (LGA's) of Hilltops, Upper Lachlan (ULSC) and Yass Valley (YVC).

The Rye Park Wind Farm received development consent in May 2017 and since this time there have been advancements in wind turbine technology and the proponents are intending to submit an application to modify the current development consent to incorporate the use of the latest, most efficient wind turbines on the project.

The current consent contains a number of options with regard to access routes for the site. In order to provide certainty and allow more detailed environmental assessment to be undertaken, it is intended to identify and commit to a preferred route/s as part of the proposed modification application.

In order to narrow down options for road access and obtain further agreement with partner Council's, a preliminary road investigation is required to assess the various access options and develop high level cost estimates which will assist decision making processes.

### 1.2 Scope and Objectives

The scope of the project is to undertake visual inspections of each of the proposed access routes to:

- Identify likely upgrade requirements along each road section;
- Identify bridges and major culverts which may require upgrade;
- Locate obvious areas where road upgrades may lead to works within private property which would require land acquisition;
- Identify approximate areas of impact on vegetation as a result of any identified upgrade work;
- Determine high level cost estimates for identified upgrade works.

The objective of the above scope of works is to provide sufficient high level information on each of the various access routes to enable discussion and consideration of the most appropriate route/s for the project moving forward. This will allow adoption of a preferred route/s and enable completion of detailed environmental assessment, and engineering design such that early agreement can be reached with the partner Council's.

### 1.3 Route Options

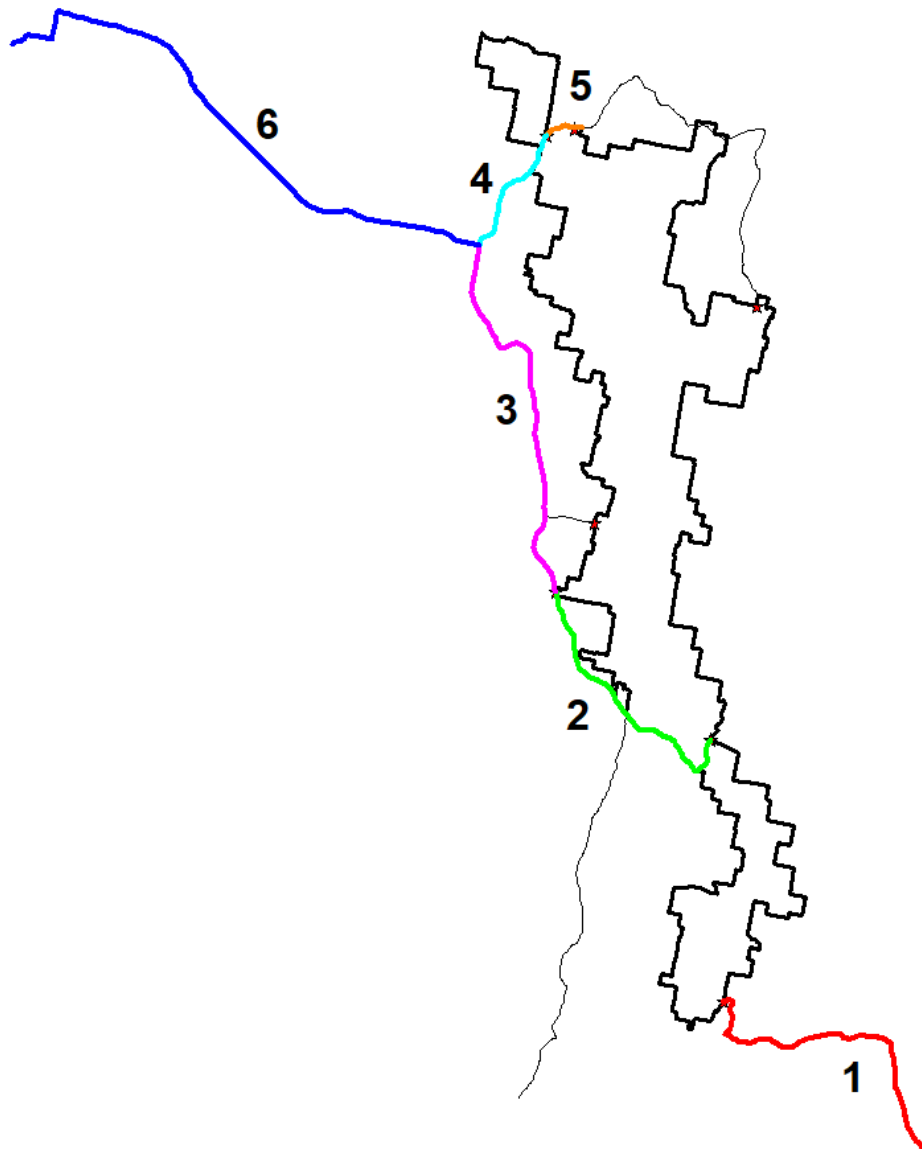
A project locality plan showing proposed wind turbine locations is included as **Attachment A**. A plan showing the current approved access route options which includes the project site boundary, access route options, and LGA boundaries has been included as **Attachment B**.

For the purposes of this assessment the access routes have been broken into six separate road sections as follows:

| Road Section No. | Description  | Approx. Length |
|------------------|--|----------------|
| 1                | Jerrawa Rd/Coolalie Rd/Bushs Rd Roads from Hume Highway to southern end of site                        | 13.5km         |
| 2                | Rye Park/Dalton Rd from site access 12, to site access 13  | 11km           |
| 3                | Rye Park/Dalton Rd from the Boorowa-Rye Park Road intersection to site access 12                       | 14.7km         |
| 4                | Grassy Creek Rd from Boorowa-Rye Park Rd to site access 2  | 5.3km          |
| 5                | Grassy Creek Rd from site access 2 to site access 10   | 1.2km          |
| 6                | Trucking Yard Road /Long Street/Boorowa-Rye Park Rd from Lachlan Valley Way to Yass Street in Rye Park | 22km           |

*Table 1 – Sections of Road Assessed*

The following map shows the location of each of the six road sections:



*Figure 1 – Sections of Road Assessed*

## 2. Existing Road Conditions

### 2.1 Jerrawa Road

Jerrawa Road runs between the Hume Highway and the village of Jerrawa and is 4.1km long. The road is sealed and is generally 6.0m wide with some sections up to 6.5m. The road is generally in satisfactory condition with some sections showing signs of age with potholes and minor pavement defects present.

The road pavement is likely to have been constructed of local materials and would be unlikely to have sufficient pavement strength or to cater for large numbers of heavy vehicles. In addition the existing narrow road width would not be suitable for use by heavy vehicles.

Upper Lachlan Council has indicated that all roads proposed for use as access roads for the wind farm, would need to be brought up to current Austroads standards including widening and pavement strengthening.

The road reserve is heavily vegetated and contains Box Gum Woodland which is identified as a Threatened Ecological Community.

### 2.2 Coolalie Road

Coolalie Road runs from Jerrawa, west to Yass with the section between Jerrawa and Bushs Road (6.6km) proposed for use as an access route for the wind farm. The first 880m of the road is sealed but is very narrow at 5.0 – 6.0m wide. The remainder of the road is unsealed and is generally 6.0 – 6.5m within ULSC and 7.0 – 8.0m wide on the section within YVC.

The alignment would generally meet an 80km/h horizontal design speed apart from two 90 degree bends located approximately 2km west of Jerrawa. This section of road is likely to need realignment to meet Council requirements and also to allow for use by over dimension vehicles.

The current vertical alignment of the road is substandard and significant earthworks would be expected to enable the road to be upgraded to the required standards.

The road reserve has significant amounts of native vegetation and earthworks associated with widening and vertical alignment improvements would impact on this vegetation.

### 2.3 Bushs Road/Days Road

Bushs Road and Days Road are very low standard unsealed roads that currently provide access to a handful of farms and residences. Both roads are approximately 3.0 – 4.0m wide and would need significant works to upgrade them to meet Council standards.

There is an existing railway crossing at the intersection of Bushs Road/Days Road which is also likely to require upgrading to enable use by large numbers of heavy vehicles and/or over dimension vehicles.

### 2.4 Rye Park-Dalton Road

Rye Park-Dalton Road as the name suggests, runs from Rye Park, south to the intersection with Blakney Creek South Road, and then heads predominantly east to the village of Dalton.

The sections proposed for use as part of the wind farm project include the 25.7km from the village of Rye Park to proposed site access 13 located approximately 1.5km north of Blakney Creek South Road. This section traverses both Hilltops and Upper Lachlan Council areas.

The portion of the road within the Hilltops Council area is all sealed and generally has a width of 8.0 – 8.2m. The portion in the Upper Lachlan Council area is predominantly unsealed with widths varying from 6.0 – 8m. Parts of the unsealed sections will need significant widening and earthworks to bring them up to the required standard.

There are numerous bridges, major culverts and causeways along the length of the road that may require upgrading or widening to cater for the proposed heavy vehicle usage.

The road reserve is well vegetated with large sections of the road being identified to contain the Threatened Ecological Community, Bow Gum Woodland. There are likely to be impacts to this community as a result of upgrade works on this section of the road.

## 2.5 Grassy Creek Road

Grassy Creek Road runs from the village of Rye Park, north toward the village of Rugby. The road is sealed but is quite narrow with the existing seal being 5.4 – 5.6m wide. The alignment of the road is meandering and there are numerous curves that would likely need realignment to meet design requirements.

The road reserve is well vegetated with large sections of the road being identified to contain the Threatened Ecological Community, Bow Gum Woodland. There are likely to be impacts to this community as a result of upgrade works on this section of the road.

## 2.6 Boorowa-Rye Park Road

Boorowa-Rye Park Road links Boorowa and Rye Park and the length proposed to be used by the wind farm is 18.9km long. The road is sealed for its entire length and is generally of a suitable standard to allow use by heavy vehicles on the project. There are isolated sections which will require widening and or pavement strengthening but this would involve minimal earthworks or disturbance.

There are numerous bridges and major culverts along this section of road which may require upgrading and/or widening to meet Council requirements.

It is not expected that there will be any significant impact on vegetation as a result of any upgrades to this road.

## 2.7 Trucking Yard Rd/Long Street

Trucking Yard Road and Long Street are urban streets within Boorowa. They are generally in reasonable condition but are quite narrow with some sections between 5.3 – 6.0m wide. It is likely that some sections will need widening and/or pavement strengthening to allow their use by large numbers of heavy vehicles.

# 3. Road Standards

## 3.1 Council Requirements

Meetings were held with relevant Council officers from Hilltops Council (20 September 2019) and Upper Lachlan Shire Council (1 November 2019) to confirm their requirements for road upgrades and identify any other expectation that would need consideration. A meeting was not held with Yass Valley Council due to the very small sections of road within their jurisdiction. It has been assumed that YVC requirements are as per previous discussions and the requirements of the development consent. A summary of upgrade requirements is below:

### Hilltops Council

- Hilltops Council are happy to stick to the agreed standard contained in the Development Consent and EIS as follows:
  - Unsealed roads to be sealed: 200 mm road base topped with double spray seal (14/7 double/double). 7.0 m seal and 8.5 m formation width.
  - Unsealed Roads: Construction width minimum 6 metres wide, maximum 8 metres wide. Pavement minimum thickness 100 mm on existing sheeted road.
- 80km/h design speed is acceptable. Higher design speeds are likely to be unachievable.

- Where possible roads to be designed to follow existing road alignments to minimise impacts on vegetation and possible land acquisition. Some minor realignment may be required in isolated locations and at intersections;
- Council are willing to help with land acquisition issues surrounding road reserves if required;
- Council will require a dilapidation assessment, prefer visual assessment, report and video;
- Tilt Renewables will undertake an updated Traffic Impact Assessment when final route is decided on;
- Council will supply a copy of their Endangered Flora and Fauna Register;
- Council are happy to have a workshop with Tilt and OEH regarding road design and vegetation clearing if required;
- As routes are refined and design work progresses, Tilt Renewables will need to confirm size/mass of heavy vehicle loads and assess the capacity of existing bridges as necessary. Options such as strengthening or construction of temporary bypass tracks/crossings may be considered if current capacity is unsuitable.

#### **Yass Valley Council**

- Road standards as per the agreed standard contained in the Development Consent and EIS as follows:
  - Unsealed roads to be sealed: 200 mm road base topped with double spray seal (14/7 double/double). 7.0 m seal and 8.5 m formation width.
  - Unsealed Roads: Construction width minimum 6 metres wide, maximum 8 metres wide. Pavement minimum thickness 100 mm on existing sheeted road.
- 80km/h design speed in accordance with YVC Road Standards policy.

#### **Upper Lachlan Shire Council**

- Any roads to be upgraded will need to be upgraded to a sealed standard;
- Roads to be designed in accordance with Austroads standards. No specific design speed specified and will be determined as part of design process. Some flexibility will be allowed on a case by case basis to design the road generally along existing alignments and to minimise vegetation removal;
- Road widths required for Regional Roads (Rye Park-Dalton Road) is a 9m formation with 8m seal. Widths of Local Roads to be agreed as part of design process.
- Pavement construction works to utilise DGB20 road base or equivalent. Some potential for use of local gravel pits or alternate equivalent pavement designs (eg. stabilisation) where this can be justified;
- Sight distance to be addressed at all intersections;
- Cadastral survey of all road reserve boundaries is required to confirm that the road is within the existing road reserve;
- Geotechnical investigation is required to inform pavement design. Pavement designed in accordance with Austroads standard for 25 year design life;
- Council fees apply for review of designs. Approval for works to be via a Works Authorisation Deed (WAD) based on RMS template. Section 138 approval also required;
- Specific consideration to be given to upgrade of the Jerrawa Road and Cooks Hill Road intersections to meet community expectations.

### 3.2 Hilltops Council Workshops

Following initial meetings with stakeholder Council's a follow up workshop was held via telephone conference between Tilt Renewables, Hilltops Council and the NSW Biodiversity Conservation Department (BCD) on 31 January 2020. Outcomes of this meeting in relation to road upgrades were as follows:

- BCD raised concerns over the extent of vegetation removal required due to road widening as a result of the 80km/h design speed, and expressed particular concerns over impacts along Grassy Creek Road;
- Tilt Renewables outlined the process that had been undertaken to assess multiple routes to minimise impacts on vegetation communities. This has resulted in some proposed routes being abandoned;
- Discussion took place around opportunities to reduce the design standard in some locations in order to reduce overall impact on native vegetation and in particular along Grassy Creek Road. Hilltops Council indicated they would be open to considering reduced road design standards providing road safety objectives could be achieved. To this end a road safety audit of the route was suggested;
- Hilltops Council noted several bridges and culverts will require upgrades and tilt Renewables undertook to complete structural assessment to identify which structures would require upgrades.

This workshop was followed by a further teleconference meeting with Hilltops Council engineering staff on 7 February 2020 to further discuss road standards. Outcomes of this meeting were:

- Hilltops Council happy to accept a design that complies with the current road speed environment on Grassy Creek Road (estimated to be approx.. 60km/h);
- Minimum 7m formation/seal width required (reduced from 8.5m formation/7m seal width). Desirable standard is 7.4m wide formation and seal with edge lines to delineate travel lanes;
- The design process is to include a review by a Road Safety Auditor to identify potential safety issues that can be addressed as part of the design process.

### 3.3 Pavement Design

Upper Lachlan Shire Council requires a pavement design to be undertaken in accordance with the *Austrroads Guide to Pavement Technology, Part 2: Pavement Structural Design 2017*. Essentially the two inputs into this design process are:

- (i) **Traffic volumes** – traffic volumes are measured in Equivalent Standard Axles (ESA's) calculated over the 25 year design life of the pavement. An Equivalent Standard Axle is defined as a dual tyred single axle that transmits a load of 80kN (8.2 Tonne) to the road pavement. ESA's are used as a standard measure against which various size and configurations of heavy vehicle can assessed.

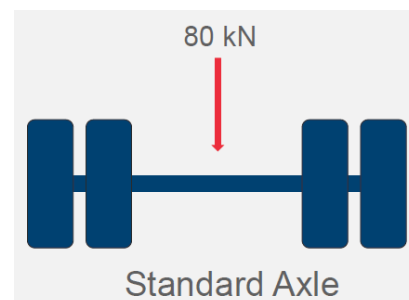


Figure 2 – Equivalent Standard Axle (ESA)

Given that heavy vehicle impacts as a result of the Rye Park Wind Farm development will be largely limited to the 18 month construction phase it is somewhat difficult to calculate ESA's over a 25 year period. In order to calculate design traffic ESA's, the following traffic volumes were adopted from SMEC 2020:

- Total of 67,896 (two way) heavy vehicle movements associated with wind farm construction over a 93 week construction period;
- Total of 58,240 (two way) light vehicle trips associated with construction over the 93 week construction period;
- Total 126,136 (two way) construction vehicle trips with 51% being heavy vehicles;
- 8 trips per day associated with O&M of the wind farm during the operational phase (Epuron Pty Ltd (2016), *Rye Park Windfarm Traffic and Transport Assessment – April 2016*).

Limited traffic data is available for the Council roads in question. A conservative existing traffic volume of 200 vehicles per day with 15% of these being heavy vehicles was adopted for use in the pavement design.

The table below provides details of key inputs and outputs of the design traffic calculation:

| Traffic Source                               | AADT                         | %HV        | Comment   |
|--|------------------------------|------------|---|
| Existing Traffic                             | 200                          | 15%        | estimate only                                     |
| Construction Traffic                         | 13                           | 51%        | Averaged over 25 years                            |
| O&M Traffic                                  | 8                            | 25%        | Assumed %HV                                       |
| <b>Totals</b>                                | <b>221</b>                   | <b>17%</b> |   |
| Design Period                                | 25 years                     |            |   |
| Heavy Vehicle Growth Rate                    | 0.5%                         |            | Assumed   |
| Axle groups per Heavy vehicle ( $N_{HVAG}$ ) | 2.8                          |            | Based on presumptive values provided in Austroads |
| <b>Design ESA's</b>                          | <b>4.08 x 10<sup>5</sup></b> |            |   |

*Table 2 – Design Traffic*

As a sensitivity analysis the AADT was increased by 10% and a 2% heavy vehicle growth rate was adopted. This resulted in a higher Design ESA value of 5.41 x 10<sup>5</sup> and an alternative pavement design was undertaken for this higher traffic volume.

- (ii) **Subgrade CBR** – To undertake pavement design, a geotechnical investigation would normally be completed to obtain subgrade samples for analysis. These samples are tested to determine the soaked California Bearing Ratio (CBR) of the underlying subgrade material.

CBR provides an indication of the bearing capacity of the layer of soil directly below the road pavement which in turn provides an understanding of its ability to withstand repetitions of heavy vehicle loading. The lower the CBR, the thicker the road pavement is required to be.

For this high level analysis a conservative CBR value of 5 has been adopted for use in the pavement design. Based on experience and the predominantly clay soils in the region it is considered that this is a realistic representation of likely lower bound CBR values that would be encountered.

Using the above inputs and utilising the empirical design method for flexible pavement design as outlined in Austroads, pavement thicknesses of 335mm – 365mm were calculated. Copies of the detailed calculation sheets have been provided as **Attachment G**. For the purposes of cost estimation

a more conservative pavement thickness of 380mm was adopted for Upper Lachlan Shire Roads. A pavement thickness of 200mm was adopted for Yass Valley and Hilltops roads as previously agreed with these parties and specified in the development consent.

## 4. Cost Estimation

### 4.1 Road Construction

It is difficult to accurately estimate likely road construction costs without detailed design and quantities. In particular earthworks quantities are difficult to estimate and have a significant impact on the construction cost per kilometre.

Earthworks quantities can vary from project to project due to the following:

- Topography;
- Amount of widening required (a function of design standards and existing road width);
- Existing horizontal alignment and the need for improvements;
- Existing vertical alignment and need for additional cuts and fills.

In addition to earthworks costs, the biggest impact on rural road construction costs comes from pavement construction with the main variables being the distance from the worksite to a suitable gravel source, and pavement thickness (pavement design).

In order to provide per kilometre rates that more accurately reflect the potential variances in quantities due to the above factors, cost estimates were undertaken for a range of scenarios and each section of road was classified into one of the following types for the purposes of cost estimation:

| Type   | Earthworks   | Formation Width (m) | Seal Width (m) | Pavement Thickness (mm) | Cost/km | Comment          |
|--------|--------------|---------------------|----------------|-------------------------|---------|------------------|
| Type 1 | None/minimal | 8.5                 | 7              | 200                     |         |                  |
| Type 2 | Minor        | 8.5                 | 7              | 200                     |         |                  |
| Type 3 | Significant  | 8.5                 | 7              | 200                     |         |                  |
| Type 4 | None/minimal | 9                   | 8              | 380                     |         | ULSC standard    |
| Type 5 | Minor        | 9                   | 8              | 380                     |         | ULSC standard    |
| Type 6 | Significant  | 9                   | 8              | 380                     |         | ULSC standard    |
| Type 7 | Significant  | 8.5                 | 7              | 200                     |         | Road realignment |
| Type 8 | Minor        | 8.5                 | 7              | 200                     |         | Widening only    |

*Table 4 – Road Types for Cost Estimation*

Copies of the detailed cost estimates undertaken for each upgrade type have been included as **Attachment F**. Survey costs were added on the basis of \$5000/km for detailed survey only, and \$7000/km where full cadastral survey is also required (Upper Lachlan Shire Council requirement).

It was assumed that any required fill material would be available on site or within close proximity and as such earthworks costs are based on cut to fill scenarios where significant importation of fill material is not required.

Road pavement costs are based on a suitable available commercial gravel source within 100km of the sites. Sealing rates assume that more than 1km would be constructed and sealed at a time, minimising establishment costs.

No allowance has been made for design, geotechnical investigation, or project management and it is assumed that these costs will be essentially the same on a per kilometre basis for each road section.

## 4.2 Intersections

Intersections were identified for upgrade based on visual assessment and utilising swept path analysis previously undertaken by Rex J Andrews – Engineered Transportation. Indicative cost were then allocated to each intersection requiring upgrade based on the likely scope of works. It is noted that it is difficult to estimate these costs without an accurate scope and quantities and as such these costs should be treated as ballpark estimates only and are intended only for comparison purposes.

Intersection upgrade costs are estimated to vary from \$50,000 to \$500,000 depending on the scale of the required works.

## 4.3 Structures

As part of the assessment structures including bridges, major culverts, causeways, and railway crossings were identified and a brief visual assessment undertaken to determine dimensions, likely age and condition. From this a list of assumed upgrades has been developed.

Costs estimates for these structures are based on the following unit rates:

- [REDACTED]/m2 for bridge construction/replacement;
- [REDACTED]/m2 for concrete causeway construction/widening;
- Large box culvert extensions – based on indicative costs for each culvert;
- Railway crossing upgrade – indicative cost only.

## 4.4 Land Acquisition

Where areas of land acquisition were identified as being likely to facilitate road improvements, approximate areas were generated from online mapping tools. Land zoned RU1 – Primary Production generally sells for around [REDACTED]/ha (NSW GLOBE) in the region depending on location, agricultural productivity, and numerous other factors. Recognising the small areas of land to be acquired, potential resistance from wind farm detractors, and the likely premium that will need to be paid to get agreement from property owners, and unit rate of [REDACTED] has been adopted. For very small areas (<1000m<sup>2</sup>) a unit rate of [REDACTED] has been adopted to reflect the premium likely to be paid for these small areas and the higher proportion of fixed costs associated with the acquisition eg. survey and legal costs. Land areas identified for potential acquisition are shown in the maps provided as **Attachment H**.

## 5. Road Assessment Outcomes

Detailed schedules for identified upgrades to roads, intersections, structures and required land acquisition have been included as **Attachments C to E**. The following table provides a summary of the results of the assessment for each of the six road sections:

| Cost Categories  | Road Section |       |      |       |       |     |
|--|--------------|-------|------|-------|-------|-----|
|  | 1            | 2     | 3    | 4     | 5     | 6   |
| Road Upgrades  | [REDACTED]   |       |      |       |       |     |
| Intersection Upgrades                                    |              |       |      |       |       |     |
| Structure Upgrades                                       |              |       |      |       |       |     |
| Land Acquisition   |              |       |      |       |       |     |
| <b>Total</b>   |              |       |      |       |       |     |
|  |              |       |      |       |       |     |
| <b>Approx. Area of Vegetation Impact (m<sup>2</sup>)</b> | 33000        | 11500 | 2000 | 10600 | 10450 | 100 |

*Table 5 – Road Upgrade Costs and vegetation impact by Road Section*

Road Sections 1 and 2 are predominantly within the Upper Lachlan Shire Council who have more stringent requirements when it comes to design and construction of road upgrades. This has led to significantly higher per kilometre rates and ultimately a high overall cost for upgrade of these roads. Section 1 also has the highest assumed vegetation impact with approximately three times the area of vegetation likely to be impacted in order to upgrade these roads. This is due to narrow existing road widths, Council expectations of road widths, and poor vertical alignment which is likely to lead to significant cuts and fills in some areas.

Road Section 6 appears by far the easiest section of road to upgrade as existing formation widths are generally adequate and upgrade works are generally limited to pavement strengthening with little or no impact on roadside vegetation. The relatively large number of structures on this section of road including a number of bridges with unknown structural capacity makes up for approximately 25% of the estimated upgrade costs.

## 6. Assumptions

The intention of this report is to provide a high level assessment of the various access route options to assist with decision making. With the limited available data currently available including no detailed road design it is not possible to accurately estimate construction costs and as such the cost estimates in this report are intended to indicate relative costs of upgrading the various road sections rather than absolute costs. Numerous assumptions have been necessary in compiling this report and these are listed below:

- Identified impact areas for vegetation should be considered indicative only and are based on a drive through of each road to identify obvious areas of vegetation impact. It was assumed that generally vegetation (generally grasslands) back to the existing tree line has previously been disturbed and is therefore of little value. No assessment of vegetation types, or qualitative assessment was undertaken;
- In order to determine which sections of road require upgrade, a visual assessment was undertaken to determine road width and pavement condition. Council requirements and previous correspondence with Councils was taken into account but ultimately the sections of road listed for upgrade were based on a judgement call and need to be confirmed with the Council's once the preferred routes are identified;
- There has been no structural assessment of bridges and other major structures to inform decision making. Where possible the age of some structures was identified and a visual inspection undertaken to determine condition. Where doubt existed over the structural capacity of structures it has been assumed that they will require full replacement. A detailed assessment of these structures will be needed and should be undertaken as soon as possible after the preferred access routes are confirmed;
- Major culverts and causeways have been individually listed where they are considered likely to require widening or replacement. No assessment was undertaken of smaller road culverts but allowance has been made for the extension of 5 small culverts (375mm – 600mm diameter) per kilometre.
- In order to determine an appropriate pavement design it was necessary to assume subgrade CBR values and also existing traffic volumes utilising the roads. Conservative values have been adopted for this purpose. A 380mm pavement thickness was adopted for ULSC roads;
- Land acquisition areas have been determined based on a desktop assessment of the road alignments based on achieving an 80km/h design speed. This is not intended to be an exhaustive list but rather to provide some relativity between the various road sections for comparison purposes;
- It has been assumed that Yass Valley Council road upgrade requirements have not changed since agreement was reached prior to issue of the current consent;
- Intersection upgrade costs are based on high level ballpark estimates in the absence of any detailed quantities;
- Quantities used in preparing costs estimates are estimated quantities only based on indicative works required for a typical kilometre of road. Unit rates were derived from previous projects in the region;
- It was assumed that the Council's would not accept unsealed roads being used as heavy vehicle access routes and as such all unsealed roads have been identified for upgrade to a sealed standard;
- It was assumed that any required fill material would be available on site or within close proximity and as such earthworks costs are based on cut to fill scenarios where significant importation of fill material is not required;

- Road pavement costs are based on a suitable available commercial gravel source within 100km of the sites.
- Sealing rates assume that more than 1km would be constructed and sealed at a time, minimising establishment costs.
- No allowance has been made for design, geotechnical investigation, structural assessment or project management and it is assumed that these costs will be essentially the same on a per kilometre basis for each road section.

## 7. References

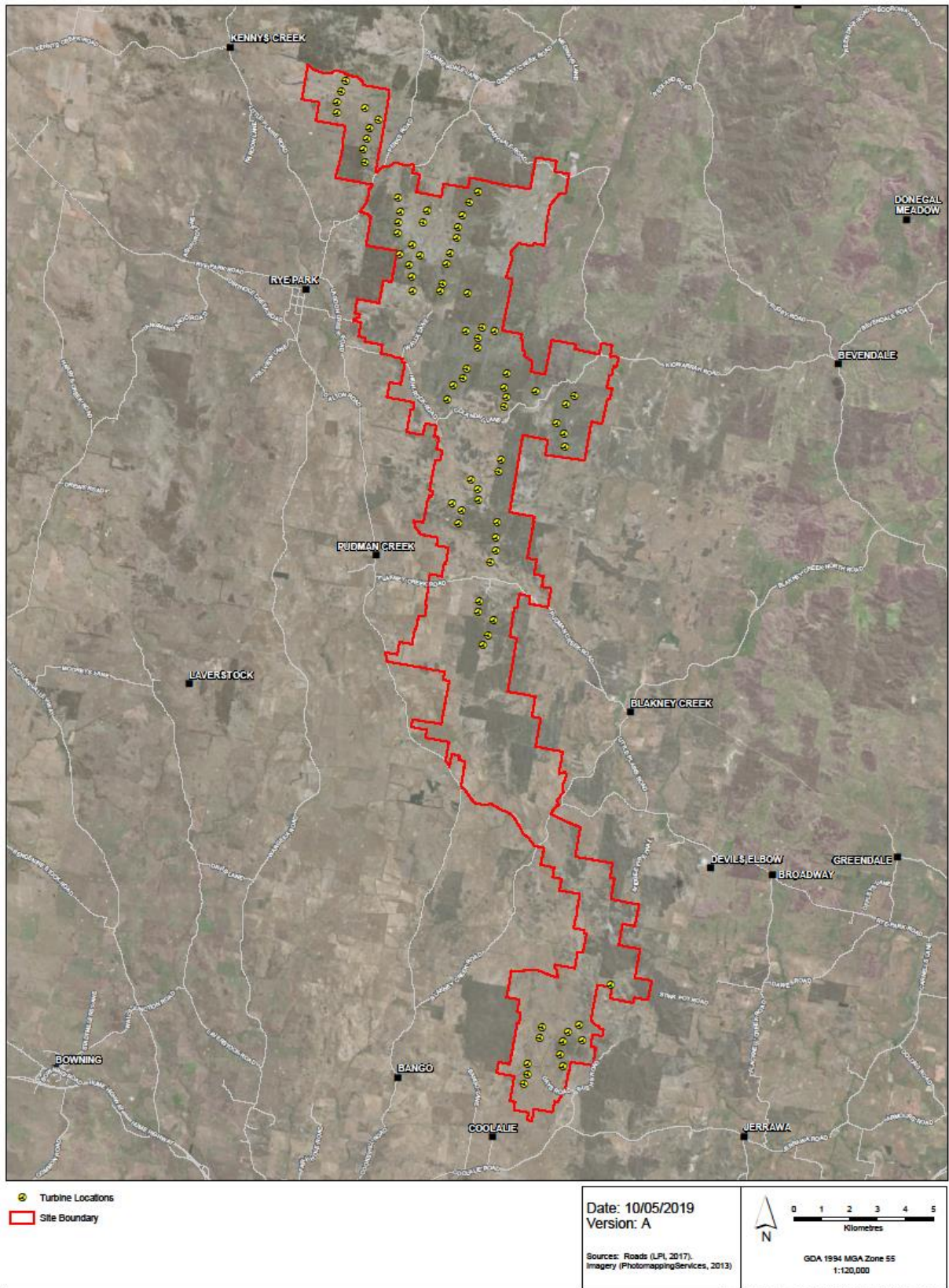
ZEM Energy Pty Ltd (2016), *Rye Park Windfarm Transport Route Assessment, (0005-RC-002)*

Epuron Pty Ltd (2016), *Rye Park Windfarm Traffic and Transport Assessment*

Rex J Andrews Engineered Transportation (2019), *Route Study: Vestas, Rye Park Windfarm: (82 Metre Blade), Ex Newcastle.*

*SMEC 2020, RPWF\_Construction Traffic Input\_800\_NOSQ\_RevD.xlsx*

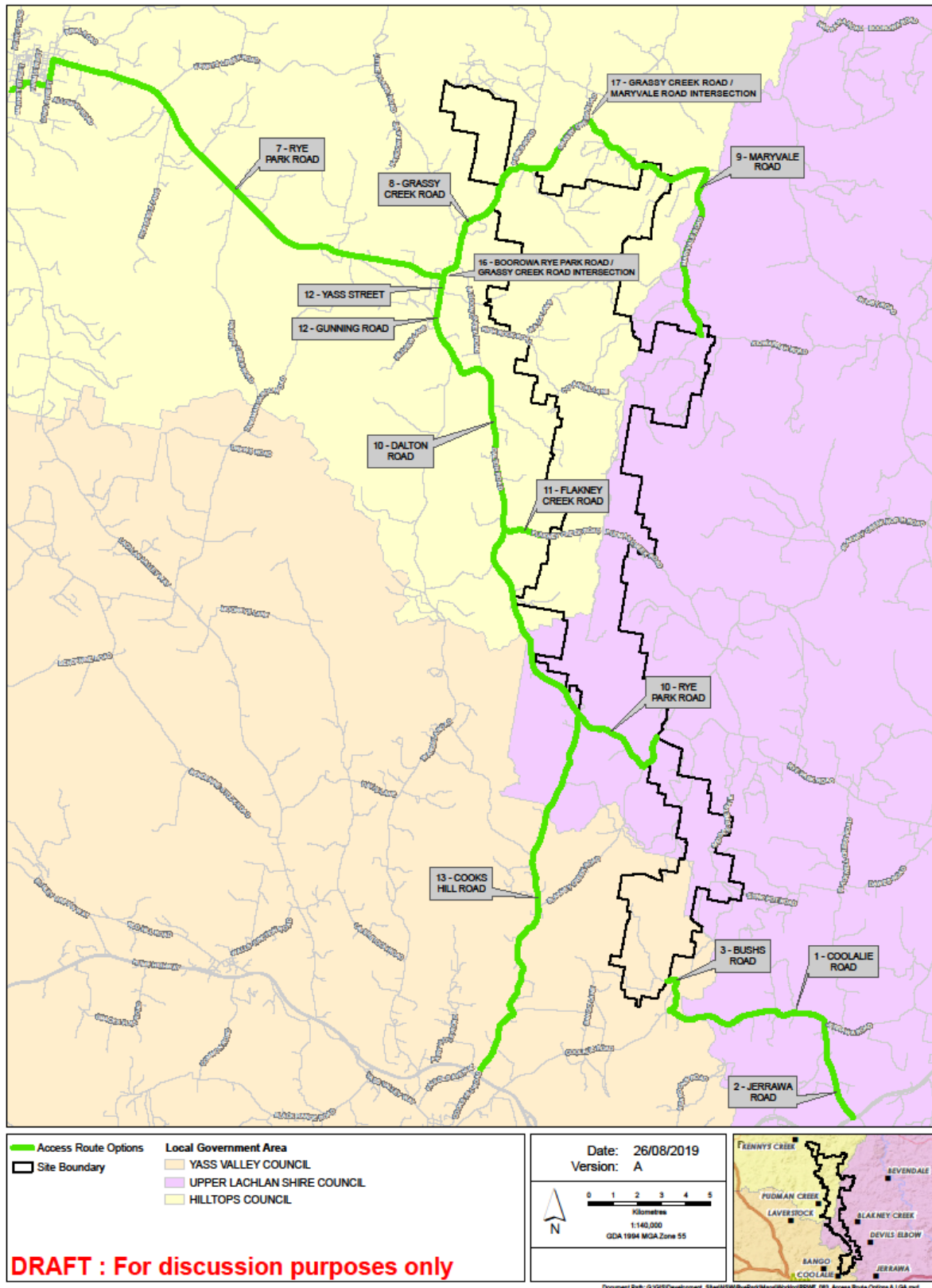
## Attachment A – Project Locality Plan



Rye Park  
80 WTG Layout



## Attachment B – Current Access Route Options



Attachment C – Detailed Road Upgrade Schedule

| Road Section | LGA      | Road Name                        | Start Loation          | Start CH (km) | End CH (km) | Length (km) | Existing Surface | Existing Width (m) | Req'd P'ment Width | Pavement Thickness (mm) | Req'd Seal Width | Upgrade Category | Upgrade Cost per km | Total Upgrade Cost | Approx. Veg Impact | Comments   |
|--------------|----------|----------------------------------|------------------------|---------------|-------------|-------------|------------------|--------------------|--------------------|-------------------------|------------------|------------------|---------------------|--------------------|--------------------|--|
| 1            | ULSC     | Jerrawa Road                     | Hume Highway           | 0             | 4.1         | 4.1         | Sealed           | 6.0 - 6.5          | 9                  | 380                     | 8                | 5                |                     |                    | 8000               | Narrow and likely low pavement strength. Likley high impact on vegetation  |
| 1            | ULSC     | Coolalie Road                    | Jerrawa Road           | 0             | 0.88        | 0.88        | Sealed           | 5.0 - 6.0          | 9                  | 380                     | 8                | 6                |                     |                    | 1000               | Very narrow. Fair to poor pavement with low pavement strength. Powerline relocations may be required and likely high vegetation impacts.                                 |
| 1            | ULSC     | Coolalie Road                    | Jerrawa Road           | 0.88          | 5.2         | 4.32        | Unsealed         | 6.0 - 6.5          | 9                  | 380                     | 8                | 6                |                     |                    | 17000              | Powerlines likely to need relocation. Poor vertical alignment (sharp crests). High vegetation impact.  |
| 1            | YVC      | Coolalie Road                    | Shire Boundary (CH5.2) | 5.2           | 6.6         | 1.4         | Unsealed         | 7                  | 8.5                | 200                     | 7                | 3                |                     |                    | 7000               | Very High vegetation impact  |
| 1            | YVC      | Bushs Road                       | Coolalie Road          | 0             | 1.3         | 1.3         | Unsealed         | 3.0 - 4.0          | 8.5                | 200                     | 7                | 3                |                     |                    | 0                  | Some earthworks required. Negligible vegetation impact. Possible rail crossing upgrade.  |
| 1            | YVC      | Days Road                        | Bushs Road             | 0             | 0.4         | 0.4         | Unsealed         | 3                  | 8.5                | 200                     | 7                | 3                |                     |                    | 0                  | Significant earthworks required. Major culvert needed at Ch0.19km.   |
| 2            | ULSC     | Rye Park-Dalton Road             | Site Access 12         | 1.3           | 1.57        | 0.27        | Unsealed         | 7.0 - 8.0          | 9                  | 380                     | 8                | 4                |                     |                    | 0                  | Requires upgrade to sealed standard  |
| 2            | ULSC     | Rye Park-Dalton Road             | Site Access 12         | 2.1           | 3.75        | 1.65        | Unsealed         | 7.0 - 8.0          | 9                  | 380                     | 8                | 4                |                     |                    | 0                  | Requires upgrade to sealed standard. Minimal vegetation or earthworks required.  |
| 2            | ULSC     | Rye Park-Dalton Road             | Site Access 12         | 4             | 5.6         | 1.6         | Unsealed         | 7.0 - 8.0          | 9                  | 380                     | 8                | 4                |                     |                    | 1500               | Requires upgrade to sealed standard. Minimal vegetation or earthworks required.  |
| 2            | ULSC     | Rye Park-Dalton Road             | Site Access 12         | 5.6           | 9.15        | 3.55        | Unsealed         | 6.0 - 6.5          | 9                  | 380                     | 8                | 6                |                     |                    | 10000              | Requires upgrade to sealed standard. Significant wideing, earthworks & vegetation removal required. Significant realignment required approaching Blakney Creek causeway. |
| 2            | ULSC     | Rye Park-Dalton Road             | Site Access 12         | 9.15          | 10.5        | 1.35        | Sealed           | 7.0 - 7.8          | 9                  | 380                     | 8                | 4                |                     |                    | 0                  | Road in good condition. Council likley to require widening and pavement strengthening  |
| 3            | Hilltops | Rye Park-Dalton Road             | Boorowa-Rye Park Road  | 0             | 1.05        | 1.05        | Sealed           | 5.5 - 6.0          | 8.5                | 200                     | 7                | 8                |                     |                    | 0                  | Yass Street Rye Park. Existing pavement OK. Widen and reseal only.   |
| 3            | Hilltops | Rye Park-Dalton Road             | Boorowa-Rye Park Road  | 3.95          | 4.5         | 0.55        | Sealed           | 8                  | 8.5                | 200                     | 7                | 7                |                     |                    | 2000               | Realignment of substandard bend near Pudman Creek Bridge   |
| 3            | Hilltops | Rye Park-Dalton Road             | Site Access 12         | 0             | 1.3         | 1.3         | Sealed           | 8                  | 8.5                | 200                     | 7                | N/A              |                     |                    | 0                  | Some Heavy patching required to address pavement defects. Assume 10% of road area.   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0             | 0.1         | 0.1         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 0                  | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0.1           | 0.4         | 0.3         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 7                |                     |                    | 0                  | Realignment of substandard bend near Boorowa/Rye Park Road   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0.4           | 2.4         | 2           | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 0                  | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 2.4           | 2.6         | 0.2         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 7                |                     |                    | 1000               | Realignment of substandard bend  |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 2.6           | 4.5         | 1.9         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 300                | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 4.5           | 4.7         | 0.2         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 7                |                     |                    | 6000               | Realignment of substandard bend  |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 4.7           | 5           | 0.3         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 300                | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 4            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 5             | 5.2         | 0.2         | Sealed           | 5.4 - 5.7          | 8.5                | 200                     | 7                | 7                |                     |                    | 3000               | Realignment of substandard bend. Site Access 2   |
| 5            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0             | 0.65        | 0.65        | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 4000               | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 5            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0.65          | 0.95        | 0.3         | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 7                |                     |                    | 6000               | Realignment of substandard bend  |
| 5            | Hilltops | Grassy Creek Road                | Boorowa-Rye Park Road  | 0.95          | 1.1         | 0.15        | Sealed           | 5.4 - 5.6          | 8.5                | 200                     | 7                | 8                |                     |                    | 450                | Narrow and good to fair pavement condition. Assume widening and allowance for 10% heavy patching   |
| 6            | Hilltops | Trucking Yard Road/Dillon Street | Lachlan Valley Way     | 0             | 1.6         | 1.6         | Sealed           | 5.3 - 7.0          | 8.5                | 200                     | 7                | 1                |                     |                    | 0                  | Good to fair pavement condition. Likely to require widening  |
| 6            | Hilltops | Long Street                      | Dillon Street          | 0             | 0.4         | 0.4         | Sealed           | 5                  | 8.5                | 200                     | 7                | 1                |                     |                    | 0                  | Narrow section of road. Requires widening  |
| 6            | Hilltops | Boorowa-Rye Park Road            | Long Street            | 0             | 1.2         | 1.2         | Sealed           | 7.2                | 8.5                | 200                     | 7                | 1                |                     |                    | 0                  | Poor pavement condition. Needs widening and reconstruction of pavement   |
| 6            | Hilltops | Boorowa-Rye Park Road            | Long Street            | 1.2           | 1.75        | 0.55        | Sealed           | 5.7                | 8.5                | 200                     | 7                | 1                |                     |                    | 0                  | Narrow and poor pavement condition. Needs widening and reconstruction  |
| 6            | Hilltops | Boorowa-Rye Park Road            | Long Street            | 5.85          | 6.7         | 0.85        | Sealed           | 6                  | 8.5                | 200                     | 7                | 2                |                     |                    | 100                | Narrow assume upgrade is required  |
| 6            | Hilltops | Boorowa-Rye Park Road            | Long Street            | 7.2           | 11.4        | 4.2         | Sealed           | 6.0 - 6.5          | 8.5                | 200                     | 7                | 2                |                     |                    | 0                  | Narrow and poor pavement condition. Needs widening and reconstruction  |
| 6            | Hilltops | Boorowa-Rye Park Road            | Long Street            | 17.8          | 18.9        | 1.1         | Sealed           | 6.7 - 7.3          | 8.5                | 200                     | 7                | 2                |                     |                    | 0                  | Fair to poor pavement condition. Assume upgrade  |
|              |          |                                  |                        |               |             | 39.92       |                  |                    |                    |                         |                  |                  |                     |                    |                    |  |

Attachment D – Detailed Structure Upgrade Schedule

| Road Section | LGA      | Road Name             | Start Location        | Approx Chainage (km) | Easting | Northing | Description   | Trafficable Width (m) | Quantity | Unit Rate | Cost | Comments  |
|--------------|----------|-----------------------|-----------------------|----------------------|---------|----------|---|-----------------------|----------|-----------|------|---|
| 1            | ULSC     | Jerrawa Road          | Hume Highway          | 2.62                 | 691004  | 6147246  | 4 x 2100 x 1500 RCBC                                  | 6.5                   | 1        |           |      | Will require widening   |
| 1            | ULSC     | Coolalie Road         | Jerrawa Road          | 0.78                 | 690168  | 6149091  | box culvert and concrete causeway                     | 5-6m                  | 135      |           |      | Will require widening or replacement  |
| 1            | ULSC     | Coolalie Road         | Jerrawa Road          | 2                    | 688980  | 6149109  | Concrete causeway with small culvert                  | 5                     | 1        |           |      | Relocate as part of road realignmnet  |
| 1            | YVC      | Days Road             | Bushs Road            | 0.19                 | 684683  | 6150475  | Large culvert or causeway required (approx. 2.1m dia) |                       | 1        |           |      | New culvert required  |
| 2            | ULSC     | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 17.7                 | 678939  | 6163175  | 4 x 1500 x 900 box culvert                            | 8                     | 1        |           |      | 3 cell culvert requires widening  |
| 2            | ULSC     | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 19.45                | 680320  | 6162002  | 2 x 2100 x 1800 box culvert                           | 8                     | 1        |           |      | 2 cell culvert requires widening  |
| 2            | ULSC     | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 22.3                 | 682496  | 6160381  | 21 x 6 concrete causeway                              | 6                     | 84       |           |      | Barlows Creek causeway  |
| 2            | ULSC     | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 23.75                | 683391  | 6159194  | 18 x 6 concrete causeway                              | 6                     | 72       |           |      | Blakney Creek causeway  |
| 3            | Hilltops | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 4.5                  | 676316  | 6175360  | 20 x 6.1 concrete bridge                              | 6.1                   | 180      |           |      | Pudman Creek - DMR 1951   |
| 3            | Hilltops | Rye Park-Dalton Road  | Boorowa-Rye Park Road | 8.1                  | 677358  | 6172377  | 16 x 6.2 concrete causeway & 2 x 1500 x 450 culverts  | 6.2                   | 48       |           |      | Flakney Creek causeway - reasonable condition assume widening only  |
| 4            | Hilltops | Grassy Creek Road     | Boorowa-Rye Park Road | 0.3                  | 675323  | 6179458  | 3 x 3000mm dia corrugated metal pipes                 | 5.6                   | 108      |           |      | Poor condition assume replacement   |
| 4            | Hilltops | Grassy Creek Road     | Boorowa-Rye Park Road | 4.4                  | 677457  | 6182711  | 7 x 16m concrete causeway                             | 7                     | 144      |           |      | Poor condition assume replacement   |
| 6            | Hilltops | Trucking Yard Road    | Lachlan Valley Way    | 0.55                 | 657987  | 6187169  | Narrow cuseway with 450mm culvert                     | 6.1                   | 120      |           |      | Will require widening   |
| 6            | Hilltops | Boorowa-Rye Park Road | Long Street           | 8.9                  | 666284  | 6183088  | 27 x 7.5 concrete bridge                              | 7.5                   | 243      |           |      | Harry's Creek Bridge - DMR 1969. Signs of deterioration to piers and unlikely to meet current standards. Assume replacement |
| 6            | Hilltops | Boorowa-Rye Park Road | Long Street           | 15.3                 | 671613  | 6180054  | 16 x 7.6 concrete bridge                              | 7.6                   | 144      |           |      | Dirthole Creek Bridge - DMR 1934  |
|              |          |                       |                       |                      |         |          |   |                       |          |           |      |   |

## Attachment E – Detailed Intersection and Land Acquisition Schedules

### Intersection Upgrades


| Road Section | LGA      | Road Name 1           | Road Name 2                | Easting | Northing | Est. Cost |
|--------------|----------|-----------------------|----------------------------|---------|----------|-----------|
| 1            | ULSC     | Jerrawa Road          | Hume Highway               | 692082  | 6144807  |           |
| 1            | ULSC     | Jerrawa Road          | Coolalie Road              | 690886  | 6148789  |           |
| 1            | YVC      | Coolalie Road         | Bushs Road                 | 684524  | 6149185  |           |
| 1            | YVC      | Bushs Road            | Railway Crossing/Days Road | 684828  | 6150377  |           |
| 2            | ULSC     | Rye Park-Dalton Road  | Blakney Creek South Road   | 683463  | 6159178  |           |
| 6            | Hilltops | Rye Park-Dalton Road  | Boorowa-Rye Park Road      | 675192  | 6179196  |           |
| 6            | Hilltops | Boorowa-Rye Park Road | Long Street                | 659123  | 6188100  |           |
| 6            | Hilltops | Dillon Street         | Long Street                | 658939  | 6187018  |           |
| 6            | Hilltops | Trucking Yard Lane    | Lachlan Valley Way         | 657413  | 6186849  |           |
|              |          |                       |                            |         |          |           |


### Land Acquisition

| Ref. | Road Section | LGA      | Road Name            | Start Location  | Approx Chainage (km) | Easting | Northing | Lot/DP                               | Approx. Land Area (m2) | Cost/m2 | Total Cost |
|------|--------------|----------|----------------------|---|----------------------|---------|----------|--------------------------------------|------------------------|---------|------------|
| 1    | 1            | ULSC     | Coolalie Road        | Jerrawa Road  | 1.6                  | 689241  | 6148983  | Lot 239 DP 754122                    | 2900                   |         |            |
| 2    | 1            | ULSC     | Coolalie Road        | Jerrawa Road  | 2                    | 688928  | 6149111  | Lot 31 DP 754122<br>Lot 2 DP 1245971 | 10400                  |         |            |
|      | 1            | YVC      | Bushs Road           | Assume 2 x substandard bends will be accepted by Council given very low traffic volumes on road |                      |         |          |                                      |                        |         |            |
| 3    | 2            | ULSC     | Rye Park-Dalton Road | Site Access 12  | 6.9                  | 618831  | 6160702  | Lot 1 DP 838933                      | 3550                   |         |            |
| 4    | 2            | ULSC     | Rye Park-Dalton Road | Site Access 12  | 8.4                  | 682969  | 6159684  | Lot 92 DP 754102                     | 2600                   |         |            |
| 5    | 2            | ULSC     | Rye Park-Dalton Road | Site Access 12  | 8.95                 | 683267  | 6159272  | Lot 4 DP 1066057                     | 3850                   |         |            |
| 6    | 3            | Hilltops | Rye Park-Dalton Road | Boorowa-Rye Park Road   | 3.95                 | 675986  | 6175291  | Lot 60 DP 754135<br>Lot 61 DP 754135 | 26000                  |         |            |
| 7    | 4            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 0.1                  | 675249  | 6179419  | Lot 2 DP 591580                      | 2650                   |         |            |
| 8    | 4            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 2.4                  | 676120  | 6181333  | Lot 154 DP 754145                    | 3500                   |         |            |
| 9    | 4            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 4.5                  | 677479  | 6182772  | Lot N DP 439287                      | 3000                   |         |            |
| 10   | 4            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 5                    | 677710  | 6183344  | Lot D DP 440134                      | 5200                   |         |            |
| 11   | 5            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 0.65                 | 678428  | 6183728  | Lot B DP 439287                      | 3200                   |         |            |
| 12   | 1            | ULSC     | Jerrawa road         | Hume Highway  | 4.1                  | 690860  | 6148792  | Lot 63 DP 754122<br>Lot 39 754122    | 650                    |         |            |
| 13   | 1            | YVC      | Bushs Road           | Coolalie Road   | 0                    | 684566  | 6149204  | Lot 215 DP 754122                    | 5350                   |         |            |
| 14   | 1            | YVC      | Days Road            | Bushs Road  | 0                    | 684804  | 6150466  | Lot 42 DP 754122                     | 7000                   |         |            |
| 15   | 6            | Hilltops | Dillon Street        | Lachlan Valley Way  | 1.5                  | 658909  | 6187007  | Lot 14 DP 1055548                    | 1250                   |         |            |
| 16   | 6            | Hilltops | Boorowa-Rye Park Rd  | Dillon Street   | 0                    | 659149  | 6188067  | Lot 1 DP 219928                      | 530                    |         |            |
| 17   | 6            | Hilltops | Boorowa-Rye Park Rd  | Dillon Street   | 0                    | 659155  | 6188118  | Lot 63 DP 754103                     | 530                    |         |            |
| 18   | 4            | Hilltops | Grassy Creek Road    | Boorowa-Rye Park Road   | 0                    | 675173  | 6179228  | Lot 1 DP 580999                      | 3500                   |         |            |
| 19   | 3            | Hilltops | Rye Park-Dalton Road | Boorowa-Rye Park Road   | 0                    | 675179  | 6179181  | Lot 1 DP 1810                        | 190                    |         |            |
|      |              |          |                      |   |                      |         |          |                                      | <b>85850</b>           |         |            |

## Attachment F – Road Upgrade Cost Estimates

## Attachment G – ULSC Pavement Design Calculations

|  |  |   |   |
|--|--|---|---|
| <b>Genium Civil Engineering</b>  |  |  |   |
| Granular Pavement Design with Thin Bituminous Surfacing - Austroads 2012   |  |   |   |
| <b>Project Reference:</b>  | Rye Park Windfarm  | <b>Designed by:</b>   | Simon Cassidy   |
| <b>Client:</b>   | Tilt Renewables  | <b>Date:</b>  | 3/04/2020   |
| <b>Project Description:</b>  | Upper Lachlan Shire Council - Typical pavement Design<br>Rye Park Road |   |   |
| <b>DESIGN TRAFFIC CALCULATIONS</b> (Refer Austroads 2012 Section 7)  |  |   |   |
| <b>Design Parameters</b>   | <b>Austroads Ref.</b>  | <b>Symbol</b>   | <b>Value</b>  |
| <i>(Note: Enter values in green cells)</i>   |  |   |   |
| Design Period  | 7.4.2  | (P)   | 25 (Typically 20-40 years)                                |
| Annual Average Daily Traffic   | 7.4.1, 7.4.4   | (AADT)  | 122 vehicles/day  |
| Direction Factor   | 7.4.1  | (DF)  | 0.5   |
| % Heavy Vehicles   | 7.4.4  | (%HV)   | 20 %  |
| Lane Distribution Factor   | 7.4.3  | (LDF)   | 1 (Refer Table 2 in Tables Tab)                           |
| Heavy Vehicle Growth Rate  | 7.4.5  | (R)   | 0.5 %   |
| Traffic Load Distribution  | 7.5  | (TLD)   | Rural Collector (Select from drop down list)              |
| Cumulative Growth Factor   | 7.4.5 Eq. 15   | (CGF)   | 26.6  |
| Presumptive Axle Groups per Heavy Vehicle  |  | (N <sub>HVAG</sub> )  | 2.8 axle groups per heavy vehicle                         |
| <b>Design Traffic</b>  | Eq. 14   | (N <sub>DT</sub> )  | 3.31E+05 Heavy Vehicle axle Groups                        |
| <b>Presumptive Damage Index Values for the selected TLD</b>  | 7.6.2  | (ESA/HVAG)  | 0.8   |
|  |  | (ESA/HV)  | 2.2   |
| <b>Design ESA of Loading (DESA)</b>  | 7.6.3  | (DESA)  | 2.65E+05  |
| <b>PAVEMENT DESIGN</b>   |  |   |   |
| Designed in accordance with Figure 8.4 and Figure 12.2 of Austroads 2012   |  |   |   |
| <b>Design CBR</b>  | <b>Adopted Design CBR =</b>  |   | 5 %   |
|  |  |   | Design period   |
| <b>Design Traffic</b>  | <b>Calculated DESA =</b>   |   | 2.65E+05  |
|  | <b>or Enter User Defined Value</b>                                     |   | Note: Entering a value will override the calculated value |
| <b>Granular Pavement Design (Empirical Design Method)</b>  |  |   |   |
|  | <b>Total Granular Pavement Thickness =</b>                             |   | 334 mm  |
|  | <b>Minimum Base Thickness =</b>  |   | 113 mm  |
|  | <b>Remaining Pavement Thickness =</b>                                  |   | 221 mm  |
| <b>Adopted Pavement Design</b>   |  |   |   |
|  | 14/7mm two coat spray seal   |   |   |
| 150 mm   |  |   | DGB 20 Base Course (97% M.D.D)                            |
| 185 mm   |  |   | DGS 20 Subbase Course (97% M.D.D)                         |
| 0 mm   | CBR =  | N/A   | Select Fill Layer (95% M.D.D)                             |
|  | CBR =  | 5   | Subgrade (95% M.D.D)                                      |
| <b>Total depth of granular material required =</b>   |  | 334 mm  |   |
| <b>Total depth of granular material provided =</b>   |  | 335 mm  |   |
| <p>This design has been carried out in accordance with the Austroads Guide to Pavement Technology Part 2: Pavement Structural Design, 2012. The recommended pavement design/s are based on sampling and testing undertaken by others. Sampling provides a snapshot of subsurface conditions at the time of testing from a limited number of boreholes at point locations across the site. Actual site conditions may vary both spatially and with climatic variations in ground conditions and should be confirmed on site during construction. It is assumed that adequate surface and subsurface drainage will be provided to the pavement and adjacent areas.</p> |  |   |   |
| Version: 2 Created: 6/4/2017   |  |   |   |

| Genium Civil Engineering   |   |                      |  |   |
|--|---|----------------------|---|---|
| Granular Pavement Design with Thin Bituminous Surfacing - Austroads 2012   |   |                      |   |   |
| <b>Project Reference:</b>  | Rye Park Windfarm   |                      | <b>Designed by:</b>   | Simon Cassidy   |
| <b>Client:</b>   | Tilt Renewables   |                      | <b>Date:</b>  | 3/04/2020   |
| <b>Project Description:</b>  | Upper Lachlan Shire Council - Typical pavement Design<br>Jerrawa & Coolalie Roads |                      |   |   |
| <b>DESIGN TRAFFIC CALCULATIONS</b> (Refer Austroads 2012 Section 7)  |   |                      |   |   |
| <b>Design Parameters</b>   | <b>Austroads Ref.</b>   | <b>Symbol</b>        | <b>Value</b>  |   |
| <i>(Note: Enter values in green cells)</i>   |   |                      |   |   |
| Design Period  | 7.4.2   | (P)                  | 25  | (Typically 20-40 years)                                   |
| Annual Average Daily Traffic   | 7.4.1, 7.4.4  | (AADT)               | 222   | vehicles/day  |
| Direction Factor   | 7.4.1   | (DF)                 | 0.5   |   |
| % Heavy Vehicles   | 7.4.4   | (%HV)                | 18  | %   |
| Lane Distribution Factor   | 7.4.3   | (LDF)                | 1   | (Refer Table 2 in Tables Tab)                             |
| Heavy Vehicle Growth Rate  | 7.4.5   | (R)                  | 2   | %   |
| Traffic Load Distribution  | 7.5   | (TLD)                | Rural Collector   | (Select from drop down list)                              |
| Cumulative Growth Factor   | 7.4.5 Eq. 15  | (CGF)                | 32.0  |   |
| Presumptive Axle Groups per Heavy Vehicle  |   | (N <sub>HVAG</sub> ) | 2.8   | axle groups per heavy vehicle                             |
| <b>Design Traffic</b>  | Eq. 14  | (N <sub>DT</sub> )   | 6.54E+05  | Heavy Vehicle axle Groups                                 |
| <b>Presumptive Damage Index Values for the selected TLD</b>  | 7.6.2   | (ESA/HVAG)           | 0.8   |   |
|  |   | (ESA/HV)             | 2.2   |   |
| <b>Design ESA of Loading (DESA)</b>  | 7.6.3   | (DESA)               | 5.23E+05  |   |
| <b>PAVEMENT DESIGN</b>   |   |                      |   |   |
| Designed in accordance with Figure 8.4 and Figure 12.2 of Austroads 2012   |   |                      |   |   |
| <b>Design CBR</b>  | <b>Adopted Design CBR =</b>   |                      | 5   | %   |
| <b>Design Traffic</b>  | <b>Calculated DESA =</b>  |                      | 5.23E+05  |   |
|  | <b>or Enter User Defined Value</b>  |                      |   | Note: Entering a value will override the calculated value |
| <b>Granular Pavement Design (Empirical Design Method)</b>  |   |                      |   |   |
|  | <b>Total Granular Pavement Thickness =</b>  |                      | 363   | mm  |
|  | <b>Minimum Base Thickness =</b>   |                      | 123   | mm  |
|  | <b>Remaining Pavement Thickness =</b>   |                      | 240   | mm  |
| <b>Adopted Pavement Design</b>   |   |                      |   |   |
|  | 14/7mm two coat spray seal  |                      |   |   |
| 165 mm   |   |                      |   | DGB 20 Base Course (97% M.D.D)                            |
| 200 mm   |   |                      |   | DGS 20 Subbase Course (97% M.D.D)                         |
| 0 mm   |   | CBR = N/A            |   | Select Fill Layer (95% M.D.D)                             |
|  |   | CBR = 5              |   | Subgrade (95% M.D.D)                                      |
| <b>Total depth of granular material required =</b>   |   | 363 mm               |   |   |
| <b>Total depth of granular material provided =</b>   |   | 365 mm               |   |   |
| <p>This design has been carried out in accordance with the Austroads Guide to Pavement Technology Part 2: Pavement Structural Design, 2012. The recommended pavement design/s are based on sampling and testing undertaken by others. Sampling provides a snapshot of subsurface conditions at the time of testing from a limited number of boreholes at point locations across the site. Actual site conditions may vary both spatially and with climatic variations in ground conditions and should be confirmed on site during construction. It is assumed that adequate surface and subsurface drainage will be provided to the pavement and adjacent areas.</p> |   |                      |   |   |
| Version: 2 Created: 6/4/2017   |   |                      |   |   |

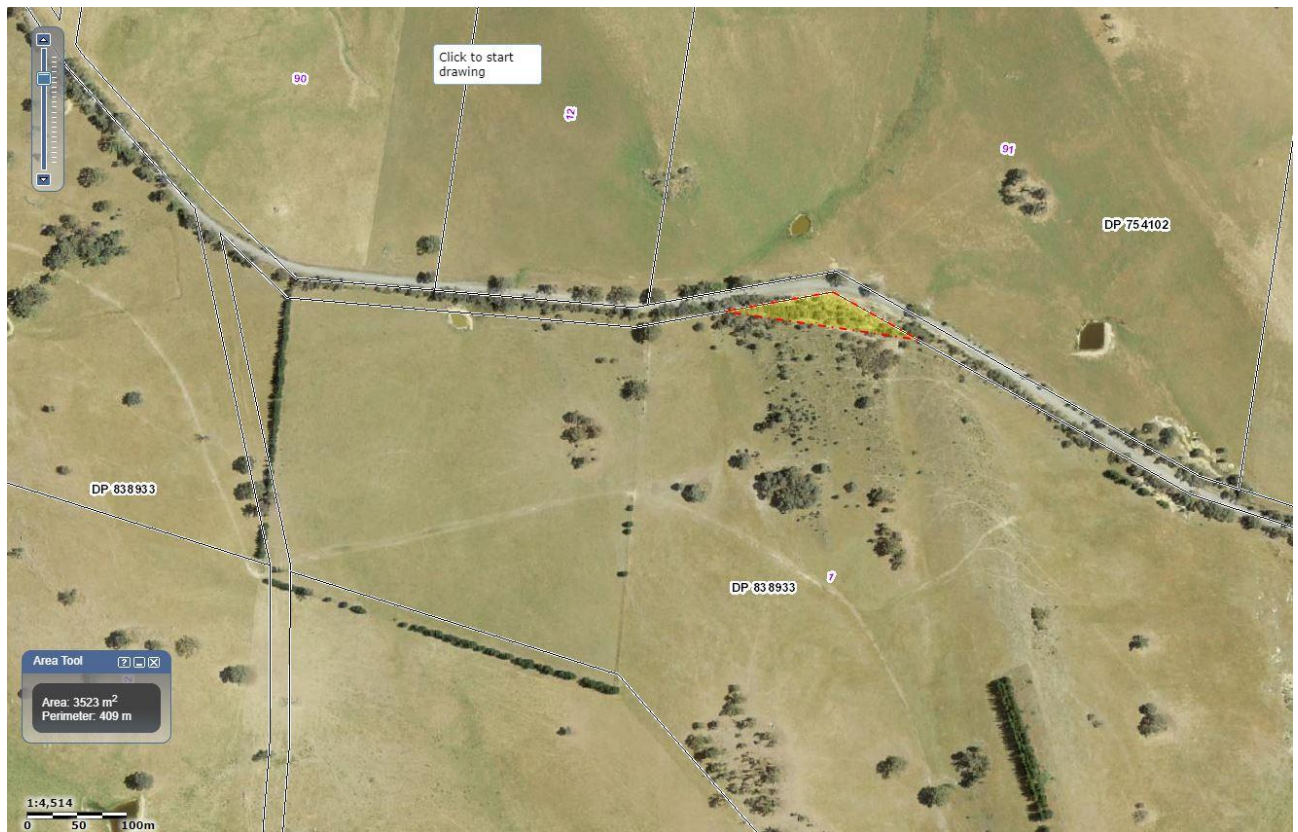
## Attachment H – Potential Land Acquisition Areas



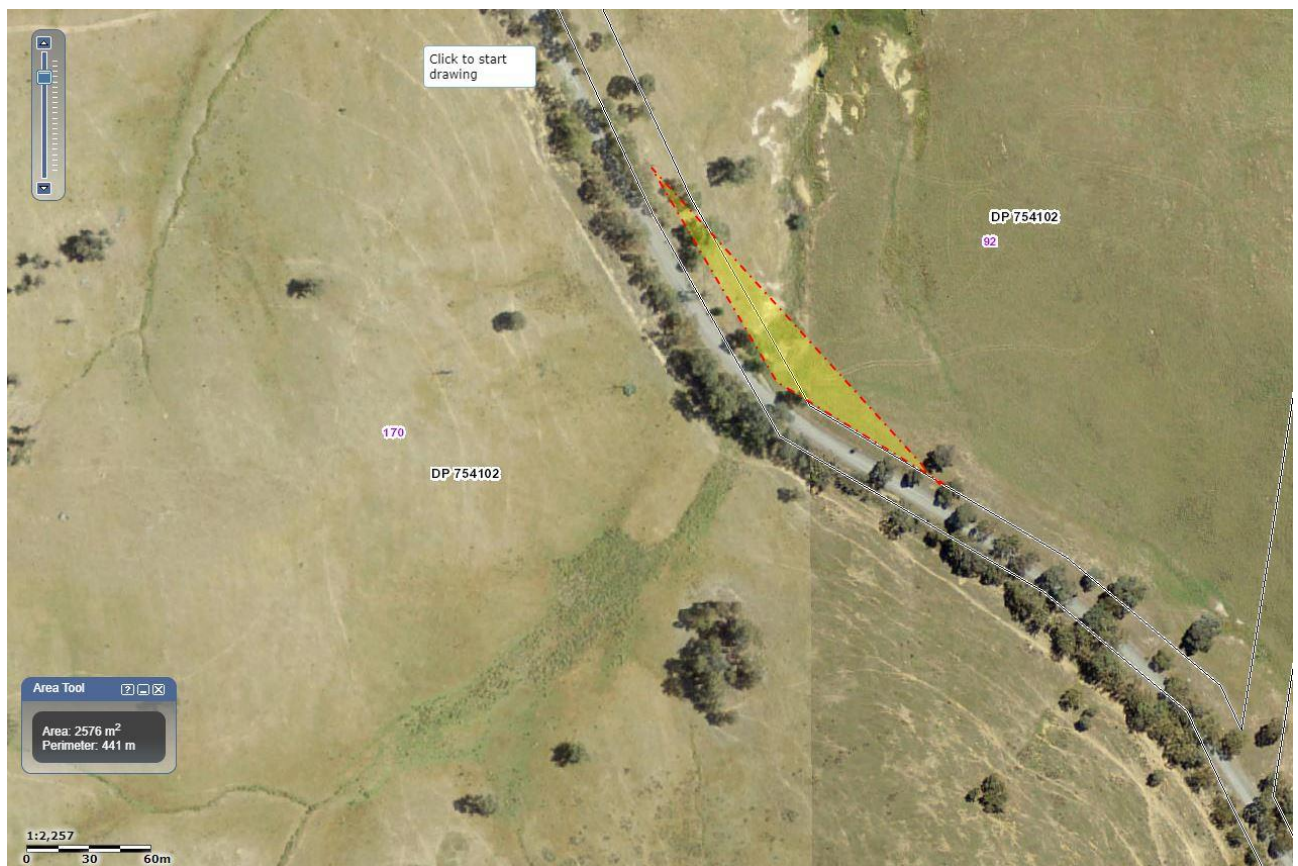
*Site 1 – Coolalie Road*



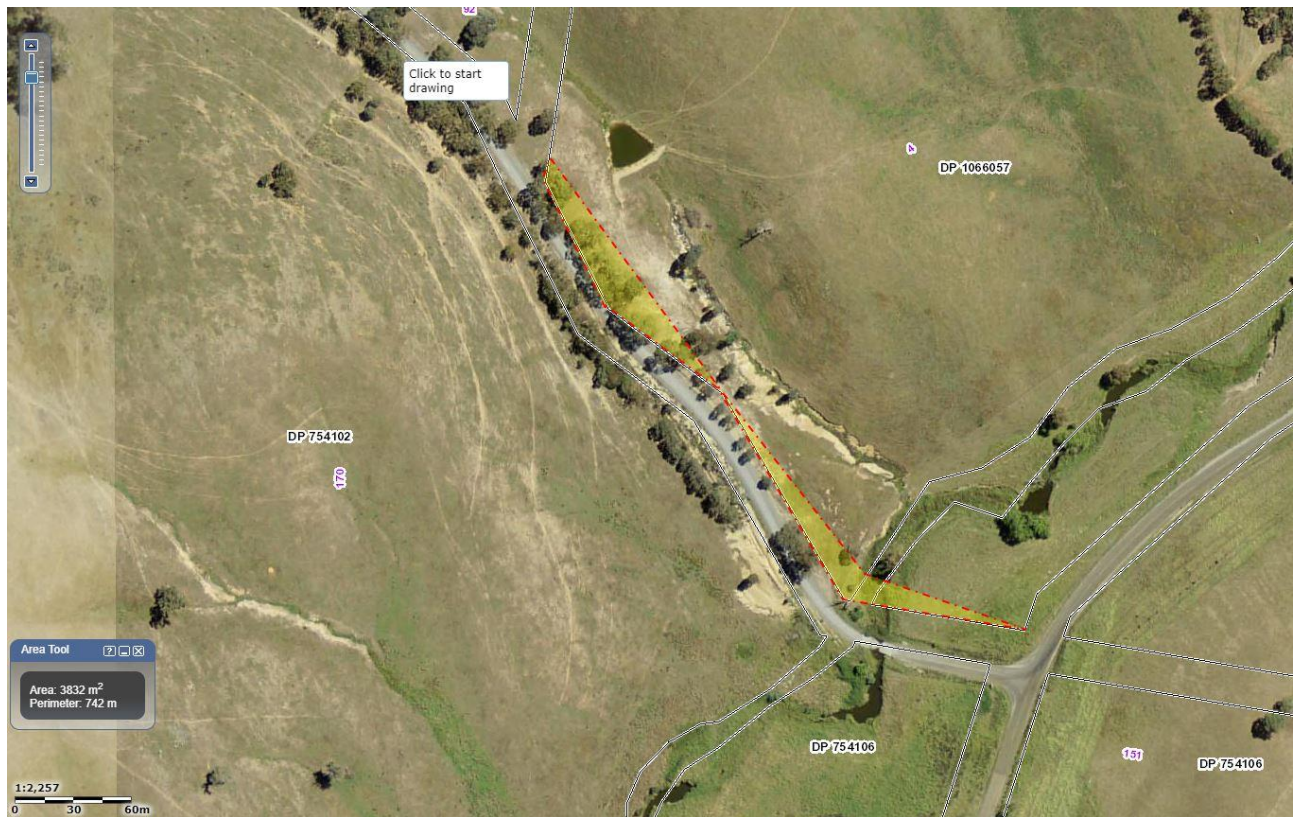
*Site 2 – Coolalie Road*



*Site 3 – Rye Park-Dalton Road*



*Site 4 – Rye Park-Dalton Road*

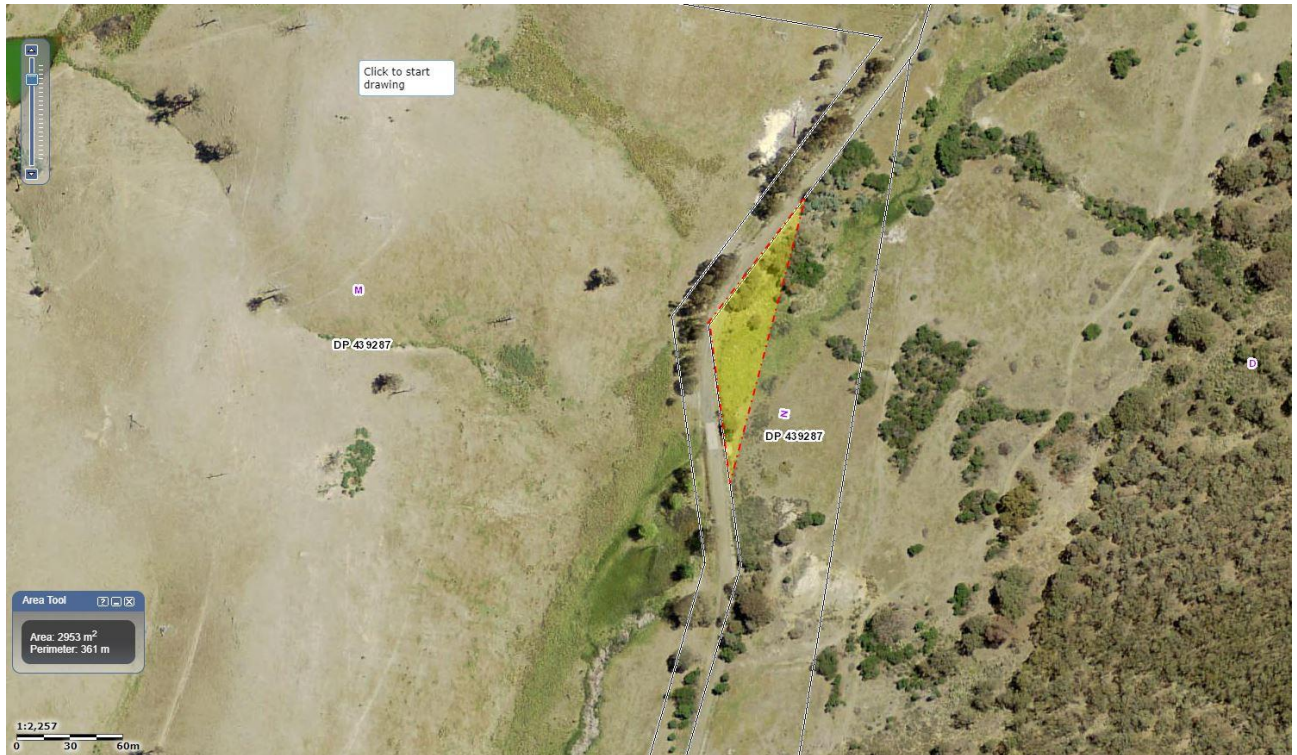


*Site 5 – Rye Park-Dalton Road*

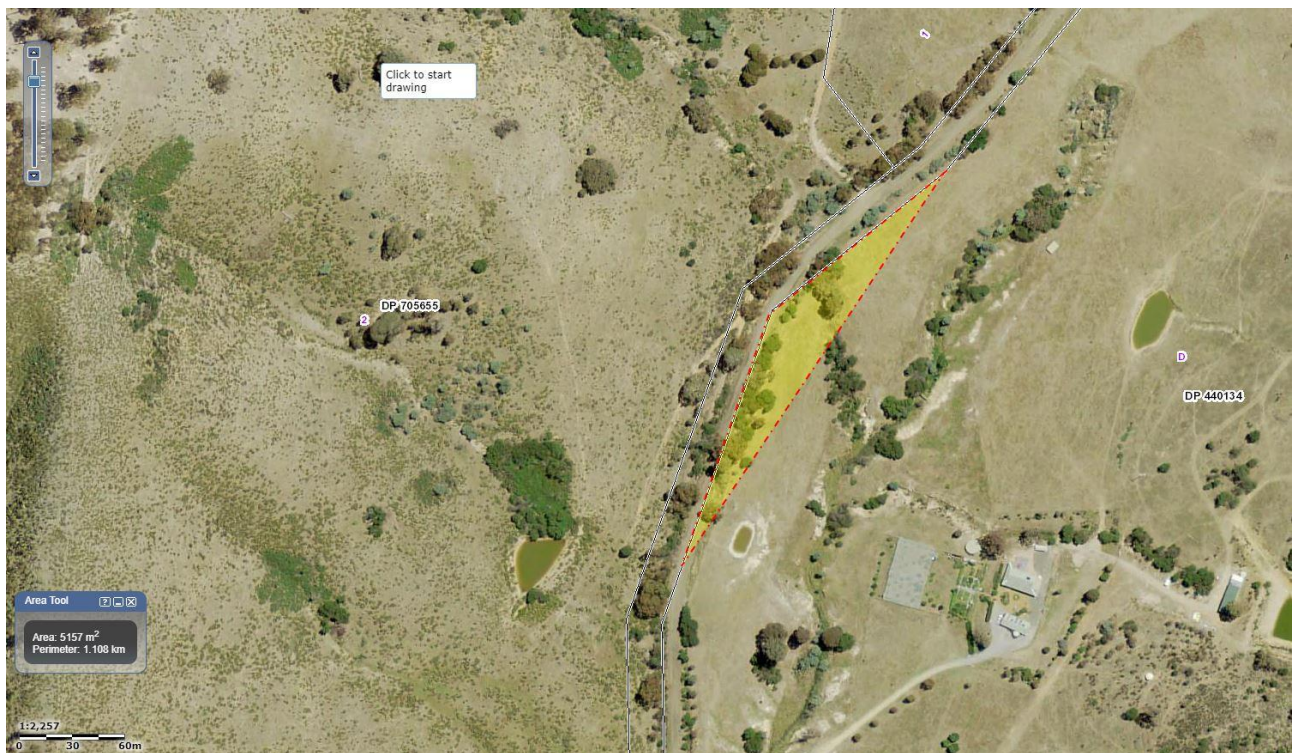


*Site 6 – Rye Park-Dalton Road*

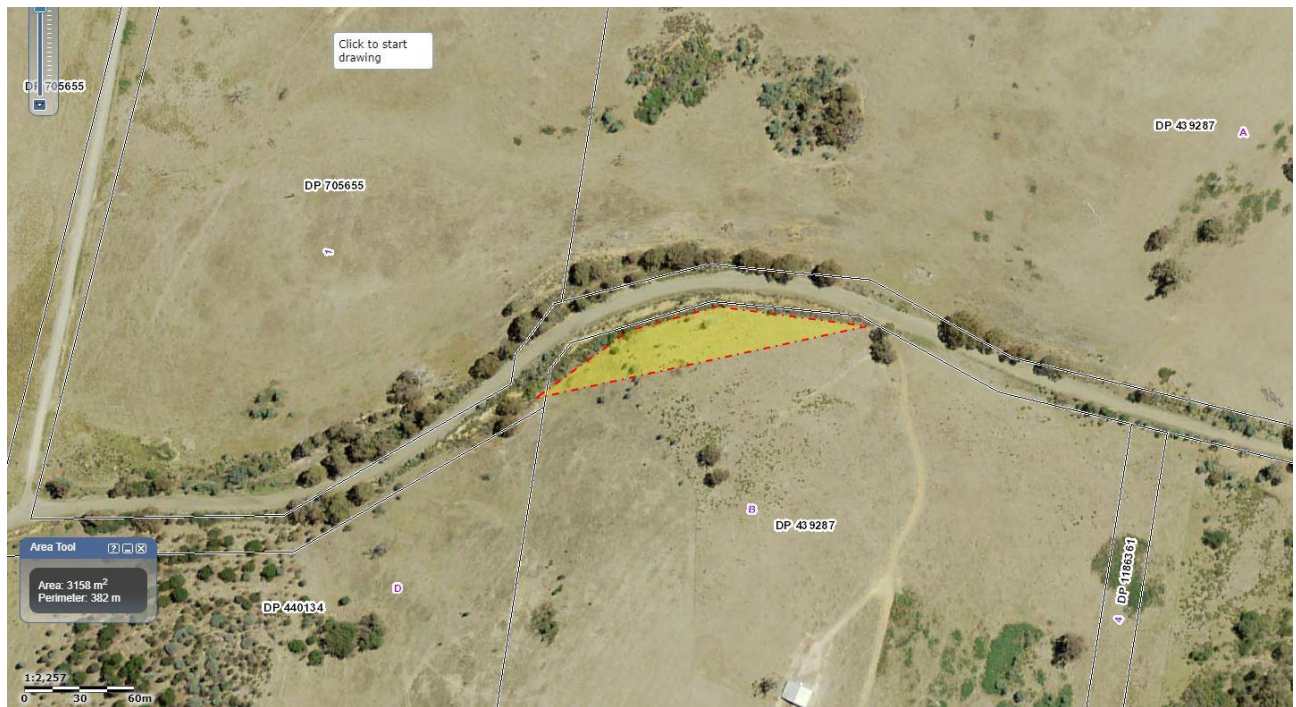
Page | 25



*Site 9 – Grassy Creek Road*



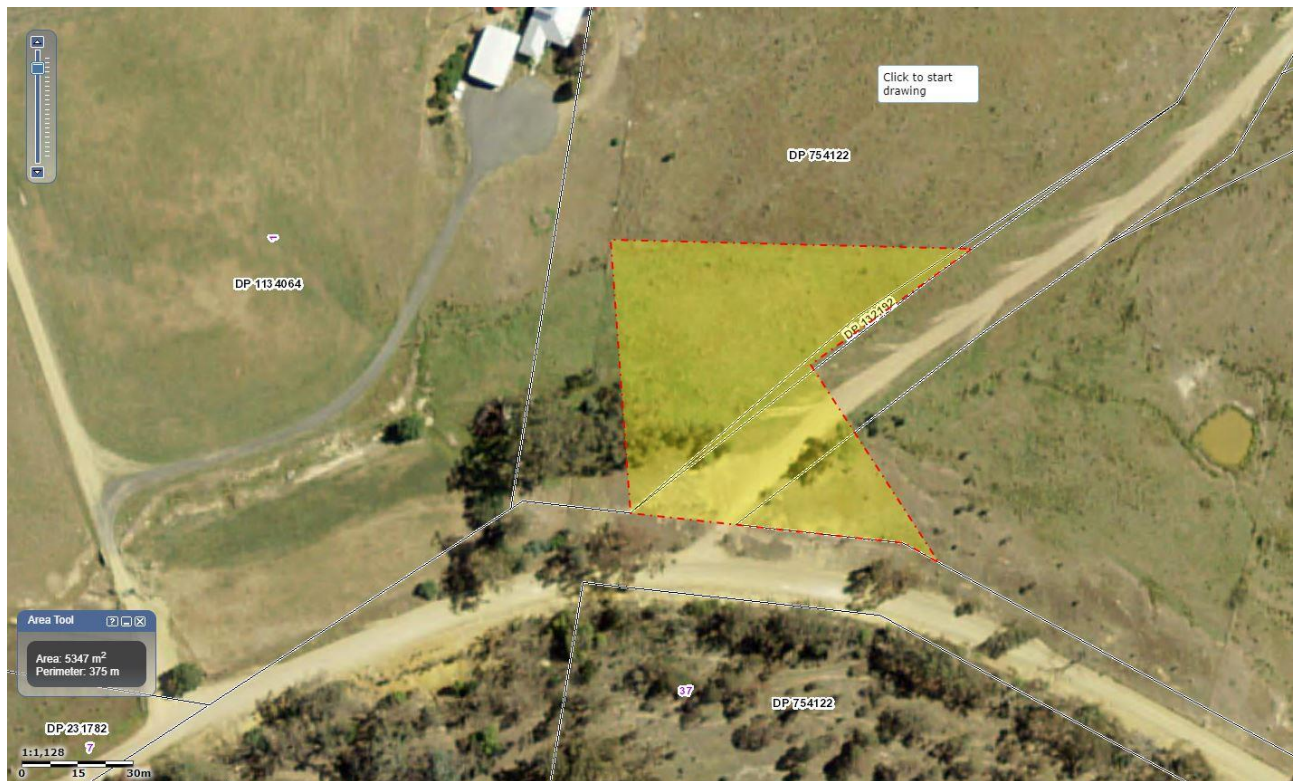
*Site 10 – Grassy Creek Road*



*Site 11 – Grassy Creek Road*



*Site 12 – Jerrawa Road/Coolalie Rd Intersection*



*Site 13 – Bushs Road/Coolalie Rd Intersection*



*Site 14 – Days Road*



*Site 15 – Long Street/Dillon Street Intersection*



*Site 16 – Dillon Street/Boorowa-Rye Park Rd Intersection*



*Site 17 – Dillon Street/Boorowa-Rye Park Rd Intersection*



*Site 18 – Boorowa-Rye Park Rd/Grassy Creek Rd Intersection*



*Site 19 – Jerrawa Road/Coolalie Rd Intersection*