

Appendix K

Visual Impact Assessment

Reavill Farm Pty Ltd
and Tucki Hills Pty Ltd

Champion Quarry,
1586 Wyrallah Road,
Tuckurimba NSW
*Landscape Visual Impact
Assessment*

November 2009

Environmental Resources Management Australia
Level 3, Yarra Tower (WTC)
18-38 Siddeley Street, DOCKLANDS VIC 3005
AUSTRALIA
Telephone +61 3 9696 8011
Facsimile +61 3 9696 8022
www.erm.com

Reavill Farm Pty Ltd
and Tucki Hills Pty Ltd

Champion Quarry,
1586 Wyrallah Road,
Tuckurimba NSW
*Landscape Visual Impact
Assessment*

November 2009

Reference: 0098287

For and on behalf of:
Environmental Resources Management Australia

Approved by: Murray Curtis



Signed:

Position: Partner

Date: 19 November 2009

This report has been prepared in accordance with the scope of services described in the contract or agreement between Environmental Resources Management Australia Pty Ltd ACN 002 773 248 (ERM) and Reavill Farm Pty Ltd and Tucki Hills Pty Ltd. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by Reavill Farm Pty Ltd and Tucki Hills Pty Ltd. Furthermore, the report has been prepared solely for use by Reavill Farm Pty Ltd and Tucki Hills Pty Ltd and ERM accepts no responsibility for its use by other parties.

CONTENTS

<i>1</i>	<i>INTRODUCTION</i>	
<i>1.1</i>	<i>METHODOLOGY</i>	<i>1</i>
<i>2</i>	<i>SITE LOCATION</i>	
<i>3</i>	<i>PROJECT DESCRIPTION</i>	
<i>4</i>	<i>PROJECT AREA AND SURROUNDS</i>	
<i>4.1</i>	<i>SURROUNDING LANDSCAPE AND TERRAIN</i>	<i>6</i>
<i>4.2</i>	<i>PROJECT AREA & IMMEDIATE SURROUNDS</i>	<i>8</i>
<i>4.2.1</i>	<i>RURAL DWELLINGS</i>	<i>9</i>
<i>4.3</i>	<i>SUMMARY OF THE PROJECT AREA AND SURROUNDS</i>	<i>10</i>
<i>5</i>	<i>VIEWSHED</i>	
<i>5.1</i>	<i>ESTABLISHING A VIEWSHED - METHODOLOGY</i>	<i>11</i>
<i>5.1.1</i>	<i>VIEWSHED CALCULATION BASED ON A HORIZONTAL FIELD OF VIEW</i>	<i>12</i>
<i>5.1.2</i>	<i>VIEWSHED CALCULATION BASED ON A VERTICAL FIELD OF VIEW</i>	<i>13</i>
<i>6</i>	<i>PRELIMINARY VISUAL ASSESSMENT</i>	
<i>6.1</i>	<i>WYRALLAH ROAD</i>	<i>17</i>
<i>6.1.1</i>	<i>VIEWPOINT 1</i>	<i>17</i>
<i>6.1.2</i>	<i>VIEWPOINT 2</i>	<i>18</i>
<i>6.1.3</i>	<i>VIEWPOINT 3</i>	<i>20</i>
<i>6.1.4</i>	<i>VIEWPOINT 4</i>	<i>22</i>
<i>6.1.5</i>	<i>VIEWPOINT 5</i>	<i>23</i>
<i>6.1.6</i>	<i>SUMMARY OF VIEWS FROM WYRALLAH ROAD</i>	<i>24</i>
<i>6.2</i>	<i>VIEWS FROM NEARBY RURAL DWELLINGS</i>	<i>24</i>
<i>6.2.1</i>	<i>VIEWPOINT 6</i>	<i>25</i>
<i>6.2.2</i>	<i>VIEWPOINT 7</i>	<i>33</i>
<i>6.2.3</i>	<i>VIEWPOINT 8</i>	<i>35</i>
<i>6.2.4</i>	<i>VIEWPOINT 9</i>	<i>37</i>
<i>6.3</i>	<i>SUMMARY OF THE LIKELY RANGE OF LANDSCAPE AND VISUAL IMPACT</i>	<i>38</i>
<i>7</i>	<i>PROPOSED BUNDS AND TREE PLANTING</i>	
<i>7.1</i>	<i>EXISTING KOALA TREE PLANTING BY PROPONENT</i>	<i>42</i>
<i>8</i>	<i>CONCLUSION</i>	

CONTENTS

ANNEX A PARAMETERS OF HUMAN VISION

LIST OF FIGURES

<i>FIGURE 2.1</i>	<i>SITE LOCALITY PLAN</i>	<i>3</i>
<i>FIGURE 3.1</i>	<i>PROJECT SITE AND PROJECT AREA</i>	<i>4</i>
<i>FIGURE 3.2</i>	<i>PROPOSED QUARRY EXPANSION SECTIONS</i>	<i>5</i>
<i>FIGURE 4.1</i>	<i>PROJECT AREA AND SURROUNDS</i>	<i>6</i>
<i>FIGURE 4.2</i>	<i>PROJECT AREA AND SURROUNDS TERRAIN</i>	<i>7</i>
<i>FIGURE 4.3</i>	<i>VIEW FROM WYRALLAH ROAD LOOKING EAST OVER FLAT FARMLAND</i>	<i>7</i>
<i>FIGURE 4.4</i>	<i>SITE EXISTING CONDITIONS</i>	<i>8</i>
<i>FIGURE 4.5</i>	<i>EXISTING QUARRY</i>	<i>10</i>
<i>FIGURE 5.1</i>	<i>THE EFFECT OF DISTANCE ON THE VISIBILITY OF A WIDE OBJECT</i>	<i>13</i>
<i>FIGURE 5.2</i>	<i>INDICATIVE SECTION THROUGH MAIN QUARRY PIT (PREPARED BY VGT)</i>	<i>14</i>
<i>FIGURE 6.1</i>	<i>VIEWPOINT LOCATIONS</i>	<i>16</i>
<i>FIGURE 6.2</i>	<i>VIEWPOINT 1 – INTERSECTION WITH MATHESON LANE & WYRALLAH ROAD</i>	<i>18</i>
<i>FIGURE 6.3</i>	<i>VIEWPOINT 2-VEHICLE TURNOUT APPROXIMATELY 1.2KM NORTH OF PROJECT AREA</i>	<i>19</i>
<i>FIGURE 6.4</i>	<i>VIEWPOINT 3</i>	<i>20</i>
<i>FIGURE 6.5</i>	<i>VIEW LOOKING NORTH ALONG WYRALLAH ROAD</i>	<i>21</i>
<i>FIGURE 6.6</i>	<i>VIEW LOOKING SOUTH ALONG WYRALLAH ROAD</i>	<i>21</i>
<i>FIGURE 6.7</i>	<i>CURRENT VIEW LOOKING SOUTH FROM ALONG WYRALLAH ROAD</i>	<i>22</i>
<i>FIGURE 6.8</i>	<i>VIEWPOINT 4</i>	<i>23</i>

FIGURE 6.9	VIEWPOINT 5 - FROM WYRALLAH ROAD, SOUTH OF THE PROJECT AREA	24
FIGURE 6.10	NEARBY RURAL DWELLINGS	25
FIGURE 6.11	VIEW TOWARDS EXISTING RURAL DWELLING LOOKING NORTH EAST	26
FIGURE 6.12	AERIAL PHOTOGRAPH OF RURAL DWELLING ON WYRALLAH ROAD (RECEIVER 1)	27
FIGURE 6.13	LIKELY RANGE OF HORIZONTAL FIELDS OF VIEW FROM REAR OF RECEIVER 1	28
FIGURE 6.14	RECEIVER 1 - LIKELY RANGE OF HORIZONTAL VIEWS TO THE PROJECT AREA	29
FIGURE 6.15	NEWLY PLANTED VEGETATION SCREENING ALONG HAUL ROAD (ACACIA ELATA)	30
FIGURE 6.16	VIEWPOINT 6	31
FIGURE 6.17	VIEW SOUTH TOWARD PROJECT AREA SHOWING NEWLY CONSTRUCTED BUNDS.	31
FIGURE 6.18	RURAL PROPERTY ADJACENT TO NORTH EASTERN BOUNDARY	33
FIGURE 6.19	VIEWPOINT 7 - FROM RURAL DWELLING (RECEIVER 2) ON EASTERN BOUNDARY	34
FIGURE 6.20	VIEWPOINT 7 – VIEW TO THE NORTH WEST ON EASTERN BOUNDARY	34
FIGURE 6.21	RESIDENTIAL PROPERTY IN SOUTH EAST CORNER OF THE PROJECT SITE	35
FIGURE 6.22	VIEWPOINT 8 – ADJACENT RURAL DWELLING ON SOUTH EAST BOUNDARY	36
FIGURE 6.23	VIEWPOINT 9	37
FIGURE 7.1	PROPOSED TREE PLANTING	40
FIGURE 7.2	EXISTING QUARRY WITH GRASSED BUND IN FOREGROUND	41
FIGURE 7.3	INDICATIVE SECTION THROUGH 20M STRIP OF KOALA TREE PLANTING	41
FIGURE 7.4	INDICATIVE SECTION THROUGH 10M STRIP OF TREE PLANTING	42
FIGURE 7.5	EXISTING KOALA TREE PLANTING AND KOALA SITING ON HAZELMOUNT LANE	43

LIST OF TABLES

<i>TABLE 5.1</i>	<i>VISUAL IMPACT BASED ON THE HORIZONTAL FIELD OF VIEW</i>	<i>13</i>
<i>TABLE 5.2</i>	<i>VISUAL IMPACT BASED ON THE VERTICAL FIELD OF VIEW TO A 10M AND 25M HIGH QUARRY FACE</i>	<i>15</i>
<i>TABLE 6.1</i>	<i>SUMMARY RANGE OF VISUAL IMPACT</i>	<i>38</i>

INTRODUCTION

Reavill Farm Pty Ltd and Tucki Hills Pty Ltd seeks to expand an existing sandstone quarry (Champions Quarry) located at 1586 Wyrallah Road, Tuckurimba, New South Wales.

This report provides a description of the likely range of landscape and visual impacts of the proposed quarry and subsequent rehabilitation works.

1.1

METHODOLOGY

The objectives of this report are to:

- describe the project;
- locate the subject *Project Area*;
- describe the proposed quarry works;
- describe the surrounding landscape and the *Project Area*;
- identify a view shed;
- locate key viewpoints within the viewshed based on an understanding of the existing *Project Area* conditions;
- describe the existing and proposed bund construction and tree planting which assists to mitigate the visual impact of the proposed quarry works; and
- assess the overall visual impact.

Champions Quarry is located at 1586 Wyrallah Road, Tuckuribma, approximately 16km south of Lismore. Wyrallah Road is a primary road managed by the NSW Roads and Traffic Authority (RTA) leading to Lismore and runs generally in a north south direction along the *Project Site's* western and southern boundaries. This road connects with the Pacific Highway in the south and the Bruxner Highway in the north and is a designated heavy vehicle route. The *Project Site and operational Project Area* location is shown on *Figure 2.1* .

The landscape between Lismore and the *Project Area* comprises areas of undulating, predominantly cleared farmland. Large patches of farmland are located in the lower lying valleys between ridgeline formations.

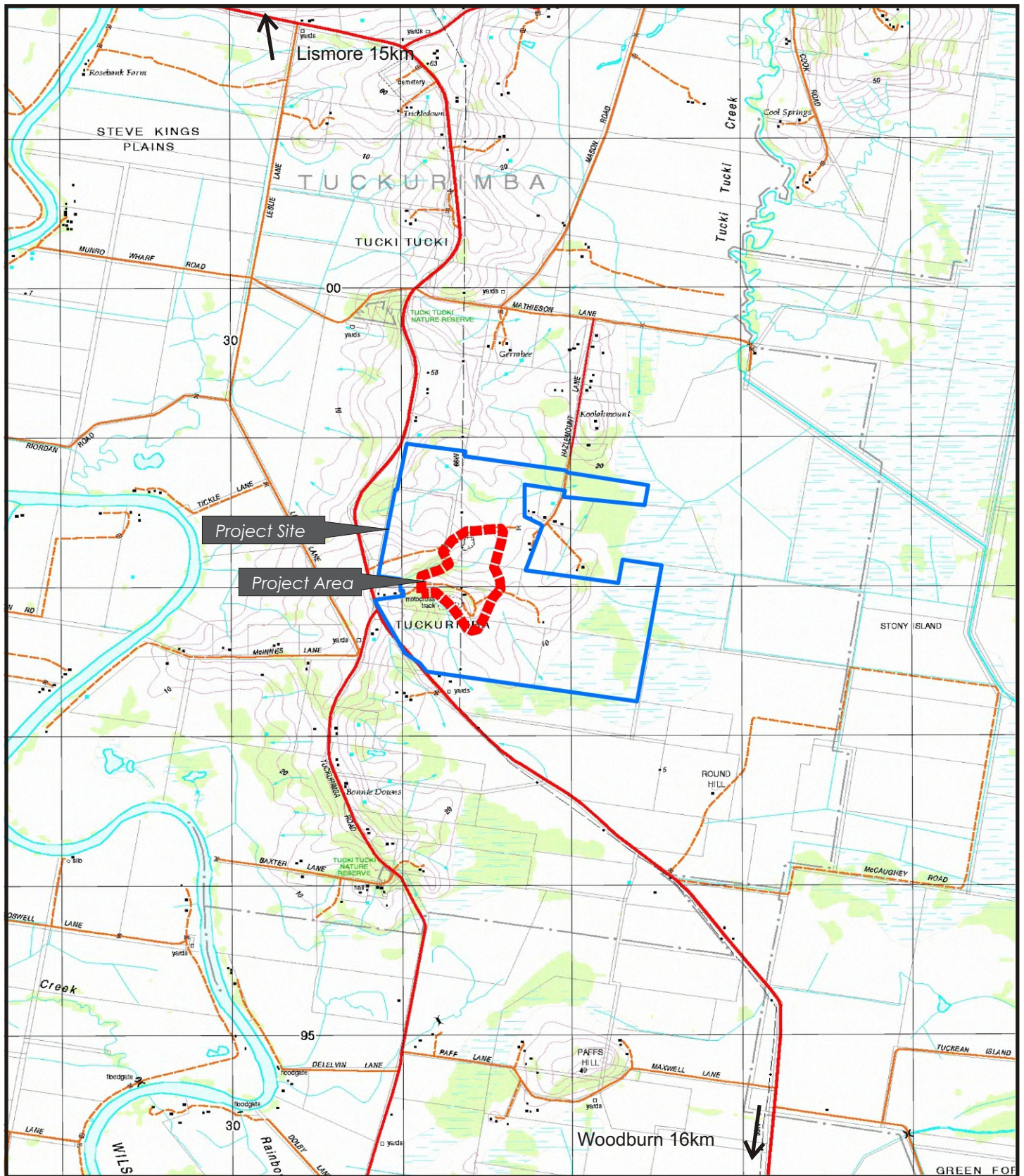


Figure 2.1

Project Locality Plan

Client:	Champions Quarry		
Project:	Champions Quarry Expansion		
Drawing No:	0098287pm_01		
Date:	12/08/09	Drawing size:	A4
Drawn by:	AM	Reviewed by:	WW
Source:	Department of Lands		
Scale:	Refer to Scale Bar		



Environmental Resources Management Australia Pty Ltd
 PO Box 5711 3/146 Gordon Street
 Port Macquarie NSW 2444
 Telephone +61 2 6584 7155



This section describes the proposed quarry expansion and associated works.

The proposal seeks to extend the existing quarry operations which is located towards the north of the *Project Area*. The extent of the proposed quarry expansion is shown in *Figure 3.1* by the dashed yellow line (*Project Area*). The proponent's property boundary is shown as the dashed red line (*Project Site*). For the purposes of this report, the extent of quarry works will be referred to as the *Project Area*.



Figure 3.1 Project Site and Project Area

The *Project Area* may be subject to minor adjustments on site in accordance with final survey.

Figure 3.2 shows the proposed *Project Area*. This is divided into the *Central Section*, which includes the existing quarry area, the *Southern Section* and the Water Management Area. The *Central Section* is to be established as a materials processing area. Rehabilitation works will be progressively undertaken on completed cells throughout the operational life of the quarry. There will be a maximum three by 3ha cells operational at the *Project Area* at any one time. In the *Southern Section* the extraction cells will be commenced at the western end and progressively moved along towards the east. The process of commencing new cells and rehabilitating completed cells will occur in a rolling fashion to minimise the extent of exposed rock and hence reduce the potential visual impact.



Figure 3.2 Proposed Quarry Expansion Sections

The main visual components associated with the quarry include the:

- quarry extraction areas;
- plant and equipment;
- stockpile areas;
- machinery sheds;
- water management areas; and
- office and staff amenities buildings;

This section will describe the *Project Area* and the surrounding area in order to identify the view shed for the visual impact assessment of the proposed development.

4.1***SURROUNDING LANDSCAPE AND TERRAIN***

Figure 4.1 shows the *Project Area* location and immediate surrounds. The *Project Area* is an irregular shaped parcel of rural land located east of Wyrallah Road. The extent of proposed quarry works is shown in a dashed yellow line.



Figure 4.1 Project Area and Surrounds

Figure 4.2 (Google Earth image) shows the terrain of the *Project Area* and the surrounding area looking in a southerly direction. The terrain is dominated by a ridgeline which runs generally in a north south direction to the west of the *Project Area*.

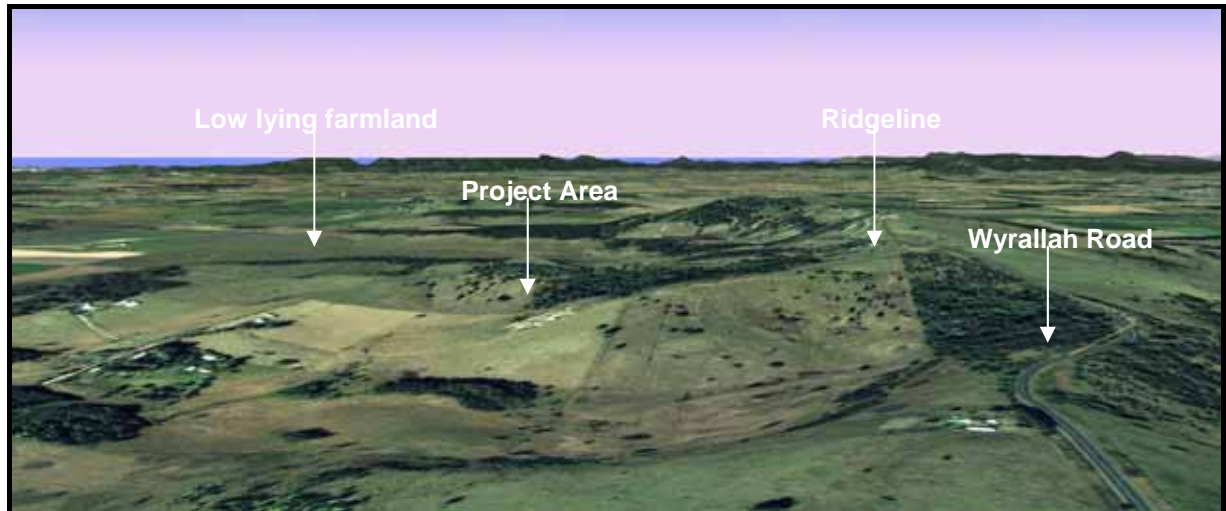


Figure 4.2 *Project Area and Surrounds Terrain*

The low lying valleys to the east and west of the ridgeline are characterised by flat, cleared farm land.

Figure 4.3 shows a view looking in easterly direction from Wyrallah Road south of the *Project Area* looking across the flat, predominantly cleared farmland located in the lower lying valleys.



Figure 4.3 *View from Wyrallah Road Looking East Over Flat Farmland*

Figure 4.3 also shows that areas of larger vegetation exist on steep topography or along property boundaries, road reserves and water courses.

Figure 4.4 which shows the existing conditions on the *Project Area* and immediate surrounds. Distance bands have been overlayed at 0.5km and 0.8km from the extent of the proposed quarry expansion area corresponding with the relevant Lismore City Council Development Control Plan (DCP) buffer zones.



Figure 4.4 Site Existing Conditions

Figure 4.4 also shows the existing nearby residential dwellings.

The contour lines in Figure 4.4 show the undulating nature of the existing *Project Area*. A short ridgeline punctuates the middle of the western boundary and runs in an east-west direction. There are areas of flatter, lower lying land located adjacent to the eastern and southern *Project Area* boundaries within the proponent's property.

The existing access to the *Project Area* is via a newly constructed sealed intersection with Wyrallah Road then a gravel haulage road down to the existing quarry area. The access road is to be fully sealed along its length as part of the proposed development. A new sealed haul road linking to the

proposed Southern section will also be constructed off the existing haul road immediately to the west of the Central section.

4.2.1 Rural Dwellings

Figure 4.4 shows that there are seven rural dwellings within approximately 800m of the proposed development boundary one of which is owned by the proponent.

For consistency these receivers have been labelled accordingly in *Figure 4.4*, other technical reports identify some of these dwellings as 'receivers'.

- *Receiver 1* is a rural dwelling located on Wyrallah Road, just over 800m north of the existing quarry.
- *Receiver 2* is a rural dwelling located on Hazelmount Lane, approximately 380m to the north east of the existing quarry.
- *Receiver 3* is a rural dwelling located off Hazelmount Lane approximately 630m east of the existing quarry.
- *Receiver 4* is located on Wyrallah Road, approximately 450m south west of the existing quarry.

Another dwelling located approximately 1.4km to the south west of the existing quarry does have view of the very top of the ridge line of the proposed Southern section. It is noted that while this dwelling would see the lowering of the top of the ridgeline over time it will not have views into the quarry pits. As such it has not been considered a direct receiver.

As previously discussed one of the rural dwellings that is located within 0.8km and to the east of the *Project Area* belongs to the proponent. Impacts to this dwelling are therefore not required to be assessed.

Figure 4.5 shows a photograph of the existing quarry taken from nearby to the proponents dwelling looking in a westerly direction.



Figure 4.5 *Existing Quarry*

Figure 4.5 also shows the ridgeline formation described above as well as some sections of the lower lying land in the foreground.

4.3 *SUMMARY OF THE PROJECT AREA AND SURROUNDS*

The following key points can be derived from the preceding description of the *Project Area* and surrounds:

- the *Project Area* is located in a predominantly rural area;
- Lismore is a regional city and is located approximately 16km north of the *Project Area*;
- Wyrallah Road is the main road (designated heavy vehicle traffic route under the control of the NSW RTA) in the area and is located on a local ridgeline, west and south of the *Project Area*;
- the *Project Area* is located on the eastern side of a ridgeline which is surrounded by low lying valleys containing predominantly cleared farmland;
- the same ridgeline on which Wyrallah Road is located restricts views from areas to the west of this ridgeline towards the *Project Area*; and
- There are only a two dwellings (*Receiver 3* and the dwelling on the corner of Tuckurimba Road and Wyrallah Road), that are located within 800m of the proposed quarry expansion *Project Area*, that will have views to the operational quarry *Project Area*.

The extent that a development can be perceived clearly within an environment is defined as the viewshed. This is largely dependant upon the size of the development. It is obvious that a small development will visually recede to an insignificant component in a landscape at a lesser distance than a larger development.

The extent that a quarry can visually impact on nearby viewpoints and localities depends upon:

- The visual contrast between the freshly quarried sandstone and the vegetation and grazing lands surrounding the site.
- The scale of the development. Obviously the less an exposed quarry face or earthmoving operations are visible, the less the extent of visual impact.
- The availability of views to quarry operational area, afforded by topographical variation or intervening vegetation.
- The existing landscape character or change in the landscape including man-made modifications. This will influence the ability of the surrounding landscape to absorb change. It will be partly dependent upon the degree that the existing landscape presents as either a homogenous character or one that appears pristine or unchanged by human development.

The overall visual impact of the quarry in relation to colour contrasts between the quarry (i.e. yellows to light greys) and the surrounding pasture land and vegetation will depend upon the surrounding agricultural activity and seasonal change. For example if adjoining paddocks are ploughed the operational quarry areas will be less discernible. This will also be the case where surrounding pastures are brown or dry. However if the paddocks are lush, the operational quarry area will be in higher contrast and therefore more noticeable. Other mitigation measures such as visual screening and rehabilitation of the completed quarry areas and bunds will assist to reduce the impact of colour contrast.

The following sections define the viewshed that may be affected by the proposed quarry.

5.1

ESTABLISHING A VIEWSHED - METHODOLOGY

One method of determining the viewshed of a development is by reference to the degree of influence on a person's field of vision at varying distances from the development. The impact of a development is based on the extent to which the development could intrude into the central field of vision (both horizontally and vertically).

These calculations are based upon the parameters of human vision that are outlined in *Annex A – Parameters of Human Vision*. Readers not familiar with these concepts are urged to read this annexure before proceeding.

5.1.1 Viewshed Calculation Based on a Horizontal Field of View

The quarry operational areas are divided into the Central section, which also includes the existing quarry area, the Southern section and the Water Management Area. Works will be undertaken in up to three progressive 3ha extractive cells within the two quarry sections.

Table 5.1 presents the analysis of the degree to which a quarry face would impact on a typical horizontal field of view if the full quarry face was visible. The analysis has based this assessment on a visible quarry face of a nominal 215m width (based on 3ha quarrying area), which is indicative of the likely maximum quarry face to be visible at any time from nearby receivers. It is noted that for the only two receivers (*Receivers 1* and *3*) that have existing views to the *Project Area* the extent of exposed area used in the analysis is considered conservative. This is due to the viewshed from these two locations towards the existing and proposed operation quarry areas being partially obscured by topography, which will be further enhanced by the proposed vegetation screening to be established within the *Project Site*.

This visual screening and staging of quarrying activities, as discussed further in *Sections 6.2.1 and 6.2.3*, will significantly eliminate views to the operational quarrying areas from *Receiver 1* and *Receiver 3*. It is also noted that current bunding along the northern boundary of the existing quarry in the *Central Section* effectively screens the quarry and operations from *Receiver 1*.

Table 5.1 **Visual Impact based on the Horizontal Field of View**

Horizontal Field of View	Distance from an observer of a 215m quarry face	Impact
<2.5° of view	>5km	<p>Insignificant</p> <p>A 215m wide quarry face would take up less than 5% of the central field of view. The quarry face, unless particularly conspicuous against the background, will not intrude significantly into the view. The extent of the vertical angle will also affect the ability to perceive the quarry face.</p>
2.5° – 30° of view	0.3km – 5km	<p>Potentially noticeable</p> <p>A 215m wide quarry face may be noticeable and its degree of visual intrusion will depend greatly on its ability to blend in with its surroundings.</p>
>30° of view	<0.3km	<p>Potentially visually dominant</p> <p>At this distance a 215m wide quarry face will fill more than 30 percent of the central field of vision and will always be noticed and only sympathetic treatments, such as creative blasting to blend and alter the face so that it appears 'natural', will be able to partially mitigate visual impact.</p>

These calculations suggest that the impact of a 215m wide quarry face reduces to insignificance at 5km, as the face would, at this distance, form less than 5% or 2.5° of the horizontal field of view.

5.1.2 Viewshed Calculation Based on a Vertical Field of View

This calculation is based on the visual impact of a 215m wide face being fully visible. That is, there is sufficient depth of quarry face visible to register the width of the face. The sketch in

Figure 5.1 shows how the viewshed of a long horizontal object such as a quarry face is sometimes determined by its height.

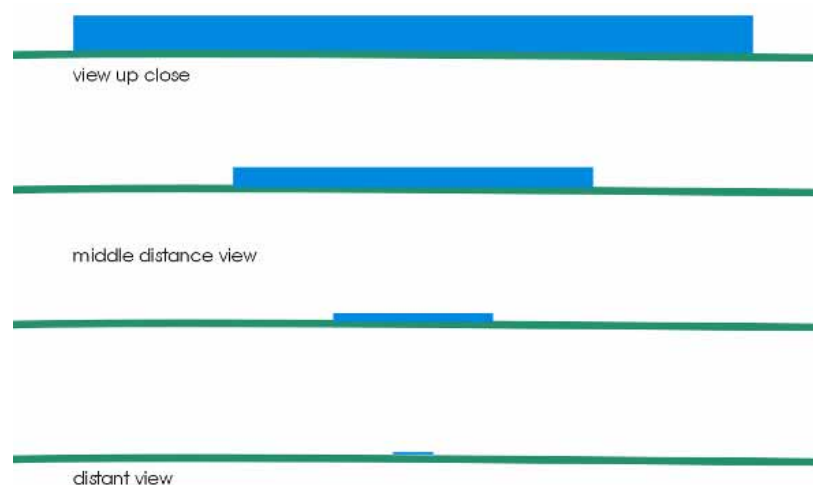


Figure 5.1 The Effect of Distance on the Visibility of a Wide Object

This effect can also be demonstrated by the example of a farm fence that may be many kilometres in length, yet as one moves further away it becomes less apparent, until at some distance it is not possible to separate this element from the horizontal plane of the landscape. Therefore, the viewshed of a long horizontal object is often determined, not by its length, but rather by its height.

A more useful calculation is the visible vertical height of the quarry face. Figure 5.2 shows an indicative section through the proposed quarry extraction area. This figure shows a potential maximum quarry face of approximately 38m. This calculation is the difference in level between the upper extraction area (RL 46 m) and the proposed quarry floor (RL 8m). This actual visible face however will be determined by the height of the proposed quarry side walls, which at the lowest point is anticipated to be approximately RL 16m.

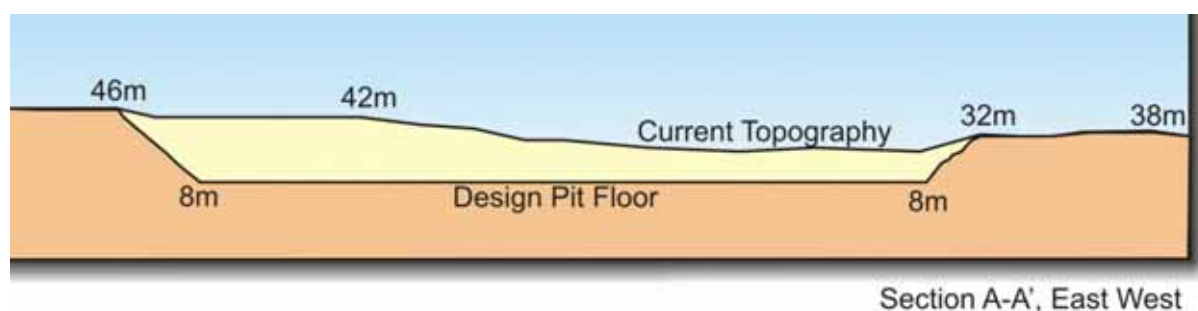


Figure 5.2 Indicative section through main quarry pit (prepared by VGT)

Therefore actual visible face on which to base the vertical field of view would be approximately 30 m.

Table 5.2 shows the relationship between impact and the proportion that an exposed 10 m and 30 m high quarry face will occupy within the vertical field of view, which in the table below is assumed to be 10° . Objects that take up 5% of this cone of view ($5\% \text{ of } 10^\circ = 0.5^\circ$) are considered visually insignificant. Once objects take up at least 10% of the vertical field of view they can be more readily discernible ($10\% \text{ of } 10^\circ = 1^\circ$) and when they take up 65% of the vertical field of view they will always dominate the view.

Table 5.2 Visual Impact Based on the Vertical Field of View to a 10m and 25m High Quarry Face

Vertical Line of Sight	Distance from an observer to a:		Impact
	➤	10m high quarry face	
	➤	30m high quarry face (in brackets)	
< 0.5° of vertical angle	➤	1.2km	Insignificant A thin line in the landscape.
	➤	(3km)	

Vertical Line of Sight	Distance from an observer to a:		Impact
	➤	10m high quarry face ➤ 30m high quarry face (in brackets)	
0.5° – 1° of vertical angle	➤	0.6km – 1.2km	Discernible May be noticeable, however will not form a large component of the view
	➤	(1.5km – 3km)	
1° – 2.5° of vertical angle	➤	0.3km – 0.6km	Noticeable The degree of visual intrusion will depend on the development's ability to blend in with the surroundings.
	➤	(0.6km – 1.5km)	
> 2.5° of vertical angle	➤	< 0.3km	Visually dominant Usually visible, however the degree of visual intrusion will depend of the width of the object, its placement within the landscape and visual screening measures (i.e. bunds and vegetation).
	➤	(<0.6km)	

These calculations show that at 1.2km the visual impact of a 10m high quarry face reduces such that it is an insignificant element in the landscape. If a 30m high quarry face is visible, it is potentially noticeable out to 3km.

The following sections of this report will look at locations within approximately 1.5km of the proposed quarry. Given the undulating topography of the area, it is also necessary to assess the visibility of the *Project Area* from a range of locations along Wyrallah Road.

It is recognised that viewpoints located out between 3km and 5km that in a worst-case scenario (i.e. 215m width x 30 m high visible quarry face) would be impacted by this development. However, this is not expected to occur as the highest quarry face would be facing in a northerly direction away from any potential line of *Project Area* of lower lying land and view points to the south and south east of the *Project Area*.

This section describes the likely range of visual impacts of the proposed quarry based on the preceding analysis of the *Project Area*, surrounds, topography, vegetation and proposed quarry works.

Photographs have been taken from publicly accessible locations from the surrounding road networks associated with the proposed quarry expansions and from within the proponent's property boundaries to assist in assessing the likely range of visual impact. These viewpoints are shown *Figure 6.1*.

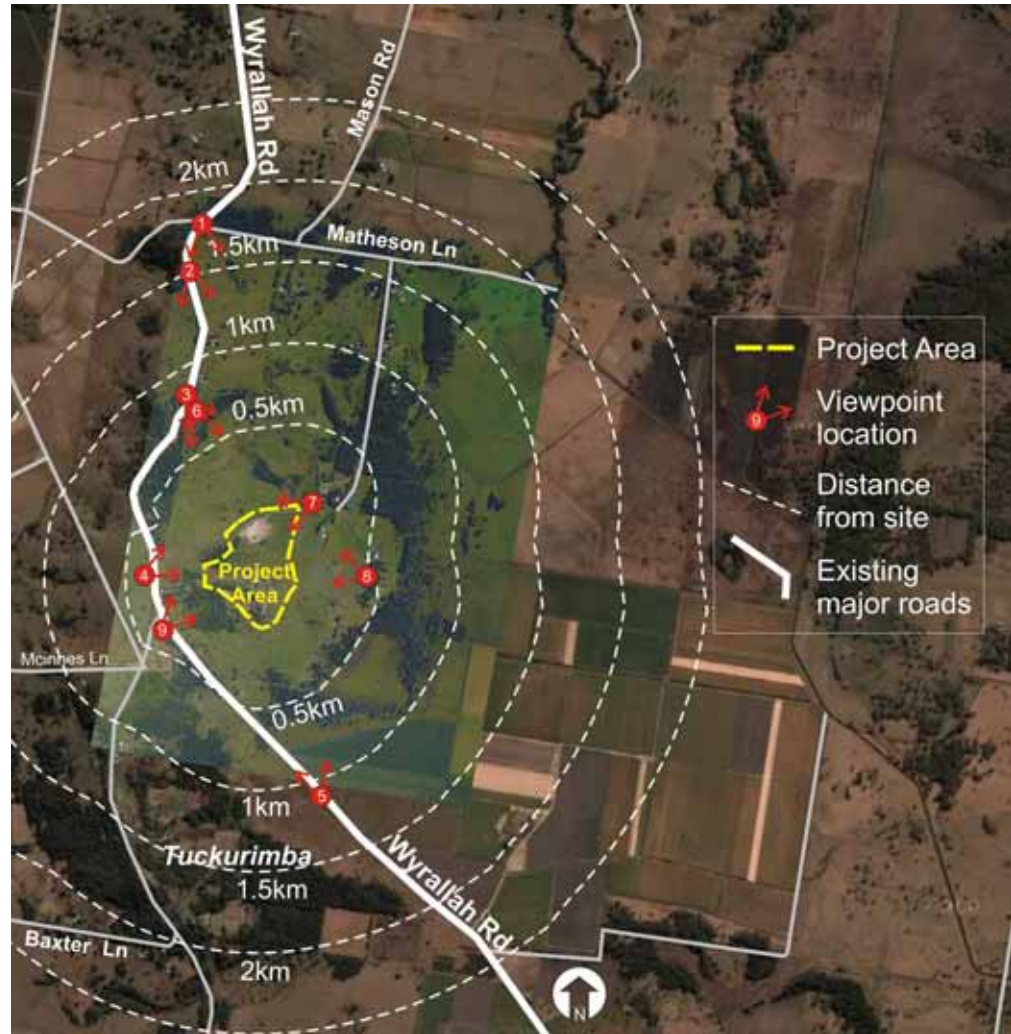


Figure 6.1 Viewpoint Locations

It is considered that these viewpoints represent a reasonable range of impacts from publicly accessible locations within the viewshed. As such, they provide a reasonable range of views on which to evaluate the likely visual impact of the proposed quarry on publicly accessible areas within the viewshed.

6.1

WYRALLAH ROAD

A series of photographs were taken looking towards the *Project Area* at suitably safe locations along Wyrallah Road. This analysis will help to establish a viewshed for the visual impact assessment by identifying the locations where the *Project Area* is visible along the road. There may however be some intermittent views of the proposed quarry when travelling along Wyrallah Road other than those shown.

6.1.1

Viewpoint 1

Viewpoint 1 is located approximately 1.75 km north of the *Project Area* boundary near the intersection of Wyrallah Road and Matheson Lane.

Figure 6.2 shows the view looking south towards the *Project Area* from this location.

The image shows the surrounding landscape and terrain at this location which comprises low hills and vegetation located both in private properties and road reserve.



Location Viewpoint 1

Figure 6.2 shows how the undulating nature of the landscape and existing vegetation that surrounds this view restricts distant or long views from most areas near to this location.



Figure 6.2 Viewpoint 1 – Intersection with Matheson Lane & Wyrallah Road

Figure 6.2 also shows that from this location there are no views beyond the immediate ridgeline on Wyrallah Road. Therefore there will be no visual impact from this location or from areas further north of this location on Wyrallah Road.

6.1.2 Viewpoint 2

Viewpoint 2 is located approximately 1.5 km north of the *Project Area* boundary at a vehicle turnout bay on Wyrallah Road.

Figure 6.3 shows the view looking south towards the *Project Area* from this location.

Viewpoint 2 shows the low hills and vegetation located both in private properties and road reserve near to this location.



Location Viewpoint 2

Similar to *Viewpoint 1*, the undulating nature of the landscape in this area and existing vegetation that surrounds this view also assists to restrict views towards the *Project Area* from this location.



Figure 6.3 Viewpoint 2-Vehicle Turnout Approximately 1.2km North of Project Area

Figure 6.3 shows that from this location there are no views towards the *Project Area* when looking south from this location. There will be no visual impact from this location.

6.1.3

Viewpoint 3

Viewpoint 3 is located approximately 800 metres north west of the *Project Area* boundary adjacent to a rural property (*Receiver 1*) on Wyrallah Road.

This location is south of *Receiver 1*. The assessment of *Receiver 1* is discussed in *Section 6.2.1* of this report.

This view is taken from a break in the road side vegetation and on the property of *Receiver 1* that allows views towards the *Project Area*.



Figure 6.4 Shows the view looking towards the *Project Area* from this *Location Viewpoint 3* location.

The existing quarry bunds and access road is visible towards the centre of the image. The vegetated ridgeline located on the western boundary of the *Project Area* restricts views to the valley floor beyond.



Figure 6.4 *Viewpoint 3*

Figure 6.5 shows the camera location for *Viewpoint 3*.

This photograph shows the existing vegetation located in private lots, the road reserve and a road side cutting along Wyrallah road near to this location. The vegetation and road side cuttings will assist to screen most views to the east from most locations along the 100km/h section of Wyrallah Road.



Figure 6.5 *View looking north along Wyrallah Road*

Figure 6.6 shows the view looking south along Wyrallah Road from this location. This view shows the extensive vegetation located in private land and the road reserve.



Figure 6.6 *View looking south along Wyrallah Road*

The dense vegetation observed during the visual assessment screened most views from Wyrallah Road to the surrounding landscape, including views to the Project Area. However, it is noted that some clearing of the road reserve has since occurred which now gives wider views of the existing quarry at this location (refer *Figure 6.7*).



Figure 6.7 *Current view looking south from along Wyrallah Road*

The view from *Viewpoint 3*, as shown in *Figure 6.4* is across undulating, predominantly cleared farmland. This landscape regularly undergoes visual change through farming and other agricultural activities. As there is a elevated angle in this viewing location the proposed quarry expansion will form a relatively small percentage of the overall field of view from this location. The vegetation that exists both within private lots and the road reserve will screen most views to the quarry when travelling south along Wyrallah Road near to this location. The quarry is now visually evident from this location however it will not dominate views from this 100km/h section Wyrallah Road. This visual impact to this location is considered to be low.

6.1.4 *Viewpoint 4*

Viewpoint 4 is located at the existing access road into the *Project Area* from the proponents western boundary with Wyrallah Road.

Figure 6.8 shows the view towards the *Project Area* from this location looking east.

Note that the existing quarry areas and much of cleared farmland which currently forms the *Project Area* is not visible from this location.



Location Viewpoint 4

This location is relatively elevated and allows open views across the *Project Area* and to the undulating hills on the horizon.



Figure 6.8 *Viewpoint 4*

The access road falls from view in the image due to the undulating terrain which falls away from this location. The distant undulating hills and vegetation visually dominate. The foreground is predominantly cleared undulating pasture land. The motorcycle track is located to the right hand side of the dense vegetation in this area.

There is a proposed 10m wide section of tree planting along the existing access road and the boundary with Wyrallah Road. This will assist visual separation between the quarry and this location. This planting is shown in *Figure 7.1* of this report.

For these reasons the visual impact of the proposed quarry will be low from this location. Some sections of the quarry works may be visible during the operational period, however following completion of the staged works, the quarry will be returned to pasture land.

6.1.5 *Viewpoint 5*

Viewpoint 5 is taken from the Wyrallah Road reserve adjacent to the low lying farmland approximately 1.1km south of the *Project Area* boundary.

Figure 6.9 shows the view towards the *Project Area* from this location.



Location Viewpoint 5

The image shows the ridgeline formation which rises steeply from the low lying farmland area. The ridgeline formation and existing vegetation prevents

views to the *Project Area* from the lower lying areas to the south of the *Project Area*.



Figure 6.9 *Viewpoint 5 - From Wyrallah Road, South of the Project Area*

Note that the existing quarry area is not visible from this location. There is minimal to no visual impact from this location.

6.1.6 *Summary of Views From Wyrallah Road*

The following are key points derived from the analysis of the views towards the *Project Area* from Wyrallah Road:

- The undulating terrain of the *Project Site* and surrounds prevents views to the *Project Area* from most outlying areas, particularly those from the low lying valleys.
- Vegetation located on Wyrallah Road and surrounding rural properties restricts views to the *Project Area* from most locations.

6.2 *VIEWS FROM NEARBY RURAL DWELLINGS*

This section describes the likely range of visual impact from rural dwellings located near to the *Project Area*. *Figure 6.10* shows the proximity of these rural dwellings and their relationship to the *Project Area*.



Figure 6.10 *Nearby Rural Dwellings*

6.2.1 *Viewpoint 6*

Viewpoint 6 is located approximately 750 metres north west of the *Project Area* adjacent to a rural dwelling on Wyrallah Road. The rural dwelling is located just over 800m from the quarry *Project Area* boundary. This viewpoint is located approximately 50m south of the rural dwelling and is therefore closer to the *Project Area*.

Figure 6.16 shows the view looking south east towards the *Project Area* from this location.

This rural dwelling has been identified as *Receiver 1* in accompanying reports.



Location Viewpoint 6

Figure 6.11 shows a photograph of the rural dwelling (*Receiver 1*) taken from Wyrallah Road. The photograph shows the dwelling and associated sheds and outhouses. The image also shows the sparse vegetation located along the property's western boundary.



Figure 6.11 ***View Towards Existing Rural Dwelling Looking North East***

Figure 6.12 is an aerial photograph of the rural dwelling adjacent to this location. This figure shows the existing sheds, pool area and vegetation located within the house lot. The house orientation and primary recreational areas are oriented to the east. The larger of the two sheds is understood to be actively utilised as a manufacturing and welding workshop.



Figure 6.12 *Aerial Photograph of Rural Dwelling on Wyrallah Road (Receiver 1)*

Figure 6.13 shows the same aerial photograph with a likely range of horizontal field of view that would be available from the east of the property overlaid. This diagram is based on the existing *Project Area* layout which includes sheds and other structures within the property. The likely portion of the horizontal field of view which includes views to the *Project Area* is shown in yellow. The likely remaining views which are unaffected by the *Project Area* are shaded in green.



Figure 6.13 *Likely Range of Horizontal Fields of View From Rear of Receiver 1*

Figure 6.14 shows the likely range of views to the *Project Area* including the *Water Reuse Dam* and surrounds from the rear of the *Receiver 1* rural dwelling.



Figure 6.14 *Receiver 1 - Likely Range of Horizontal Views to the Project Area*

The likely portion of the horizontal field of view which includes views to the *Project Area* is shown in yellow. The affected field of view is approximately 27 degrees or approximately 20% of the overall available horizontal field of view from this location. It is noted that this incorporates the *Project Area* including the *Water Reuse Dam*. The field of view is significantly reduced (approximately half) if only considering the quarry operational and extraction areas. As previously discussed bunding along the northern boundary of the existing quarry in the *Central Section* effectively screens the operational quarry an operation plant from view for *Receiver 1*.

As part of the proposed development of the quarry vegetation screening to be planted along this boundary and along the length of the haul road will effetely

screen all views into the *Central Section* and of the haul road and a substantial portion of the *Southern Section* in the foreground view from *Receiver 1*.

It is also noted that the proposed staging of works in the *Southern Section* will also mean that quarrying in this area will commence in the western most portion. This area is obscured from view from *Receiver 1* by a ridgeline and vegetation of the Pine Forest located to the immediate west of the *Central Section*. It is expected that quarrying of the higher areas of the visible ridgeline and the eastern portion of the *Southern Section* will not commence within the first ten years of operation. Hence, this will allow sufficient time for the proposed vegetation planting (fast growing Cedar Wattle and longer term native vegetation) to establish a screen to the operational areas. In later stages as the top of the ridgeline is excavated down, the exposed quarry areas will be effectively screened from view by vegetation.

Figure 6.15 below shows the commencement of screen planting along the northern boundary of the haul road using fast growing Cedar Wattle (*Acacia elata* - expected growth height in excess of 20m). This planting is to be complimented by further rows of native vegetation including Casuarina and other smaller bushy in-fill species along the northern and southern sides of the haul road.



Figure 6.15 *Newly Planted Vegetation Screening Along Haul Road (Acacia elata)*

Figure 6.16 shows the view from Viewpoint 6 which was taken from a break in the road side vegetation that allows views towards the *Project Area*. This viewpoint is the closest publicly accessible location to *Receiver 1*. The view is across a highly modified landscape that has been cleared for agricultural purposes. The *Project Area* currently undergoes seasonal visual changes through agricultural practices. These can be seen in the pasture colour in *Figure 6.16*.



Figure 6.16 *Viewpoint 6*

Only the highest elevation of the proposed Southern section of the quarry, and the *Water Reuse Dam*, will be visible from this location once screening vegetation is established. Existing bunds currently screen the existing *Central Section* (quarry operations and quarry faces). The proposal to line the main access haulage road with vegetation, along with newly installed bunds around the existing quarry, will not only screen out *Project Area* traffic, but also the majority of the operation quarry areas from view at this location. *Figure 6.17* shows the newly constructed bunds ready to be vegetated with low native shrubs and fast growing trees (Cedar Wattle – *A. elata*) and longer term taller native species.



Figure 6.17 *View south toward Project Area showing newly constructed bunds.*

Views from this location provide a panorama of the surrounding landscape. The quarry will form a relatively small percentage of the available horizontal field of view from this location. The foreground view is over a highly modified landscape that has been cleared for agricultural purposes and already contains the existing approved quarry. The proposed *Southern Section* quarry area is currently visually evident from this location. Vegetation and tree planting along the full extent of the main access road will not only visually screen quarry traffic using road, but also in time will substantially

screen the lower portion of the *Southern Section*. Ultimately the *Southern Section* quarry pit will not be visible due to the vegetation screening. It must be recognised that the quarry will be a staged operation, and will be rehabilitated at the completion of each stage.

Upon completion, the quarry will be returned to an agricultural landscape, that is consistent with the existing landscape character.

Figure 6.11 shows the effectiveness of vegetation near to this location to filter views to the surrounding landscape. Views towards the quarry from this location may be mitigated through onsite vegetation and within the immediate house lot. Strategic planting of vegetation may be undertaken to screen the foreground views to the quarry area, whilst retaining the distant views to the surrounding landscape. Further details of proposed tree planting within the proponent's property are detailed in Section 7 of this report.

The proponent has indicated that they would be willing to fund landscape mitigation of this nature on neighbouring lots. This would be undertaken in consultation with the property owners if approved.

The visual impact from this location may be considered high without landscape mitigation, however with mitigation the scenic qualities of this area can be preserved throughout the operational life of the quarry. Through landscape rehabilitation, strategically sited bunds and planting, the visual impact would not be permanent.

If mitigation measures were adopted then visual impact to this residence will be low to moderate.

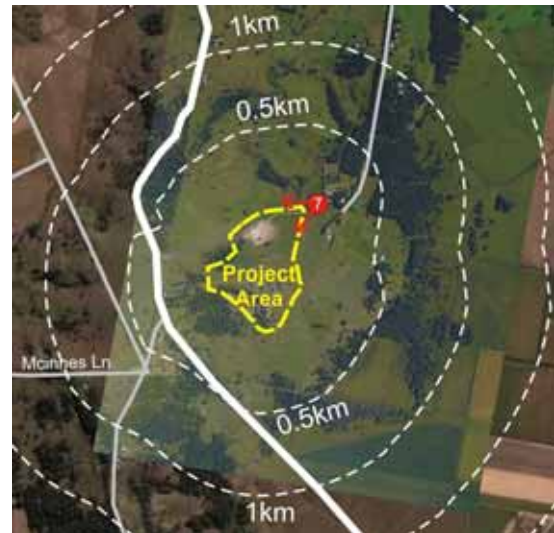
6.2.2

Viewpoint 7

Viewpoint 7 shows the view towards the *Project Area* from near the common boundary with the rural dwelling, approximately 150m from the *Project Area* boundary and 380m from the existing quarry (nearest proposed operation area).

This has been identified as Receiver 2 in accompanying reports.

Figure 6.19 shows the view towards the *Project Area* boundary from this location.



Location Viewpoint 7



Figure 6.18 ***Rural Property Adjacent to North Eastern Boundary***

Figure 6.18 shows *Receiver 2*, the rural property and associated buildings, located adjacent to the north eastern boundary in the north east corner of the *Project Area*.

Receiver 2's boundary is defined by post and wire fence and a row of medium sized trees.

Figure 6.19 shows that the view toward the proposed expanded quarry is screened by a vegetated bund. The terrain beyond this falls into a low lying valley area before rising again towards the existing quarry and the ridgeline beyond.



Figure 6.19 *Viewpoint 7 -From Rural Dwelling (Receiver 2) on Eastern Boundary*

Two earthen bunds planted with trees were approved in this area by Lismore City Council in a Consent Modification Permit dated March 19th 2008, Development Application No. 2005/999 (Amended). This earthen bund and planting has mitigated views to the proposed quarry from this location. An additional bund has been sought as part of the noise mitigation measure described in the Noise Assessment report accompanying the Environmental Assessment report..

Figure 6.20 shows the view from the boundary of *Receiver 2* to the north west. There will be no impact to the visual outlook in this direction.



Figure 6.20 *Viewpoint 7 – View to the north west on Eastern Boundary*

There is no visual impact from this location following the implementation of the approved earthworks and tree planting.

6.2.3

Viewpoint 8

Viewpoint 8 is taken from within the proponents *Project Site* boundary from a similar elevation to *Receiver 3* and has been used as a representative view for this receiver.

This location is at a similar elevation and is closer, approximately 450m, to the proposed quarry boundary.

Figure 6.21 shows the view looking east to *Receiver 3* from within the proponents property.



Location Viewpoint 8



Figure 6.21 *Residential Property in South East Corner of the Project Site*

Figure 6.22 shows the view towards the *Project Area* from the property boundary adjacent to this dwelling at approximately the same RL in order to provide an indication of the likely range of visual impact.

It is considered that this figure provides an indication of the likely range of visual impact from the rural property located to the east of the *Project Area*. This was further confirmed during the community consultation period when viewing from the veranda of *Receiver 3*.

The *Central Section* and existing quarry are only partially visible from *Viewpoint 8*.



Figure 6.22 *Viewpoint 8 – Adjacent Rural Dwelling on South East Boundary*

The proposed tree planting seen in *Figure 7.1* shows a line of trees placed on the ridgeline in the middle ground of this view. The proposed bund and tree planting along the full length of the ridgeline will provide further visual separation between the rural property and the quarry *Project Area*.

The photograph shows in the background that only a small section of the ridgeline in the *Southern Section*, located within proposed quarry expansion area, is visible from this location. This is because of the ridgeline formation shown in the foreground of the image.

The screenings effect of this ridgeline in conjunction with the proposed planting of fast growing Cedar Wattle (*A. elata*) and longer term native vegetation will remove the visual impact of the operational *Project Area* from this location to a low level. It is noted that quarry of the highest parts of the *Southern Section* are not expected to commence for up to 10 years, in which time the screening vegetation would be expected to be well established.

6.2.4

Viewpoint 9

Viewpoint 9 is taken from the road reserve adjacent to the rural property located at the corner of Wyrallah Road and Tuckurimba Road.

Figure 6.23 shows the view towards the *Project Area* from this location.



Location Viewpoint 9

This is an elevated location, adjacent to an existing rural property approximately 400m south west of the *Project Area*. The area directly opposite this location is the densely vegetated moto cross track. The top of the ridgeline within the Southern section of the *Project Area* is just visible through tree line to the centre right of shot.

Distant views to the hills beyond are visible on the horizon line over the tree canopy line.



Figure 6.23 Viewpoint 9

The dense vegetation and low ridgeline shown in *Figure 6.23* show that neither the existing quarry nor cleared farmland associated with the subject *Project Area* is visible from this location.

Because of this limited visibility of the current *Project Area*, it is considered that there will be only limited visual impact as a result of the proposed quarry expansion as the ridge line in the *Southern Section* is lowered.

The following table is a summary of the likely range of visual impact from the viewpoints assessed.

Table 6.1 *Summary Range of Visual Impact*

Viewpoint	Likely Range of Visual Impact	Proposed Mitigation Measures
1	None. <ul style="list-style-type: none"> Quarry not visible. 	Not required
2	None. <ul style="list-style-type: none"> Quarry not visible. 	Not required
3	Low. <ul style="list-style-type: none"> View is between a gap in roadside vegetation along Wyrallah Road. Quarry forms a relatively small percentage of the overall field of view from this location. 	The proponent has constructed bunds adjacent to the existing central section of the quarry and the entry to the quarry which will be tree planted, as will the entire length of the <i>Project Area</i> access road. Proponent is willing to fund further mitigation works such as tree planting on adjoining land with permission of land owners if agreed. Quarry <i>Project Area</i> to be reinstated to pasture land following quarry operations. This remediation will be undertaken at the completion of each stage.
4	Low. <ul style="list-style-type: none"> Site terrain falls away to valley from this location. Main views are to the distant hills and vegetation to the east. 	Tree planting along access road and Wyrallah Road <i>Project Area</i> boundary.
5	None. <ul style="list-style-type: none"> Quarry not visible. 	Not required
6	High/Low. <ul style="list-style-type: none"> Proposed quarry development likely to be visible in approximately 27% of the horizontal field of view, including the <i>Project Area</i> water management area. The extractive areas represent in the order of 20% or less of the field of view. High to moderate during some early stages of the proposed development. Low following completion of bunds and vegetation screen tree planting, along with lowering of <i>Southern Section</i> quarry pit. 	The proponent has constructed bunds to the north of the existing quarry and the entry to the quarry which will be tree planted, as will the entire length of the <i>Project Area</i> access road. Proponent is willing to fund further mitigation works such as tree planting on adjoining land with permission of land owners if agreed. Quarry <i>Project Area</i> to be reinstated to pasture land following quarry operations. This remediation will be undertaken progressively.
7	None. <ul style="list-style-type: none"> Existing tree planting along common boundary with rural dwelling. Living areas oriented away from the quarry. Quarry no longer visible following implementation of earthen bunds and tree planting. 	Additional earthen bund works and tree planting.

Viewpoint	Likely Range of Visual Impact	Proposed Mitigation Measures
8	<p>Low.</p> <ul style="list-style-type: none"> The majority of the <i>Project Area</i> is not visible from this location and is obscured from view by the existing ridgeline between Receiver 3 and the <i>Project Area</i>. The higher parts of the <i>Southern Section</i> that are visible will be visually screened by vegetation along the dividing ridgeline prior to quarry in this area. 	Screen tree planting and bund along the ridgeline will substantially mitigate views to the proposed development.
9	<p>Low</p> <ul style="list-style-type: none"> Quarry barely visible 	Not required

This section describes the proposed bunds and tree planting on the *Project Area* which are designed to achieve the following objectives:

- assist to mitigate the visual impact of the proposed quarry works from sensitive viewpoints identified in the preceding sections of this report; and
- make a positive contribution to the landscape and biodiversity of the area by adding to the existing Koala habitat tree planting which has already been successfully undertaken by the proponent in other nearby areas.

Figure 7.1 shows the proposed tree planting on the *Project Area*.



Figure 7.1 *Proposed Tree Planting*

The proposed tree planting includes three typical treatments:

- Koala habitat tree planting (20m wide);
- non koala tree planting (10m wide); and
- tree planting in approved earthen bunds (5-10m wide).

Where plantings are required for screening purposes fast growing species such as *Acacia elata* will be used, to be supplemented by longer term native shrubs and trees. A detailed Vegetation Management Plan is to be developed for the site which will include details for all screen planting. Temporary bunds and completed section of the quarry will be grassed as soon as

practicable to minimise visual impacts due to colour contrast between the exposed sandstone and surrounding grazing land and vegetation.

Figure 7.2 demonstrates a recently grassed bund constructed at the eastern edge of the existing quarry on the Central Area.



Figure 7.2 *Existing Quarry with Grassed Bund in Foreground*

Figure 7.3 shows an indicative section through the proposed 20m wide strip of Koala tree planting.

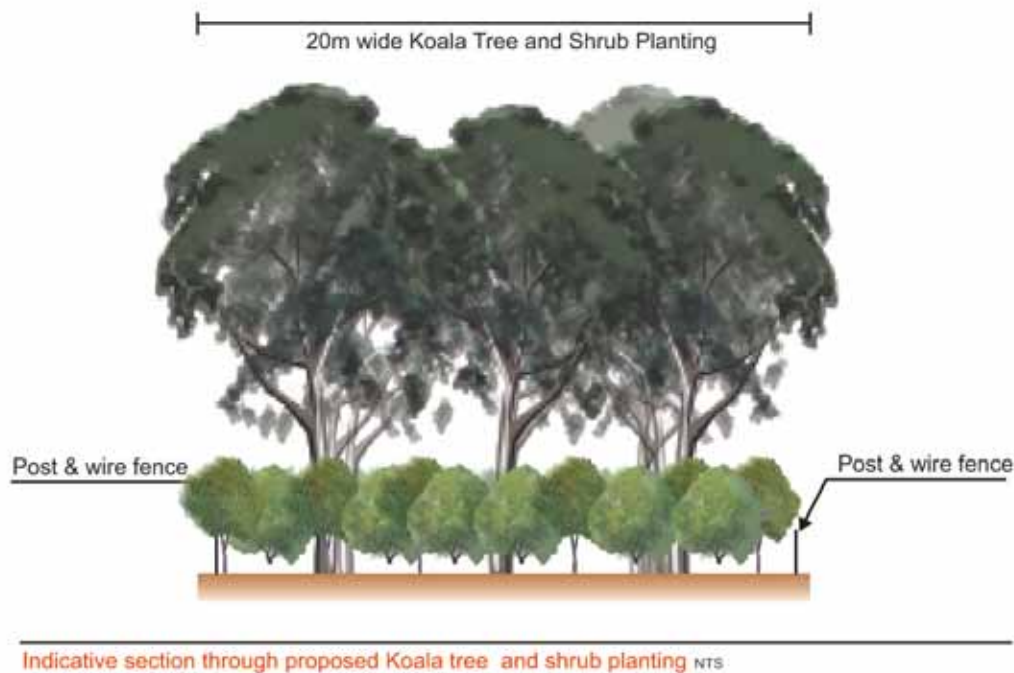


Figure 7.3 *Indicative Section Through 20m strip of Koala Tree Planting*

Figure 7.4 shows an indicative section through the proposed 10m strip of tree planting.

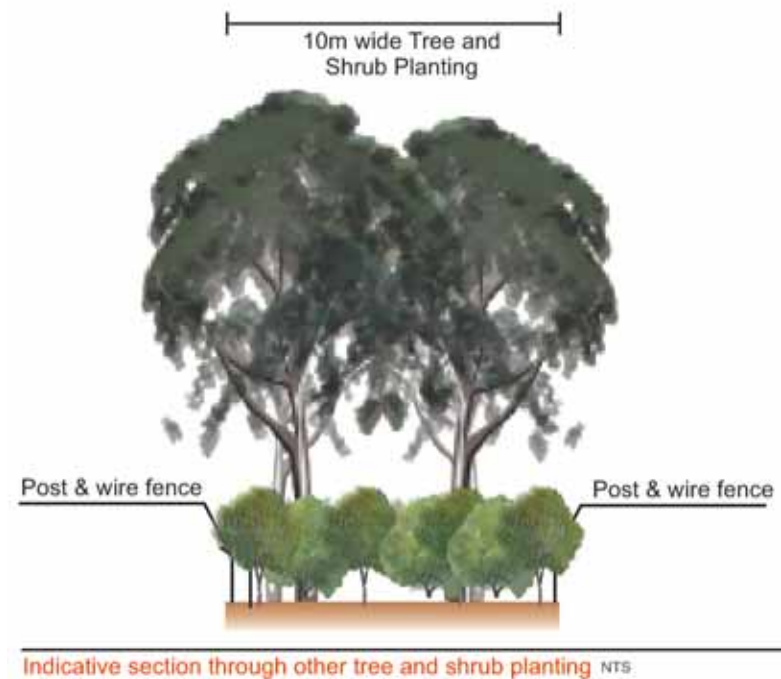


Figure 7.4 *Indicative Section Through 10m Strip of Tree Planting*

7.1 *EXISTING KOALA TREE PLANTING BY PROPONENT*

This type of tree planting has already been successfully undertaken by the proponent beyond the north east corner of the *Project Site* along Hazelmount Lane.

The trees are well established and provide a locally renowned habitat for Koalas. *Figure 7.5* also shows a Koala sited in trees planted along Hazelmount Lane during the *Project Area* inspection undertaken for this report.



Figure 7.5 Existing Koala Tree Planting and Koala Siting on Hazelmount Lane

In conclusion the visual impact of the proposed quarry works will be minimal. This conclusion was reached based on the following considerations:

- The topography of the *Project Area* and surrounds is undulating.
- The proponent owns approximately 850 acres surrounding the *Project Area*.
- The undulating topography restricts views to the *Project Area* from Wyrallah Road and the surrounding area to the immediate vicinity of the *Project Area* near the *Project Area* boundaries.
- The *Project Area* would be visible from the following locations:
 - Wyrallah Road near Receiver 1 described in *Viewpoint 3 & 6*;
 - Corner of Wyrallah Road and Tuckurimba Road;
 - *Receiver 3* to the south east of the *Project Area* described in *Viewpoint 8*;
 - Wyrallah Road at the entrance gate into the *Project Area* on the western boundary as described in *Viewpoint 4*;
- The visual impact of the quarry from these locations can be mitigated and reduced through the planting of bunds and screening trees on the *Project Area* to create a visual buffer between the proposed works and these locations.
- Following the completion of rehabilitation works, the *Project Area* is to be restored to pasture land. This landscape type will integrate with the surrounding rural landscape character. The provision of additional tree planting will provide an overall improvement in the landscape quality of the *Project Area* and surrounds.

Annex A

Parameters of Human Vision

A.1

ANNEX A – PARAMETERS OF HUMAN VISION

The visual impact of a development can be quantified by reference to the degree of influence on a person's field of vision. The diagrams on the following pages illustrate the typical parameters of human vision. These provide a basis for assessing and interpreting the impact of a development by comparing the extent to which the development would intrude into the central field of vision (both horizontally and vertically).

A.1.1

Horizontal Cone of View

The central field of vision for most people covers an angle of between 50° to 60°. Within this angle, both eyes observe an object simultaneously. This creates a central field of greater magnitude than that possible by each eye separately.

This central field of vision is termed the 'binocular field' and within this field images are sharp, depth perception occurs and colour discrimination is possible.

These physical parameters are illustrated in the Figure opposite.

The visual impact of a development will vary according to the proportion in which a development impacts on the central field of vision.

Developments, which take up less than 5% of the central binocular field, are usually insignificant in most landscapes (5% of 50° = 2.5°).

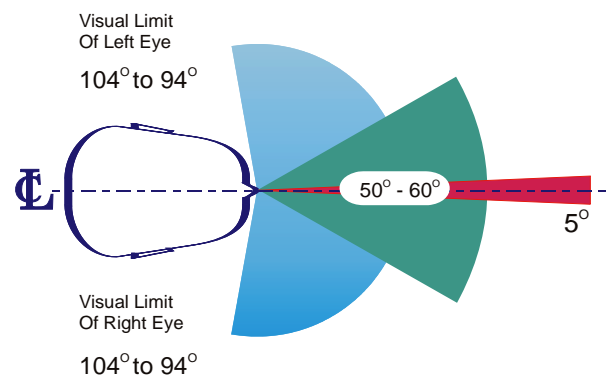


Figure A.1 Horizontal Field Of View.

A.1.2 Vertical Field of View

A similar analysis can be undertaken based upon the vertical line of sight for human vision.

As can be seen in the Figure opposite the typical line of sight is considered to be horizontal or 0°. A person's natural or normal line of sight is normally a 10° cone of view below the horizontal and, if sitting, approximately 15°.

Objects, which take up 5% of this cone of view (5% of 10° = 0.5°) would only take up a small proportion of the vertical field of view, and are only visible when one focuses on them directly. Objects that take up such a small proportion of the vertical view cone are not dominant, nor do they create a significant change to the existing environment when such short objects are placed within a disturbed or man-modified landscape.

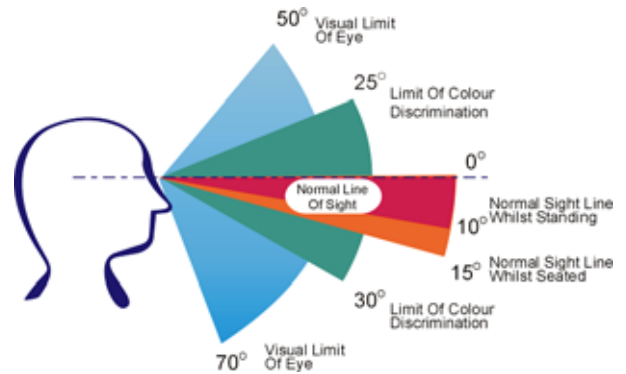


Figure A.2 Vertical Line of Sight