Appendix

I

Visual Impact Assessment

Continuation of Boggabri Coal Mine

visual impact assessment

September 2010

a report prepared by

Integral
landscape architecture
& visual planning

Continuation of Boggabri Coal Mine

visual impact assessment

September 2010

This report was prepared by:

INTEGRAL
Landscape Architecture & Visual Planning

20/8 Bunton Street
Scarborough QLD 4020
Phone: 07 3880 0847
Fax: 07 3880 1659
john@ilavp.com.au

CONTENTS

CONTENTS (continued)

List of Figures

Glossary

Areas of Primary Visual Concern	Areas that have potential views to the Project based on a consideration of topography alone as a screening element
Visual Sensitivity	The degree to which a change to the landscape will be perceived in an adverse way
Visual Effect	A measure of the visual interaction between the Project and the landscape setting within which it is located
Primary View Zone	This zone is the central most critical part of a view that is seen with the greatest clarity. It is that part of a view that is within an horizontal arc of 30^0 either side of the centre line of a view and a vertical arc of 30^0 above the horizontal
Field of View	This area includes the total view, consisting of the primary view zones above and the secondary or peripheral view zones around the primary view zone, out to about 70^0 either side of the central view line in both vertical and horizontal plain
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual effect that considered together determine the visual impact of a development
Contrast	The degree to which a development component differs visually from its landscape setting
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view
Screen	The degree to which a development element is unseen due to intervening landscape elements such as topography or vegetation
VCU	Visual Character Unit. Areas of landscape that have similar topographic, vegetation and land use features that create areas of similar visual character

1. INTRODUCTION

1.1 Background

Boggabri Coal Pty Limited (Boggabri Coal), a wholly owned subsidiary of Idemitsu Australia Resources Pty Ltd (IAR), operates the Boggabri Coal Mine. Boggabri Coal Mine is located approximately 15 km north east of Boggabri in the Narrabri Shire Council (NSC) Local Government Area (LGA) in the central north of NSW, see Figure 1.1.

1.2 The Project

Boggabri Coal is proposing to apply for approval to continue its open cut mining operations for a further 21 years. Project Approval is sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to gain a single, contemporary planning approval for the continuation of its mining operations within the Project Boundary (the Project).

The Project generally comprises the following:

- Continuation of mining operations via open cut methods up to 7 Mtpa product coal to the Merriown seam;
- Open cut mining fleet including excavators and fleet of haul trucks, dozers, graders, water carts and other equipment with the flexibility to introduce a dragline as required utilising up to 500 employees;
- Modifications to existing and continuation of approved (but not yet constructed) infrastructure including:
    - Coal Handling and Preparation Plant (CPP);
    - Modifications to existing site infrastructure capacities including: Run of Mine (ROM) coal hopper, second crusher, stockpile area, coal loading facilities, water management and irrigation system;
    - Rail loop and 17 km rail line across the Namoi River and flood plain including overpasses across the Kamilaroi Highway, Therribri Road and Namoi River;
    - Minor widening of the existing coal haul road including overpasses across the Kamilaroi Highway, Therribri Road and Namoi River;
    - Upgrading and relocating site facilities including offices, car parking and maintenance sheds as and when required;
- Closing a section of Leard Forest Road; and
- Upgrading the power supply capacity to 132 kilovolt (kV) high voltage lines suitable for dragline operations.

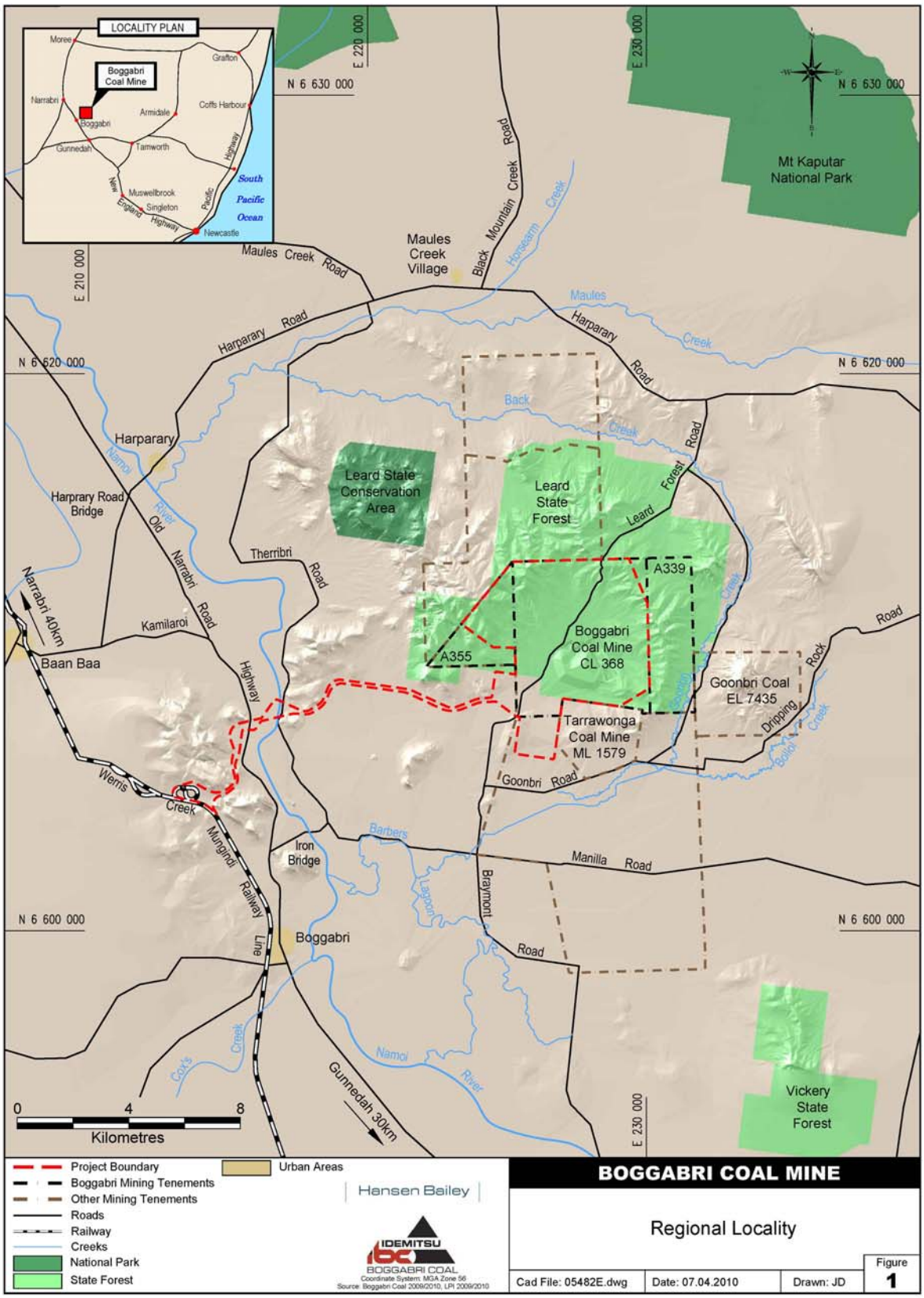

Figure 1.1 | Locality Plan.

1.3 Description of project area and surrounds

The Project is predominantly located within the Leard State Forest and is bounded by the Willow Tree Range that reaches approximate heights of 460 m. The ridge encloses the existing Boggabri Coal Mine surface and Leard State Forest. The catchment area includes numerous ephemeral creek lines where water drains towards the Namoi River.

Boggabri Coal Mine commenced coal extraction in 2006 and is located within the Project Boundary. Tarrawonga Mine is located immediately south of the Project Boundary. The nearest residential area is the township of Boggabri, located approximately 15 km south west of the mining area.

1.4 Visual assessment objectives

This technical report is a visual assessment of the potential impacts of the Project on the existing landscape and visual values of the area, including existing land uses. The report identifies the visual character of the existing landscape as well as that likely to occur as a consequence of the Project. The visual impact of the Project, including both short term and long term impacts, has been assessed and visual impact mitigation strategies developed.

2. ASSESSMENT METHODOLOGY

2.1 Introduction

The methodology to determine the level of visual impact of the Project involves, in the first instance, a consideration of the existing visual environment. This includes a consideration of existing landscape settings, and how they are seen from various viewing locations. In this way the visual character of the landscape as well as visual sensitivity of the various viewing locations can be determined.

Secondly, the visual effect of the Project is determined by considering the visual characteristics of the Project in the context of the landscape within which it is seen.

A combined consideration of both visual sensitivity and visual effect identifies impacts and directs if any mitigation strategies are required. The overall method of visual assessment of the existing landscape and the Project in the context of the landscape is outlined in Figure 2.1.

2.2 Evaluation of the existing visual environment

The evaluation of the existing visual environment consists of the assessment of both the landscape and viewing locations within it. It also includes consideration of the statutory framework within which any development must be considered.

Landscape setting

The landscape setting can be defined in terms of topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape that the Project interacts with. Within any landscape there are areas of similar visual features are defined as a Visual Character Unit (VCU). Defining the landscape in terms of these units assists in understanding the visual character of the landscape as a whole.

Viewing locations

The viewing locations are those areas where people are likely to obtain a view of the Project. These viewing locations have different significance based on numerous factors, collectively evaluated through land use and distance.

Statutory framework

This impact assessment has been prepared in accordance with Part 3A of the EP & A Act. The EP&A Act requires that environmental impacts including visual impacts be assessed and mitigated where required.

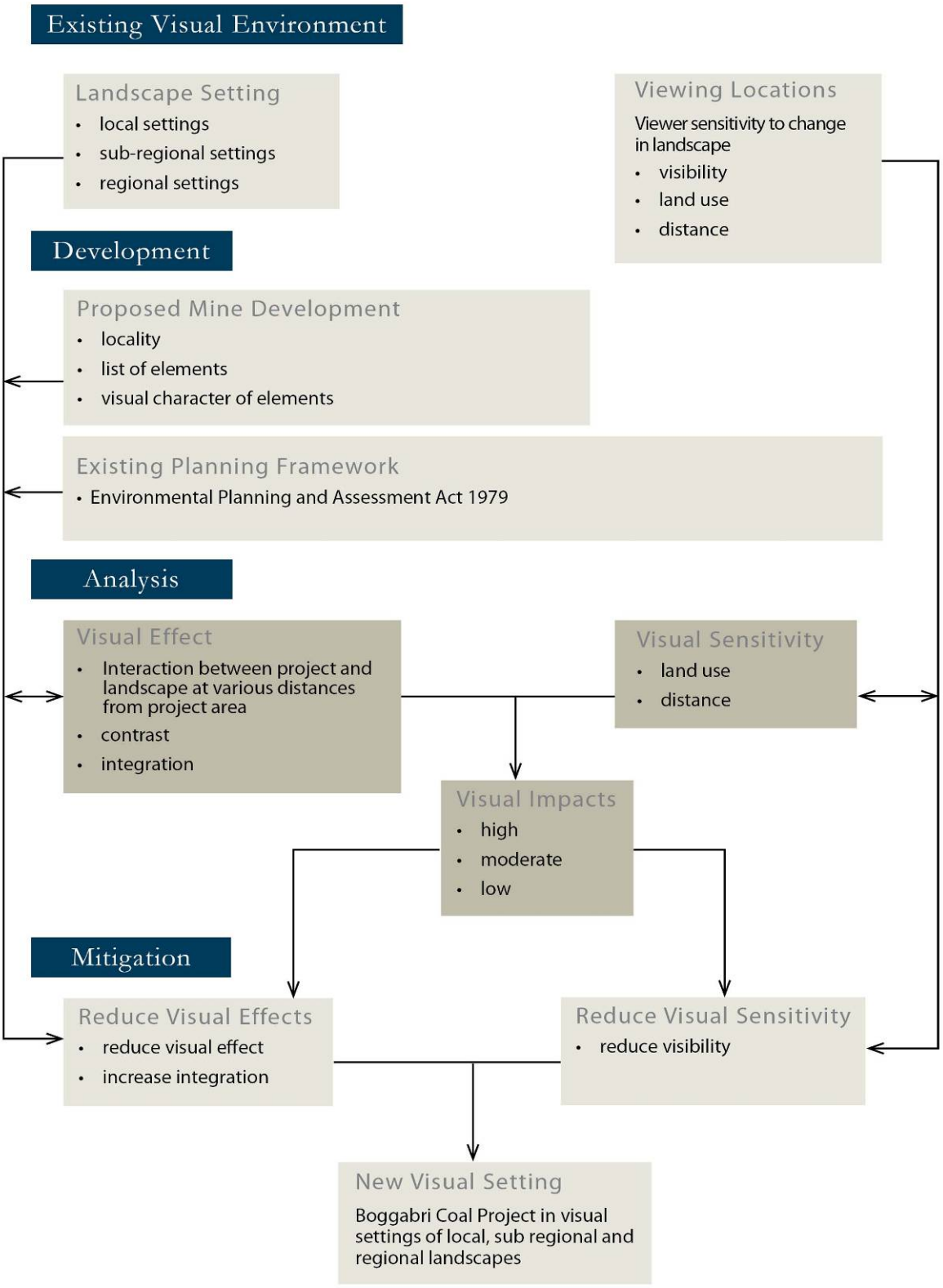

Figure 2.1 | Visual Assessment Methodology

The Project

The Project is evaluated to define the visual elements that are most significant from a visual perspective. The Project elements are defined as being major or minor and are considered in terms of how they contrast with the existing environment.

2.3 Analysis of the Project and its Setting

The analysis of the interaction between the existing visual environment and the Project provides the basis for determining impacts and mitigation strategies. It is done by defining the visual effect of the Project and visual sensitivity of viewing locations to determine impact.

Visual effect

Visual effect is a measure of the level of visual contrast and integration of the Project with the existing landscape.

The degree to which the visual characteristics of the Project contrast with the existing landscape will determine the level of visual effect. A newly created mine will have a higher visual effect due to strong contrast. Extension of operations in an existing mine will have a lesser visual effect. A successfully rehabilitated Project Boundary will have a low visual effect due to limited contrast with the existing landscape.

In a similar way a development is said to be integrated with the existing landscape based on issues of scale, position in the landscape and contrast. High visual integration is achieved if a development is dominated by the existing landscape, is of small scale and or of limited contrast.

The magnitude of the visual effect as outlined in Figure 2.2 is determined by a balanced consideration of the following:

Contrast and integration

The level of contrast and integration of the Project with its surrounding landscape determine visual effect. Project elements as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also to varying degrees integrate with it.

The proportion of a view that includes project areas

For any given level of contrast and integration the lower the proportion of the view that is occupied by the Project the lower will be the level of visual effect which is determined by defining the proportion of the total field of view occupied by the Project. This in turn is most appropriately determined by defining what percentage of the Primary View Zone it occupies, see Figure 2.3.

The Primary View Zone is that area that is occupied by an arc created by sight lines from the eye radiating out vertically and horizontally at angles of 30 degrees around a centre view line.

Visual Properties		Visual Effect Levels			
Contrast Levels with elements in primary view zone	Visual Integration with elements in primary view zone	High Visual Effect	Moderate Visual Effect	Low Visual Effect	Very Low Visual Effect
High Development elements do not borrow, form, shape, line, colour or texture or scale from existing features of the visual setting and contrast levels are high with existing landscape and or…. Active face of REA	Low The development lacks integration with visual setting because of scale totally dominating the ability of site or surrounding features, vegetation and or topographic features to integrate the development.	It occupies more than 2.5% of the primary view shed	It occupies between 2.5 - 1% of the primary view shed	It occupies between 1 - 0.5% of the primary view shed	It occupies less than 0.5% of the primary view shed
Moderate Development elements borrow from some features of the visual setting in terms of form, shape, line pattern and or colour and scale, reducing visual contrast with existing setting and or….. newly rehabilitated pit area	Moderate The development has some degree of visual integration with setting from other features, vegetation and or topography achieve some level of integration	It occupies more than 20% of the primary view shed, generally when in a foreground location	It occupies between 20-10% of the primary view shed	It occupies between 10 - 5% of the primary view shed	It occupies less than 5%
Low Development elements borrow extensively from features in visual setting in terms of form, shape, line, pattern colour and scale minimizing contrast with the existing setting and or…… rehabilitated landscape pattern	High Visual integration is high due to other features, vegetation and or topography achieving dominance and screening or filtering	The development occupies more than 40% of the primary view shed	The development occupies 40-30% of the primary view shed	The development occupies between 30 -20% of the primary view shed	The development occupies less than 20% of the primary view shed

Note: The visual effect of the mine pits changes through time with open pits having high contrast and low visual integration creating high impacts at low levels of exposure i.e. 5%. Rehabilitated pits with rehabilitated landscape patterns create moderate to low contrast and higher integration levels increasing the percentage of a primary view shed permissible for moderate and low visual effects.

Figure 2.2 I Visual Effect Levels

Area of Primary View Zone at various distances from project area

Distance from project area	Area of Primary View Zone
1 km	0.52 km²
2 km	2.09 km²
3 km	4.71 km²
4 km	8.38 km²
5 km	13.07 km²
6 km	18.85 km²
7 km	25.65 km²
8 km	33.51 km²
9 km	42.41 km²
10 km	52.36 km²
11 km	63.35 km²
12 km	75.40 km²
13 km	88.49 km²
14 km	102.62 km²
15 km	117.81 km²

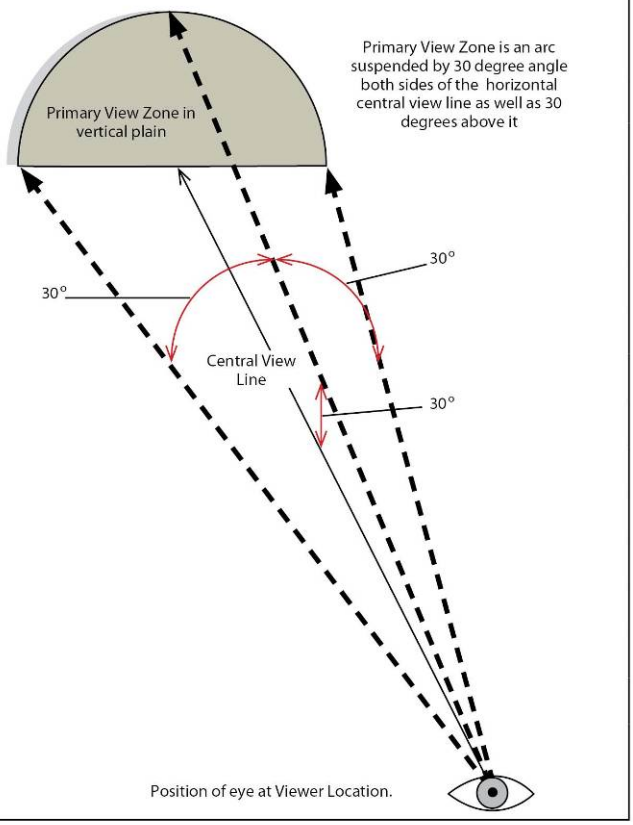

Figure 2.3 | Area of Primary View zone at various distances from the development.

The primary view zone is the most critical and central part of a view. It is not the total view, but the most important part.

Measuring the percentage of the primary view zone occupied by a development will provide a more critical measure than a measure of the development in the context of the whole view zone which would include both primary and secondary view areas, representing a view arc of 120^0, instead of a view arc of 60^0 represented by the primary view zone only.

Generally, a high visual effect will result if a visible area of the Project has a high visual contrast and low integration to the surrounding landscape.

A low or very low visual effect will occur if there is minimal contrast between the visible area of the Project and the existing landscape setting and or the area occupied by the Project are only small parts of a total view.

Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a project.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas including industrial, agricultural or transport corridors, because land uses, such as residential, use the scenic amenity values of the surrounding landscape and may be used as part of a leisure experience and often over extended viewing periods. Figure 2.4 indicates the levels of visual sensitivity associated with the Project.

However, the visual sensitivity of individual residences may range from high to low, depending on the following additional factors:

- Screening effects of any intervening topography, buildings or vegetation. Residences with well screened views of the Project will have a lower visual sensitivity than those with open views;
- Viewing distance from the residence to visible areas of the Project. The longer the viewing distances, the lower the visual sensitivity; and
- General orientation of residences to landscape areas affected by the Project. Residences with strong visual orientation towards the Project, i.e. those with areas such as living rooms and/or verandas orientated towards it, will have a higher visual sensitivity than those not orientated towards the Project, and which do not make use of the views toward the Project.

For any area to be given a sensitivity score, it must have visibility to the Project. This visibility was determined based on field assessment, evaluation and computer assessment of topographic and vegetation data.

Land Use	Visual Sensitivity Levels			
	Nearest visible mine elements less than 2.5km away	Nearest visible mine elements between 2.5 - 7.5 km away	Nearest visible mine elements between 7.5 - 12.5km away	Nearest visible mine elements more than 12.5km away
Urban and rural houses	High Sensitivity	High/Moderate Sensitivity	Moderate Sensitivity	Low Sensitivity
Tourist destination of visually sensitive land uses eg. horse studs, vineyards etc.	High Sensitivity	High/ Moderate Sensitivity	Moderate/Low Sensitivity	Low Sensitivity
Designated tourist & main roads - Kamilaroi Highway	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Other roads - Manilla Road	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Minor local roads in rural zone - Therribri, Goonbri Roads	Moderate/Low Sensitivty	Low Sensitivity	Very Low Sensitivity	Very Low Sensitivity
Broad acre rural lands	Low Sensitivity	Low Sensitivity	Very Low Sensitivity	Very Low Sensitivity

Figure 2.4 | Visual Sensitivity

Visual Impact

The visual impact of the Project has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact level. The way in which the visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is illustrated in Figure 2.5.

Visual Effect	Visual Sensitivity		
	High	Moderate	Low
High	High Visual Impact	High/Moderate Visual Impact	Moderate/Low Visual Impact
Moderate	High /Moderate Visual Impact	Moderate Visual Impact	Moderate/Low Visual Impact
Low	Moderate/Low Visual Impact	Moderate/Low Visual Impact	Low Visual Impact
Very Low	Low Visual Impact	Very Low Visual Impact	Very Low Visual Impact

Visual Impact is dependant on the interaction between visual effect and sensitivity.

Figure 2.5 | Visual Impact

2.4 Development of Treatments

Visual impact mitigation strategies are developed for both on site and off site as required ensuring that either visual effects and or visibility/visual sensitivity factors are decreased in appropriate time frames to achieve impact mitigation.

Reduce visual effects

Rehabilitation of disturbed areas associated with the Project will decrease the visual contrast created by mining operations to the existing landscape. The rehabilitation strategies that emulate patterns, shapes, line and colour of the existing landscape will reduce the contrast between the Project and the existing landscape, reducing visual effect.

Reduce visual sensitivity

Reducing visual sensitivity is achieved by carrying out treatments to minimise visibility to the Project. Due to the scale of open cut coal mine components, such as the Overburden Emplacement Areas (OEA), screening is best done at or close to the point of viewing. Such screening treatments can also be used to redirect views to areas not affected by mining activities as well as generally enhancing the landscape at the viewing point.

New visual setting

On completion of mining operations and following rehabilitation, a new local landscape will be created. This new landscape will reflect post mining land.

3. EXISTING ENVIRONMENT

3.1 Introduction

This section of the report establishes the visual character of the Project site and the surrounding landscapes that make up its visual settings. The existing visual settings of the Project are created by a range of different landscapes, which vary as a result of topography, vegetation cover and land use types. Based on visual differences created by these landscape elements, five Visual Character Units (VCU) were established.

These VCU were analysed in terms of their visual character within the primary view zone of the mine.

3.2 Primary Visual Catchment

At a regional scale, the Visual Catchment is defined by the ridges of the Willow Tree Range which surround the Western, Northern and Eastern edges of the Project Boundary. To the south west ranges associated with Mt Boggabri define the Primary Visual Catchment (PVC) boundary. To the south, distance and tree cover on plains and gentle hills define the boundary while in the south east hills within and around Vickery and Kelvin State Forest, eventually linking to the screening created by the Willow Tree Range.

The PVC represents the area within which the majority of critical views of the Project are located. It is the critical part of the Visual Catchment. The PVC does not enclose all view points, but a consideration of those within the PVC will achieve proper visual assessment of the Project. The PVC is illustrated in Figure 3.1.

As with the Visual Catchment the PVC is defined to the north east and west by the Willow Tree Range. It is defined to the south west by the hills and mountains associated with Mt Boggabri. In the south the township of Boggabri defines the boundary while being included in the PVC. To the east of Boggabri the visual catchment boundary follows Braymont Road and then generally heads to the north western boundary of Vickery State Forest and then north to Wean and north west back to the south eastern corner of Leard State Forest.

The Namoi River is the main river system of the valley and along with the isolated geological features such as Robinsons Mount and Barbers Pinnacle creates a diverse landscape of high visual interest.

The PVC for the Project is defined in Figure 3.1.

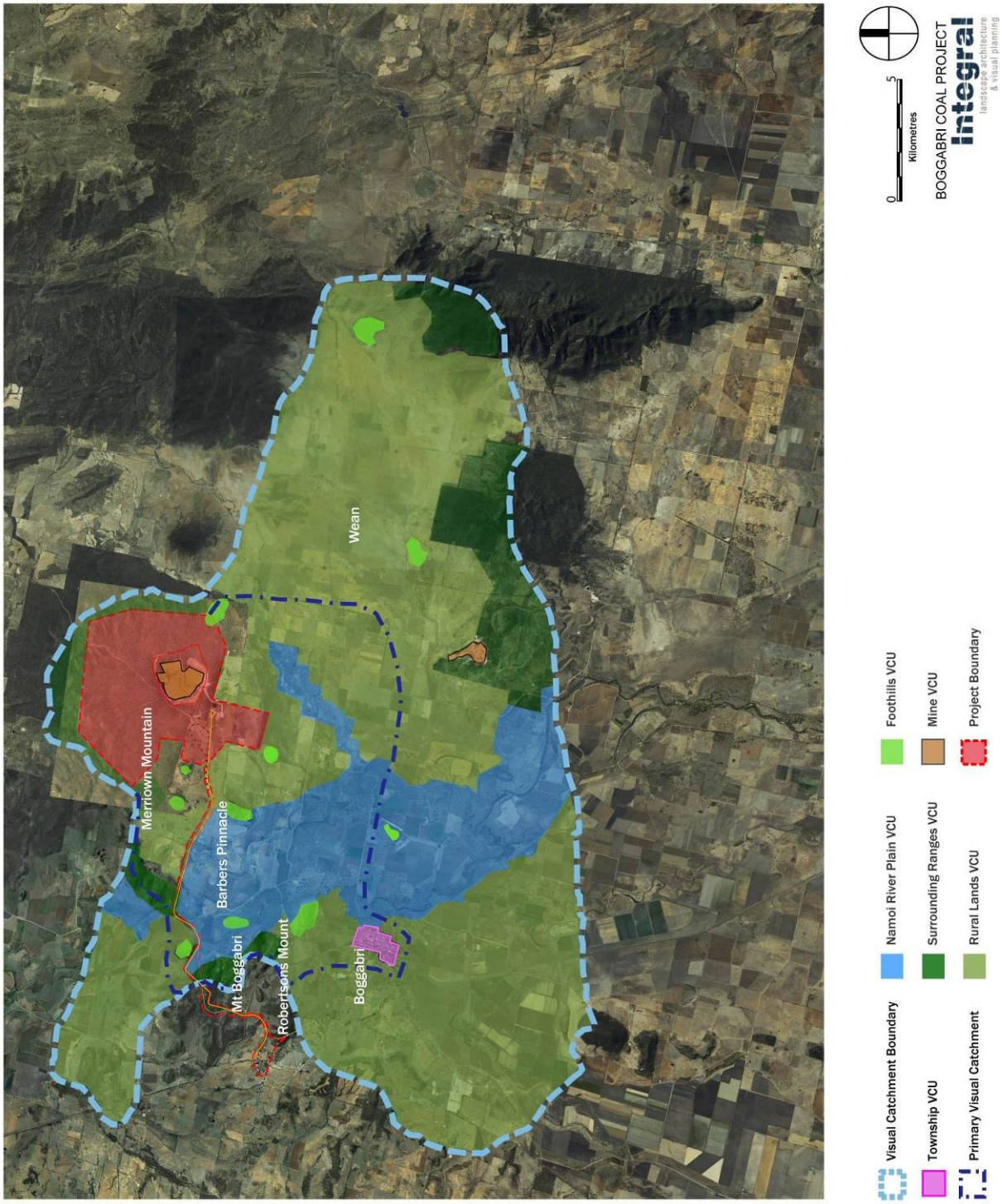

Figure 3.1 | Primary Visual Catchment of the Project.

3.3 Visual Character of the Landscape

The visual character of the regional and local landscape in the vicinity of the Project is created by the mosaic of topographic form, vegetation and land cover, hydrological features of the Namoi River and land use patterns. These landscape features combine in various ways to create areas of relative visual uniformity that can be defined as Visual Character Units (VCU). The VCUs combine in various vistas that are obtained from viewing locations such as residences and roadways.

Figure 3.1 illustrates the VCUs within the PVC and include the:

- Namoi River Flood plain VCU;
- Lowland Foothills VCU;
- Rural Lands VCU;
- Town Area VCU;
- Surrounding Ranges VCU; and
- Mine and Infrastructure Area VCU.

Each is discussed further below.

3.4 Namoi River Plains VCU

The Namoi River Plain dissects the PVC in a south to north direction of flow; the river itself flows past the Boggabri Township. The Goonbri Creek also contributes to this plain VCU, the creek flows from the eastern side of Leard State Forest in a western direction joining the Namoi system in Barbers lagoon approximately 3 km north east of the Boggabri Township. Visually the VCU is dominated by the expansive river flats that by virtue of soils and irrigation, support cropland, creating vivid rectilinear patterns in the midst of dryland grass and woodlands on adjoining slopes, see Figure 3.2.

The Namoi River Plain VCU creates strong contrast and visual interests to surrounding landscapes as shown in Figure 3.2. The VCU is relatively flat and the grass / crop cover that allows for long views from the cleared rural lands to the surrounding ranges. Also occurring on the Plain are remnant Red Gum woodlands that can restrict long distance views.

There are a number of scattered rural residences within the VCU. However, they are generally limited due to the flood potential within the VCU. They occur at the edges or on slightly elevated areas above the flood plain.

There are a number of roads which pass through this VCU. Generally these roads skirt the flood plain and like the rural Residences, are generally located in the lower part of the Foot Hill VCU for flood avoidance purposes.

The Namoi River Plain Unit supports and provides a connection between the Town Area and Lowland Foothills VCUs.

The significance of the unit in addition to its visual character is the open views it gives to more distant locations.

3.5 Foothills VCU

The Lowland foothills provide the connection between the surrounding ranges and the flood plain of the Namoi River and Goonbri Creek, Figure 3.3. The hills vary from slight undulations to rising hills just below the surrounding ranges. Slopes vary between gently sloping elevations to steep slopes leading to the higher elevation ridges and hills. This VCU supports many rural Residences in the lower and more gentle sloped areas adjacent to the flood plain and in the more intensively cleared grazing areas.

The lowland foothills VCU occurs throughout the Visual Catchment.

To the north, these hills are generally gently sloping rising to form the ridges of the surrounding ranges. These hills for the greater part have been cleared for grazing purposes and support grasslands with scattered trees or open forest woodlands on steeper areas and along some gully lines.

The southern part of the VCU has a number of foothills that exist in isolation and in most instances are not connected directly to any particular surrounding range in the south. The elevation of the hills in the vicinity of Barbers Pinnacle limits visibility to the Boggabri Coal Mine in a northerly direction, however residences located on the elevated slopes of the foothills have potential views to existing mining operations.

In the east these hills are dominated by more gently sloping low elevation hills, the land cover is a mixture of grasslands, woodlands and open forest. These hills generally continue to the east of the locality of Wean, Figure 3.1, eventually linking with the Vickery State Forest with an average elevation of 320 m. The hills limit views of existing mining operations at Boggabri Coal Mine, however, there are views from the elevated locations in some areas.

To the west the foothills are a series of hills to the north west of the Boggabri township, the most prominent being Mount Boggabri. This series of foothills also provide screening for the Boggabri Coal Terminal located on the Werris Creek Mungundi Railway. The lookout at 'Gins Leap' provides views to the north east across the flood plain.

The hills in all sectors create a significant visual block to the Project.

3.6 Rural Lands VCU

The rural lands VCU is the most extensive unit covering a range of agricultural land uses, the major use is grazing see Figure 3.4. The general character of the unit is of gently rolling topography with scattered tree cover and stronger tree belts in some locations along roadways and drainage lines. There are a number of rural residences within this VCU.

3.7 Township VCU

The township of Boggabri is situated on the Kamilaroi Highway between Gunnedah and Narrabri and 15 km to the south west of the Boggabri Coal Mine. The town has a mix of residential, institutional, commercial and industrial land uses, this along with its open space and streetscape character help create the visual character of the town see Figure 3.5.

The township is located immediately adjacent to the Namoi River Flood plain and is generally on flat to gently sloping land. The topography tends to limit long distant views out of the town due to foreground screening by adjoining buildings, gardens and street plantings.

3.8 Surrounding Ranges VCU

The surrounding ranges generally consist of steep forested slopes that define the edges of the VCU. The ranges include the Willow Tree Range, Mt Boggabri and associated ridges to the west and the Nandewar Range to the east. The Willow Tree Range encompass the mine site, on the western, northern and eastern side of the mining area and forms an unbroken line that functions as a visual barrier to the mine as seen from those directions see Figure 3.6.

The visual significance of Ranges is that they often create the background to valley views from a full range of view locations and as discussed frequently act as visual barriers to long distant views.

3.9 Mine and Infrastructure VCU

The visual character and scale of the Boggabri Coal Mine and the adjacent Tarrawonga Mine are strong enough to create a VCU based on the visual character of the mines.

The existing Boggabri Coal Mine generally consists of an active mine void, OEA private haul road, and mine infrastructure facilities. The workshop, offices and truck loading bin is visually evident as you approach the site from the south and west along Leard Forest Road. The site already has a strong industrial visual character.

The OEA has two profiles: the first being the outer edge that is progressively rehabilitated as works are completed and is orientated to the south (Figure 3.7) and the second being the active OEA that is orientated to the north.

The rehabilitated southern side of the OEA quickly integrates with the existing landscape of rolling hills in adjacent landscape areas. This is largely due to the progressive revegetation of the OEA face.

Figure 3.2 | Namoi Plains VCU

The Namoi Plains VCU is dominated by the regular pattern of croplands with strong greens and contrasting random pattern of woodland with more muted colours of the Eucalypts and dry grassland.

Figure 3.3 | Foothills VCU

The Foothills VCU consists of feature elements such as Barbers Pinnacle and Merriown Mountain as well as subtle hills and spurs.

Figure 3.4 I Rural Lands VCU

The Rural Lands VCU is dominated by dryland grass with scattered tree cover. It also supports a limited number of rural residences.

Figure 3.5 | Township VCU

Boggabri is the only town within the Town VCU. It is dominated by buildings and landscapes of the streets and gardens.

Figure 3.6 | Surrounding Ranges VCU

The Surrounding Ranges VCU dominates skylines and screen views to areas outside the VCU.

Figure 3.7 I Mines & Infrastructure VCU

The main visual elements of Boggabri & Tarrawonga are the OEA.

4. THE PROJECT & VISUAL EFFECT

This section of the report evaluates the various components of the Project and defines their visual effects in terms of how these elements contrast with the existing landscapes. It is important to note that the existing Boggabri Coal Mine and Tarrawonga Mine will significantly reduce the visual effect levels of the Project.

4.1 Mine Components

From a visual perspective, the Project essentially relates to increasing the scale of two major elements: the open cut mining void and OEA. There will be some additional infrastructure required to accommodate an increase in coal production (see section 1.3) including the construction and operation of a 17km rail spur line with a bridge across the Kamilaroi Highway.

In relation to the visual effects of the Project, development elements can be divided into major and minor elements. Major elements have the potential for significant visual effect in relation to external view. Minor elements, although not insignificant in horizontal scale, have a less significant visual effect due to lack of vertical scale and visual projection outside the Project Boundary.

Both the major and minor components already occur within the existing environment because of the already established Boggabri Coal Mine and the neighbouring Tarrawonga Mine.

Development components that have visual significance include the open cut mining void, OEAs, as well as associated infrastructure including water sedimentation dams, roadways and rail spur.

Major mine development components, shown in Figure 4.1, include:

- Open cut mining void;
- OEAs; and
- Rail spur and associated bridges.

Minor mine development components include:

- Transmission line
- CPP;
- ROM stockpile areas;
- Rail Loading Facility;
- Minor widening of the existing private Haul Road;
- Mine infrastructure modifications (including administration buildings, workshops, parking, etc);

- Internal haul roads and internal light vehicle road network;
- Conveyor systems; and
- Water management infrastructure.

As stated above, many of these elements are currently in place and to varying degrees create the visual effects of the mine as seen from external areas. Many of the components (e.g. the Truck loading bin, ROM stockpile and Boggabri Coal Terminal) are well screened and visible from minor local roads only.

4.2 Mine Voids

Physical Character

Following vegetation removal, topsoil is stockpiled for reapplication on rehabilitated areas post-mining.

Overburden removal then takes place, and will continue from the current approved areas, predominately by conventional truck and excavator operations working the mine void, and in future may be supported by a dragline. Mining will continue on from existing operations to the east before changing direction and progressing to the north west of the Project Boundary.

The Project is largely contained within the basin formed by the natural ridge line of the Willow Tree Range. The mine progresses in a north easterly direction to the lower eastern slopes of the western ridge line up the first year 10 of the mine life, Figures 4.2 – 4.5. Mining then progresses in a northerly direction. The ridge line/skyline will not be impacted by the mine void or associated OEA.

Visual Effect

The Mine void consists of two significant components. These include the 'highwall' (active mining area) and the 'low wall' which forms part of the OEA. These are the major visual components of the void, however both are generally below natural ground level and therefore only visible to view points with higher elevations.

The exception may be a limited extent of the highwall above an elevation of 380m, close to the end of the mine life. These areas are limited in scale and are fragmented. These small areas may be visible over the top of existing topography and vegetation and or the rehabilitated overburden emplacement areas to the south of the highwall towards the end of the mine life of 21 years

The visual effect of mine void is created by the colour of the raw earth and exposed rock contrasting with the surrounding landscape. The open mining face also creates strong form, shape and line characteristics that differ from the existing landscape. These effects are greatly decreased over distance and by atmospheric conditions such as cloud cover, backlight and heat haze.

The location of the void within Leard State Forest, its enclosure by the Willow Tree Range and the OEA eliminates views into the mine void from all locations.

The mine void creates a moderate to high visual effect. This effect cannot be reduced until the final landform is created at the end of all mining activity with only the void left untreated to some degree. However as stated above, these voids are not visible to sensitive receptors in the surrounding landscape so the visual effect has no impact significance.

4.3 Overburden Emplacement Areas

Physical Character

There are two out of pit OEAs, an eastern and southern OEA. These OEAs will be completed by year 5 after which all overburden will be placed in the mining void. The southern OEA will be constructed in the location of the existing OEA, and will develop across the site throughout the life of the mine.

The existing OEA has an approved elevation of 350m from the EIS and was generally in the location now described as the southern OEA.

This OEA is located to the south within the Project Boundary and will increase in elevation as mining progresses to the north. The OEA for the Project will have an elevation up to 395m.

The eastern OEA will be positioned to the east of the mine void and adjacent to the Willow Tree Range. The entire mining area will be well shielded in all directions following the completion and rehabilitation of the outer slope of the Southern OEA.

Based on the anticipated production schedule the southern OEA will be completed by year 5 and the critical south and south east outer faces of the OEA will be rehabilitated (Figure 4.2). By year 10 the small window left by the western haul road is also filled and rehabilitated (Figure 4.3). For the remainder of the mine life, Figure 4.4, overburden will be placed back into the mine void and will have no further visual effect on external views, except to the haul road between the eastern and southern OEAs. Progressive rehabilitation on the outer slopes of the OEAs throughout the life of the mine will decrease any visual contrast between the OEA and the surrounding landscape.

Visual Effect

The OEAs will create strong contrasting form in the landscape, and will initially also have a strong colour contrast, Figure 4.6. This contrast and high visual effect will be reduced to moderate/low by landscaping and progressive rehabilitation following mining. The high contrast is somewhat offset by the moderate integration level achieved by the OEA being below the natural forested ridge line of the Willow Tree Range.

However, the significance of these contrast levels are reduced by the existing approved OEA. The out of Pit OEAs will be completed within five years and the increase of elevation to 395m over part of the OEA is not considered visually significant as it is only a small increase in bulk over the whole OEA. The final landform that has a modulating ridge line is of greater visual interest than one that is uniform.

Visual effect levels are generally moderate due to the small area of OEA that would be in an un-rehabilitated state at any one time. These effects would reduce to low over 5 years and very low as tree cover matures and obtains mature foliage colour and texture values.

4.4 Rail Spur and Loop

The rail spur and loop will be constructed adjacent to the existing coal haul road that connects the mine site to the Boggabri Coal Terminal on the Werris Creek Mungundi Railway. The rail spur will cross Therribri Road and will have a bridge over the Namoi River and an overpass across the Kamilaroi Highway.

The rail spur will be designed to meet Australian Rail Track Corporation standards including grades of 1% for loaded trains and 2% for unloaded trains and will require additional cut and fill in some areas of its proposed easement. The bridge over the river will be adjoined by a rail gantry spanning approximately 1.1 km. This would allow for the crossing of the Namoi River flood plain at an RL above the 1:100 year flood level.

Visual Effect

The rail spur, as with much of the current haul road, borrows line from the existing landscape. Disturbance area for the rail spur including cut and fill will create some landform contrast with associated colour contrast in the cuttings and fill embankments. The contrast will be similar to that created by the existing haul road.

The Namoi River Bridge and associated flood plain viaduct will create strong line, shape and form contrasting with the adjoining flood plain and will have a high visual effect in the immediate locality. However its form as a simple structure lessens the potential impact.

The railway overpass over the Kamilaroi Highway, Figure 4.7, will be similar to the existing highway overpass, Figure 4.8, but will have extended earth embankments to allow for more gentle grades.

The visual effect of the rail spur and loop will be low where it follows the alignment of the existing haul road and for works at both the mine site and at the junction with the Werris Creek Mungundi Railway as those elements already exist in that location.

The visual effect will initially be high for cut and fill batters as well as box cuts associated with establishing the rail spur, especially to the west of the Kamilaroi highway in the vicinity of 'The Rock'. Similarly berms established for the rail over pass will have a high visual effect. However this visual effect is quickly reduced to low, when rehabilitation is achieved, Figure 4.9.

The visual effect of the rail gantry, the Namoi River Bridge and overpasses of Therribri Road and Kamilaroi Highway will be high in the immediate foreground of those roads.

4.5 Infrastructure Elements

The additional infrastructure elements including the ROM coal handling facilities, CPP, as well as other buildings will have no significant visual effect as they will be built in locations where such elements already exist.

Similarly, the proposed transmission line will upgrade the existing power line between the Boggabri Coal Terminal and the mine infrastructure area and generally follow the proposed rail spur alignment. The existing 11kv transmission line has a complex cruciform configuration of insulators at the top of concrete poles. This will be replaced by a 132kV transmission line that will be on similar but slightly taller concrete poles and with a significantly improved and visually simplified post mounted insulator structure.

Visual Effect

The new transmission line is over one kilometer from the nearest house. Given this distance, the scale of the transmission line and the woodland settings the visual effect is low and is not significant.

4.6 Leard Forest Road Closure

A section of Leard Forest Road will be closed as mining progresses to the northwest. The mine void and some infrastructure will intersect Leard Forest Road as mining progresses.

Visual Effect

Any upgrades or alternatives considered will be undertaken in consultation with the Narrabri Shire Council. The visual effect of the road is low.

4.7 Visual Effect Summary

The visual effects of the mine elements vary from high to low. However, most significant high visual effect areas are not visible to external view locations. Only the outer face of the southern OEA is visible to some southern view locations, and visual effects of this element are quickly reduced by rehabilitation of high visibility outer slopes. Outside of the mine site, the railway crossings of the highway will be highly visible but initial high visual effects are generally reduced to low following rehabilitation of earthwork batters.

Mine Void

The establishment and excavation of the mine void will continue to have a high visual effect throughout the life of the mine. However, the void will not be visible to external views.

OEA

The southern outer face of the southern OEA is the mine element that is most visible to external view. This southern face of the OEA will be progressively built and completed over approximately the first 5 years of the mine life. During this period exposed areas of pre-rehabilitated OEA that have high contrast and low integration will generally not exceed 2.5% of a primary view shed and therefore will have a moderate visual effect. If this level is exceeded a high visual effect will temporarily occur until rehabilitation is complete.

Rail Spur

The rail spur will have a low visual effect except where for the viaduct and bridge sections that will create a high visual effect in the immediate foreground of Therribri Road and the Kamilaroi Highway. The visual effects of the terminating loop and other elements will have moderate to low effects due to other infrastructure already being in place in these locations.

Transmission Line

The power line runs from the mine infrastructure site to the Boggabri Coal Terminal. This element would have a low visual effect as it is replacing a similar transmission line element.

Other Infrastructure Elements

Although these elements can be large scale, the visual effects are low as they occur adjacent to or replace other elements of similar scale and character.

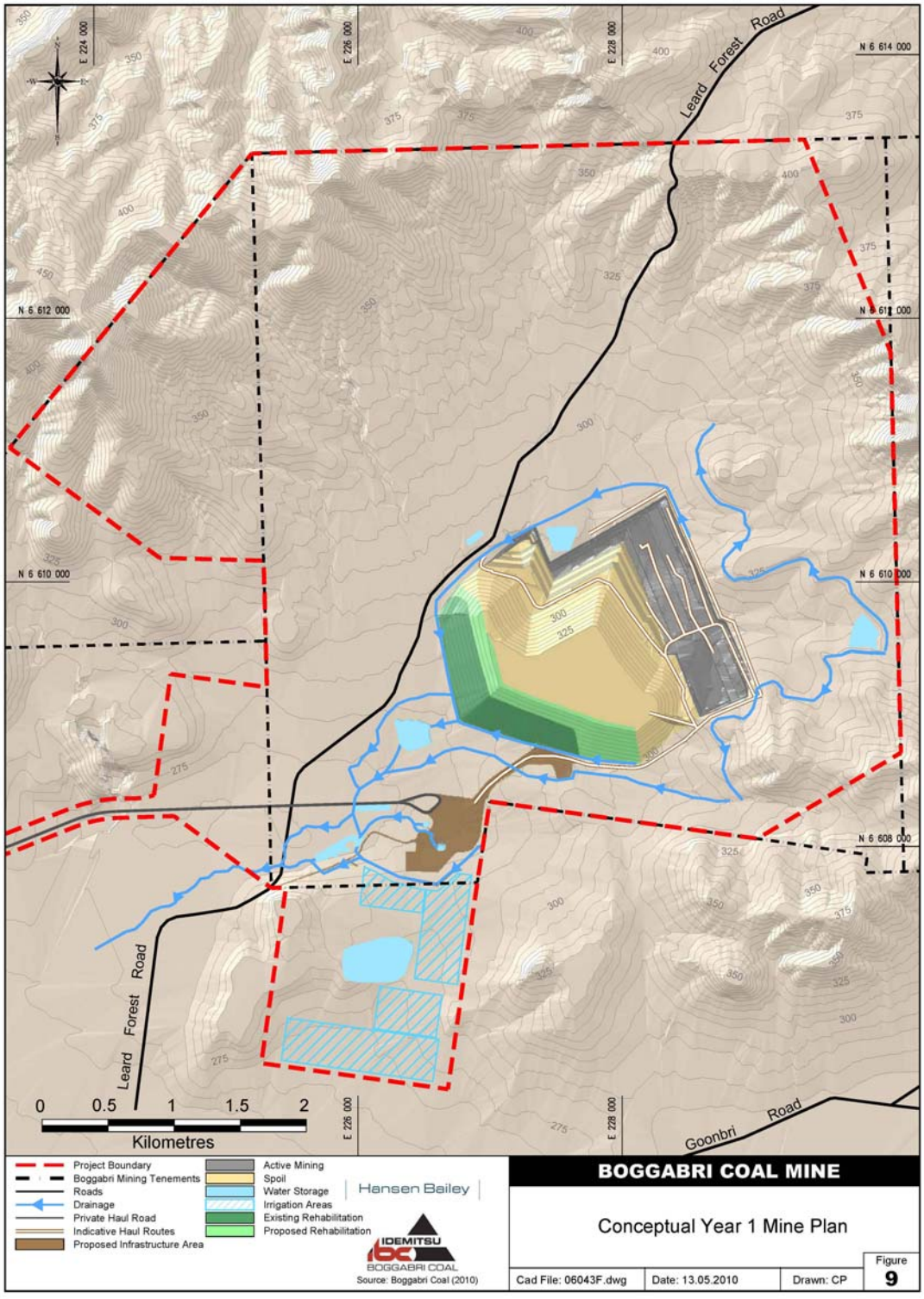

Figure 4.1 | Conceptual Year 1 Mine Plan

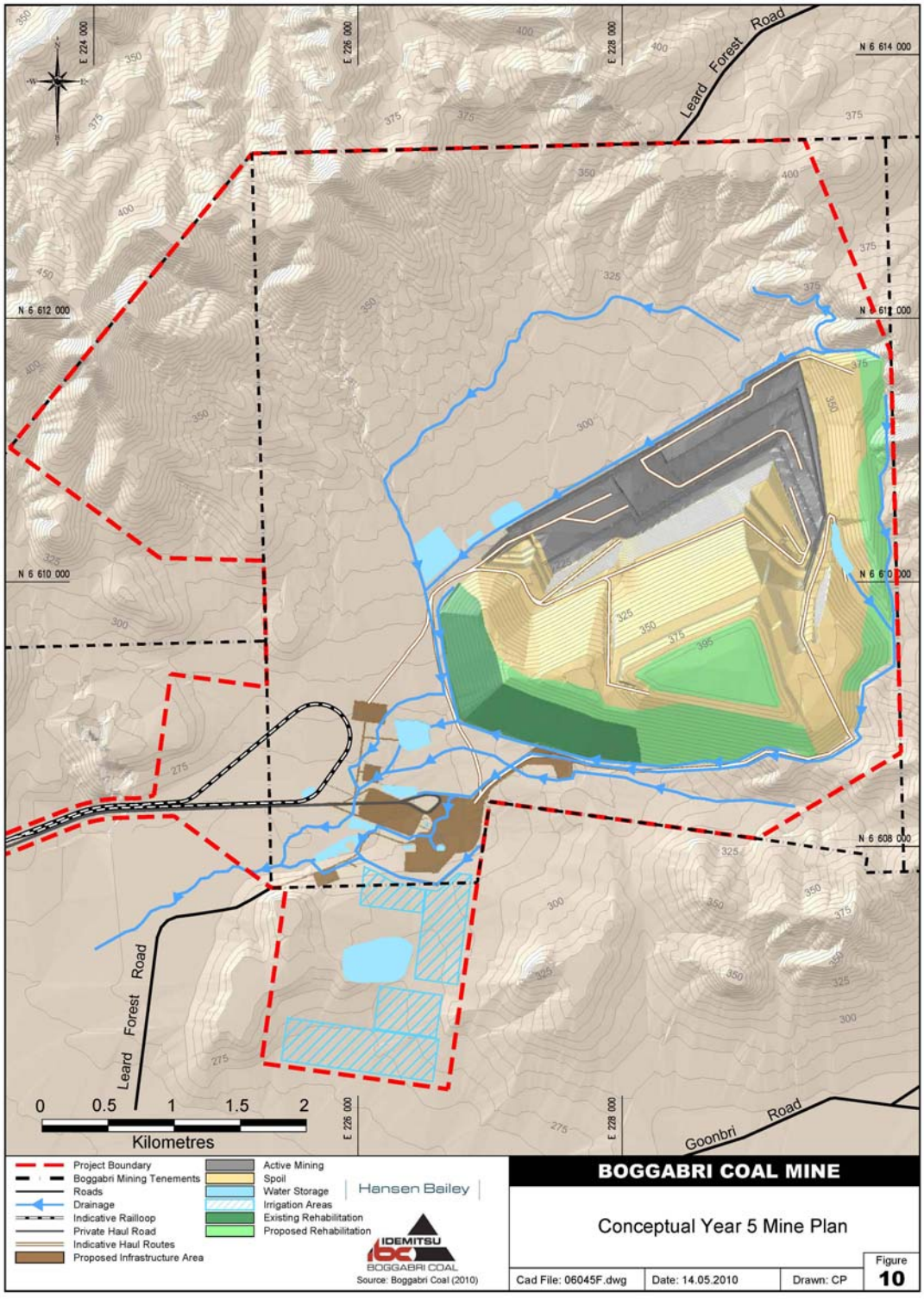

Figure 4.2 | Conceptual Year 5 Mine Plan

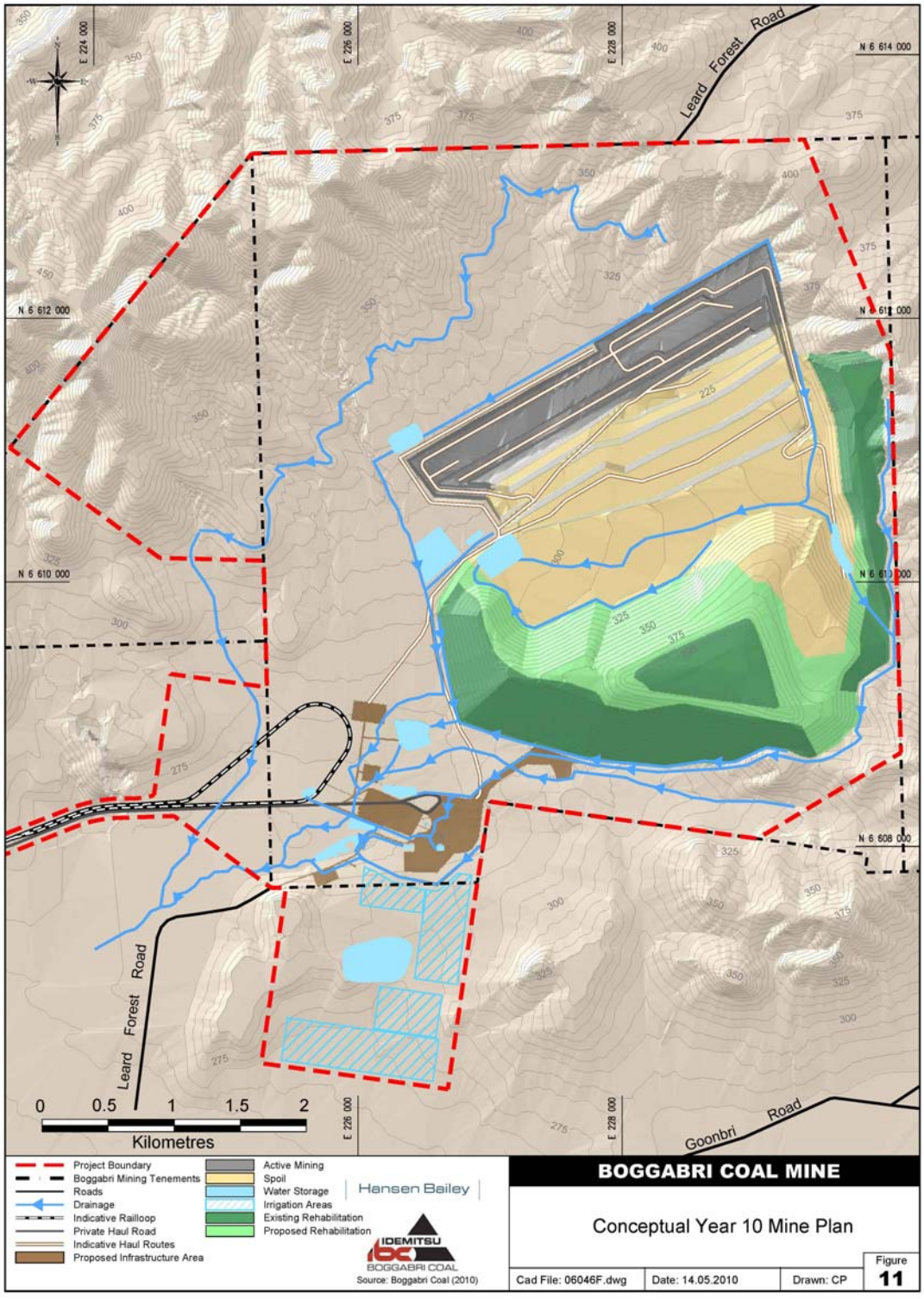

Figure 4.3 | Conceptual Year 10 Mine Plan

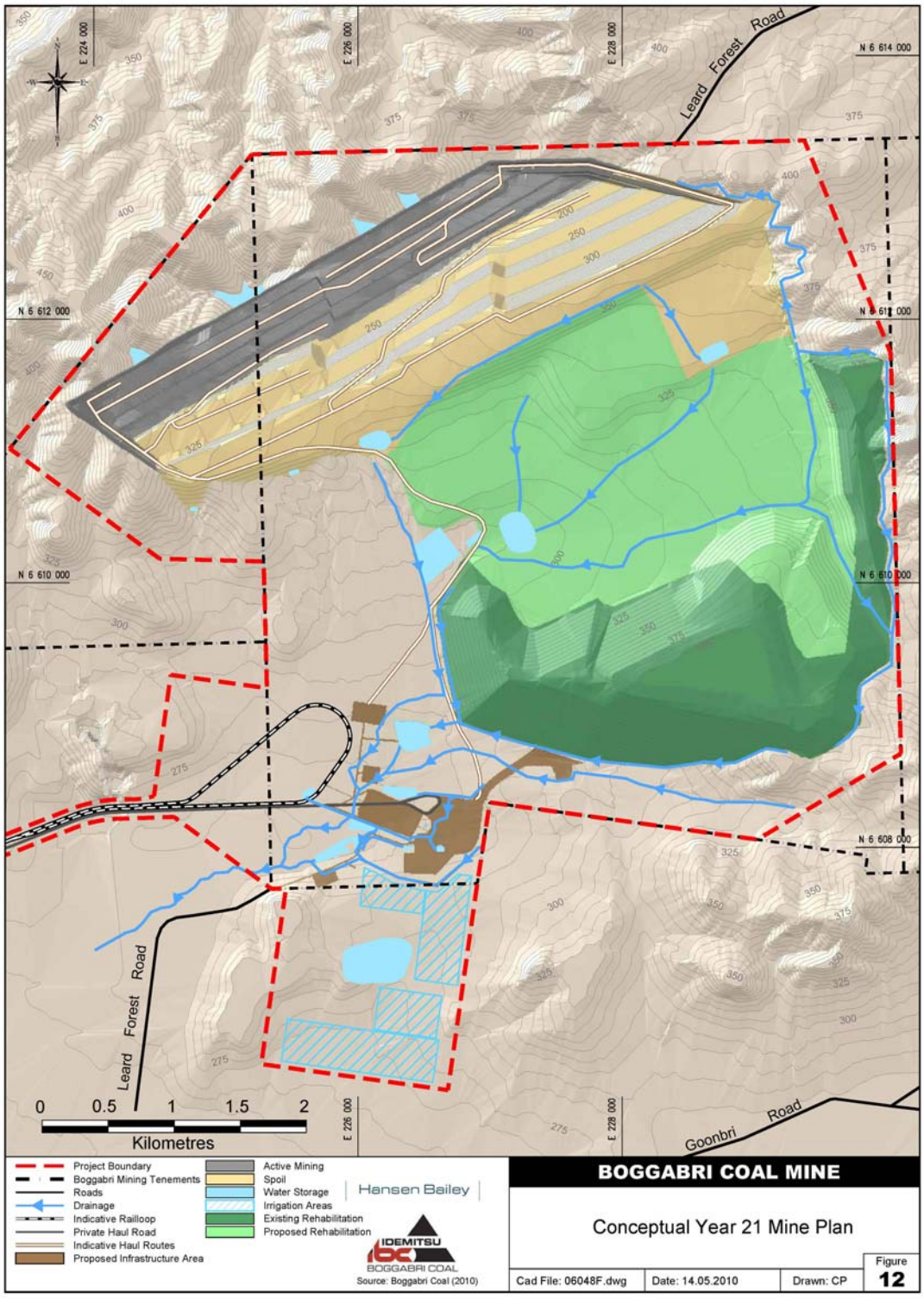

Figure 4.4 | Conceptual Year 21 Mine Plan

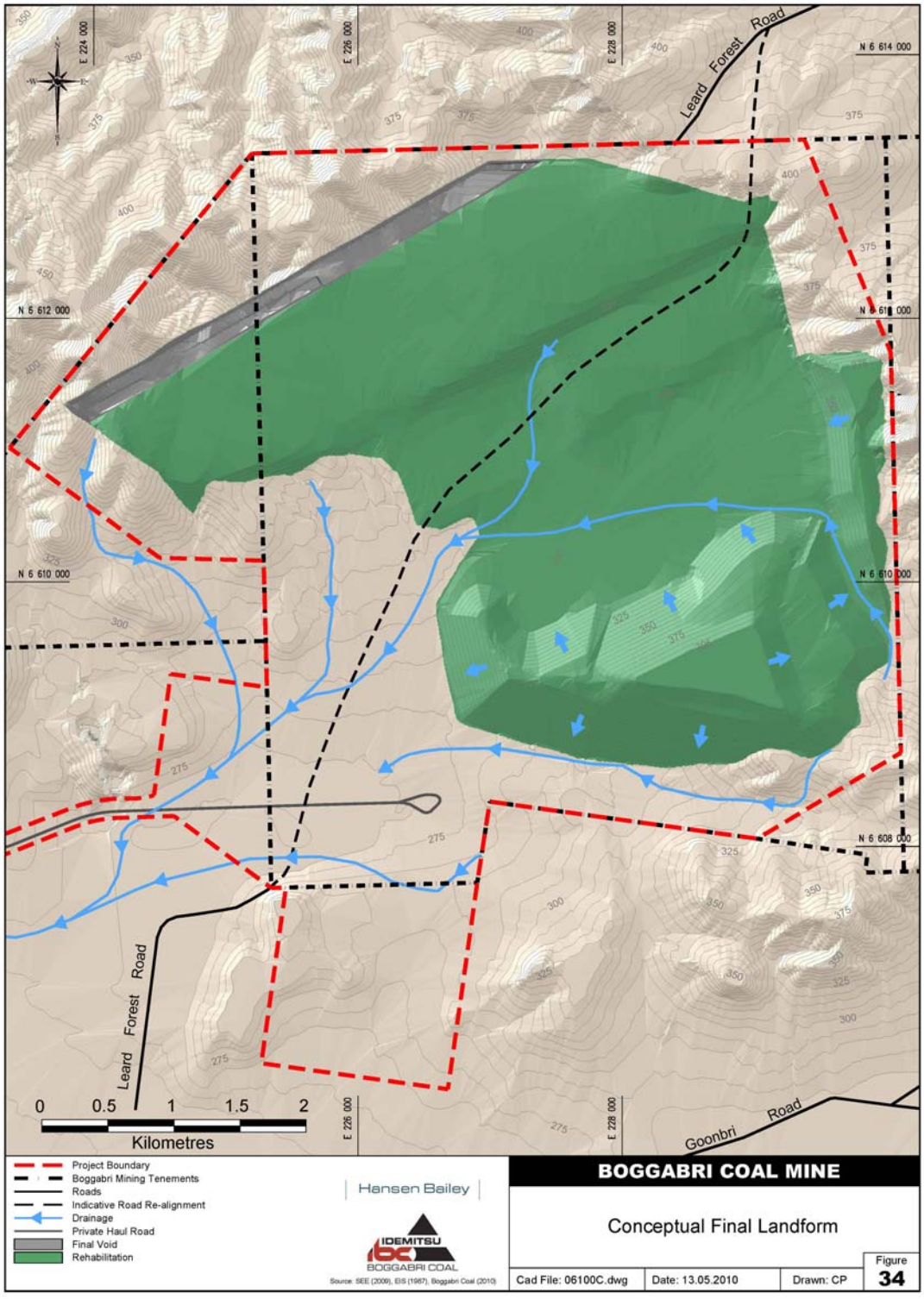

Figure 4.5 | Conceptual Final Landform

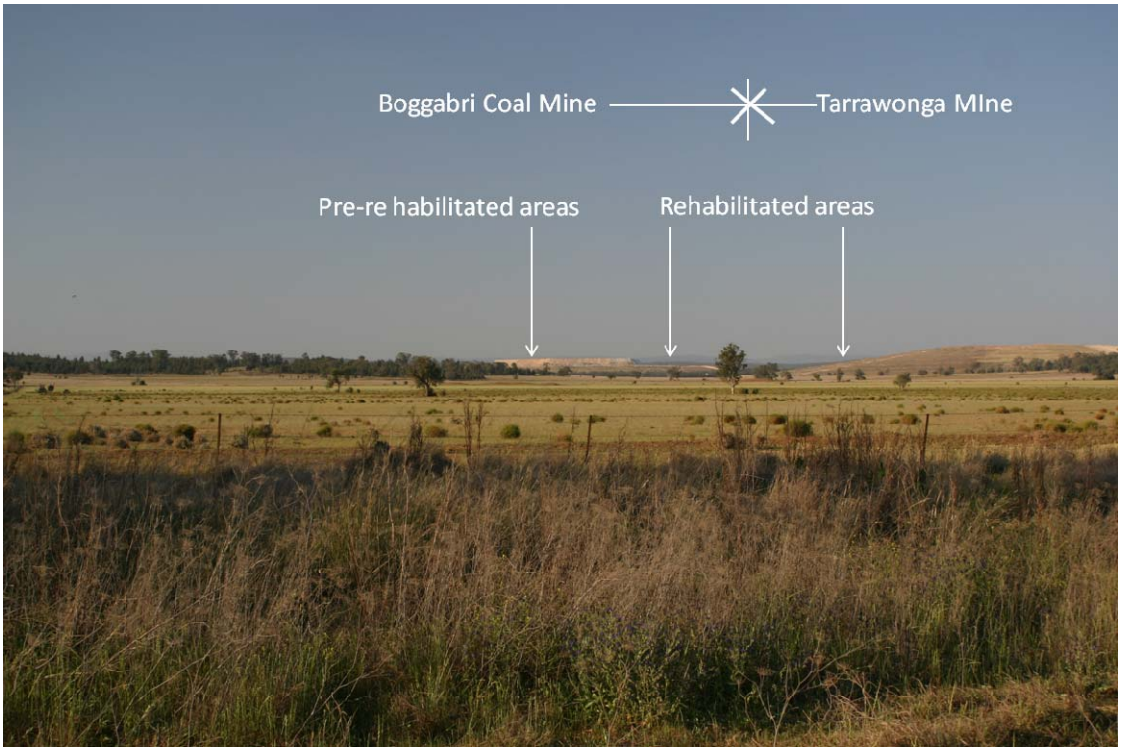

Figure 4.6 | OEA Form

View to Boggabri Coal Mine and Tarrawonga Mine showing OEA. Rehabilitation can be seen from outside the Project Boundary. Rehabilitated slopes have a low visual effect when compared to pre-rehabilitation areas.

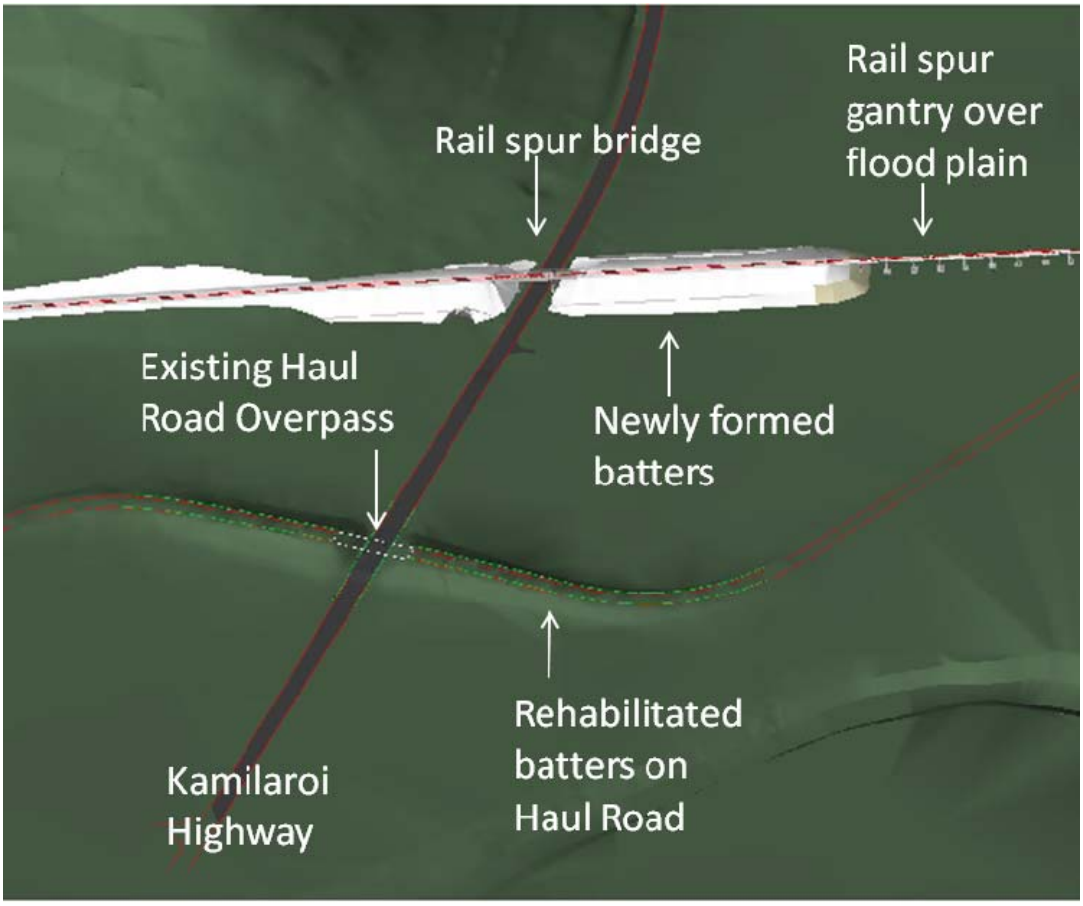

Figure 4.7 | Rail Spur 3D Model

A 3D model of the rail spur crossing of the Kamilaroi Highway. The rail bridge will be similar to that of the existing Haul Road crossing. Following rehabilitation of earthen slopes visual effects will be minimised

Figure 4.8 | Existing Haul Road Bridge

View of the existing haul road bridge over the Kamilaroi Highway looking north. The reduction in visual effect of rehabilitated road batters as well as screening by existing trees along the haul road overpass illustrate mitigation strategies for the rail spur highway overpass.

Figure 4.9 | 'The Rock' with Haul Road in Background

The rehabilitated haul road cut and fill batters illustrate the low visual effects that result from rehabilitation of these earthworks. The same would also be achieved for the rail spur.

5. VISIBILITY AND VISUAL SENSITIVITY

This section of the report evaluates and analyses the visibility of the Project including the rail spur to external view locations such as homesteads and the highway. There has to be visibility to the various mine components for an impact to be incurred.

5.1 Area of primary visual concern within PVC

Figure 5.1 illustrates the view from the southern OEA. The area that is seen in this view is the area of visual concern and that has potential views into the Project Boundary and more specifically the OEA as it is built up from its present elevation of 340 m to approximately 395 m. The general boundaries to the area of visual concern for the Project are identified below:

As is illustrated in Figure 5.1:

- to the west, the Willow Tree Range;
- to the north, the Willow Tree Range; and
- to the east, the Willow Tree Range.

As is illustrated in Figure 5.2:

- to the south west, Mt Boggabri and associated hills and ranges;
- to the south the collective of topographic elements such as Robinsons Mount, Barbers Pinnacle and foothills as well as the screening effect of open woodland trees adjacent to and in foreground areas up to 2 km away from potential view locations;
- To the south, based on distance and screening effect of adjoining woodland and foothills, Braymont Road; and
- To the south east, based on distance and intervening tree cover.

5.2 Significant Topographic Features

In addition to the Willow Tree Range (Figure 5.1) and the ranges associated with Mt Boggabri, (Figure 5.2), there are significant topographic features within this area that further limit potential views to the Project and creates limited viewing corridors. These topographic features, some dramatic (e.g. Barbers Pinnacle and Robertsons Mount) and some gentle and often not prominent (e.g. foothills to south of Project Boundary) are important insofar as their influence on the visibility of operations associated with the Project (see Figure 5.2). Many of these features will assist in screening various parts of the operations from adjoining areas.

The significant ridge lines and their relevance to views from different directions are illustrated in Figure 5.1 & 5.2.

Figure 5.1| Willow Tree Range

The Willow Tree Range surrounds the mine lease to the east, north and west, effectively screening operations from sensitive valley view locations in those directions

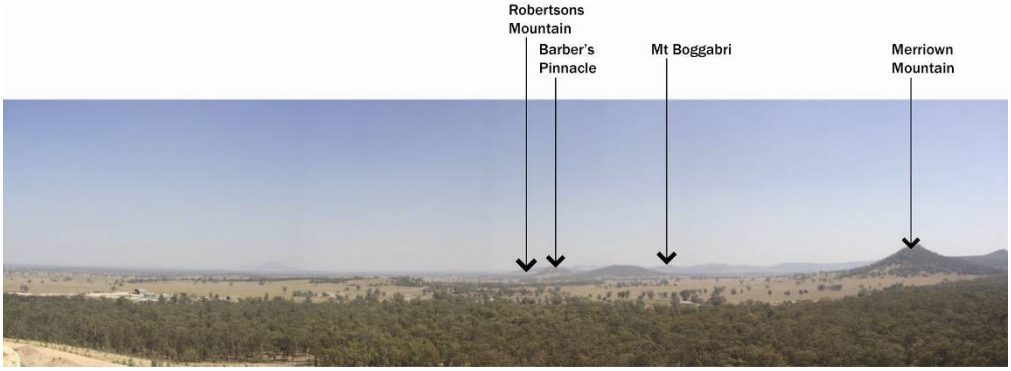

Figure 5.2 | Southern OEA – View to South

A view to the south from the southern OEA illustrates the sensitive visual valley view areas. The screening effect of the scattered foothills to the south of the Boggabri Coal Mine, such as Barbers Pinnacle and Robertsons Mount is evident.

5.3 Significant vegetation areas

Tree cover is important in providing potential screening to the Project components. It is especially significant when it is close to the viewing locations as shown in Figure 5.3.

In addition to the screening effect of native woodland especially that associated with the eucalypts along the flood plain cultural plantings around rural residences also create screening effects. Cultural plantings and residual tree areas in the foreground or near middle ground can be significant in reducing views to Project areas. In the same way vegetation around residences or village streets can greatly assist in screening views to the Project Boundary.

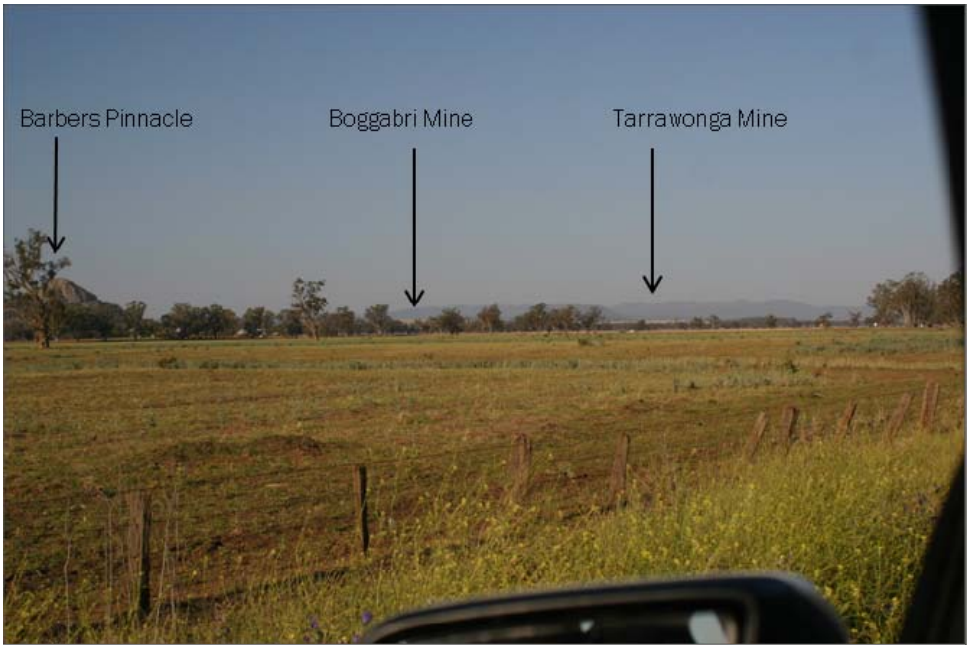

Figure 5.3 | Manilla Road – View to North

A view from Manilla Road towards Boggabri Coal Mine illustrates the screening potential of trees in the foreground, even if they are not immediately adjacent to the road. It can be seen that even trees in a semi-open woodland configuration can screen mining activity. Gaps in this vegetation pattern illustrate Boggabri Coal Mine's location.

5.4 Distance

The effect of distance coupled with foreground vegetation screen views to the Project area and that of the surrounding forests. For example based on topography alone there would be views to the mine site and surrounding forested hills associated with the Willow Tree Range. However given the distance of some 10 km, even Barbers Pinnacle is just visible as are the ridge lines behind the mine site through a small gap in the tree cover as seen from Braymont Road, see Figure 5.4.

5.5 Visibility considerations

There is a range of potentially sensitive viewing locations around the Project Boundary. These include Boggabri, rural residences, roads and tourist facilities/recreation areas.

Towns

The only town in the vicinity of Boggabri Coal Mine is the township of Boggabri. The only other village within the vicinity, Baan Baa is screened from the Project Boundary by vegetation and topography.

Figure 5.4 | Braymont Road – View to Project

A View from Braymont Road. Distance and foreground trees screen views to the Willow Tree Range and the Project.

Roads and Railway

The major road in the locality is the Kamilaroi Highway. The other roads within the locality are generally minor roads with the east west Manilla Road being the only regional road in the locality; Braymont Road joins the Manilla Road from Boggabri. Therribri Road is located on the western side of the Namoi River and joins the Manilla Road and Harparary Road. Local roads that provide access to the site are the Leard Forest Road and leading off it, the Goonbri Road.

Tourist/Recreation Areas

Tourist activity relates to the highway and general travel along it and visitation to Boggabri. Tourist sites of significance are 'Gins Leap', although not accessible to the general public and the adjacent Highway roadside rest area. It is possible to get views of Boggabri Coal Mine from this location.

Leard State Forest, as with all state forests in NSW, is available for forest recreation, especially forest driving, hunting and other recreational activities.

Rural Residences

Rural residences are spread throughout the locality. Significantly, all residences to the north, east and west are unable to view the Project due to the Willow Tree Range. Residences in the southern areas are 'potentially' exposed to views of the mining area, especially when the OEA reaches RL 395.

Rural Areas

The predominant land use within the visual catchment and the primary visual catchment is rural production land, including grazing and cropping and improved pastures in some flood plain areas along the Namoi River. These areas have a low visual sensitivity.

These land uses occur around the Project Boundary and are evaluated in terms of the north, east southeast, south west and western sector. These sectors are illustrated on Figure 5.5. Specific consideration in terms of land use type, visibility and distances to the Project Boundary as well as the rail spur in the various sectors.

Figure 5.5 | View Sectors

5.6 Northern Sector

Immediately to the north of the Project Boundary are the forested ridges of Willow Tree Range that will screen the mining activities from view. The sector as a whole is therefore assigned a low sensitivity to the project.

The view sector is more clearly illustrated in Figure 5.1.

5.7 Eastern Sector

To the east of the mine lease, the Willow Tree Range also screens the mining operations from external view, so the sector has low sensitivity to the Project.

5.8 South East Sector

Residences

There are a limited number of rural residences in this sector. They include Jeralong (52) off Leard Forest Road and one house (54) on Goonabri Road and a number of houses on Manilla Road (85, 86 & 88). These houses are generally unsighted to the Project Boundary due to topography and vegetation, including homestead planting as well as the orientation of the homesteads.

In some situations there are potential views based on topography so that if there are no foreground trees there may be some views to the Project Boundary, especially when the OEA achieves approximately RL 395. Also above this elevation there may be potential views to small sections of the high wall of the mining void in the latter years of the mine life. However, if seen these will be isolated elevated pockets of disturbance contained within the framework of surrounding forest and rehabilitated OEAs. Field assessment and evaluation of aerial photography and mapping illustrate that this is generally not the case.

There are a number of private residences with a 7.5 km radius of the Project Boundary and may have a high sensitivity, dependant on visibility and view orientation. Residences beyond this distance would have a moderate sensitivity if they have views of the southern OEA.

Local Roads

The main roads in the south east sector are the Manilla Road and to a lesser extent Goonbri Road. Both roads would have low sensitivity ratings at distances greater than 2.5 km.

5.9 South West Sector

Residences

There are a number of rural residences in this sector, see Figure 4 in the EA. These include Roma (43), Glenhope (45), Belleview (35), Cooboobindi (33) and Billabong (32). Brighton (33. Belleview is the closest residence, but is over 6km from the OEA. No houses in the sector had strong orientation towards the Project and intervening topography, vegetation also mitigate any view potential.

There are potential views based on topography in some locations so that if there are no foreground trees there may be some views to the Project Boundary, especially when the OEA achieves approximately RL 395. Also above this elevation there may be potential views to small sections of the high wall of the pit in the latter years of the mine life. However, if seen these will be isolated elevated pockets of disturbance contained within the framework of surrounding forest and rehabilitated OEAs.

This is not considered to be the case. Roma, Glenhope, Brighton and Billabong are screened by topographic features associated with Barbers Pinnacle. Belleview,

Cooboobindi and Billabong are unsighted by intervening woodland vegetation and or weak orientation towards the Project Boundary.

Private residences that are within a 7.5 km radius of the Project Boundary may have a high sensitivity, dependant on visibility and view orientation. Residences beyond this distance would have a moderate sensitivity if they have views of the southern OEA.

However some of these residences on Therribri Road are close to the rail spur alignment and would have a high sensitivity, if visibility and view orientation characteristics of the residence create open views to this part of the Project.

Residences would have a moderate to low sensitivity to activities within the Project Boundary, however some residences could have a high visual sensitivity to sections of the rail spur development.

Boggabri

The north eastern corner of the town would have potential views; however the distance of approximately 15 km generally means that even the Willow Tree Range is obscured by foreground and middle ground trees, similarly rendering the mine area out of view. Also, in terms of distance, sensitivity would be low, even if Project Boundary could be seen.

Kamilaroi Highway

Views from the highway are restricted by topographic elements such as Robertsons Mount, Barbers Pinnacle, Merriown Mountain, associated ridges and the foothills adjacent to the Project Boundary.

On leaving Boggabri, potential views to the south west of Robertsons Mount to the distant hills of the Willow Tree Range are obtained. Similarly adjacent to ‘‘Gins Leap’, fleeting views of the Project Boundary are available between Barbers Pinnacle and Merriown Mountain. More significant, will be views to the rail spur and railway overpass from the Kamilaroi Highway. This occurs in the immediate foreground of the highway.

At a distance of 10 km, the Kamilaroi Highway would have a low sensitivity to views of the Project Boundary. Similarly there would be a low sensitivity from the road side rest area due to distance. There would be a high sensitivity to the immediate area where the rail spur crosses the Kamilaroi Highway.

Residences

This sector contains a limited number of residences.

Micro-topographic features of the foothills south of the Leard State Forest, in addition to the major features of Merriown Mountain and Barbers Pinnacle, vegetation in the foreground or near middle ground of many residences as well as general homestead orientation in directions other than the Project Boundary minimise views to the mining area.

Private residences, west of Leard Forest Road are some 8-10 km away, creating moderate visual sensitivity to mine activity at this distance.

Local Roads

The sector supports a number of local roads including Manilla Road, Therribri Road and Leard Forest Road. The Project is visible from parts of Leard Forest Road within the Project Boundary, however it is not visible from this road at more distant locations due to roadside forest cover.

There will be views from Therribri Road to the rail spur viaduct across the flood plain, the road itself and the river. In the immediate foreground the sensitivity rating would be moderate.

5.10 Western Sector

This sector is totally screened by the Willow Tree Range so no impacts are anticipated.

5.11 Summary

The visibility of the Project's mining operations area is very limited. To the east, north and west, the forest covered Willow Tree Range completely encloses and screens the active Project Boundary. To the south east and south west there are a number of topographic elements that also screen the Project Boundary. Some like Barbers Pinnacle are spectacular but some like the foothills to the south of the Project Boundary are subtle.

There are some limited views from the highway, the roadside rest area at 'Gins Leap', very limited views from rural residences and some views from some local roads. Generally the visual sensitivity of these view locations will be moderate to low. The exception would be Residences inside 7.5 km that have clear views from primary view areas around the homestead either to the mine or rail spur. The other minor exception is the Kamilaroi Highway in the foreground of the rail spur highway overpass.

6. VISUAL IMPACT AND MITIGATION

The visual effects of the various elements of the Project were discussed in Section 4 of this report. The visual sensitivity levels of the Project were discussed in Section 5 of this report.

This section considers the visual impact of the Project based on visual effect and sensitivity values and outlines strategies to mitigate those impacts. The impact of the development will vary according to the visual effect of the Project, its visibility, and the visual sensitivity of areas from which it is seen. These two factors are considered together as indicated in Figure 2.5 to determine impact levels. The visual impacts are considered in relation to the various sectors.

6.1 North Sector

Residences and roads in this sector are screened from view by the Willow Tree Range so they will not experience any visual impacts from the Project.

6.2 East Sector

There will be no visual impacts from the Project on residences in the eastern sector as views will be screened by the Willow Tree Range.

6.3 South East Sector

Rural Residences

While there is potential for views of the Project from some residences in this sector. Site and aerial photo evaluation have indicated this would be very limited. Residences in this sector will have a high sensitivity up to 7.5 km with moderate sensitivities past this distance if views were available. This coupled with moderate to low visual effects creates moderate to low visual impacts.

A high impact would only occur if a high visual effect is experienced due to excessive exposure of pre-rehabilitated OEA. It is considered that areas of the high-wall potentially exposed to view will be limited, small scale and fragmented. Such an impact would reduce to moderate and low following rehabilitation of the exposed OEA.

In all, any high to moderate impact would only occur in the first five years of the mine life as the constant maturing of tree cover on the outer slopes of the southern OEA reduce effects and impact levels to very low and insignificant.

Manilla Road

The visual impact on this road would be low reflecting moderate to low visual effects and a low visual sensitivity. This would reduce to very low and become insignificant and barely perceivable when rehabilitation of the outer face of the OEA is completed.

Goonbri Road

This road has exposure to the outer face of the OEA and the upper parts of the high-wall, but visual effects would generally be moderate to low. At this distance (i.e. greater than 2.5 km) the visual sensitivity is defined as low. Visual impact levels are therefore low and will reduce to very low when rehabilitation is complete.

6.4 South West Sector

Rural Residences

Private residences located in this sector are more than 8 km away from the mine. These residences would have a moderate visual sensitivity if views were available. However field, mapping and aerial photography analysis illustrate this not to be the case.

Given that visual effects are likely to be low to moderate if seen, low impacts would be experienced in this sector. If high visual effects do occur due to excessive exposure of pre-rehabilitated OEA, a high impact could occur until the OEA is rehabilitated.

There is potential for a high impact on residences close to where the rail gantry will cross Therribri Road if house views are orientated in that direction.

Boggabri

Although parts of the site would potentially be visible from Boggabri, to the west of Barbers Pinnacle, foreground screening within the town by houses, buildings, street and garden planting eliminates this view.

Further outside the town the adjoining woodlands along the Namoi River screen views from the edges of town. In keeping with this, the township has a low sensitivity and there is no visual effect or impact on the town.

Kamilaroi Highway

The greatest potential impact on this road occurs north of the township of Boggabri on the journey north for up to 5 km. There may be potential views onto the southern face of the OEA. However the visual effect is limited at this distance and the visual sensitivity is low. There would be a low impact on the highway if any part of the mine is seen.

The visual effect of the rail overpass will be moderate to high, the effect reduced somewhat as another such bridge is also located in this viewshed. The sensitivity is considered to be high reflecting its use by tourist traffic. This creates a high impact for approximately 300 m either side of the rail overpass. However, considered in the context of a journey and time of visual exposure, approximately 10 seconds of impact are anticipated in each direction.

Therribri Road

There are potential views from Therribri road to the OEA. The visual effect at this distance would be moderate reducing to low following rehabilitation. At this distance,

visual sensitivity is low creating a low visual impact level. This would reduce to very low and becoming insignificant and barely perceivable following rehabilitation.

The greatest impact on this road is that created by the rail gantry that passes overhead. This will have a high visual effect up to approximately 400 m. The visual sensitivity in the immediate foreground is moderate, creating a high impact on foreground views.

Tourist Localities

With the exception of Boggabri township and the Kamilaroi Highway, there are no significant tourist destinations in the primary visual catchment, with the possible exception of the roadside rest area on the highway below Mt Boggabri. The mining area will be over 10 km away from this location. Visual effects of the OEA before rehabilitation will be small in area and will create a moderate to low visual effect at this distance. Also given the distance, visual sensitivity would be low.

Visual impacts would be low and would be further reduced and become insignificant following rehabilitation.

6.5 West Sector

This sector is screened from view of the Project Boundary by the Willow Tree Range so there is no visual impact on Residences.

6.6 Impact of Night Light

General

The visual effect of lighting surrounding the Project Boundary will vary. It will be influenced by the locality of operations on-site, the relative level at which the viewing location is situated and the presence of any off-site barriers such as topographic features and / or vegetation.

There are two types of lighting effects that could be experienced from the Project. The first effect is where the light source is directly visible, and will be experienced if there is a direct line of sight between a viewing location and the light source.

The second effect relates to the general night-glow (diffuse light) that results from light of sufficient strength being reflected into the atmosphere. This type of effect will create a strong local focal point and the effect will vary with distance and atmospheric conditions such as fog, low cloud and / or dust particles which all reflect light.

Both of these light effects already exist in the locality of Boggabri Coal Mine and Tarrawonga Mines and are discussed further below in relation to the Project.

Direct Light Effects

Direct light effects are generally restricted to vehicles / train lights and mine void lighting, as other operational light would be hooded.

Generally Project truck and vehicle lighting will be screened by topography, vegetation and eventually by the OEA itself. During the first 5 years of the mine life as the southern OEA is constructed, night lighting from dump trucks and other machinery working on the outer faces of the OEA will project lighting effects outside the Project Boundary.

The other form of direct lighting effects will be created by train movement along the rail spur. In this situation, the train lights are for the greater part directly in front of the train along the rail track. There are no sensitive receptors within this zone of influence. Such light may be seen from some adjoining locations such as roads and more distant houses in much the same way, but significantly less frequently than, highway traffic lights seen from a side on location. Such roads would include Therribri Road and the Kamilaroi Highway. It is not expected that rural residences would be affected by such light.

Diffuse Light Effects

Both Boggabri Coal Mine and Tarrawonga Mine already contribute diffuse light effects into the night sky. Depending on the proximity of the viewing zone, this glow will not create a significant visual effect. Further, the influence of surrounding mining operations and associated lighting activities will reduce the visual impact of diffuse light associated with the Project. The diffuse night lighting effect of the Project would be similar to that which is currently experienced and may increase slightly reflecting the increase in operational intensity.

Night Light Impacts

The visual effect of lighting associated with the Project would be at a similar level to that currently approved and experienced. Potentially the light effect of the train would be less than that of a truck and certainly less frequent. The main light effects will be from diffuse light.

The major mitigation elements against night light effects from Boggabri Coal Mine are topography, vegetation and distance to sensitive receptors. All mitigate light effects to a level that will not create a significant visual impact.

6.7 Visual impact summary

The potential for visual impacts is restricted due to the visual screening effects of the Willow Tree Range which effectively eliminates the potential for any impact to the north east and west of the mine.

The visual impacts associated with the Project to the south are created for the greater part by the OEA and to a lesser extent by the rail spur bridge and gantry over the Namoi River flood plain and the highway. The impacts of the infrastructure are insignificant as they are collocated with other elements and are not visible from any sensitive receptor.

The visual impacts created by the OEA relates to the outer face before it is progressively rehabilitated. This will limit visual effects to moderate and low, reducing to low following rehabilitation and very low following reestablishment of tree cover. This will result in low impacts to any sensitive receptors around the Project.

6.8 Mitigation

Mitigation measures in relation to reducing visual impact relevant to the Project include:

- On site treatments to reduce visual effects; and
- At viewer location treatments to reduce visual sensitivity.

On site treatments involve rehabilitation of landforms and land cover, while viewer location treatments could involve a range of treatments to screen views, filter views and or reorientate primary views should this be needed. It should be noted that on site treatments are already being carried out as they relate to OEA establishment and rehabilitation.

The need for Off Site treatments at viewer locations is considered unlikely and would only be considered if a high impact is experienced at a residence for a substantial period.

On site treatments to be implemented for the Project include:

- Additional infrastructure constructed in forest tones (i.e. green, grey, cream) to blend with the surrounding natural environment as far as practical;
- A continuation of existing rehabilitation programs;
- Implementation of already completed landform design of the eastern and southern OEAs and associated drainage structures;
- Establishment of visual and ecological forest planting patterns to achieve landscape patterns that emulate existing forest colour and texture continuums in the landscape;
- Within the established rail and road easements rehabilitate earthwork batters and carry out tree plantings to provide vertical scale to balance and integrate, but not necessarily screen, overhead rail gantries and bridges, especially in relation to views from the Kamilaroi Highway and Therribri Road;
- If possible place transmission poles in locations of high visual absorption or well away from the crossing of the Kamilaroi Highway and Therribri Road; and
- Where possible and consistent with health and safety requirements, ensure lights are hooded or directed away from sensitive receivers to avoid direct light spillage from the site.

7. CONCLUSION

The visual impacts associated with the Project are anticipated to be minimal on its surrounds. Limited visual impacts will occur over the first five years of the Project.

The location of the mining area within Leard State Forest limits its visibility from surrounding sensitive receptors. The Willow Tree Range will screen views from the north, east and west eliminating any possibility of visual impacts in these sectors.

The visual impacts on southern locations are also limited by topographic elements and vegetation to only allow glimpses of limited mining activity by way of the outer face of the OEA. This OEA will generally be constructed and progressively rehabilitated through the first five years of mining, reducing any potential high to moderate impact to low. As tree cover becomes established, impacts will be further reduced to become insignificant.

The rail spur generally has low impact except for the rail gantries and bridges. These elements will have localised high impacts that can be treated by tree plantings within the easement to decrease any potential adverse visual impacts.