APPENDIX

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Visual and Lighting Impact Assessment

Maules Creek Coal Project

visual impact assessment

November 2010

a report prepared by

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landscape architecture
& visual planning

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Maules Creek Coal Project

visual impact assessment

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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
Contrast	The degree to which a development component differs visually from its landscape setting
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
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view
Photomontage	An image of a project at a point in time that combines a photograph of a view with a computer generated and rendered image of the project as seen from that view.
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
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
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
Visual Effect	A measure of the visual interaction between the Project and the landscape setting within which it is located
Visual Sensitivity	The degree to which a change to the landscape would be perceived in an adverse way

1. INTRODUCTION

1.1 Background

The Maules Creek Coal Project (the Project) is located approximately 18 km to the north-east of the township of Boggabri in the north-west region of NSW within the Narrabri Local Government Area (LGA) (refer Figure 1.1).

The Project is owned by Aston Coal 2 Pty Limited (Aston), a wholly owned subsidiary of Aston Resources Limited (Aston Resources). It is considered to be one of only a few remaining Tier 1 undeveloped semi soft coking and thermal coal assets in NSW. Located in the Gunnedah Coal Basin, it is a large delineated coal project with Joint Ore Reserves Committee (JORC) Coal Reserves of 610 Million tonnes (Mt) of semi-soft coking and thermal coal, capable of supporting a large open cut operation for more than 21 years.

Mining tenements across the Project were originally granted in the 1970s. Following this, extensive exploration activities were undertaken with the ultimate aim of defining the local geology and developing a viable open cut mine plan. To this end, the document entitled *Maules Creek Coal Project Environmental Impact Statement* (Maules Creek EIS) (KCC 1989) was prepared and submitted to the Narrabri Shire Council (NSC) in October 1989.

Development Consent approval (DA 85/1819) was granted on 12 June 1990 for the Maules Creek Coal Mine pursuant to the Maules Creek EIS. DA 85/1819 was physically commenced in 1995 with the construction of the Development Dam; however, no open cut mining has been undertaken at the site to date. DA 85/1819 has no sunset clause and remains valid.

1.2 The Project

Integral was commissioned by Hansen Bailey on behalf of Aston Resources to undertake a visual impact assessment for the Maules Creek Coal Project (the Project). The purpose of the assessment is to form part of an Environmental Assessment (EA) being prepared by Hansen Bailey to support an application for a contemporary Project Approval under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) to facilitate the development of a 21 year open cut coal mining operation and associated infrastructure.

Specifically, the Project, Figure 1.2, would consist of:

- The construction and operation of an open cut mining operation extracting up to 13 Million tonnes per annum (Mtpa) Run of Mine (ROM) coal to the Templemore Seam;
- Open cut mining fleet including excavator / shovels and fleet of haul trucks, dozers, graders and water carts utilising up to 470 permanent employees;
- The construction and operation of a Coal Handling and Preparation Plant (CHPP) with a throughput capacity of 13 Mtpa ROM coal;
- The construction and operation of a Tailings Drying Area;
- The construction and operation of a rail spur, rail loop, associated load out facility and connection to the Werris Creek to Mungindi Railway Line;
- The construction and operation of a Mine Access Road;
- The construction and operation of administration, workshop and related facilities;
- The construction and operation of water management infrastructure including a water pipeline, pumping station and associated infrastructure for access to water from the Namoi River;
- The installation of supporting power and communications infrastructure; and
- The construction and operation of blasting facilities.

1.3 Description of project boundary and surrounds

The Project is predominantly located within the northern part of Leard State Forest and is bounded by the Willow Tree Range to the south that reaches approximate heights of 460 m. This range encloses the Maules Creek Coal Project. The Project Boundary is within the Back Creek catchment that drains into Maules Creek shortly before it drains towards the Namoi River.

The Project Boundary is located on undulating moderately sloping hills generally with a northerly aspect at elevations ranging from 400m in the south to 500m in the north. Vegetation cover consists of open forest with small open grass areas in the northern and north western edges of the area within the Project Boundary.

1.4 Objectives of the Visual Assessment

This technical report is a visual assessment of the potential impacts of the project on the existing landscape and visual values of the surrounding areas. The report identifies the visual character of the existing landscape as well as that proposed for the Project.

The visual impacts of the Project, including both short-term and long-term impacts, have been assessed with visual impact assessment methodologies developed in accordance with best practice. Such methodologies are not formalized but they have been written to include:

- An assessment of the existing visual settings created by various landscapes in and around the project;
- Establishing the visual character and visual effect created by the Project;
- A consideration of the visibility of the Project from sensitive receptors;
- The likely visual impacts created by the Project giving regard to visual effect and
- sensitivity; and
- The development of mitigation strategies to ameliorate adverse visual impacts.

The report also considers cumulative visual impacts in the locality and includes a consideration of night light effects.

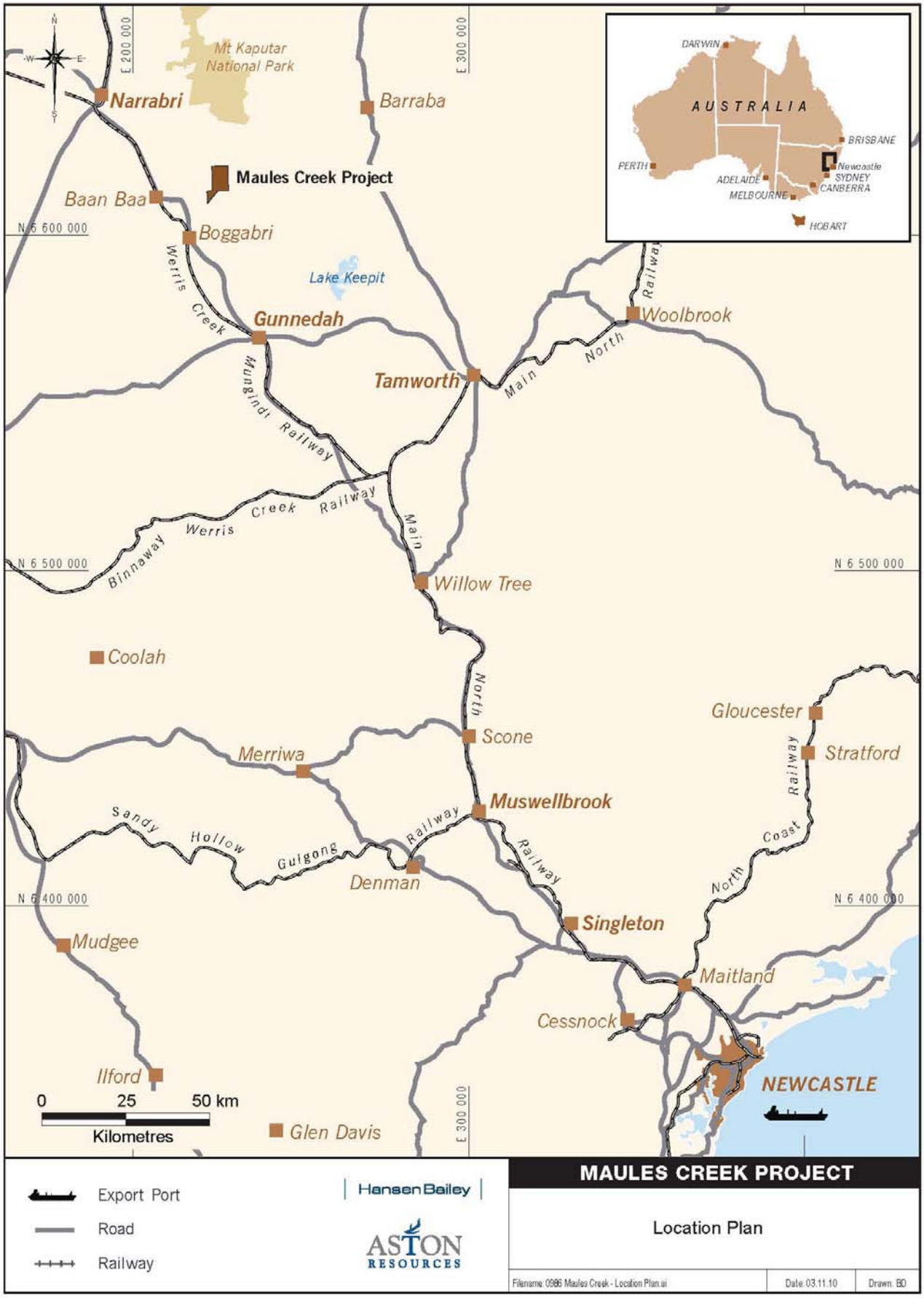

Figure 1.1 | *Project Locality Plan*

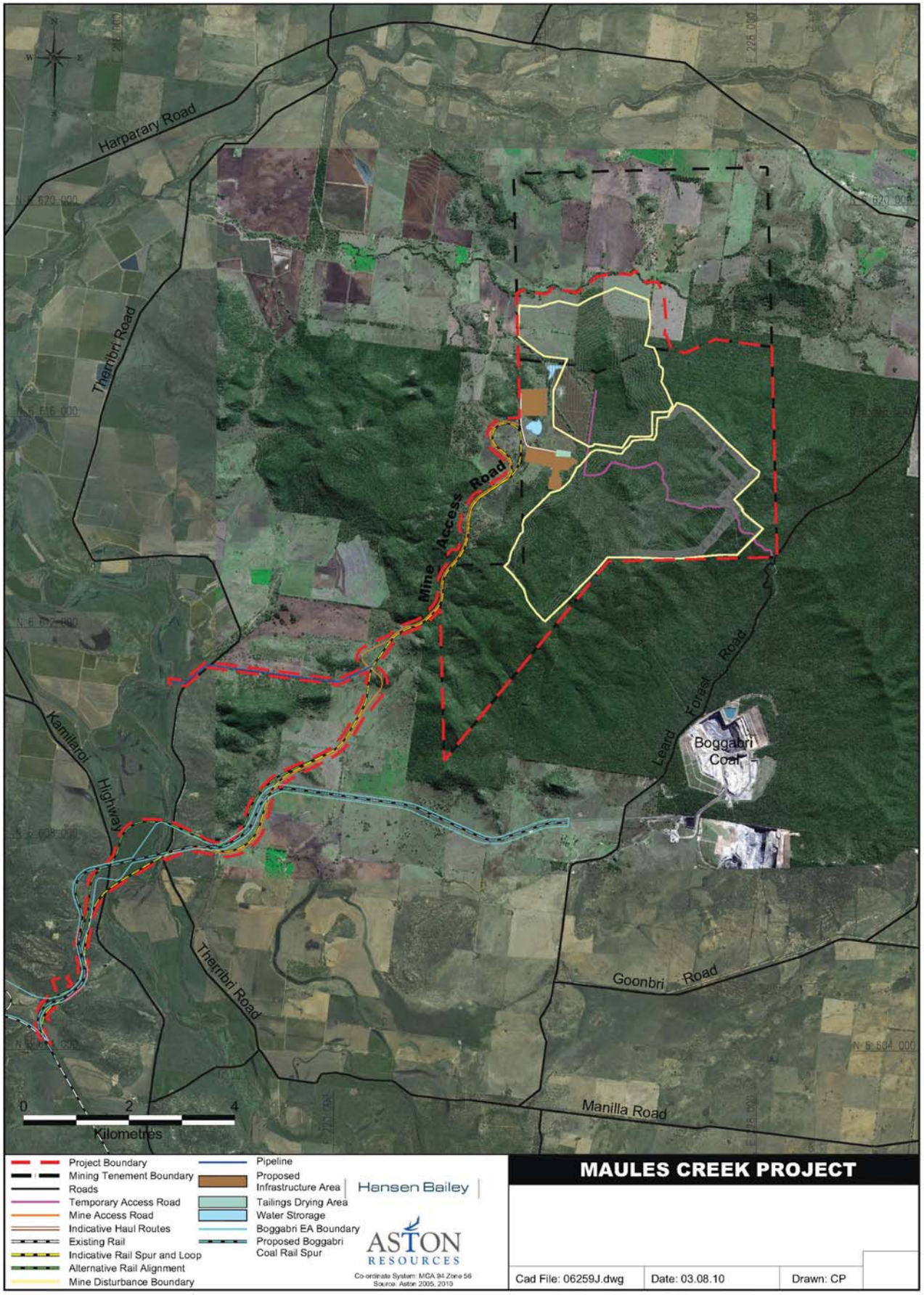

Figure 1.2 | The *Project*

2. ASSESSMENT METHODOLOGY

2.1 General Method

This section outlines the methodology used to assess the visual impact of the Project. The methodology to determine the level of visual impact of the Project, involves, in the first instance, a consideration of the existing visual environment (Section 3). This includes a consideration of the existing landscape setting and how it is 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 Project and its major components are described (Section 4) and its visual effects are then able to be 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 (Section 5) and visual effect determines what the visual impacts are likely to be and gives some direction for the consideration of mitigation strategies (Section 6). The overall methodology of visual assessment for the Project in the context of the existing landscape is outlined in Figure 2.1.

2.2 Existing Visual Environment

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

2.2.1 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 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.

2.2.2 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 viewing distance to the Project.

There are numerous locations within the vicinity of the Project Boundary that would potentially be visually impacted by the Project to various levels. For the purpose of the visual impact assessment a number of sites within key sectors of the primary visual catchment were selected as representative viewing locations. These representative viewing locations were selected as part of the field assessment and detailed analysis of aerial photography and topographic plans to determine the likely visibility of the Project. Whilst there would be some variation in the impacts on specific viewing locations, an overall assessment of the visual impact on the selected locations would be representative for the majority of views experienced. The representative viewing locations selected were evaluated using photomontage simulations of the Project (Section 4).

2.2.3 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 necessary.

2.3 The Project

The Project would have various components with particular visual characteristics. The visual character of these components, including their modification of the landscape, must be defined in terms of the visual expression factors of form, shape, line, and colour and to a lesser extent texture. An understanding of the visual character provides an appreciation of how the various mine components would be seen in the landscape. This provides the basis for visual effect analysis of the Project.

2.4 Impact Assessment

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

2.4.1 Visual Effect

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

An existing landscape has certain visual characteristics expressed through the visual elements of form, shape, line colour and texture. A development such as a large scale open pit mine has different visual characteristics that would create contrast 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 Greenfield mine development will have a higher visual effect due to strong contrast, keeping in mind that distance will have a marked effect on the perception of this contrast. An extension of operations in an existing mine will have a lesser visual effect. A successfully rehabilitated mine area will have a low visual effect due to limited contrast with the existing landscape.

A Project can 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 visual effect of a Project is determined by factors illustrated in Figure 2.2 and 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 the Project

For any given level of contrast and integration the lower the proportion of the view that is occupied by the Project the lower the level of visual effect will be. This can be determined by defining the proportion of the total field of view occupied by the Project or visible Project components. 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		
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
High Project elements do not borrow, form, shape, line, color or texture or scale from existing features of the visual setting and contrast levels are high with existing landscape	Low The Project 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	CATEGORY 1	Visible element occupies more than 2.5% of the primary view shed	Visible element occupies between 1 - 2.5% of the primary view shed	Visible element occupies less than 1% of the primary view shed
Moderate Project elements borrow from some features of the visual setting in terms of form, shape, line pattern and or color and scale, reducing visual contrast with existing setting	Moderate The Project has some degree of visual integration with setting from other features, vegetation and / or topography achieving some level of integration	CATEGORY 2	Visible element occupies more than 10% of the primary view shed, generally when in a foreground location	Visible element occupies between 20-10% of the primary view shed	Visible element occupies less than 10% of the primary view shed
Low Project elements borrow extensively from features in visual setting in terms of form, shape, line, pattern color and scale minimizing contrast with the existing setting	High Visual integration is high due to other features, vegetation and or topography achieving dominance and screening or filtering	CATEGORY 3	Visible element occupies more than 40% of the primary view shed	Visible element occupies 40-30% of the primary view shed	Visible element occupies less than 30% of the primary view shed

Figure 2.2 I Visual Effect

Area of Primary View Zone at Various Distances from Project Site

Distance from Project Site	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

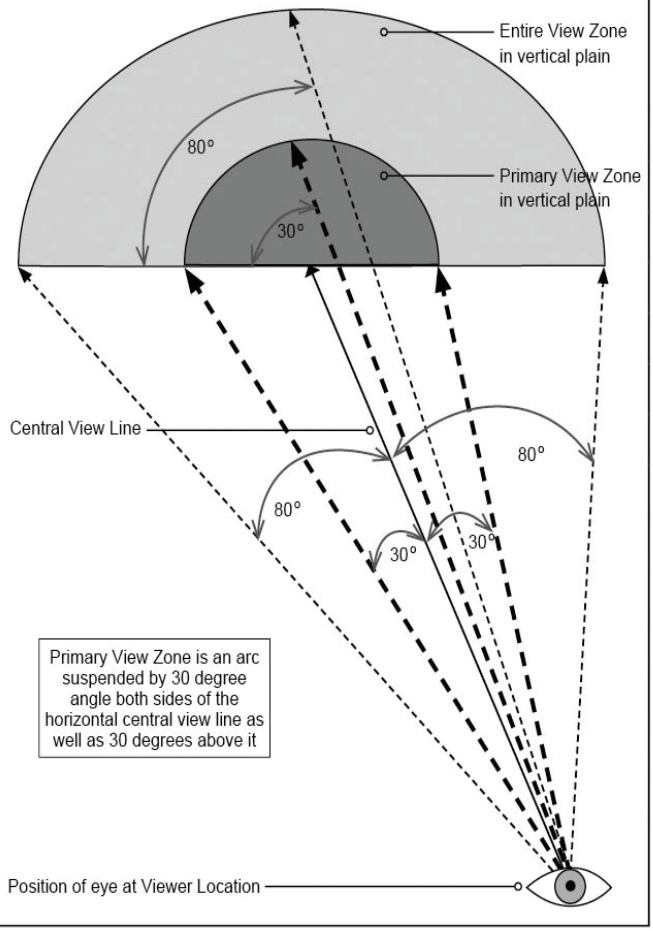

Figure 2.3 | Area of Primary View zone at various distances from the Project

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.

Photomontage Development

The visual effect of the Project on external viewpoints was determined by the development of a number of photomontage simulations taken from the selected representative locations within the four sectors of the primary

visual catchment. The assessment of visual effect from these locations takes into account the views of the Project expected to be seen from these areas.

Photographs of the area within the Project Boundary were taken at standing eye level from the selected viewing locations. The precise location of each of these photograph positions was recorded by GPS. The photography provides a realistic representation of the site landscape and how it is seen from each viewing location in response to light and atmospheric conditions.

Three dimensional computer models of the Project at Year 5, 10 and 21 were developed from digital surface topography and Project development plans. The models enable accurate views of the Project to be generated from any specified viewing location and account for screening of views by natural topography. The photographs of the area within the Project Boundary and its landscape setting were overlain on the model view from the same viewing location and the location of future visible components of the Project were determined taking into account any foreground screening from topography or vegetation in the photograph. Realistic colours and textures were applied to the visible Project components taking into account viewing distances to the visible components. The end result is an accurate and realistic photomontage of the likely future view of the Project from the selected representative viewing locations.

2.4.2 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.

2.4.3 Visual Impact

The visual impact of a Project is 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.

Land Use	Visual Sensitivity Levels			
	Nearest visible project elements less than 2.5 km+ away	Nearest visible project elements between 2.5 - 7.5 km away	Nearest visible project elements between 7.5 - 12.5 km away	Nearest visible project elements more than 12.5 km away
Rural houses, villages, towns & cities	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Tourist destination of visually sensitive land e.g. Lookout Mt Kaputar	High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Designated tourist roads, main roads and highways	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Other roads e.g. Maules Creek Road, Harparary Road, Narrabri Road, Rangari Road	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Minor local roads in rural area, Therribri Road, Black Mountain Creek Road	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Broad acre rural lands and state forest lands	Low Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity

Figure 2.4 | Visual Sensitivity

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

2.5 Visual Impact Mitigation

Visual impact mitigation strategies are developed to ensure that visual effects and/or visual sensitivity factors are decreased in appropriate time frames, where necessary, to reduce visual impact. Depending on the situation, effective impact mitigation strategies may be implemented either on the project site or off-site.

2.5.1 Reduce Visual Effects

Rehabilitation and revegetation of disturbed areas will decrease the visual contrast created by the Project with the existing landscape. Rehabilitation strategies will be designed to emulate patterns, shapes, line and colour of the existing landscape, as far as practicable, and will reduce the contrast between the Project and the existing landscape, therefore reducing visual effect.

2.5.2 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 may be best carried out off-site or as close as possible to the viewing location. 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.

2.5.3 New Visual Setting

A new visual setting will be created by the Project in the context of the surrounding landscape. The new setting will reflect the various stages of the Project as well as the completed Project in the context of the surrounding landscape. Neither will be seen without the other.

3. EXISTING ENVIRONMENT

3.1 Introduction

This section of the report establishes the visual character of the existing environment. This is required to establish a baseline against which visual effect can be measured. It also identifies the patterns of land use and informs the assessment of likely visual sensitivities to the Project.

As shown in Figure 3.1 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, seven Visual Character Units (VCU) were established.

These VCU were analysed in terms of their visual character within the primary visual catchment of the Project.

3.2 Primary Visual Catchment

The Primary Visual Catchment (PVC) represents the area from which the Project could potentially be seen. It covers an area of approximately 150km^2. At a regional scale, the Visual Catchment is defined by the ridges of the Rangari Road to the south. To the east and north the visual catchment is defined by the mountainous range associated with Mt Kaputar. To the west, distance and tree cover on plains and gentle hills define the boundary that has been extended to the Kamilaroi Highway.

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

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, the creek and river system of the Namoi 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 are rarely seen in isolation but rather in combination with one another in various vistas that are obtained from viewing locations such as residences and roadways.

The VCUs shown on Figure 3.1 are briefly described in the sections below and include:

- Creeks and Rivers VCU;
- Cropping Lands VCU;
- Slopes & Foothills VCU;
- Rocky Hills VCU;
- Forested Hills VCU;
- Surrounding Ranges VCU;
- Villages VCU; and
- Mine and Infrastructure Areas VCU.

Each is discussed further below and shown on Figure 3.1.

3.2.1 Creeks and Rivers VCU

This VCU contains the creeks and rivers within the PVC. The Namoi River runs south to north along the western edge of the PVC. Within the PVC the river is feed by two creek systems, namely the Goonbri Creek/Barbers Lagoon drainage system south of Leard State Forest and the Maules Creek system north of the State Forest.

The water elements of these creeks and rivers have only ephemeral or localised foreground effects. More significant visually are the riparian woodlands that adjoin these meandering drainage channels. A representative photograph of the Rivers and Creeks VCU is shown in Figure 3.2.

Significance of the VCU

The significance of the Creeks and Rivers VCU is that it creates visual backdrops to many of the adjoining open fields and croplands. This VCU also creates visual filters to views of the Project at times creating foreground to middle-ground screens to long distant views.

3.2.2 Cropping Lands VCU

Cropping lands for the greater part adjoin the flood plains of the Namoi River and feeder creeks. Visually the VCU is dominated by the expansive flats that by virtue of soils and irrigation, support cropland, creating vivid rectilinear patterns between the riparian woodlands along creek and river corridors and the dry land grass and woodlands on adjoining slopes. A representative photograph of the Cropping Lands VCU is shown in Figure 3.3.

The VCU is relatively flat and the grass / crop cover allows for long views from the cleared rural lands to the riparian woodlands and more distant surrounding ranges. Notably, the riparian woodlands can restrict long distance views.

There are a number of roads which pass through this VCU. These roads include Harparary Road, Maules Creek Road, Therribri Road and Rangari Road. There are also a number of scattered rural residences within the VCU.

Significance of the VCU

The significance of the cropping lands VCU, in addition to its visual character, is the open views it gives to more distant locations.

3.2.3 Slopes and Foothills VCU

The slopes and foothills generally occur between the cropping lands and forested hills, rocky hills and or surrounding ranges. The gentle to moderate slopes are generally cleared and maintained as grazing land. The dry land grass areas generally have some degree of tree cover. This cover can vary from scattered trees to scattered clumps of trees, but grassland is the dominant land cover. A representative photograph of the Slopes and Foothills VCU is shown in Figure 3.4.

Significance of the VCU

The Slopes and Foothills VCU is often in views of the rural landscapes, including views towards the area within the Project Boundary.

3.2.4 Rocky Hills VCU

The rocky hills represent geological outliers of the Mt Kaputar Mountain Range. They are feature elements in the landscape as they rise suddenly and steeply from the gently sloping surrounding footslopes. The vegetation cover is often open forest increasing the contrast with the surrounding grasslands and croplands of the slopes and plains.

The rocky hills include Turkey Ridge, Black Hill and Scrubby Hill to the north, Middle Mountain and Goonbri Mountain to the east, as well as Boggabri, Barbers Pinnacle and Robertsons Mount to the south west and the hills and spurs of the Leard State Conservation Area to the west of the Project Boundary.

Another major component of the Rocky Hills VCU is within the Leard State Conservation Area. This area contains large areas of rocky outcrops, steep slopes and prominent spurs and ridges. A representative photograph of the Rocky Hills VCU is shown in Figure 3.5.

Significance of the VCU

The significance of this VCU is that it creates feature landscape elements in the landscape and in some situations limits views to the area within the Project Boundary.

3.2.5 Forested Hills VCU

The forested hills are within the Leard State Forest. The state forest is dominated by open eucalypt and cypress forest adjoining the Willow Tree Range. The topography has gentle to moderate slopes that rise from the surrounding slopes and foothills with elevations in the vicinity of 300m– 480m along the Willow Tree Range.

The range creates a semi circular spine within the forest and defines the visual catchments between northern and southern view sheds.

The forest is not very prominent in various views because of its limited relief in relation to the surrounding slopes and plains. A representative photograph of the Forested Hills VCU is shown in Figure 3.6.

Significance of the VCU

The forest cover creates a uniform colour texture continuum against which the Project's operations will be viewed. The limited elevation of the forested hills inhibits their visibility to surrounding locations. The Willow Tree Range within the VCU creates a boundary between northern and southern view sheds.

3.2.6 Surrounding Ranges VCU

The surrounding ranges define the eastern edge of the PVC. It consists of very steep mountains and ridges that rise from 300m to 900m. The steep slopes support open eucalypt and cypress forests. The ranges contrast with and enclose the landscapes to the west and create visual backdrops to them. A representative photograph of the Surrounding Ranges VCU is shown in Figure 3.7.

Significance of the VCU

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.

3.2.7 Villages VCU

The small village of Maules Creek consists of a small school, village hall, sports oval and a limited number of residences. The village is located on Harparary Road within croplands between Maules Creek and Black Mountain Creek. The village has significant tree cover in and around the houses.

The village of Maules Creek is located 4.5km to the north of the Project Boundary but is some 6-7km away from proposed coal mining areas. The village of Baan Baa is larger and located on the western boundary of the PVC. This village is over 15km from the Project Boundary and will not have views to it.

A representative photograph of the Villages VCU is shown in Figure 3.8.

Significance of the VCU

The village of Maules Creek represents a community node that would have high visual sensitivity.

3.2.8 Mine and Infrastructure Areas VCU

There are existing coal mines within the southern part of the PVC. They include the Boggabri Coal Mine and Tarrawonga Mine. 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 VCU contains active mine pits, overburden emplacement areas and mine infrastructure facilities including coal handling facilities, truck loading facilities and haul roads. A representative photograph of the Mine and Infrastructure Areas VCU is shown in Figure 3.9.

The mine and infrastructure areas contrast with the surrounding forest and agricultural landscapes.

Significance of the VCU

The mine and infrastructure areas creates a visual context for the Project. However these mines are for the greater part in a separate visual catchment, therefore minimising this visual connection and context.

3.3 Summary

The various VCUs within the PVC create a diverse range of visual settings and views. The open croplands allow for long distant views while the riparian vegetation along the drainage lines, creeks and rivers often create visual buffers and screens to long distant views while also creating pleasing contrast and backdrops to the open terrain of crop and grazing lands.

The rocky hills create visual features within the landscape, contrasting strongly with the clear and gentle slopes of the croplands, slopes and foothills. They also often create visual screens to the Project Boundary. In this regard the rocky hills within the Leard State Conservation Area are especially significant.

The surrounding mountain range creates a strong visual feature to the east and defines the visual catchment in that location.

The forested hills within which the Project Boundary is situated are a gentle landscape that is restricted to the general view due to its limited topographic relief. Surrounding topographic features, as well as riparian vegetation along various creek fronts, break up views to the Project Boundary.

All the VCUs interact visually to create various landscape settings as seen from a range of viewpoints. They create the total view as well as screening or providing view corridors to the Project Boundary and potential operations within it.

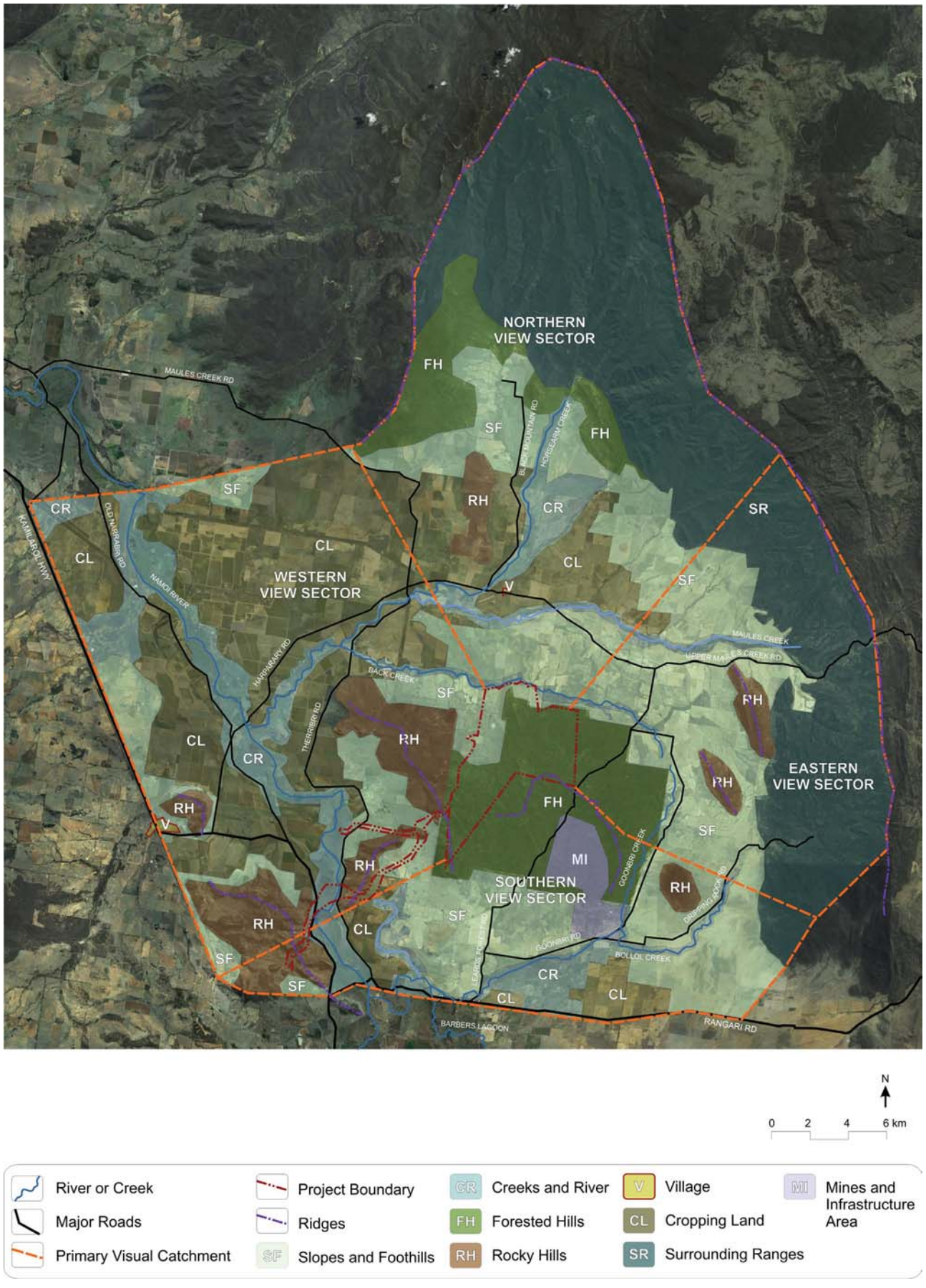

Figure 3.1 | *The Primary Visual Catchment and Visual Character Units*

Figure 3.2 | *Creeks and Rivers VCU*
The redgum woodlands define the creeks and water ways in the landscape and often act as visual barriers to more distant views.

Figure 3.3 | *Cropping Lands VCU*
Croplands create strong pattern shape, line and colour in the landscape. They create open views to more distant landscapes over adjoining riparian vegetation if view points are well back from the creekside vegetation.

Figure 3.4 | *Slopes and Foothills VCU*
The undulating country is generally cleared with scattered tree cover.

Figure 3.5 | *Rocky Hills VCU*
The rocky hills are often features in the landscape and often create visual screens to the Project Boundary.

Figure 3.6 | *Forested Hills VCU*
The forested hills include gentle to moderate slopes with limited topographic relief that limits its visibility to many external view locations. Open views such as this from Leard Forest Road are not generally available north of the forest.

Figure 3.7 | *Surrounding Ranges VCU*
The Surrounding Ranges VCU dominates skylines and create spectacular backdrops to local landsape settings within the primary visual catchment.

Figure 3.8 | *Villages VCU*
The villages within the primary visual catchment are limited to a number of small buildings such as the church and adjoining house at Biloena.

Figure 3.9 | *Mine & Infrastructure Areas VCU*
The main visual elements of mines to external view are the overburden emplacement areas (OEAs). The visual effect of rehabilitated OEAs are similar to the existing landscape while pre-rehabilitated OEAs contrast strongly with it.

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. The layout of the Project is illustrated in Figure 4.1.

4.1 Mine Components

From a visual perspective, the Project essentially relates to three components; the open pit, OEA's and mine related infrastructure. There will also be some additional infrastructure required to accommodate coal product transportation, as well as the supply of water and electricity to the mine site. In relation to the visual effects of the Project, development elements can be divided into major and minor components. Major components have the potential for significant visual effect in relation to external view. Minor components, 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 as part of the established Boggabri Coal Mine and the neighbouring Tarrawonga Mine.

Major mine components include:

- Open pit;
- OEAs; and
- Mine Related Infrastructure (including CHPP, ROM stockpiles and coal loading facilities);

Minor mine components include:

- Transmission lines;
- Rail spur and loop;
- Mine Access Road;
- The construction and operation of blasting facilities; and
- Water Pipeline.

4.1.1 Open Pit

Physical Character

The open pit face will be established on a north-west / south-east axis that is approximately 1km in length at year 1 of mining (see Figure 4.2). Mining and the active face move in a south easterly direction with the mine face gradually increasing in length up to 4.5km at year 5 (see Figure 4.3) then only slightly increasing up to approximately 5km by year 10 (See Figure 4.4). By year 15, mining has reached the southern boundary of CL 375 (see Figure 4.5). Mining then continues in a north easterly direction on a 2km front until year 21 (see Figure 4.6).

The Project is generally contained by the natural ridge line of the Willow Tree Range on the southern boundary of the CL 375. However mining does proceed to it by year 15.

Visual Effect

The open pit consists of two significant components. These include the 'highwall' (active mining area) and the 'low wall' which forms part of the OEA. 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 at the upper elevation of the site close to the top of the Willow Tree Range, close to year 21. 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 the open pit is created by the colour of the raw earth and exposed rock contrasting with the surrounding landscape. The open pit 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 open pit within Leard State Forest, its enclosure by the Willow Tree Range in the south and the development of the northern OEA eliminates views into the open pit from all locations. To some extent the mine areas could be visible to elevated views from the Mt Kaputar Range. However, such views are very distant with lookouts generally over 25km away.

The open pit creates a high visual effect (Visual Effect Category 1, see Figure 2.2). 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 foreground and middle-ground so the visual effect has no impact significance. Potential views would be limited to far background viewing locations within the Mt Kaputar National Park over 25km away.

4.1.2 Overburden Emplacement Areas

Physical Character

There is one out of pit OEA being the northern OEA which is located around a small hillock to the north of the open pit. The hillock has an elevation of 370m. The eastern and western emplacements are in pit emplacements that are constructed following mining of those areas. Each of these emplacement areas are described below:

Northern Overburden Emplacement Area

The northern OEA is for the greater part completed in a 5 year period, reaching an elevation of 400m. The outer faces of the northern OEA including the eastern, northern and north western faces are sloped at 1:4 and are rehabilitated initially with grass and then a tree cover. The western face will remain steep at the angle of repose, approximately 1:2 and in a pre-rehabilitated condition.

After year 5, except for a short period during years 8 - 9, in which the northern OEA will rise by approximately 40 m, all emplacement will be within the open pit. The eastern, northern and the north western faces of the northern OEA are proposed to be rehabilitated by year 10 (see Figure 4.4). Rehabilitation of the top of the northern OEA will then commence and is proposed to be completed by year 15 (see Figure 4.5). The western and southern faces of the northern OEA are not proposed to be rehabilitated until mining activities cease (see Figure 4.7).

Western In Pit Overburden Emplacement Area

The western in pit OEA has a top elevation of approximately 440m. This elevation is close to existing ground levels to the south west, approximately 20m higher along the north western boundary, 40m higher on the south eastern face and 80m higher on the eastern face. The western in pit OEA is similarly rehabilitated and scheduled to be completed by year 21 (see Figure 4.6). The steep eastern face of the OEA will not be rehabilitated until mining is completed and the final landform created (see Figure 4.7).

Eastern In Pit Overburden Emplacement Area

The eastern in pit OEA is constructed behind and to the north of the mining face. Its elevations are such that this OEA will screen views from the east to the western in pit OEA. It is proposed to be constructed over the full life of the mine and at year 21 will reach its final elevation of approximately 430m. At the highest point this is approximately 80m above ground level on the eastern face. Significantly the outer faces of this emplacement cannot be rehabilitated during the mine life and will only be rehabilitated when mining is complete (see Figure 4.7).

Visual Effect

The OEAs will create strong contrasting form in the landscape, and will initially have a strong colour contrast. This contrast and high visual effect (Visual Effect Category 1, see Figure 2.2) will be reduced as grass cover establishes, lowering visual effects to moderate/low, (Visual Effect Category 2). Following the establishment of tree cover the visual effect will be low, (Visual Effect Category 3).

Some high visual effect levels may be experienced for 1-2 years due to visual exposure to a pre-rehabilitated condition of the OEA. These effects may be minimised by optimising rehabilitation timetables for the outer face.

4.1.3 Mine Related Infrastructure

Physical Character

The majority of the mine site infrastructure is located to the west of the open pit and northern OEA (see Figure 4.8). The site will support both major elements including the ROM coal handling facilities, CHPP, as well as other buildings and facilities.

All the major infrastructure elements have a distinct industrial character. They are large scale with many elements such as the CHPP characteristically being over 30m. The coal rail loading bin also has a similar elevation.

The three coal stockpiles are over 500m in length and generally have an elevation in the order of 15m.

These major elements coupled with the minor elements create an industrial complex covering approximately 2km^2

The lighting effects of the infrastructure area are of visual concern. This area will be lit at night to meet all applicable health and safety standards. This will require high illumination levels in intense work areas with more general lighting to be provided in intermediate areas.

Visual Effect

The mine related infrastructure elements will create a high visual effect (Category 1) contrasting strongly with the surrounding rural landscape. The rectilinear form, shape and line of the CHPP, storage bins, coal stock piles, conveyors, etc will contrast strongly with the natural form shape and line of the topography and vegetation of the locality.

4.1.4 Transmission Line

Physical Character

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 (see Figure 4.9), and with a significantly improved and visually simplified post mounted insulator structure.

Visual Effect

The 132kV transmission line is a medium height pole with a simple structure for insulators and conductors. It would create a moderate to low visual effect unless a pole is immediately adjacent to a sensitive receptor and closer than 100m.

4.1.5 Rail Spur and Loop

Physical Character

The rail loop will be constructed adjacent to the proposed mine infrastructure area and the rail spur will connect to the Werris Creek to Mungundi Railway line (see Figure 4.1).

The rail loop, spur and connection with the Werris Creek to Mungindi Railway Line will be designed to meet the relevant Australian Rail Track Corporation standards and will require additional cut and fill in some areas of its proposed easement.

Visual Effect

The rail spur and loop will be at grade and have little vertical projection. While the cut and fill earth embankments are being constructed a moderate visual effect (Category 2 visual effect) will be created. However, this visual effect will be reduced to low (Category 3 visual effect) when the earth batters are rehabilitated and grassed.

4.2 Photomontage Illustration of Visual Effect

The visual effects of the Project were also evaluated by completing a photomontage analysis from a number of select representative viewing locations. These locations are illustrated on Figure 4.10 and are listed below:

- Location 1 Leard Forest Road;
- Location 2 Harparary Road at Maules Creek;
- Location 3 Maules Creek Village;
- Location 4 Middle Creek Road; and
- Location 5 Harparary Road West.

4.2.1 Location 1 – Leard Forest Road

The view from Leard Forest Road is onto the east of the Project Boundary. The view is from a slightly elevated location. Views from further east, that would be more typical for sensitive receptors are from lower elevations and would not see the full extent of the view illustrated in this photomontage. They would be similar in extent of view as would be illustrated in the photomontage taken from Location 2 – Harparary Road at Maules Creek.

The existing view from this location (see Figure 4.11a) is taken from a spur across part of the slopes and foothills VCU looking over a small section of the cropping lands VCU onto the Forested Hills VCU within which the Project Boundary would be located.

Up until year 5 the open pit will be screened behind retained forested hills. During this period the northern OEA (see Figure 4.11b) will be created up to an elevation of 400m some 100m above natural ground level. This will be

30m higher than an existing knoll that the northern OEA would be built around. The OEA would progressively be rehabilitated minimising the exposure of pre-rehabilitated OEA.

By year 10, the northern OEA would increase in elevation by another 40m resulting from extra overburden emplacement during years 8-9 (see Figure 4.11c). This overburden would be rehabilitated with grass cover by year 10.

By year 21, the northern OEA would be totally rehabilitated as seen from the east (see Figure 4.11d). Forest cover would be well established and approaching the colour texture values of the adjoining forest.

It can be seen from Figure 4.11d, that the southern face of the northern OEA and the eastern face of the eastern in pit OEA would be visible in pre-rehabilitated conditions. These raw earth overburden emplacement faces maintain strong colour contrast maximising the visual effect of these residual pre-rehabilitated areas.

In summary, the visual effect of the Project as seen from the east would initially be high reflecting the pre-rehabilitated condition of the eastern face of the northern OEA. After 5 years this visual effect would be reduced to moderate/ low as rehabilitation is completed. This visual effect will continue to reduce except for a brief period during years 8-9 when an extra 40mwould be added to the overburden. At Year 21 only a small area of overburden would remain in a pre-rehabilitated state. These areas would continue to have a category 1 visual effect, but would only have a moderate to low visual effect past 3km.

4.2.2 Location 2 – Harparary Road at Maules Creek

When viewed from this location (see Figure 4.12a) the site and Leard State Forest as a whole would be seen through the remnant red gums along a drainage line associated with Maules Creek. By year 5 (see Figure 4.12b), the emplacement would be just visible behind a forested knoll that is to the north of the Project Boundary and behind red gums along Back Creek.

By Year 10 (see Figure 4.9c) the rehabilitation on the northern OEA would have matured to some extent and thereby decreasing the level of contrast with surrounding foreground vegetation. Less well integrated would be the additional 40m of emplacement that has been placed on the northern OEA in years 8-9. At this stage it would be still in an early rehabilitation phase and still displaying moderate contrast to surrounding forested areas.

By year 21 (see Figure 4.12d), this contrast would be completely removed and the northern OEA for the greater part screens views to other parts of the operation are fully rehabilitated and cannot be easily differentiated from adjoining forest areas. What would become visible are small slivers of the un-rehabilitated eastern face of the eastern in pit OEA as well as parts of the northern western faces of the active mine face.

The visual effects of the operation as seen from this location and locations like it would be moderate for a very short period of time when the northern OEA comes into view. In early stages of rehabilitation the visual effect would be reduced to low due to the limited areas that are visible.

The visual effect of the slivers of pre-rehabilitated eastern in pit OEA are low due to their limited scale.

4.2.3 Location 3 – Maules Creek Village

The current view from Maules Creek village is dominated by foreground vegetation along roadways, adjoining community buildings and in garden areas. However from a clear roadside area views are obtained across the cropping lands VCU towards the riparian vegetation along Maules Creek and to forested knolls beyond (see Figure 4.13a).

By Year 5 the northern OEA would be visible to west of the forest knoll with the rest of it screened behind it (see Figure 4.13b). By year 10 the additional 40m on the northern OEA increases its elevation above the forested

knoll in the foreground (see Figure 4.13c). This visual effect would be experienced from more distant locations such as Middle Creek Road.

From this location, the visual effect of the eastern in pit OEAs and the open pit are screened by the northern OEA and vegetation along Maules Creek.

The visual effects of the Project on the village of Maules Creek may be high for very limited times up to year 5. From that time the visual effects would be lowered due to the rehabilitation of the northern OEA and the progressive establishment of forest cover. There would be a short period of heightened visual effect as an extra 40m of overburden would be added to the top of the northern OEA during years 8 – 9.

There would be no visual effect of the eastern in pit OEA and open pit due to the screening effect of the northern OEA.

4.2.4 Location 4 – Middle Creek Road

From this location, views are obtained along Middle Creek road across the top of the distant red gum woodland along Maules Creek, towards the Project Boundary (See Figure 4.14a). By year 5 the northern OEA would be visible over the tree line and would be clearly visible to the west of the forested knoll (see Figure 4.14b). The first level of rehabilitation has been achieved at the end of year 5.

At the end of year 10 (see Figure 4.14c), the lower portion of the northern OEA would have been rehabilitated and the established tree cover would start to integrate back in with the surrounding forested hills. The additional 40 m of overburden proposed to be added to the northern OEA during years 8 – 9 would be still illustrating the early stages of rehabilitation with the grass cover contrasting more strongly with the foreground tree cover.

By year 21 tree cover would be well established on the northern OEA and contrast to the surrounding forest would be minimal. However there are some views to the faces of the eastern in pit OEA. These elements although minor, spatially do create a high Category 1, visual effect.

The visual effect on northern locations such as Middle Creek Road are significantly mitigated by vegetation along creeks and drainage lines as well as some topographic features to the north of the Project Boundary. The visual effect of the northern OEA pre-rehabilitation could be high but would be quickly reduced to moderate by year 5. For a short period around year 8-9 the visual effect would be increased by the addition of another 40m of overburden. However as this would be rehabilitated the visual effect would be again lowered.

Although there are some areas of the open pit that remain visible they remain minor in scale and would create a moderate to low visual effect.

4.2.5 Location 5 – Harparary Road West

The view from Harparary Road West illustrates views to the Project Boundary (see Figure 4.15a) from the north-west. From this location, views are across cropping lands towards Maules Creek and the red gum woodlands that are located in that area. Beyond this, to the south east are the forested hills and rocky hills associated with the Leard State Conservation Area. This area screens western views that are located further to the south than Location 5. Leard State Forest and the area within the Project Boundary would be for the greater part screened by the riparian woodlands along Maules Creek.

By year 5 the northern OEA would be visible in some areas between small breaks in the red gum woodlands along Maules Creek (see Figure 5.15b). The northern most end of the OEA would be less visible as it would be in the early stages of rehabilitation. The south western end of the northern OEA retains high levels of contrast created by the colour of raw overburden in this location.

By year 10 (see Figure 4.15c), the additional 40m of overburden has been added to the elevation of the northern OEA. This would be barely noticeable when compared to the view from this location at year 5. Also the northern parts of the northern OEA are becoming less obvious as the tree cover continues to establish in the rehabilitation areas on the northern and north western faces of the OEA.

By year 21 (see Figure 4.15d), the northern end of the northern OEA has a similar appearance to the Leard State Conservation Area to the south. The unconsolidated western slopes of the northern OEA continue to create strong colour contrast to the surrounding landscape, especially to the trees along Maules Creek and the adjoining Leard State Conservation Area.

The visual effect from this location would be high during years 2-5 and would continue to be so. However in this situation the visual filtering effect of the red gum forest along Maules Creek reduces visual effects to moderate.

The extent and scale of the pre-rehabilitated northern OEA and parts of the western in pit OEA *have the potential to create a high visual effect for a distance of up to 5km and a moderate visual effect up to a distance of 8km. However in many situations the foreground filtering effects of vegetation would modify these visual effect levels to moderate and low in most instances.*

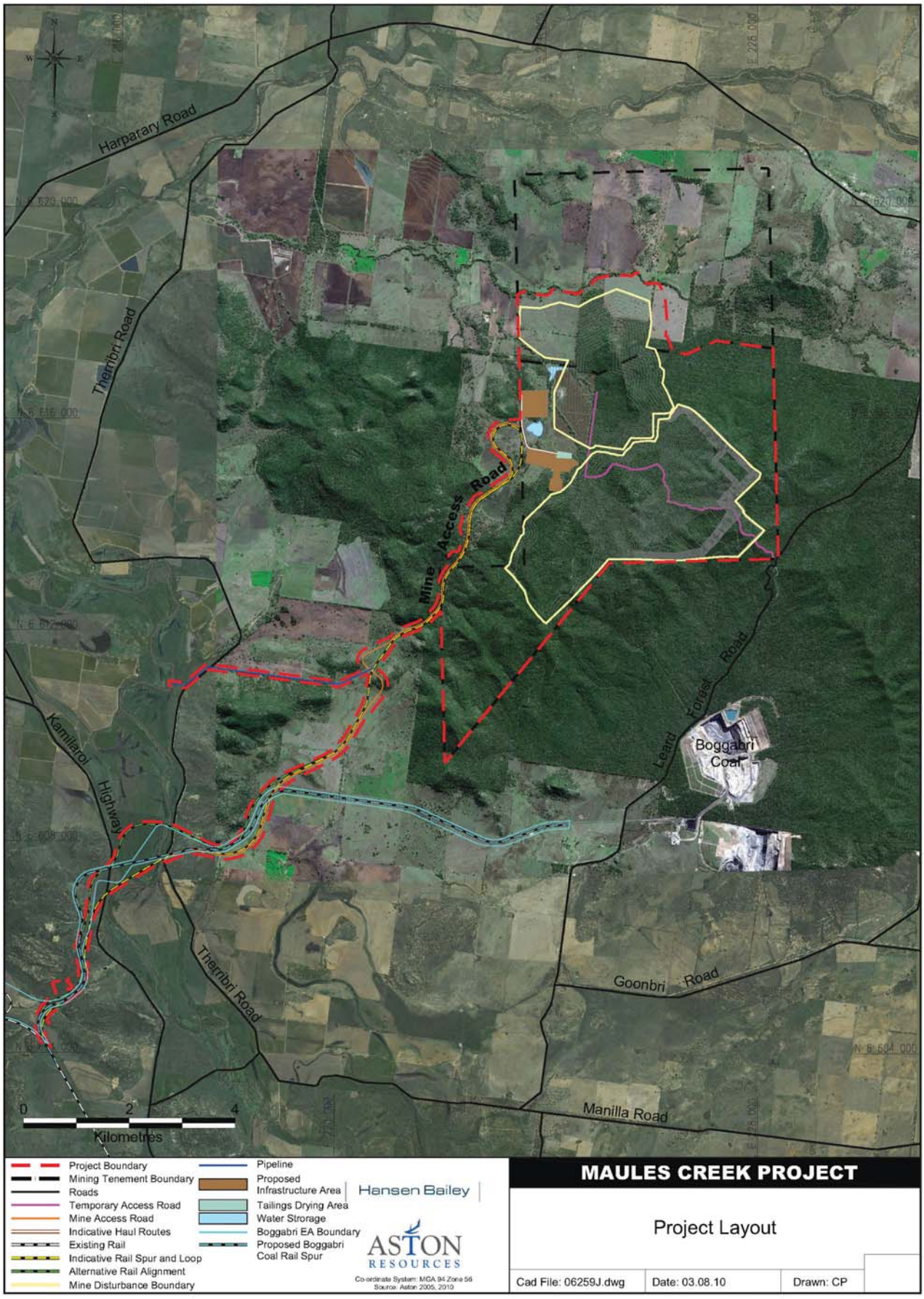

Figure 4.1 | *Project Layout*

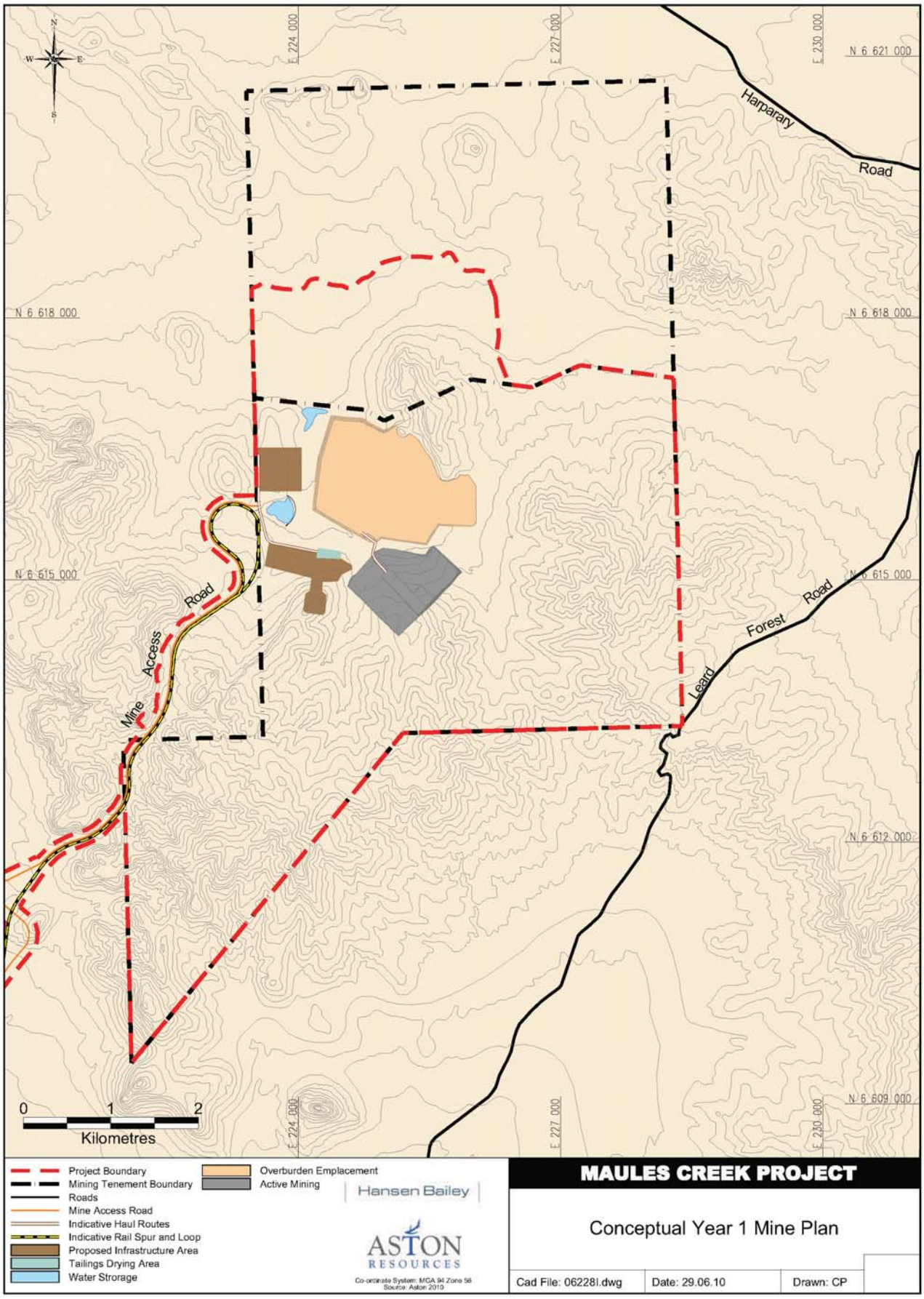

Figure 4.2 | *Conceptual Year 1 Mine Plan*

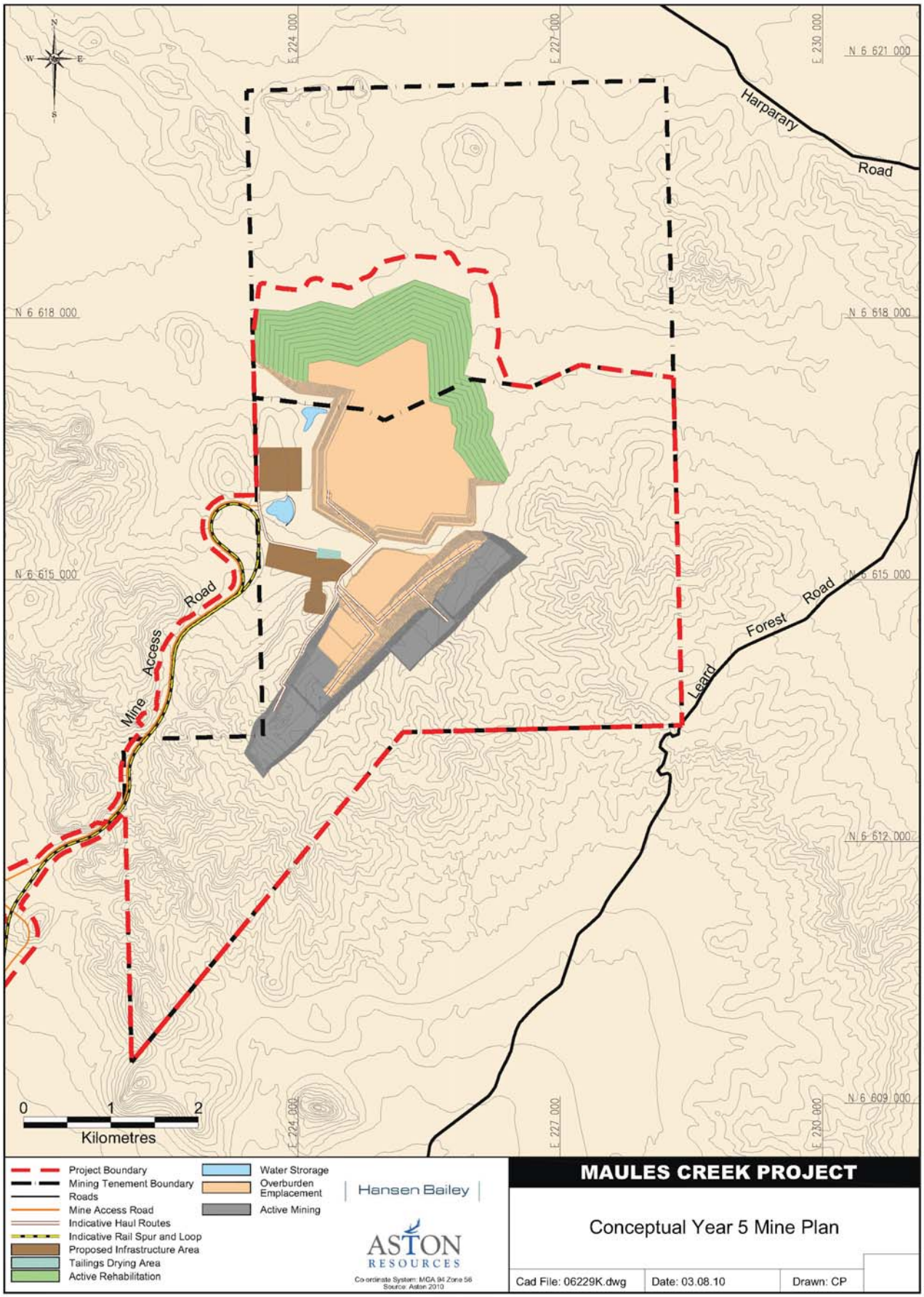

Figure 4.3 | *Conceptual Year 5 Mine Plan*

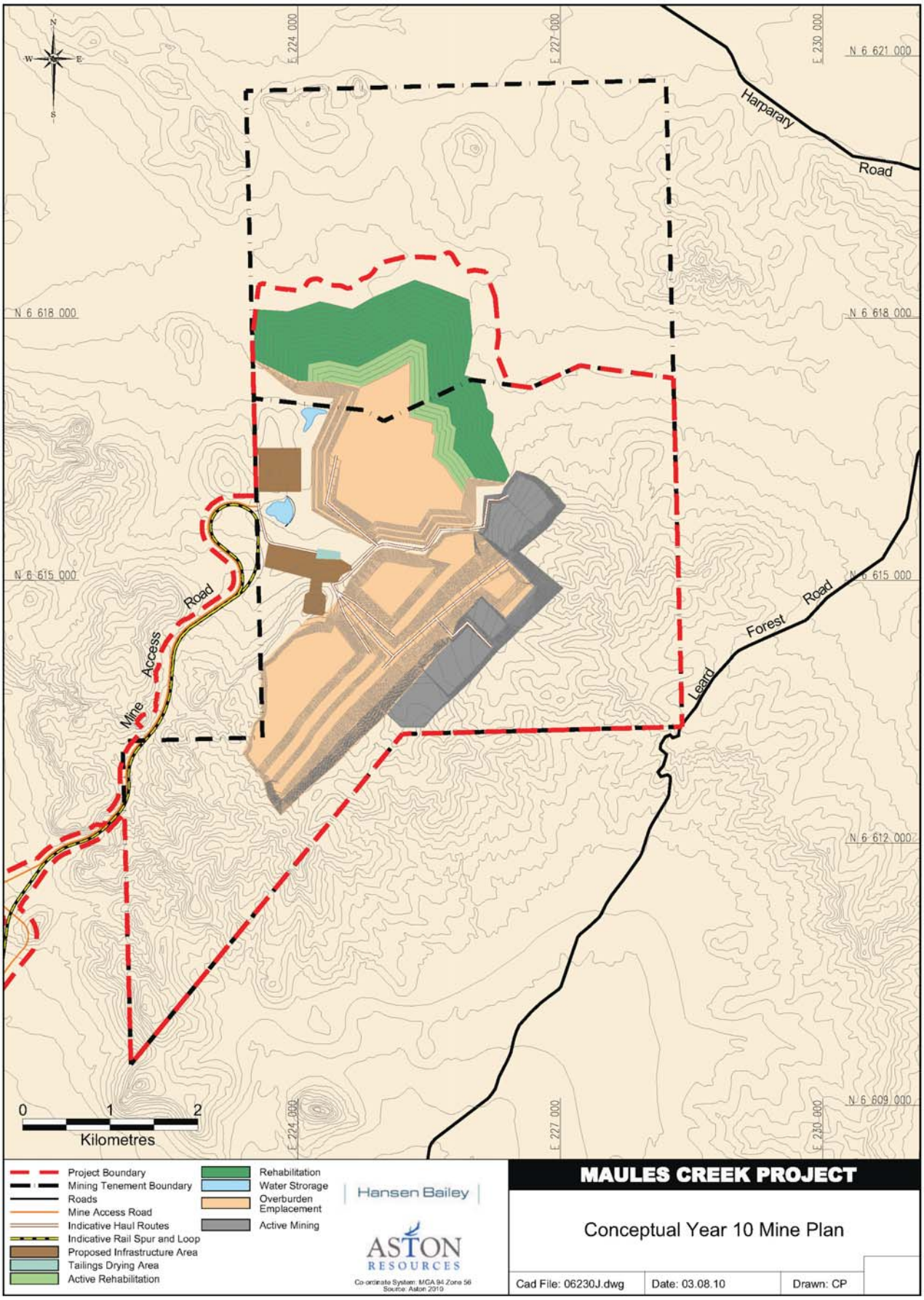

Figure 4.4 | *Conceptual Year 10 Mine Plan*

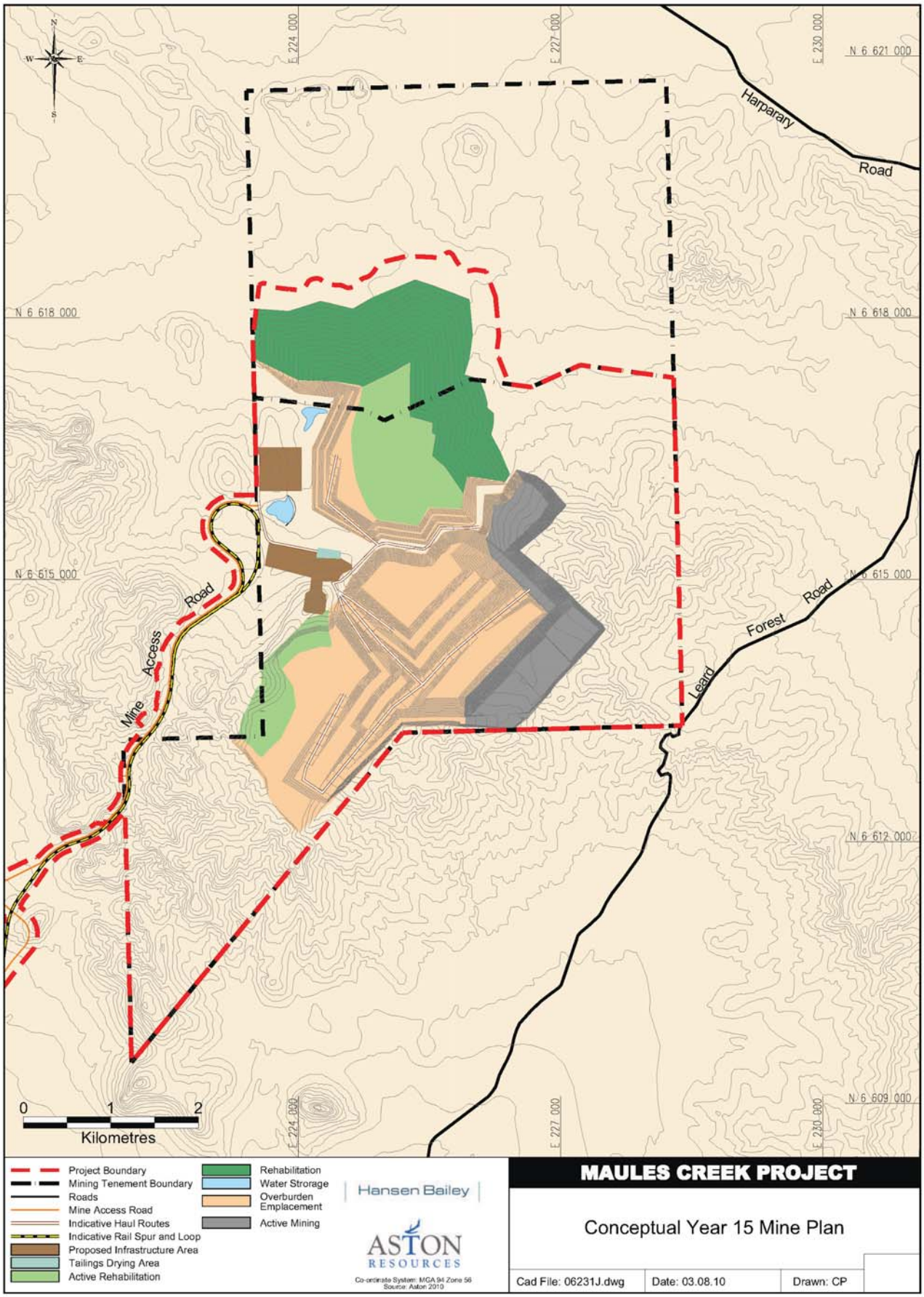

Figure 4.5 | *Conceptual Year 15 Mine Plan*

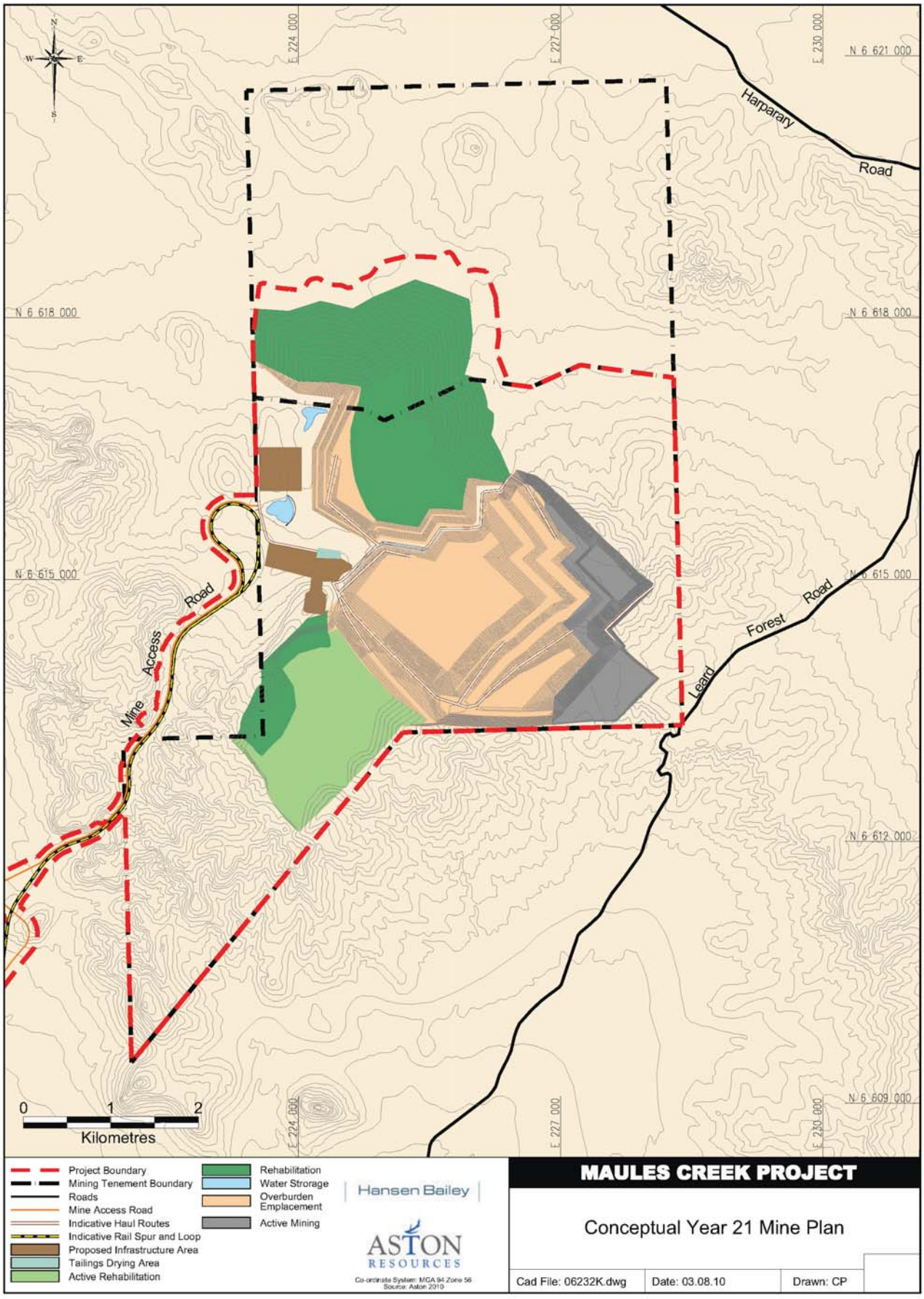

Figure 4.6 | *Conceptual Year 21 Mine Plan*

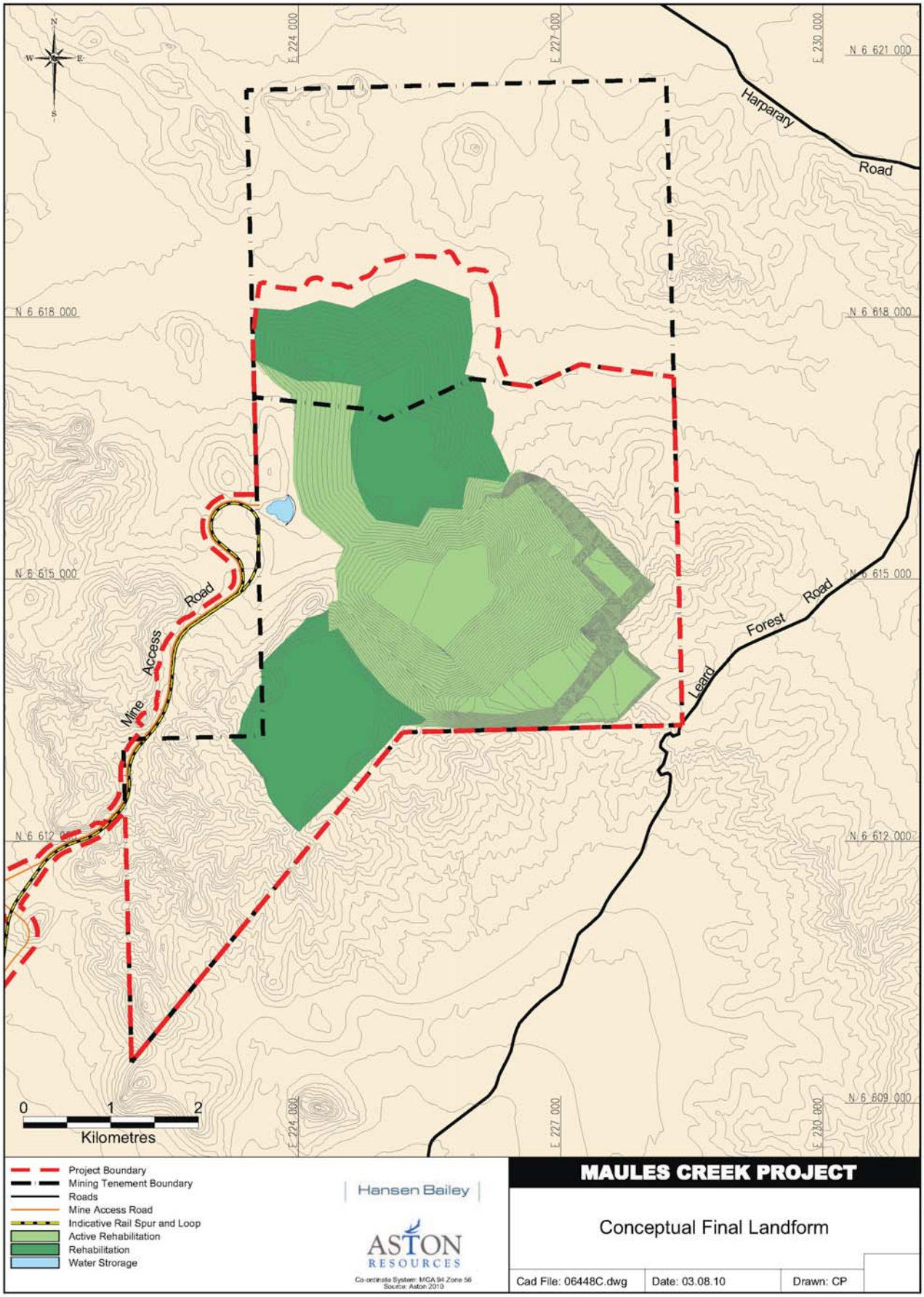

Figure 4.7 | *Final Landform*

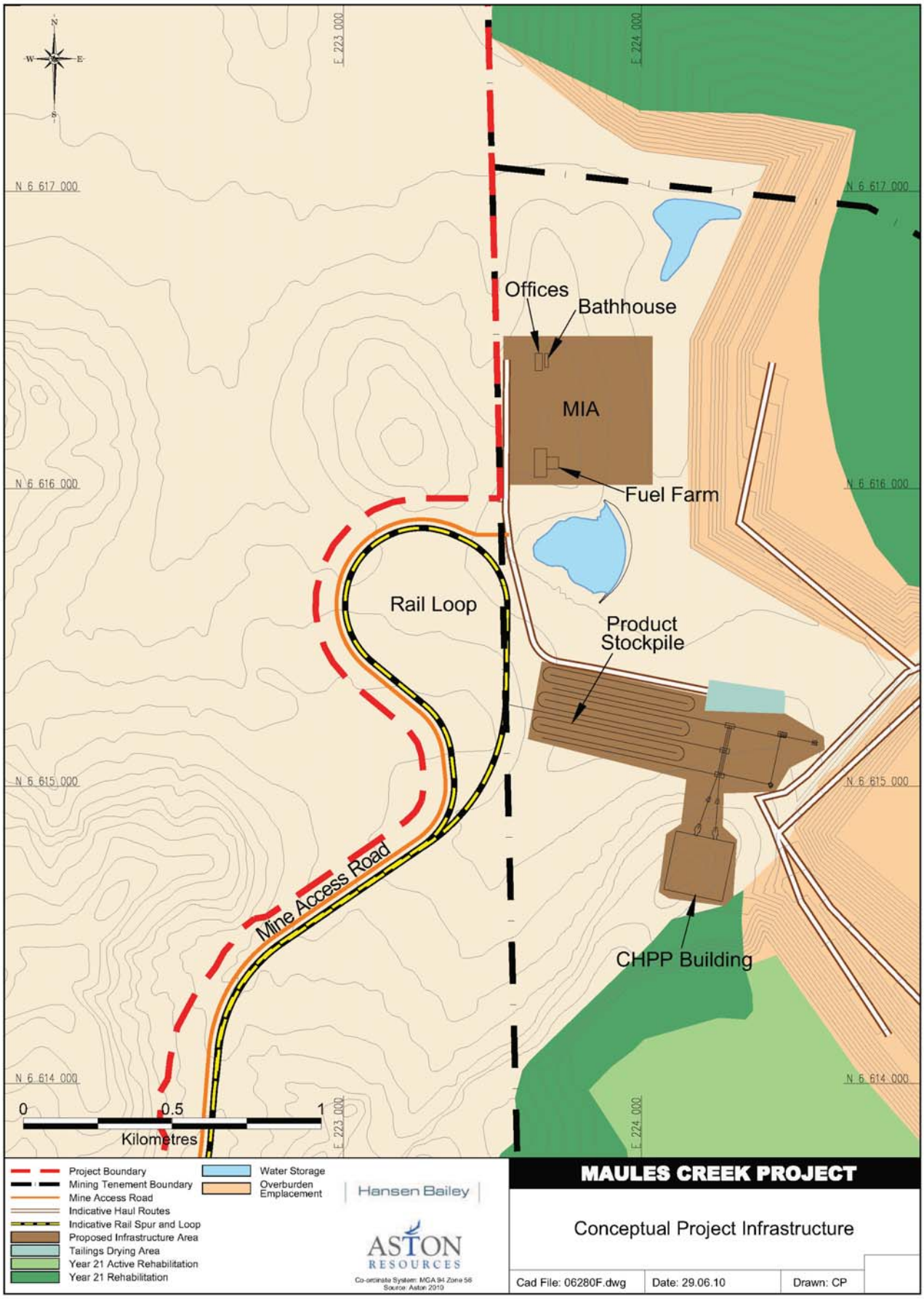

Figure 4.8 | *Infrastructure Area*

Figure 4.9 | *132kV Transmission Line the proposed transmission line has simple form shape and line and is generally in scale with the surrounding rural landscapes into which it is placed.*

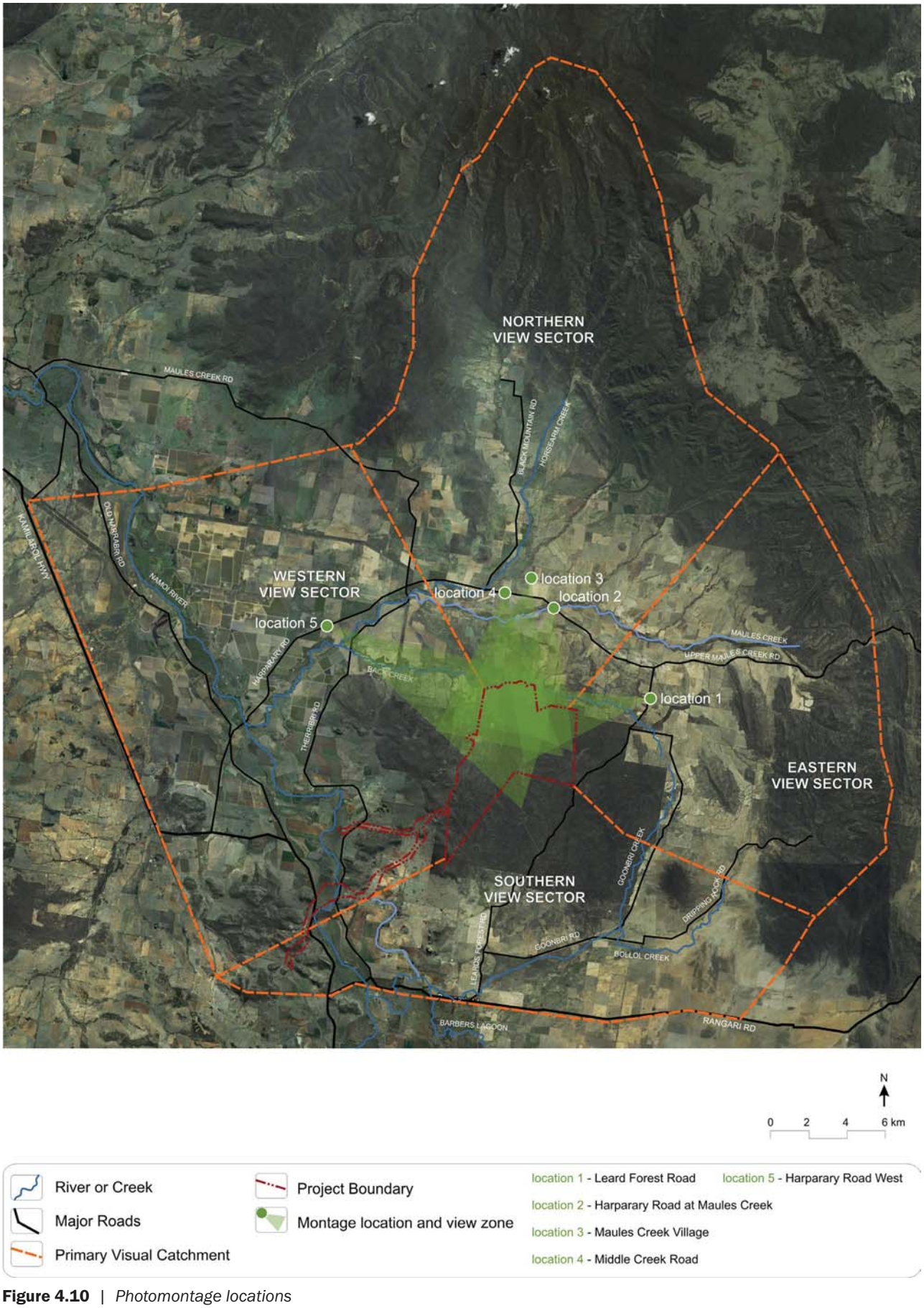

Figure 4.10 | *Photomontage locations*

Figure 4.11a | Location 1 - *Leard Forest Road - existing view*

Figure 4.11b | Location 1 - *Leard Forest Road - view illustrating mine at year 5*

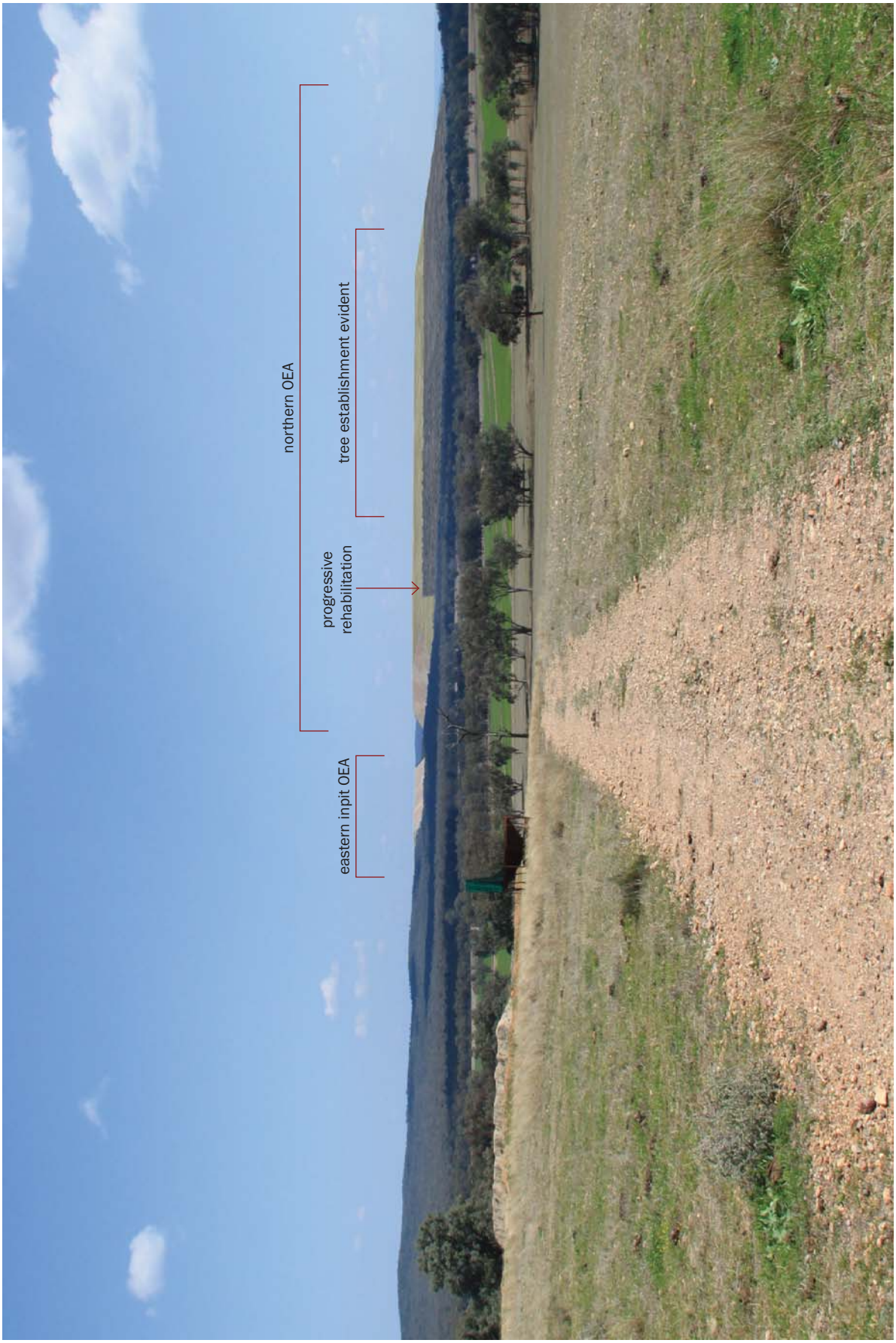

Figure 4.11c | Location 1 - *Leard Forest Road - view illustrating mine at year 10*

Figure 4.11d | Location 1 - *Leard Forest Road - view illustrating mine at year 21*

Figure 4.12a | Location 2 - *Harparary Road at Maules Creek - existing view*

Figure 4.12b | Location 2 - *Harparary Road at Maules Creek - view illustrating mine at year 5*

Figure 4.12c | Location 2 - *Harparary Road at Maules Creek - view illustrating mine at year 10*

Figure 4.12d | Location 2 - *Harparary Road at Maules Creek - view illustrating mine at year 21*

Figure 4.13a | Location 3 - *Maules Creek Village - existing view*

Figure 4.13b | Location 3 - *Maules Creek Village - view illustrating mine at year 5*

Figure 4.13c | Location 3 - *Maules Creek Village - view illustrating mine at year 10*

Figure 4.13d | Location 3 - *Maules Creek Village - view illustrating mine at year 21*

Figure 4.14a | Location 4 - *Middle Creek Road - existing view*

Figure 4.14b | Location 4 - *Middle Creek Road - view illustrating mine at year 5*

Figure 4.14c | Location 4 - *Middle Creek Road - view illustrating mine at year 10*

Figure 4.14d | Location 4 - *Middle Creek Road - view illustrating mine at year 21*

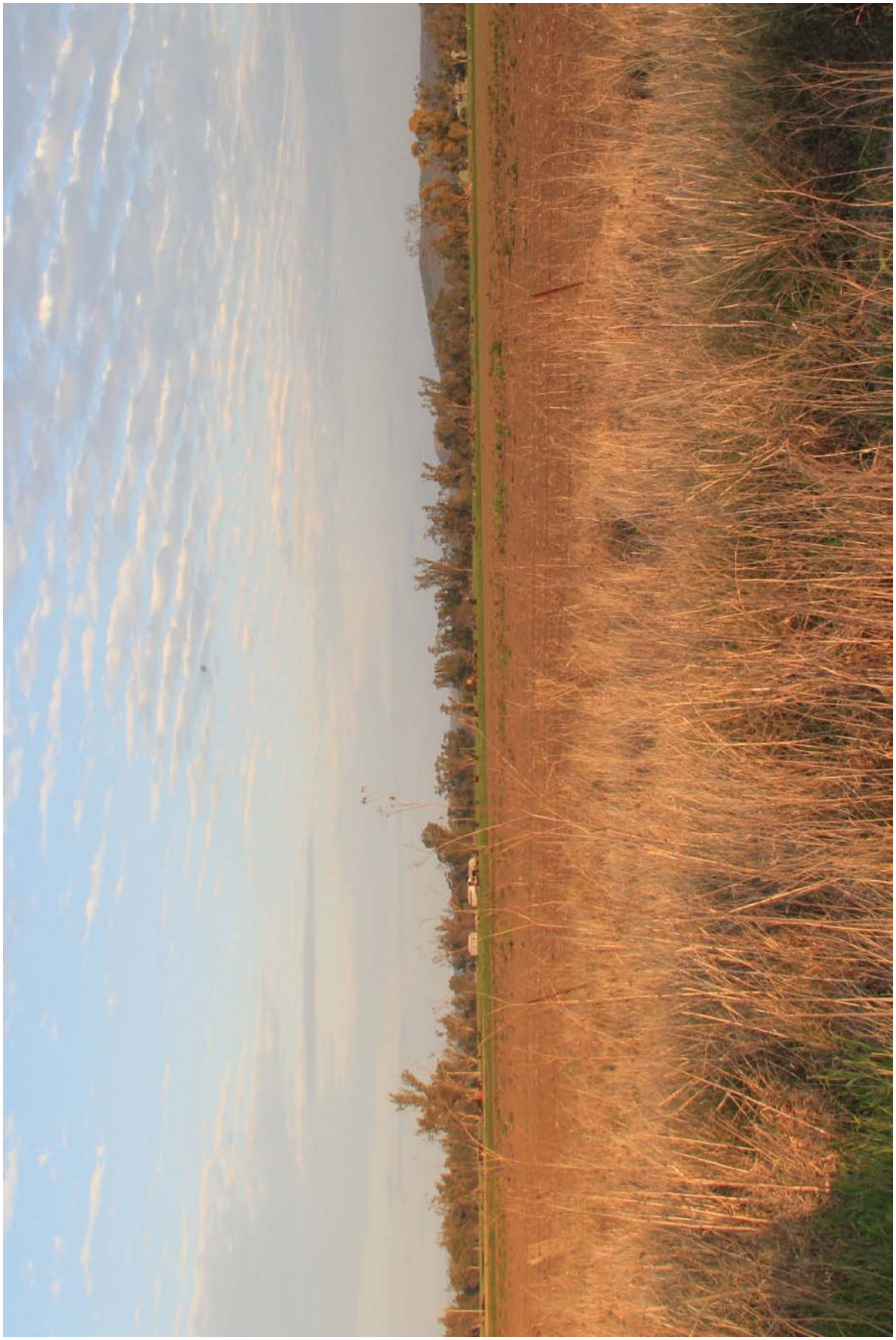

Figure 4.15a | Location 5 - *Harparary Road to the west - existing view*

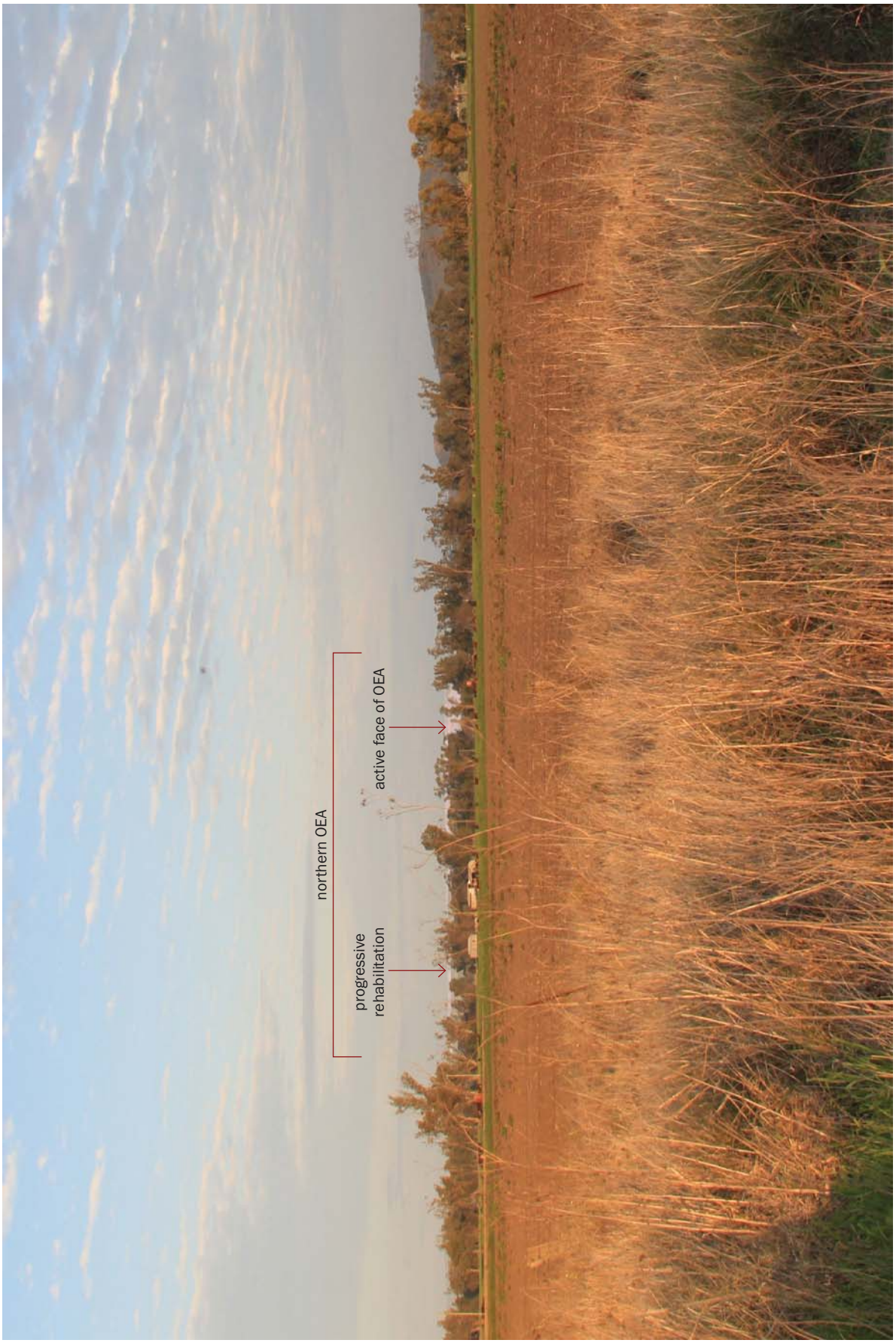

Figure 4.15b | Location 5 - *Harparary Road to the west - view illustrating mine at year 5*

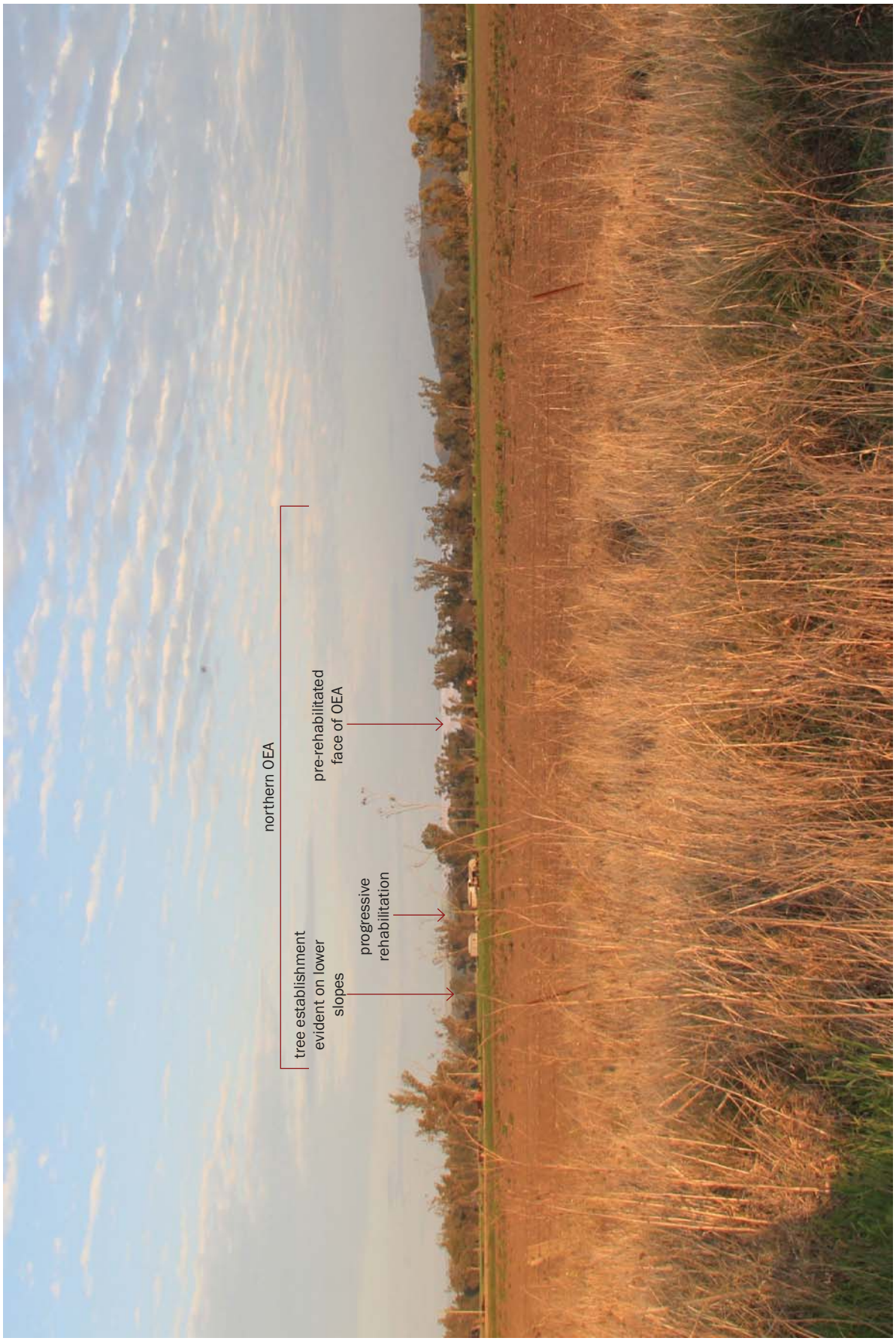

Figure 4.15c | Location 5 - *Harparary Road to the west - view illustrating mine at year 10*

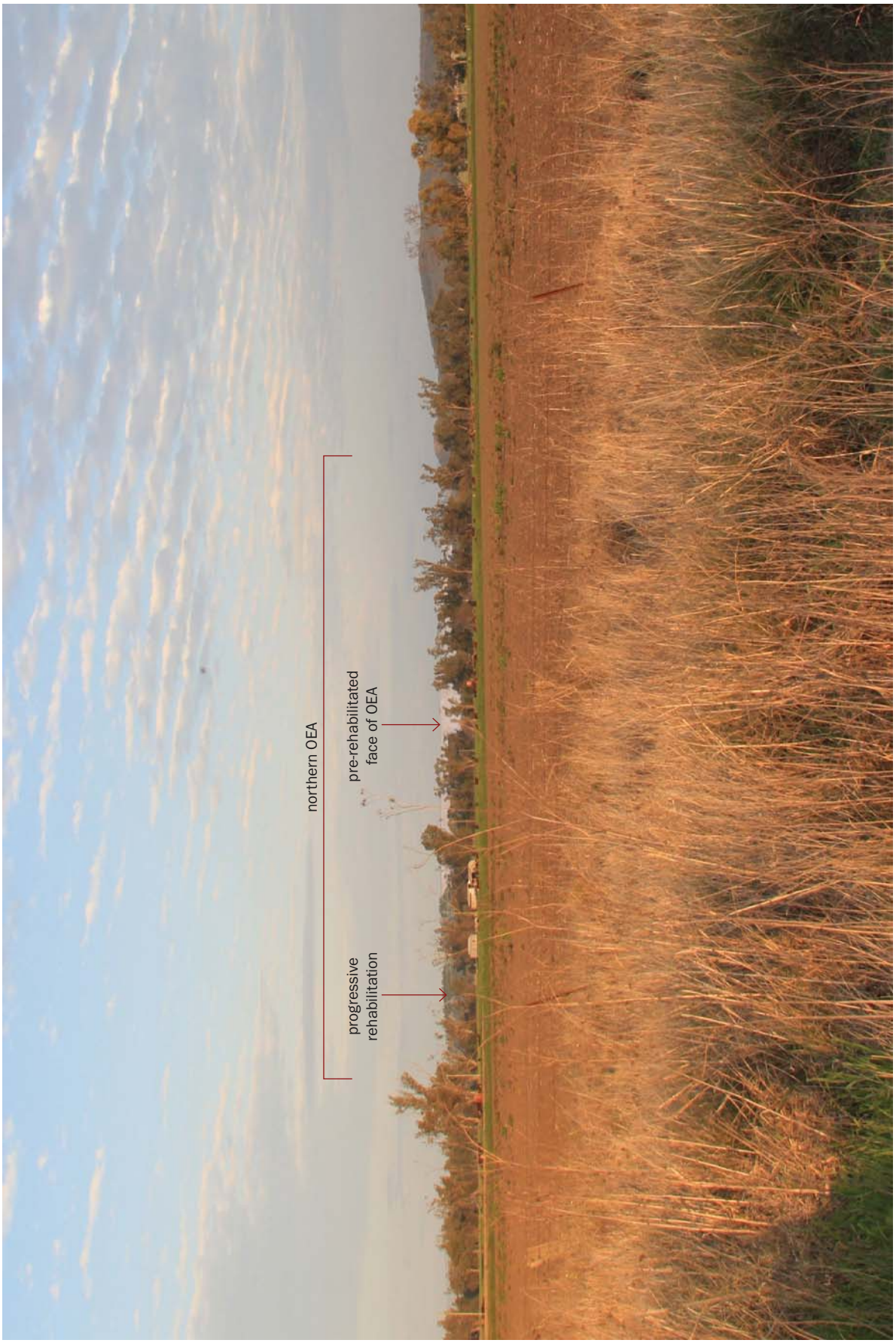

Figure 4.15d | Location 5 - *Harparary Road to the west - view illustrating mine at year 21*

5. VISIBILITY AND VISUAL SENSITIVITY

This section of the report evaluates and analyses the visibility of the various components of the Project from locations surrounding the Project Boundary. Visibility would vary depending on a combination of topography and vegetation; especially foreground vegetation close to points of viewing. There has to be visibility to the various mine components for an impact to be incurred.

The sensitivity of the various areas that have views of the Project would depend on the land use. Land use areas or activities that utilize the view, e.g. houses, would have a high sensitivity. Conversely, areas such as rural lands would have a low sensitivity. A consideration of sensitivity must be responsive to local conditions and current perceptions about the visual amenity aspects of a landscape, as illustrated through current land use practices.

The determination of visibility and sensitivity give direction to potential mitigation strategies (Section 6) for any areas with high visual impact.

5.1 Viewing Locations - General

There are a range of potentially sensitive viewing locations within the PVC surrounding the Project Boundary (see Figure 5.1). These include villages, scattered rural houses, roads and a limited number of tourist and recreation areas. A determination of general visibility of the Project was completed from a combination of evaluation of mapping, field investigations and analysis of the 3D models of the Project. To assist in an evaluation of visibility and sensitivity the PVC has been divided into the Northern, Eastern, Southern and Western Sectors (see Figure 5.1).

5.2 Significant Topographic Features

There are a number of topographic features that greatly assist in limiting the visibility of mine areas (see Figure 5.2). These features limit views to the north, east, south and west in various ways.

There are small topographic features to the north of the Project Boundary that define the catchment between Back Creek and Maules Creek that would have limited potential to provide screening to the Project. Beyond this the mountains and ranges associated with Mt Kaputar define the limits of the PVC.

To the east there are a series of ridges including the ridgeline that extends south from Mt Kaputar that define view sheds. Views to the Project are limited to the eastern faces of elevated spurs and ridges.

To the south the Willow Tree Range screens all views from the southern sector. The only potential exception would be elevated hill areas that do not support any sensitive receptors.

To the west, the topography of the Leard State Conservation Area limits views to sensitive receptors in that sector. Views are also limited by the numerous rocky hills in this sector on both sides of the Kamilaroi Highway.

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 creeks and drainage lines, garden plantings around rural residences and villages also create screening effects. Garden plantings and residual tree areas in the foreground or near middle ground can be significant in reducing views to the Project. In the same way vegetation around residences or village streets can greatly assist in screening views to the Project Boundary.

5.4 Sensitive Receptors

There are a range of potentially sensitive viewing locations around the Project Boundary. These include the Maules Creek Village, rural residences, roads and tourist and recreation areas. These are outlined below. The visibility and sensitivity for the identified sensitive receptors within each of the sectors of the PVC are described in Sections 5.5 – 5.8.

Maules Creek Village

The village and houses close to the Church (see Figure 5.4) are the only clustering of residences and community facilities within the primary PVC.

Rural Residences

There are a number of rural residences spread throughout the locality, Figure 5.5. Most significant are those located to the north and north west of the Project Boundary.

Roads and Railway

The major road in the locality is the Kamilaroi Highway, Figure 5.6, which is to the west of the Project Boundary. The other roads within the locality are generally minor rural roads.

Tourist and Recreation Areas

The major tourist attraction in the region is the Mt Kaputar Range, Figure 5.7. Tourist activity is also associated with the highway. 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 to the Project Boundary from this location.

Leard, Plagyan Rusden and Denah State forests as with all state forests in NSW, are available for forest recreation, especially forest driving, hunting and other recreational activities. However activity generally would not include recreation that would make use of the landscape amenity of the locality.

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 lands occur in all sectors around the Project Boundary. In addition, to the east a significant area of rural lands is within the mountainous terrain that is the southern end of the Mt Kaputar Range.

All of these areas in the northern, eastern, southern and western sectors have a low visual sensitivity.

5.5 Northern Sector

This sector is dominated by low sensitivity rural lands. However it does contain Maules Creek Village, a number of rural residences as well as Mt Kaputar National Park, all of which would have a high sensitivity to the Project if visible.

Mt Kaputar National Park

The Mt Kaputar National Park dominates the eastern and northern skylines of the PVC. The park areas would support visually sensitive recreational activities such as picnicking, camping and bushwalking. However, most areas are unsighted due to foreground vegetation. Some lookouts such as the Doug Sky lookout have a higher sensitivity although the higher sensitivity of such locations is mitigated by the distances at which they are located from Project Boundary (greater than 20km away).

The lookout and national park areas would have a low sensitivity based on the distances from the Project Boundary.

Maules Creek Village

The village of Maules Creek is located approximately 8km to the north of the northern OEA which is the most northerly and potentially visible Project component.

Many views from the village area would be screened by vegetation within the village. However it is possible to obtain views to the Project where this screening is not present.

The village would have a high sensitivity if any development component is seen within 7.5km, however most Project elements are outside of this range and would result in a moderate sensitivity being ascribed.

Rural Residences

There are numerous rural residences along the various roads in the sector (see Figure 5.1) On the basis of topography alone many of these houses would have views to the northern OEA. However often house orientation, homestead landscapes as well as trees in adjoining fields and along creeks and drainage lines screen such views.

Views from residences closer than 7.5km would have a high sensitivity with a moderate sensitivity being ascribed up to 12.5km and a low sensitivity past that.

Local Roads

There are views from local roads including Harparary, Glencoe, Middle Creek, Black Mountain Creek and parts of Maules Creek Roads. However these roads are all greater than 6km away.

The roads are minor rural roads and would have a low sensitivity.

5.6 Eastern Sector

To the east there are a number of rural residences, local roads and the southern part of the Mt Kaputar Range within the eastern sector. The Kaputar Range is within freehold rural lands.

Rural Residences

There are approximately 11 residences on Upper Maules Creek and Thornfield Crossing Road that would have potential views to Project elements based on topography. However these residences are not orientated to the Project site and are often surrounded by homestead gardens and adjoining creek side vegetation. Further these residences are further than 7.5km away from the Project Boundary.

Other residences on Mallee Lane and Dripping Rock Road would not have views to the Project Boundary.

The visual sensitivity of these residences would be moderate to low

Local Roads

The roads in this location are minor rural roads and include the eastern end of Harparary Road, Upper Maules Creek Road, Thornfield Crossing Road as well as Mallee Land and in the south east Dripping Rock Road.

These roads would have low sensitivity.

5.7 Southern Sector

This sector is dominated by rural lands with scattered rural residences and local roads as well as a small section of the Kamilaroi Highway. The sector also supports parts of Leard State Forest that contain the Boggabri and Tarrawonga Mines.

Residences

There are a small number of residences located in the eastern part of the southern sector in the vicinity of Dripping Rock Road and Goonbri Road. These residences would not have views to Project components. Similarly residences in the western part of the southern sector in the vicinity of Therribri Road also would not have views to the Project. They may have views to parts of the railway infrastructure associated with the existing Boggabri mine.

Local Roads

There is no visibility from the local roads situated within the southern sector to the Project. There would be views from Therribri Road to the rail infrastructure that has been considered in previous visual assessments associated with the existing Boggabri Mine.

Kamilaroi Highway

The roadside rest area at Gins Leap would have some views to the Project. However views are to operational areas over 11km away and would have a low sensitivity at this distance.

5.8 Western Sector

The western sector is dominated by rural lands that include significant cropping land areas along the Namoi River. This sector contains the highest density of rural residences, as well as the village of Baan Baa, the Kamilaroi Highway and local rural roads.

Views in this sector are restricted to the north-west. Westerly views are screened by the topographic features of the Leard State Conservation Area. Only the elevated terrain of the rocky hills, in the vicinity of the Kamilaroi Highway, obtains views in this sector and these areas do not support sensitive receptors.

Rural Residences

The western sector contains the highest number of rural residences (approximately 50). This reflects the intensive agriculture associated with the cropping lands adjacent to the Namoi River. The residences are located on Harparary Road, Browns Lane, Bellview Road, Roseville Lane and Maules Creek Road, as well as along Trantham and Ellerslie Roads closer to the Project Boundary. A number of the residences that are situated on Ellerslie and Trantham Roads / Teston Lane would have visibility based on topography but creek-side vegetation along Back Creek and local gardens could screen such views.

Other residences, further afield along Harparary Road, Browns Lane, Bellview Road, Roseville Lane and Maules Creek Road would have views across open cropping lands and to the north west of the Leard State Conservation Area.

Residences on Ellerslie and Trantham Road/Teston Lane and a small section of Therribri Road would have a high sensitivity if views of the Project are possible as they are within 7.5km of the northern OEA. Other residents outside this would have a moderate to low sensitivity. Residences to the west of Leard State Conservation Area are screened from view.

Kamilaroi Highway

Views from the highway are restricted by topographic elements such as the Leard State Conservation Area. There is a potential view location in the vicinity of the highway intersection with the Narrabri Road however this location is over 10km from the operational areas.

At a distance of 10 km, the Kamilaroi Highway would have a low sensitivity to views of the Project Boundary. There would be a high sensitivity to the immediate area where the Boggabri rail spur crosses the Kamilaroi Highway, however this Project element is considered under the visual impact assessment relating to infrastructure development as part of the Boggabri Coal Mine.

Baan Baa

The village of Baan Baa is screened from view by the adjoining Rocky Hill immediately west of the town.

5.9 Summary

Visibility of the Project is generally restricted to northern areas. The elevated surrounding mountains have visibility but with few exceptions do not support sensitive receptors. The exception is the Doug Sky lookout within the Kaputar National Park. However this and other view locations within the park are generally over 20km away and such views would have low sensitivity.

The most critical potential views relate to rural residences to the north and north west. Residences with a view up to a distance of 7.5km have been ascribed a high sensitivity. The number of residences inside this distance is limited to residences in Teston Lane, Ellerslie Road and Harparary Road from its intersection with Leard Forest Road to the east and Black Mountain Creek Road to the west. A high sensitivity would result if houses have views and are orientated to the views of the Project. Generally rural residences in this location are not orientated to external views but rather create a garden that often limits long and panoramic views.

There are very limited views from the highway. This includes a location at the roadside rest area at 'Gins Leap', and a location in the vicinity of the highway / Narrabri Road intersection. However from these locations views are fleeting and or are over 10km away and would have a low sensitivity.

There would be views from the local roads but most are limited and many are screened by adjoining roadside and creek side vegetation.

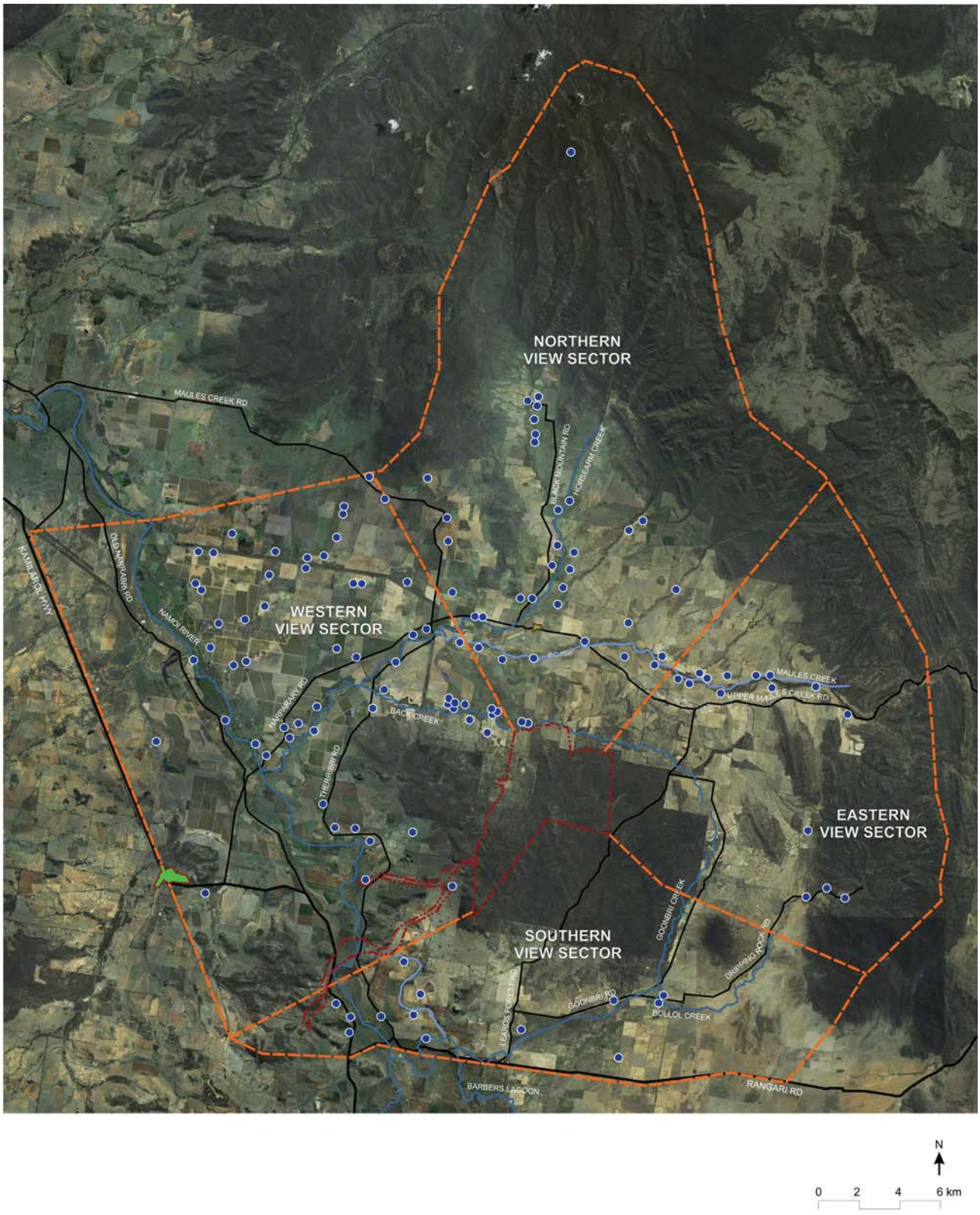

Figure 5.1 | *View Sectors and Sensitive Receptors*

Figure 5.2 | *Topographic Features such as the Leard State Conservation Area can create significant visual screens to the Project Boundary.*

Figure 5.3 | *Vegetation Features such as the Red Gum woodlands along the creeks and drainage lines create significant visual screens to the Project Boundary.*

Figure 5.4 | *Maules Creek Village is located approximately 2.5km to the north of the Project Boundary. Views from within the village are often screened by vegetation surrounding village buildings, but views are available from certain locations.*

Figure 5.5 | *Rural Residences that have high visual sensitivity are scattered throughout the Primary Visual Catchment. They are often associated with other farm buildings and tree cover that assists in screening long distant views.*

Figure 5.6 | *The Kamilaroi Highway is the most significant road within the Primary Visual Catchment. There are limited views from this distant roadway to the Project Boundary.*

Figure 5.7 | *Mount Kapatar National Park is the most significant recreation area within the Primary Visual Catchment.*

Figure 5.8 | *Rural areas dominate the Primary Visual Catchment. There are a range of views from such areas however they have low sensitivity*

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 would vary according to the visual effect of the Project 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 visual impact levels. The visual impacts are considered in relation to the various sectors.

6.1 Northern Sector

The northern sector is dominated by rural lands. It includes parts of the Cropping Lands, Slopes and Foothills, Rocky Hills, and the Surrounding Ranges VCU's. The sector includes numerous rural residences, some local roads as well as the village of Maules Creek. Mount Kaputar National Park and Rusden and Denah State Forests also occur within the Northern Sector.

Rural Residences

There is potential for views of the Project from a number of residences in this sector based on topography alone. However as can be seen from the montages developed for viewpoints within the sector (Locations 2, 3 and 4) intervening vegetation has an effect on the degree of visibility. In addition to this, a review of aerial photography illustrates that houses are generally not orientated to long distant views, especially those towards Leard State Forest. Rather most houses are located within a landscape that includes trees that have the potential to screen views. There are however potential exceptions.

Residences in this sector are ascribed a high sensitivity up to 7.5 km if there are views to the Project. This includes two residences on Trantham Road, two on Ellerslie Road and six on Harparary Road and another four off other rural roads. The remainder in this sector would have a moderate sensitivity if there are views to the Project. As discussed above evaluation of aerial photography would indicate that most residences are not orientated to the Project Boundary and are generally surrounded by homestead landscape and at times intervening woodland or forest areas.

On the basis of the visual effect levels, sensitivity and likely visibility, a high visual impact may be experienced from a limited number of houses for a brief period if there are views to the Project. Generally it is considered that these conditions do not occur, reducing impact levels to moderate and low as rehabilitation progresses. But higher impacts could occur for residences that are closer to the Project Boundary, especially for those houses on Ellerslie and Trantham Road.

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 northern OEA reduce effects and impact levels to very low and insignificant.

Maules Creek Village

There are potential views from the village that are totally dependent on foreground vegetation to create screening. Such vegetation is often in place preventing views. In the absence of such vegetation open views to the northern face of the northern OEA would be obtained. This would create high to moderate visual effects until rehabilitation is under taken and tree cover is established. Given the high sensitivity of the locality a high to moderate visual impact would result. This would reduce to low when rehabilitation is completed.

Local Roads

There are potential views from the local roads to the northern OEA. From the roads there are views to the northern and eastern faces of the northern OEA. The visual effects could be high for short periods of time as pre-rehabilitated OEA would be viewed but this would reduce to moderate and low once rehabilitation progressed. From the eastern parts of the Northern Sector there may be views to slivers of in pit OEA. However due to the reduced sensitivity assigned to local roads visual impacts would be low. Moderate impacts may be experienced for short periods of time if a high visual effect occurs on pre-rehabilitated OEA.

Doug Sky Lookout – Mt Kaputar National Park

There are open views from this lookout to the Project Boundary. The Project would be overlooked from this location with views to the OEAs and open pit possible. However at a distance of over 30km a low visual effect and sensitivity would result in a low visual impact level.

6.2 Eastern Sector

The eastern sector includes parts of the Slopes and Foothills, Rocky Hills, Surrounding Ranges and the Creeks and River VCU's.

The eastern sector is dominated by rural lands. This sector also supports the Plagyan State Forest within the PVC.

Rural Residences

There are approximately 11 rural residences along Upper Maules Creek Road and Thornfield Crossing Road. Five of these houses are within 7.5km of the northern OEA and therefore would have a high sensitivity if views of it are obtained. However homestead landscape and vegetation along Maules Creek and its feeder gullies could create visual screens to such views. Visual orientation to the Project Boundary is not strong. Beyond 7.5km similar visual conditions occur and visual sensitivity is ascribed as generally moderate to low if views are obtained.

The visual impacts for most viewing locations from this sector would be low following rehabilitation of the eastern face of the northern OEA. There remains a potential for a high impact to be experienced from residences that may be within 7.5km from the Project that have views to the northern OEA in pre-rehabilitated condition. However once rehabilitation of the northern OEA occurs visual impacts would be reduced to moderate to low.

Residences along Dripping Rock Road and Mallee Lane are unsighted by topographic elements. As such there would be no visual impact on these houses.

6.3 Southern Sector

The southern sector includes parts of the Forested Hills, Rocky Hills, Slopes and Foothills, Cropping Lands and Mine & Infrastructure VCUs. The sector is dominated by rural land uses with mining occurring on the southern side of the Willow Tree Range. There are a number of rural residences, local roads, parts of the Kamilaroi Highway as well as Gins Leap Roadside Rest Area in the sector.

Rural Residences

There are a number of scattered rural houses within the southern sector. For residences located in the eastern most part of the southern sector there are only limited potential for views of the Project along Goonbri Road and Rangari Road. However site and aerial photo evaluation have indicated this would be very limited. Residences in this sector would have a moderate to low sensitivity as they are further than 7.5 km away. This coupled with

moderate to low visual effects creates moderate to low visual impacts for rural residences within the southern sector.

Local Roads

Where views are able to be obtained from the local roads within this sector they would be only be small and passing. As such the visual impact on these roads would be low reflecting low visual effects and a low visual sensitivity. This would reduce to very low and become insignificant and barely perceivable when rehabilitation is completed. It is expected that there would be no visual impacts on the local roads within this sector.

Kamilaroi Highway

This road is generally unsighted however there are potential views from the road in the vicinity of Gins Leap as well as from the rest area in that location. This location is over 10km away and would have a low sensitivity. Views would be onto the most elevated parts of the OEAs. The visual effect of these areas would be low at this distance and rehabilitation would further reduce this to very low.

The visual impact would be low on these view locations.

6.4 Western Sector

The western sector includes parts of the Forested Hills, Rocky Hills, Slopes and Foothills, Cropping Lands and Creeks and Rivers VCUs. The sector is dominated by rural land uses. It supports a large number of rural residences as well as the village of Baan Ba. It encloses a section of the Kamilaroi Highway as well as a number of rural roads including: Therribri; Harparary; Maules Creek; and Narrabri Roads. Significantly the smaller Trantham Road and Ellerslie Road are in close proximity to the Project Boundary in this sector.

Rural Residences

There are approximately 14 residences within 7.5km of the Project Boundary. Many of these residences would likely have garden landscapes and or adjoining red gum woodlands that would screen or filter views. However if these residences have views they would have a high sensitivity. This coupled with high visual effects would create a high visual impact until rehabilitation has taken place. These residences are located on Trantham, Ellerslie, Therribri and Harparary Roads.

For residences outside the 7.5km distance a moderate to low sensitivity has been ascribed. This would correspondingly generate lower visual impacts on these locations. The actual impact experienced by various residences would vary and be totally dependent on foreground or middle-ground vegetation.

Baan Baa

Baan Baa is to the west of a rocky hill in that locality that totally screens the village from views of the Project. There would be no visual impact on this village.

Local Roads

The visual impact on local roads would be low as most are located outside 2.5km and have been ascribed a low sensitivity.

Kamilaroi Highway

There is some potential for views from the highway in the vicinity of the Narrabri Road intersection. However remnant woodlands along the highway corridor as well as woodland on the adjoining Narrabri River would filter out strong views. At this distance (approximately 11km), the highway would have a low sensitivity and visual effects would also be low, so impacts would be low from this locality.

6.5 Lighting Impacts

6.5.1 General

The visual effect of lighting surrounding the Project Boundary would vary. It would 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 would be where the light source is directly visible, and would 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 would create a strong local focal point and the effect would vary with distance and atmospheric conditions such as fog, low cloud and / or dust particles which all reflect light.

The PVC of the Project would have very low ambient night light that would be generated by dispersed homesteads and vehicle travel on local roads. The cumulative effect of these lights would be unperceivable. There would be some effect of the ambient light created by the existing Boggabri and Tarrawonga Mines especially on foggy nights where atmospheric particles could reflect ground lights creating a night glow.

6.5.2 Direct Light Effects

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

Generally Project truck and vehicle lighting would be screened by topography, vegetation and eventually by the northern OEA itself. During the first 5 years of the mine life as the northern OEA would be constructed, The other form of direct lighting effects would 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. Such roads would include Therribri Road and the Kamilaroi Highway. It would be not expected that rural residences would be affected by such light.

The infrastructure area, including the elevated lighting on the ROM dump hopper would also create direct light effects. However, these lights would be screened by adjoining topography of the adjoining hills with the exception of a small area to the north west. However even in this sector direct lighting would generally be screened by vegetation. Diffuse Light Effects

Both Boggabri Coal Mine and Tarrawonga Mine already contribute diffuse light effects into the night sky. This would be screened to a large degree by the Willow Tree Range, however these mine areas would potentially contribute to diffuse light.

Similarly, lighting from the Project would collectively create a glow of light that would be seen in the ambient dark night. This glow would represent the indirect lighting effects of all the lights including machinery as well as lights around work areas and infrastructure elements.

Generally, this glow would not create a significant visual effect but would be apparent from time to time.

6.5.3 Night Lighting Impact Level

The Project would result in night lighting impacts due to direct and diffuse light effects. The visual effect of lighting associated with the Project would be at a similar level to that currently approved and experienced to the south at Boggabri and Tarrawonga coal mines.

Direct lighting would create a higher impact but is more limited in extent. The main light effects would be from intermittent lights associated with truck movement associated with the construction of the northern OEA. These elevated locations would negate the screening effect of surrounding vegetation and topography and create direct light effects. However the distances to sensitive receptors would mitigate these effects. Similarly the screening and filtering effects of foreground vegetation, other buildings and window treatments (such as curtains) at residential points of viewing would also mitigate these effects.

The diffuse lighting effects would have a lower impact although they would be more widely experienced, especially if moisture or particulate matter such as dust is present in the atmosphere. This would create a halo of light above the mine components that are the sources of the light. This halo of light would be seen from many locations all around the Project Boundary. Although evident it is not considered that it would create a significant visual impact, due to a combination of large viewing distances, orientation of residences and screening effects of topography and vegetation as well as house design and features.

6.6 Cumulative Visual Impact

The Project would be the third coal mine in the region within and in the vicinity of Leard State Forest. Boggabri and Tarrawonga coal mines are located in the southern parts of the forest with the Project occurring to the north.

If the mine plans are viewed collectively or in fact from the air, the cumulative visual impact could be high at any one time. This would depend on the amount of mine area that would be in a pre-rehabilitated state and contrasting strongly with the surrounding forest. However at ground level this impact would be vastly different.

The topography of the region in the vicinity of Leard State Forest and Leard State Conservation Area mitigate against an experience of a cumulative visual impact. The ridges and spurs within these areas fragment the visual catchments that have the potential to view mining activity associated with the Maules Creek, Boggabri, and Tarrawonga mines.

Boggabri and Tarrawonga are enclosed within the semi circle of the Willow Tree Range that effectively isolates these mine areas from views to the north, east and west. The Tarrawonga mine breaks this containment and has an increased projection to the south. Similarly mining of the Goonbri Coal ELA 7435 would project to the east and south in a very limited way. These mines impact on a limited number of sensitive receptors in the southern sector of the Maules Creek PVC, Figure 5.1. Sensitive receptors in the eastern sector are even more limited. The impact of these mines was also evaluated in the EA associated with the Boggabri Coal Mine.

The experience of Project visual impacts are isolated from these impacts in the same way that the visual impacts of Boggabri and Tarrawonga are isolated from sensitive receptors that view the Maules Creek Coal Mine. The minor exception would be the visual projection of small parts of the southern face of the western in pit OEA to southern view sheds of Boggabri/Tarrawonga mines, through a narrow re-entrant in the Willow Tree Range. This element in itself would only have a low visual effect even in the pre-rehabilitation phase. This effect level and impact level would be further reduced by the scale and similar visual character of the Boggabri and Tarrawonga Mine OEAs.

Considered in the reverse situation, the Boggabri and Tarrawonga Mines have no visual effect or impact on the view sheds, and sensitive receptors, of the Maules Creek Mine. The potential exception would be to the low visual impact of diffuse night light that would not be screened by the Willow Tree Range.

6.7 Visual Impact Summary

The potential for visual impacts would be greatest to the north and to the north-west of the Project Boundary. Visual effects are restricted in other areas due to the visual screening effects of the Willow Tree Range to the south, its north eastern spurs to the east and the Leard State Conservation Area to the north west.

In relation to northern and eastern viewing locations, during the first 5 years, visual impacts could be high. This would occur for limited periods of time until rehabilitation of the northern and eastern faces of the northern OEA would be completed. Rehabilitation initially with grass cover reduces visual effects to moderate and the later tree cover would reduce this effect to low, reducing visual impacts in these areas to low.

To the north-west the visual effect of the pre-rehabilitated western face of the northern OEA and the north western faces of the eastern and western in pit OEAs would remain high until mining within the Project Boundary ceases. This could create a high visual impact on rural residences within a 7.5km radius and a high to moderate visual impact to a distance of 12km. To various extents these impacts are mitigated by intervening vegetation that would be either at a residence or created by adjoining woodland.

Any impacts created by the pre-rehabilitated faces of the western and eastern in pit OEAs cannot be mitigated on site until mining within the Project Boundary would be complete. Where such impacts may occur, off site treatments may be required, though they are considered unlikely to be necessary

6.8 Mitigation

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

- On site treatments to reduce visual effects; and
- Off site treatments at viewer locations to reduce visual sensitivity.

On site treatments involve rehabilitation of landforms and land cover, while off site 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 incorporated in the design and operating plans for the Project 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.

The following on site treatments are proposed to be implemented for the Project:

- Revegetation of disturbed areas as soon as practicable after the completion of construction;
- Progressive rehabilitation and revegetation of the northern OEA;
- Where feasible rehabilitation would be undertaken to landscape patterns that emulate existing forest colour and texture continuums in the landscape;
- Use of compatible tones for building and cladding colours. Such colours would include tonal variations of existing colours in the surrounding landscape. However, contrasting but discordant colours that stand out in the landscape should be avoided;
- Within the established rail easements rehabilitate all earthwork batters; If possible place transmission poles in locations of high visual absorption or well away from the crossing of the Kamilaroi Highway and Therribri Road;
- Design of fixed night lighting to the minimum level necessary for operations and safety;

- Use of low flux lamps and direction of fixed lights toward the ground, where practical;
- Implementation of work procedures related to the use of mobile lighting plants to avoid adverse off-site lighting impacts; and
- Where possible, conduct operations behind noise/light barriers, especially at night, particularly on the OEA, to avoid adverse off-site lighting impacts.
- Off-site treatments would include the reinforcement of plantings around the house and potentially along driveways.

The mitigation measures listed above would reduce the visual effect of Project components by reducing the level of contrast with the surroundings. The revegetation of disturbed areas would also increase screening of views of Project components.