APPENDIX K

Visual and lighting assessment

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Mangoola Coal Modification 6

Visual and Lighting Assessment

Prepared for Xstrata Mangoola Pty Limited | April 2013

Planning + Environment + Acoustics

Mangoola Coal Modification 6

Visual and Lighting Assessment

Prepared for Xstrata Mangoola Pty Ltd | 10 April 2013

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Mangoola Coal Modification 6

Final

Report J11043RP1 | Prepared for Xstrata Mangoola Pty Ltd | 10 April 2013

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1 Introduction

1.1 Overview

Xstrata Mangoola Pty Limited operates Mangoola Coal, an existing open cut coal mine in the upper Hunter Valley. Xstrata Mangoola is seeking approval to modify Mangoola Coal's project approval (PA06_0014) under section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The key element of the proposed modification is an increase in the rate of extraction from 10.5 million tonnes per annum (Mtpa) run-of-mine (ROM) coal to 13.5 Mtpa ROM coal due to efficiencies already realised in the operation of the coal handling and preparation plant (CHPP).

The result of the increased maximum extraction rate, if sustained, would be to reduce the active life of coal recovery within the approved project disturbance boundary from 15 to 12 years.

1.2 Current operations and approval history

Open cut mining commenced at Mangoola Coal in September 2010 under PA06_0014 to extract a coal resource of approximately 150 Mt. Mining commenced in the northern portion of the approved project disturbance boundary. Mining has been progressing in a south-easterly direction, on the eastern side of a 500 kV electricity transmission lines (ETL).

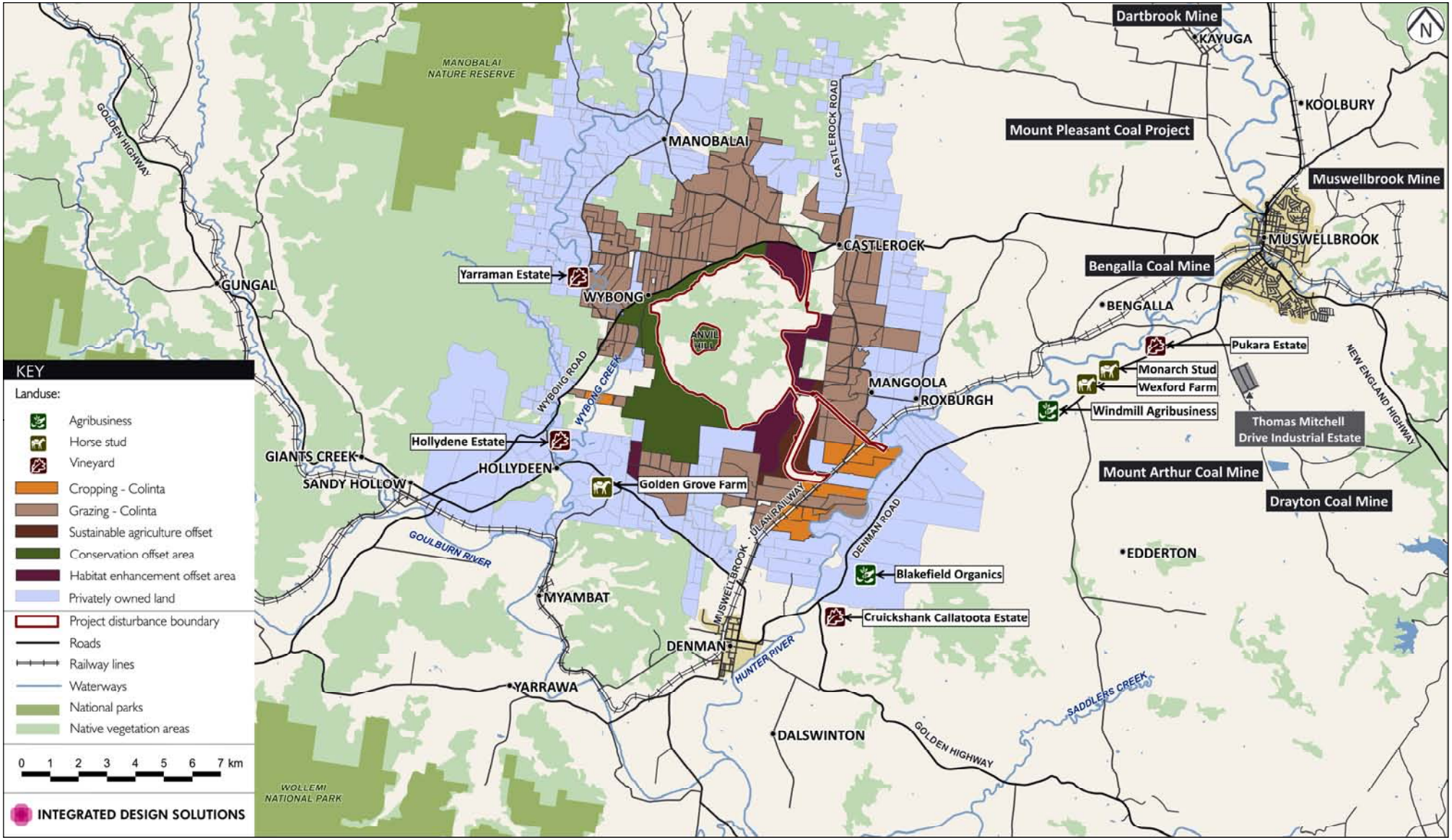
PA06_0014 was originally granted in June 2007 under Part 3A of the EP&A Act. Five modifications have since been granted to alter various elements of the operations. The most notable modification was the relocation of the ETL that bisects the mine disturbance area. The presence of this line creates a significant constraint to the mining operation and, as a result of a modification application (Modification 4 approved in June 2012), this ETL is to be relocated around the western edge of the approved project disturbance boundary to further optimise the extraction of the coal resource.

1.3 Project location

Mangoola Coal is approximately 20 kilometres (km) west of Muswellbrook and 10 km north of Denman within the Muswellbrook Shire local government area (see Figure 1.1). The nearest major roads are the Golden Highway, approximately 3.5 km from the site, and the New England Highway, approximately 15 km east of the site.

1.4 Purpose of this report

The purpose of this report is to provide an assessment of the impacts of the proposed modification on the visual landscape. This visual and lighting assessment accompanies the environmental assessment (EA) for the proposed modification. An assessment of likely additional or cumulative impacts as a result of changes to the conceptual mine plan has been undertaken. The conceptual mine plan has been used to determine amelioration measures that should be considered to help minimise visual impacts.



Project location and surrounding land uses

Mangoola Coal Modification 6 Visual and Lighting Assessment

Figure 1.1

1.5 Report Structure

This visual and lighting assessment has been prepared by EMGA Mitchell McLennan Pty Limited (EMM) for inclusion in the EA for the proposed modification. The components which are included in this report are:

- Chapter 2 – provides a summary of the methodology used in the visual assessment;
- Chapter 3 – describes the approved project and a description of the proposed modifications;
- Chapter 4 – provides a qualitative assessment of the potential visual impacts as a result of the proposed modification;
- Chapter 5 – details existing management and mitigation measures to be implemented under the proposed modification; and
- Chapter 6 – provides a summary of the findings of the visual assessment.

2 Study methodology

2.1 Methodology

The visual and lighting assessment of the proposed modification is a qualitative analysis of viewpoints with potential to be impacted by the proposed modification, or are representative of views of mining activities at the site from private residences or public roads in the surrounding areas.

The methodology used in the visual assessment is as follows:

- desktop review of the viewpoints identified in previous visual assessments for current operations at Mangoola Coal for relevance in respect of the proposed modification. These viewpoints are also shown in Appendix 9 of the current approval (PA06_0014);
- site survey to undertake a line of site analysis of each viewpoint to assess view type/ context and determine visual absorption capacity;
- assessment of the significance of the visual impact of the proposed modifications from each of the identified viewpoints; and
- review of mitigation measures stipulated in PA06_0014 and employed at the current operations to determine adequacy and whether additional measures are considered necessary.

2.2 Study area and viewpoints

A number of visual assessments have been undertaken for the current operations which have provided a qualitative assessment of visual impacts. Previous visual assessments undertaken include:

- *Visual & Lighting Impact Assessment Anvil Hill Project* prepared by O'Hanlon Design Pty Ltd (2006). This report was prepared as part of the original EA for Mangoola Coal;
- *Anvil Hill Coal Mine: Visual Impact Mitigation Report* prepared by Hansen Bailey (2008) to meet condition 53 of PA 06_0014; and
- *Visual and Lighting Impact Assessment* prepared by O'Hanlon Design Pty Ltd (2010) as part of the Modification 4 application for changes to the mine plan and infrastructure.

O'Hanlon Design (2006) selected 12 viewpoints which were considered significant due to potential impacts to a receptor at that viewpoint or because they were considered representative of views to Mangoola Coal from a particular area. Selection of the viewpoints had regard for landscape, sensitivity of viewer location and the nature of mine activities visible from a given point.

To ensure consistency and ease of comparison between the visual impacts of the current operations and the proposed modification this assessment has utilised the same viewpoints identified in O'Hanlon Design 2006.

Each of the 12 viewpoints are illustrated and described in Chapter 4.

2.3 View type and context

View type and context describes the existing landscape character, particularly the built environment, and topography and screening provided by vegetation or other elements. The context is a primary factor in the visual absorption capacity of the view; generally sites within higher contrasting landscapes have greater ability to absorb change, whereas sites within a uniform or highly ordered landscape have lower absorption capacity.

2.4 Visual absorption capacity

Visual absorption capacity is a measure of the landscapes ability to absorb development without a significant change in the character. It is a function of the view type and context. In this instance, a major factor influencing visual absorption capacity is the level of contrast of the mining activities against the natural landscape setting in which they sit.

Visual absorption capacity is rated on a scale of high to low. The physical characteristics of the landscape, including existing development features, are integral components in determining the visual absorption capacity. For example, a high visual absorption capacity would represent a modification/addition to the landscape area which would result in minimal visual contrast and a high level of visual integration with the surrounding landscape. Similarly, a low visual absorption capacity would represent a modification/addition which would result in a high visual contrast to the surrounding landscape with little or no visual screening.

3 Proposed modification

3.1 Proposed modification

The proposed modification involves the following key elements:

- an increase in the maximum rate of extraction from 10.5 Mtpa ROM coal to 13.5 Mtpa ROM coal;
- increase in equipment numbers to support increased mining intensity;
- increase of up to 150 additional employees and up to 90 full time equivalent contractors;
- amendment to blasting conditions to increase frequency of blasting from five blasts per week to six blasts per week and removing the condition relating to maximum instantaneous charge;
- re-define one temporary ROM stockpile to a permanent (life of mine) ROM stockpile;
- crushing and production of up to 50,000 tonnes per annum (tpa) of gravel for on–site use;
- discharge of saline water to the Hunter River under the Hunter River Salinity Trading Scheme (HRSTS); and
- alterations to the water management system and infrastructure.

Key elements of the proposed modification are illustrated in Figure 3.1.

3.1.1 Mine plan staging

Xstrata Mangoola proposes to increase the maximum extraction rate from 10.5 Mtpa to 13.5 Mtpa of ROM coal. As no additional disturbance area is requested as part of this modification, the increased extraction rate would result in the recovery of coal within the approved project disturbance boundary over a shorter time period. If the proposed maximum rate of extraction is sustained, the time required to extract the coal resource within the approved project disturbance boundary would reduce from 15 years to a total of 12 years as a result of the proposed modification. In practice, however, extraction rates will vary over the life of the mine.

The main alteration to the current approved mine plans sought under the proposed modification is the rate of progression of mining operations. Essentially, the progression of the mine within the approved footprint would remain generally in accordance with the current approved mine plan but would progress at a faster rate. The mine plan scenarios utilised in this visual assessment (Years 2, 5 and 10) are briefly described below:

- Year 2 – represents the early stage of coal extraction with open cut mining activities (OCMA) occurring in the north-east area of the mine (the Northern Pit) and progressing in a south-easterly direction towards the mine infrastructure area. The overburden emplacement area (OEA) is well established behind the general progression of the pit.
- Year 5 – coal extraction occurs in the north-west area (the Main Pit) and southern area (the Southern Pit) of the mine. The Main Pit progresses in a southwest direction around Anvil Hill and Southern Pit in a north-west direction.

- Year 10 – there is only one active pit in the south-western area of the approved project disturbance boundary. The majority of the mined land is rehabilitated by this time and represents the end stage of the mine life.

A comparison of proposed conceptual mine plans and comparison to the currently approved mine plans are shown in Figures 3.2, 3.3, 3.4 and 3.5.

The proposed increase in the maximum extraction rate of ROM coal would require additional plant and equipment to be utilised in the recovery of coal. This would nominally include an additional front end loader and excavator, and ancillary fleets of equipment such as additional haul trucks, dump trucks, graders, drill rigs, and mobile lighting plant. This equipment is referred to as mobile mine machinery for the purposes of this report. Operational requirements may vary from time to time due to constraints such as weather conditions, and would also depend on maintenance and repair works.

While no changes are proposed to the maximum height of emplacement, more land will be rehabilitated at the maximum height of 240m RL. No changes are proposed to the final void.

The increase to the maximum extraction rate and the additions to the mining fleet required to meet this increase have potential, temporal visual impacts when viewed from surrounding areas. Changes in the extraction rate alters the mine staging plan and, therefore, the time period that a viewpoint will be exposed to various OCMA, OEA and rehabilitation work, as compared to the current operations. The proposal to rehabilitate more land at RL 240 has the potential for works to be more visible from various viewpoints due to the superior elevation of this area. Similarly, viewers may be exposed to a greater number of mobile mine machinery operating around the site. The potential visual impacts associated with the changes described have been assessed from each viewpoint in Chapter 4.

3.1.2 Changes to coal handling and processing

The increased ROM coal maximum extraction rate will be achieved through an increase in mobile mine machinery used in the recovery of coal, as well as utilisation of a existing bypass coal system, which allows processing of ROM coal as bypass product.

3.1.3 Gravel crushing

Approval is sought for crushing of gravel from the stripped overburden in the pit areas prior to extraction of ROM coal. It is anticipated that up to 50,000 tpa of gravel would be crushed on-site. The gravel crushing plant will be mobile and follow pit progression to minimise travel distance between the source of gravel production and where it will be used. The unit will generally be positioned on a subsurface level or within a bunded area to protect it from prevailing winds and will operate during daylight hours only to minimise noise emissions.

3.1.4 Rail movements

The increase in maximum extraction rate to 13.5 Mtpa will not result in an increase in the approved daily maximum of 10 trains.

3.1.5 Final landform and rehabilitation

The approved project disturbance boundary would continue to be progressively rehabilitated in accordance with the project approval, as soon as practicable following disturbance, as shown on the conceptual mine plans for Years 2, 5 and 10 and final landform (refer to Figures 3.2, 3.3, 3.4 and 3.5).

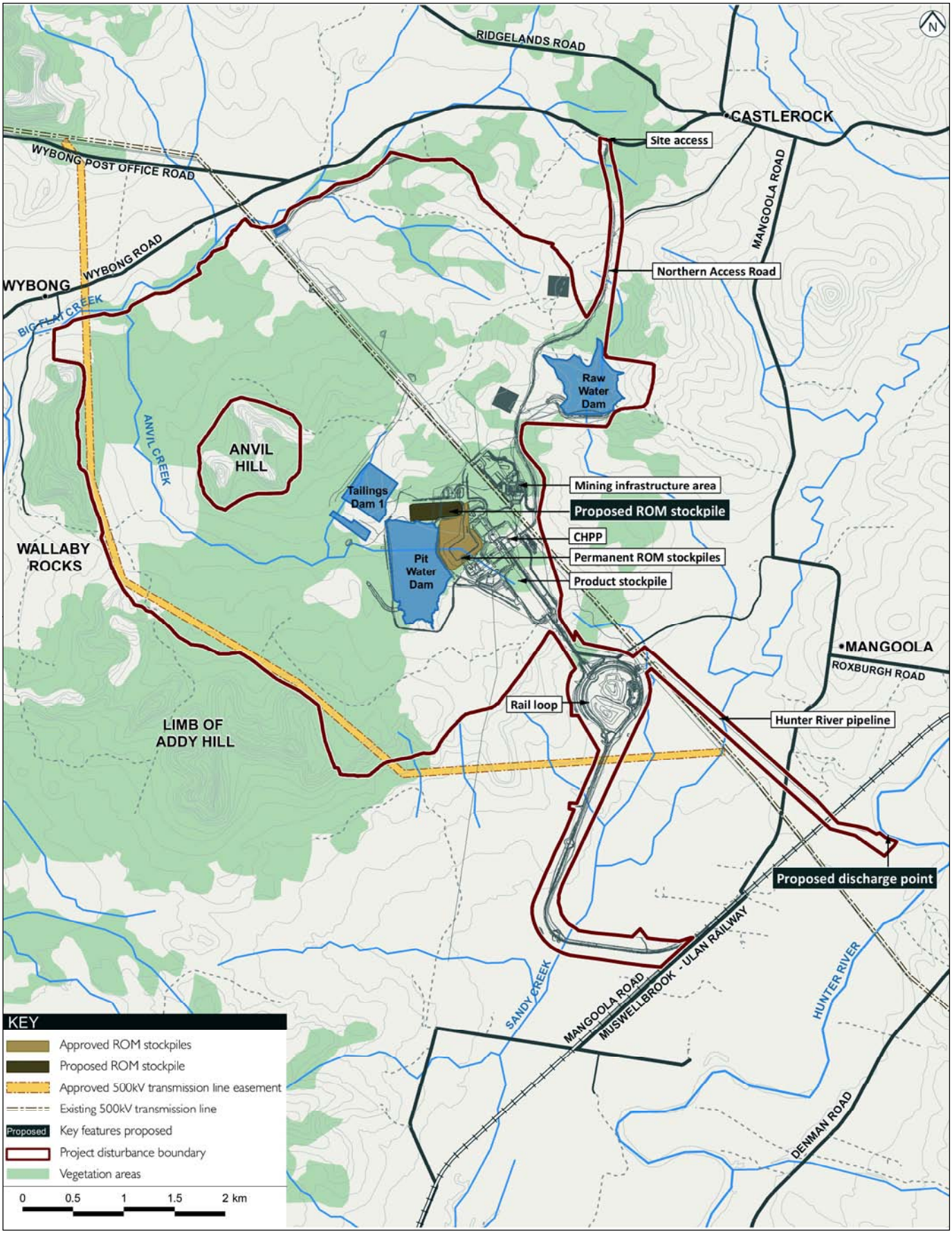
Rehabilitation of the disturbance area would continue to be undertaken progressively, but will occur at faster rate due to the increased rate of extraction.

There are minor alterations to the approved conceptual final landform due to the proposed modification to the mine plan and increased maximum rate of ROM coal extraction. While no changes are proposed to the maximum height of emplacement, more land will be rehabilitated at the maximum height of 240 m RL. A conceptual final landform is presented in Figure 3.5.

The additional area has potential for spatial and temporal visual impacts for viewers in surrounding areas. The additional area may expose viewers to additional OEA and rehabilitation works that may not have been possible under the current operations. Similarly, spatial impacts by changes in the final landform may result by way of alteration to the horizon, as viewed from certain viewpoints. These potential visual impacts have been assessed within this visual assessment.

The approved project disturbance boundary would continue to be progressively rehabilitated in accordance with the principles outlined in the Rehabilitation and Offset Management Plan, as soon as practicable following disturbance. Xstrata Mangoola remains committed to continual improvement and is currently working creating a more natural landform design to achieve sustainability outcomes, improve habitat values and restore ecological function. The process of sustainable landform design requires consultation with appropriately qualified specialists to ensure the final design is able to effectively manage runoff events, minimise erosion, sustain plant growth and maximise use of natural resources for growth medium and habitat restoration. It also needs to be able to be safely constructed following site procedures and utilising site equipment and software where possible.

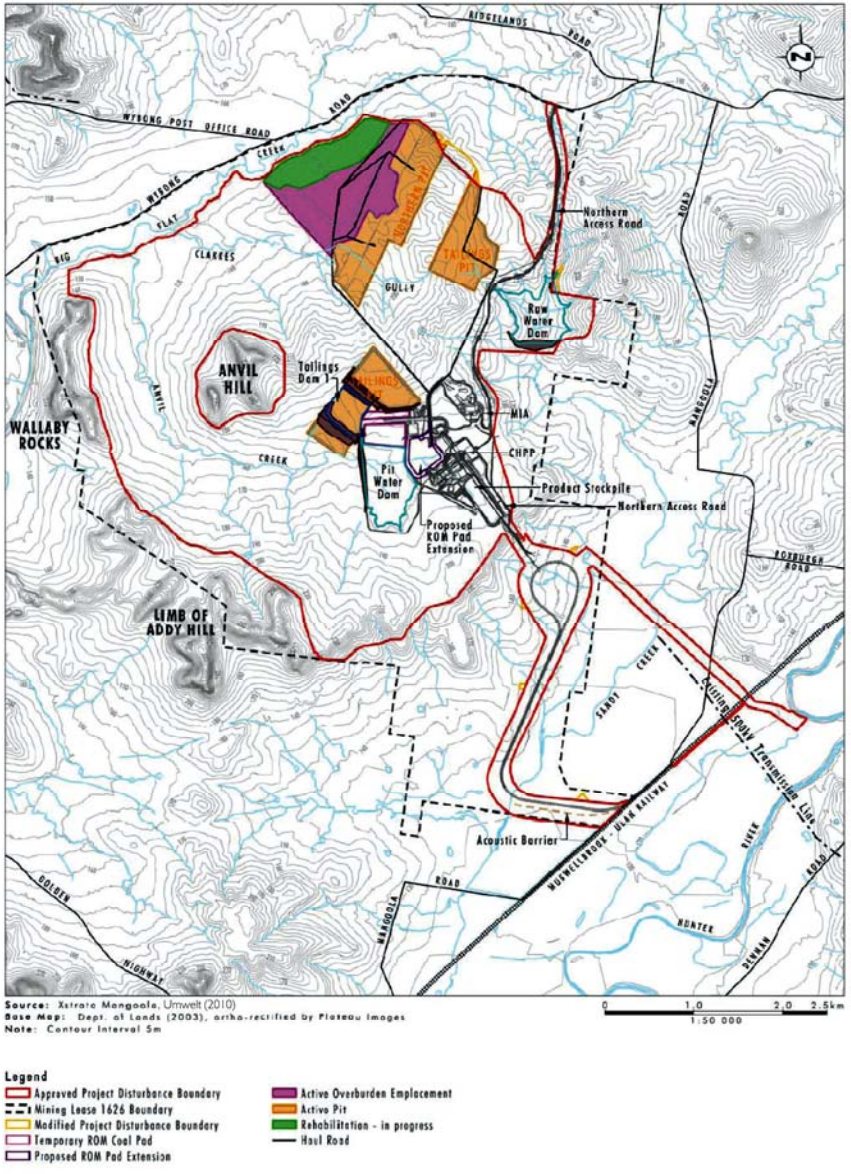
The sustainable landform design project will not require amendment to the approved maximum RL, project disturbance boundary or where surface water runoff will report to. The changes would be in relation to the shaping of the landform (undulations instead of flat surfaces where appropriate) and the way by which the surface water will reach its eventual destination (eg gullies and ponds/riffles that are created to look like a natural part of the landscape would be preferable over symmetrical engineered structures).

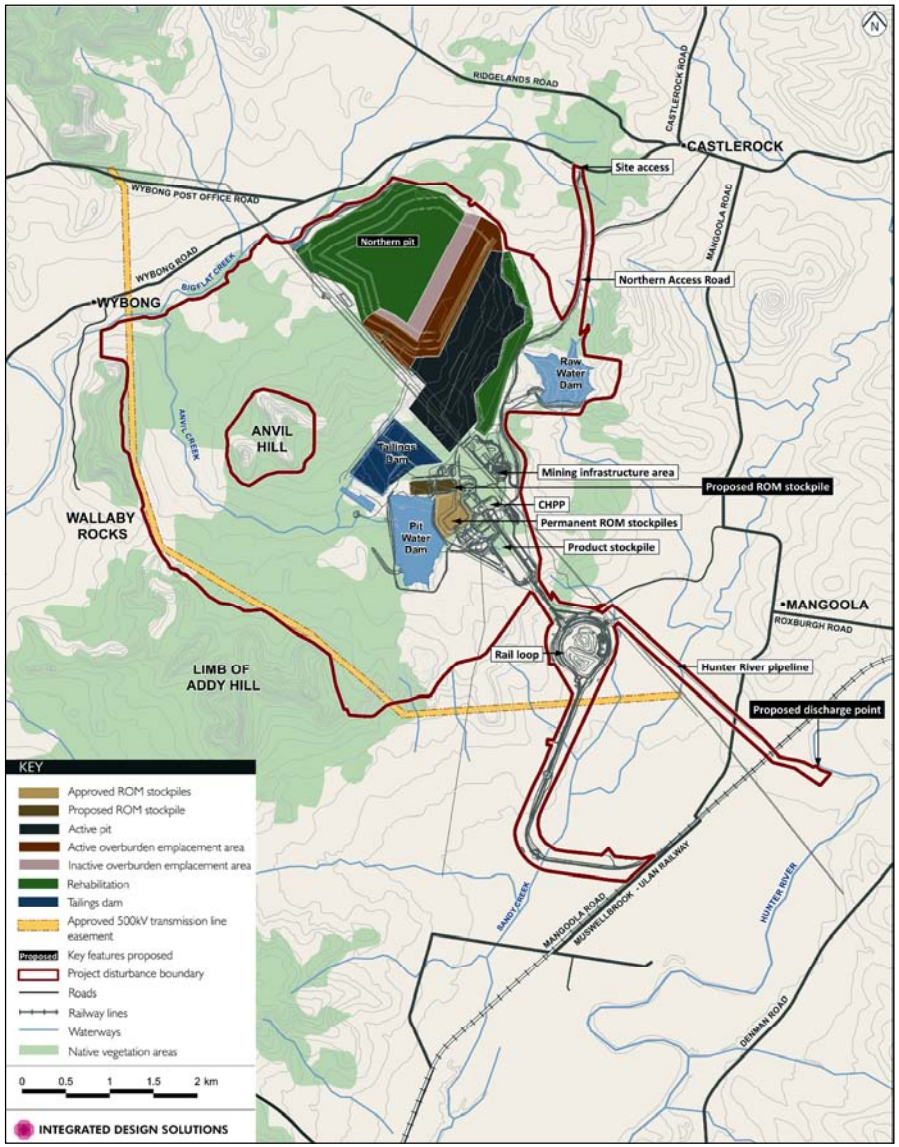


Key features of the proposed modification

Mangoola Coal Modification 6 Visual and Lighting Assessment

Figure 3.1





Mine staging plan comparison – Year 2

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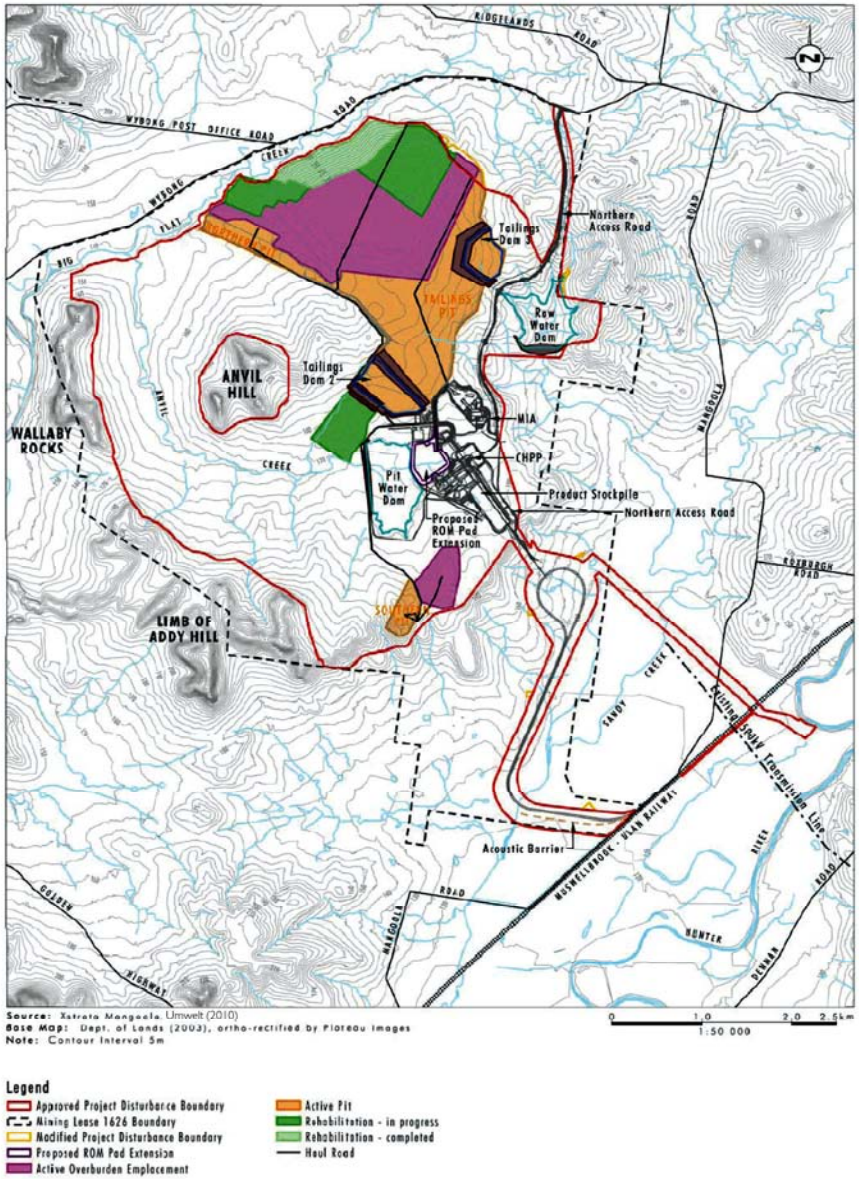
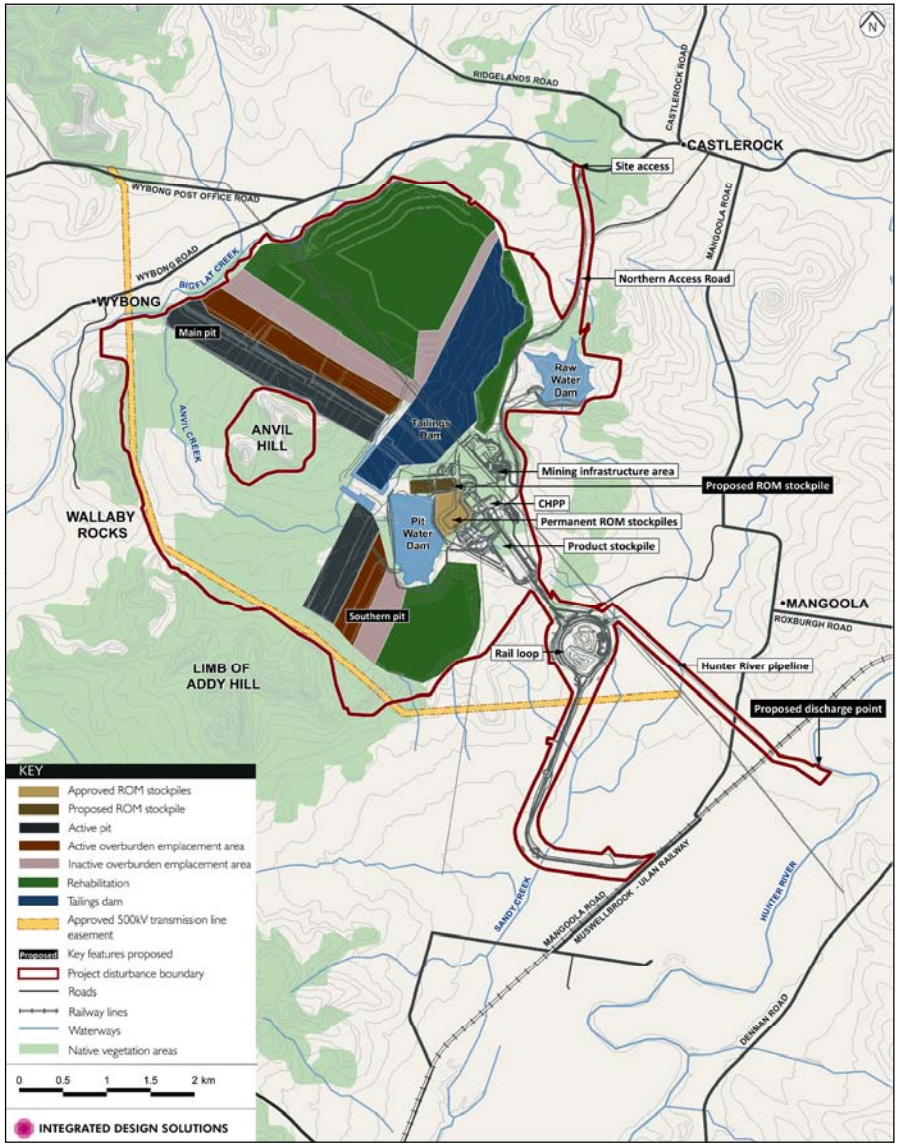
Figure 3.2





Mine staging plan comparison – Year 5

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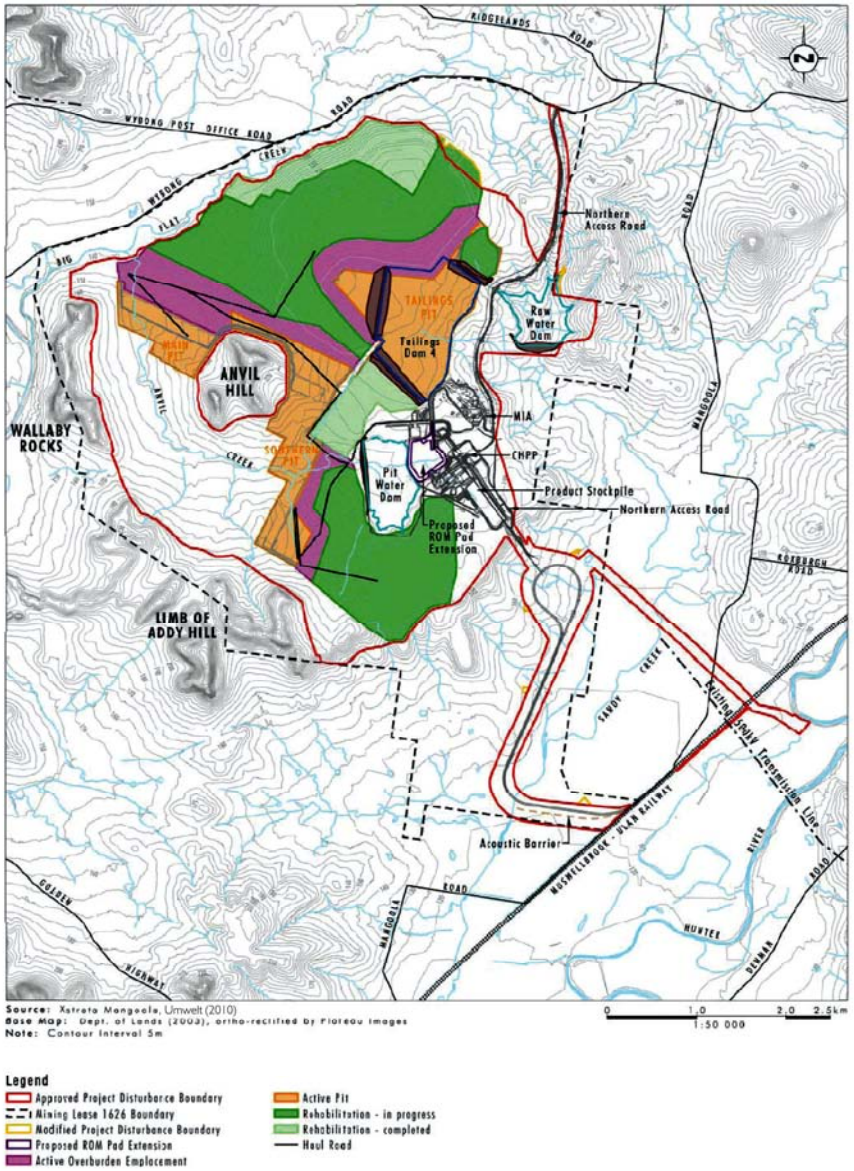
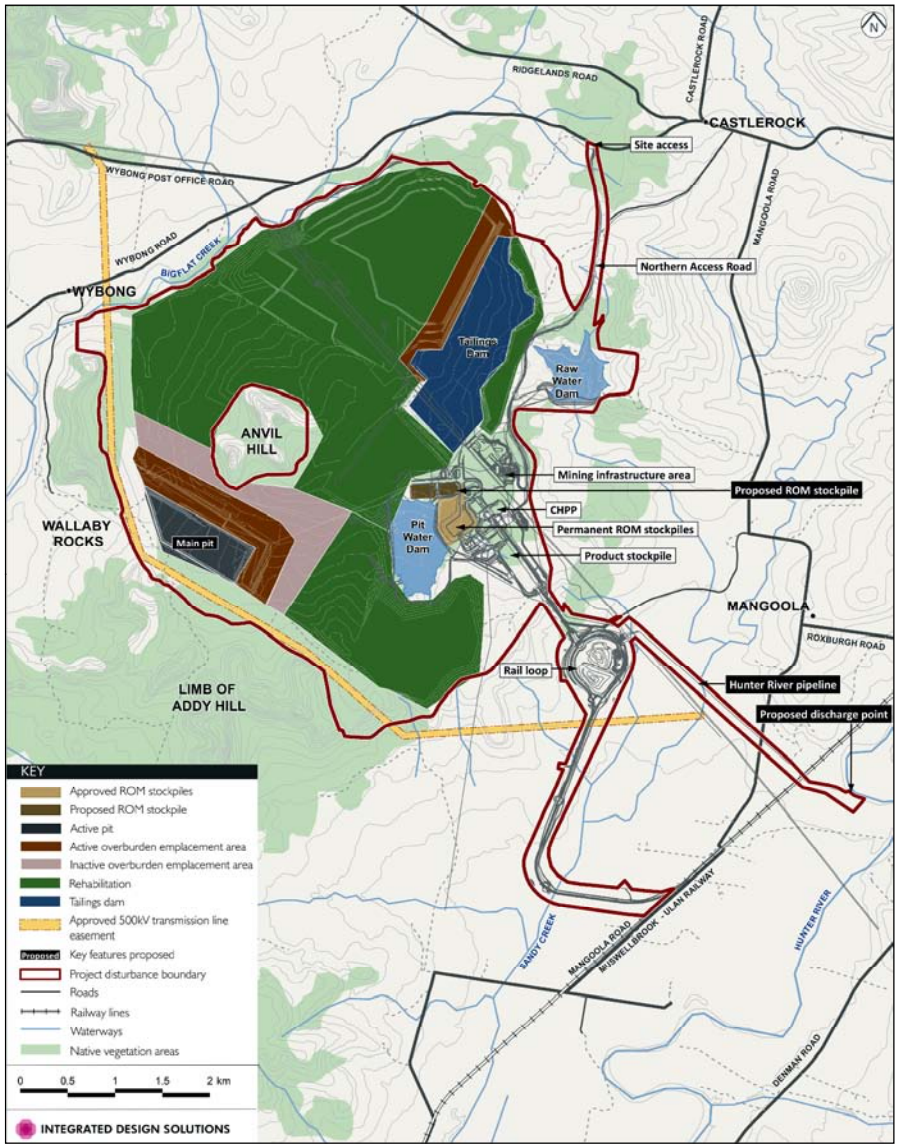
Figure 3.3





Mine staging plan comparison – Year 10

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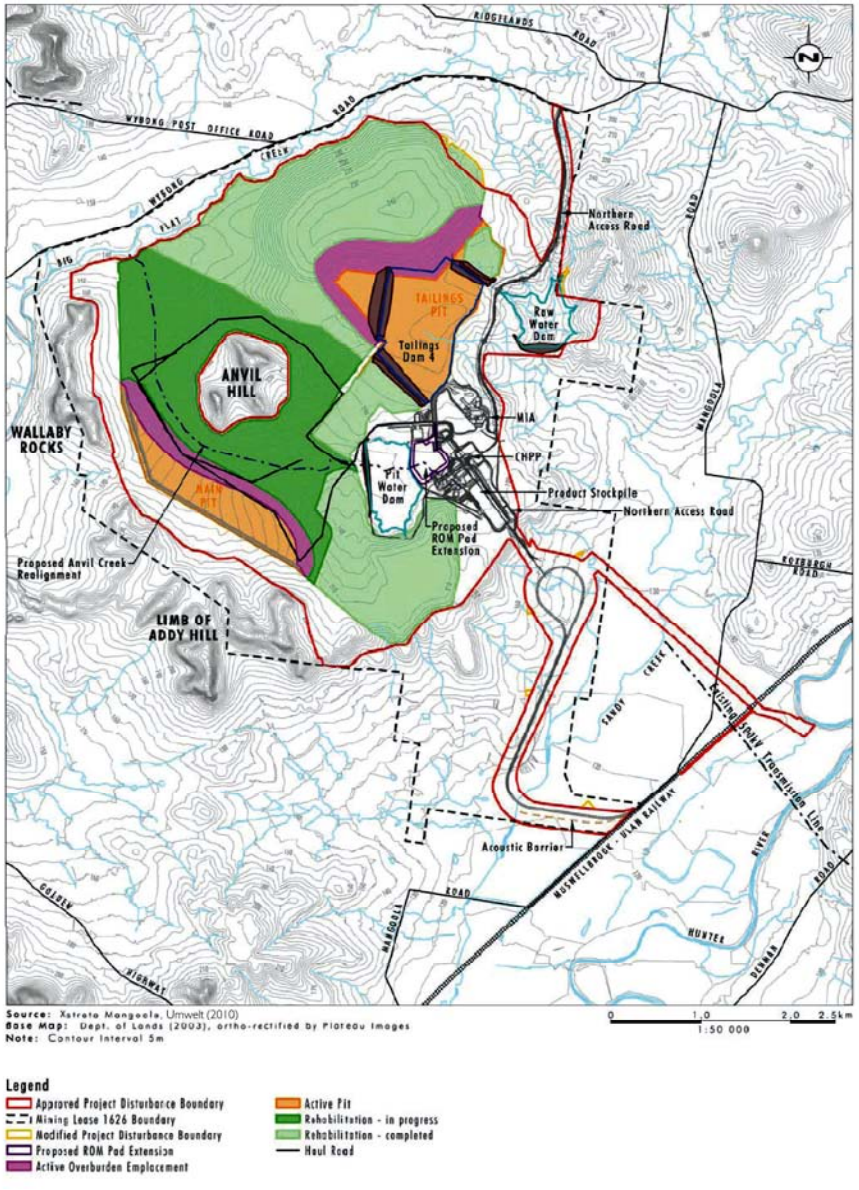
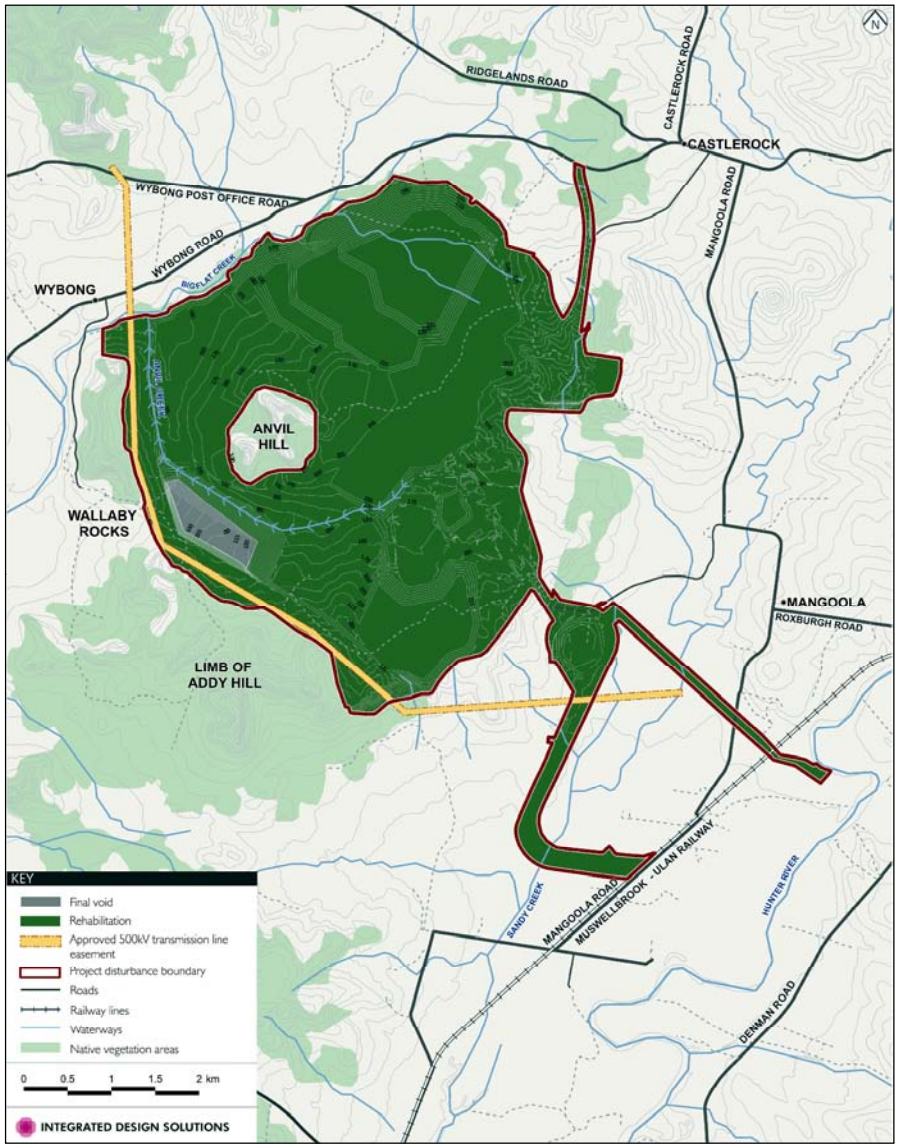
Figure 3.4





Mine staging plan comparison – Year 15 approved vs. Final landform (modification 6)

Mangoola Coal Modification 6 Visual and Lighting Assessment

Figure 3.5

4 Viewpoint visual assessment

As previously outlined for reasons of consistency, this visual assessment has utilised the viewpoints used in each of the previous visual assessment that have accompanied applications for the original mine approval or subsequent modifications. The location of each of these viewpoints is in Figure 4.1.

Each of the viewpoints are described and illustrated below. The visual assessment has analysed the likely visual and lighting impacts as a result of the proposed modifications.

4.1 VP1 – Roxburgh Road (1,500 m from the Wybong Road intersection: 265 m RL

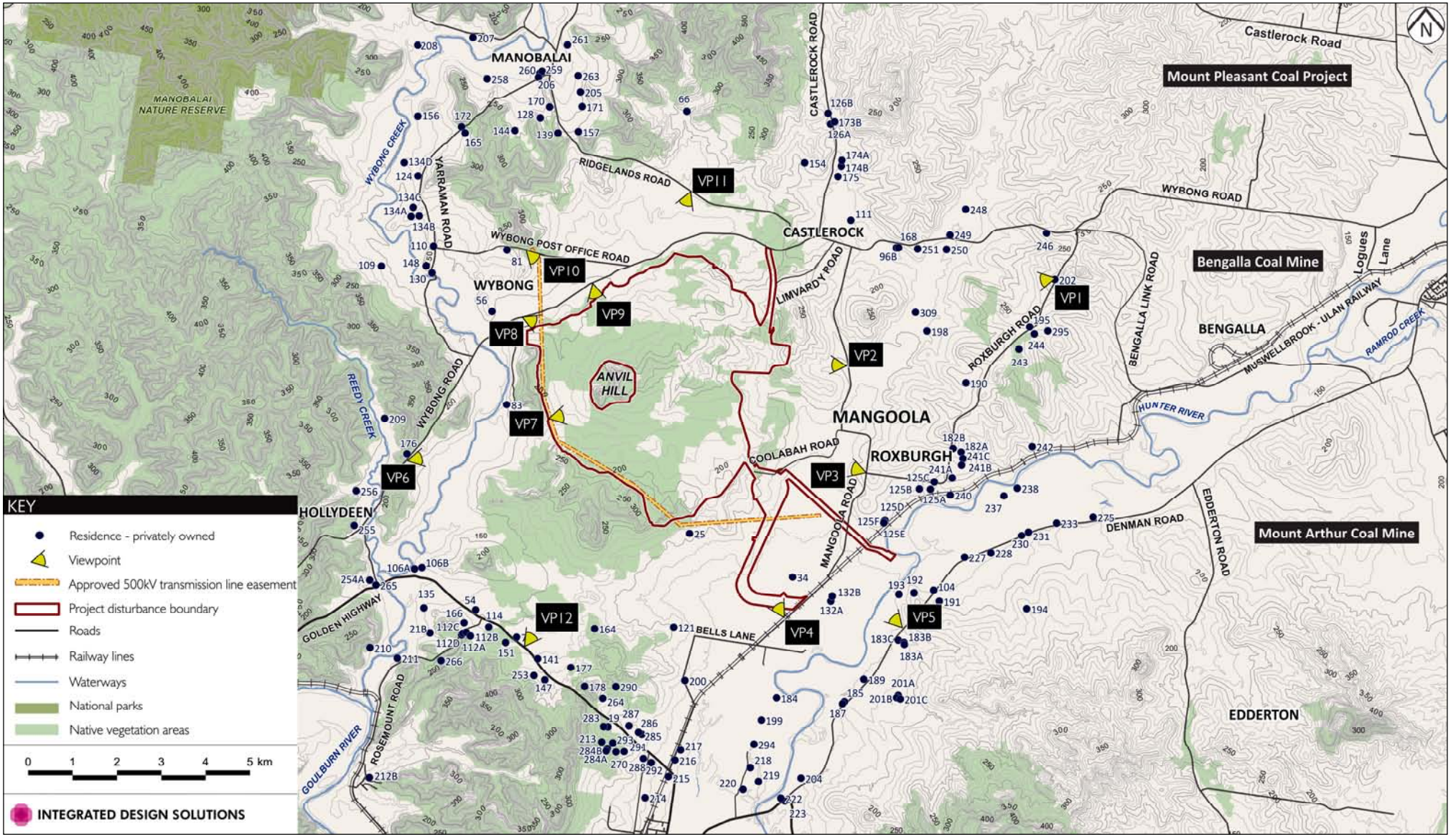
4.1.1 Viewpoint type and context

The relevant viewing direction from VP1 in relation to Mangoola Coal is facing west and south-west. This view is shown in Photograph 4.1 and Figure 4.1. Viewers would typically be motorists travelling south along Roxburgh Road. There are no privately owned residences in the vicinity of this viewpoint.

Photograph 4.1 View from VP1 – to south-west from Roxburgh Road

Views are dominated by the long grasses and other scattered vegetation in the foreground. A series of both cleared ridgelines and dense vegetation are prominent in the middle ground. Upper wooded slopes and more elevated ridgelines can be seen in the distant background. At a height of 265 m RL this viewpoint provides a superior, albeit limited and distant, viewing position over the mine operations at a distance of 7 to 12 km.

The topography of this elevated location, although relatively flat at the viewing point, falls away sharply toward the mine, with slopes in excess of 30%. The middle ground, although predominantly obscured from view, exhibits undulating alluvial flood plains which have been heavily cleared for grazing.



Visual assessment locations

Mangoola Coal Modification 6 Visual and Lighting Assessment

Figure 4.1

The landscape is one of a natural setting with little in the way of cultural modifications visible from this viewpoint. The viewpoint is considered to have a low visual absorption capacity due to its high scenic value resulting from a largely unmodified landscape.

4.1.2 Visual impacts of modification

From this receptor, much of the mine infrastructure is obscured due to the undulating topography and existing vegetation. Glimpses of existing infrastructure such as the rail loader are possible; however, given the distance of approximately 8 km to this feature, it is almost indiscernible and not a prominent feature in the viewscape.

At the superior viewing elevation, views to OCMA, OEA and rehabilitation work will be visible for the Southern Pit. The viewing distance to the mine pits result in the mining activities sitting in the background of the visual landscape and below the horizon. Impacts from mining activities would be similar to those under the current operations. The increased maximum rate of extraction will potentially result in a reduced period in which mining activities would be visible from this viewpoint. Views to the Northern and Main Pits will largely be obscured by a knoll and ridgeline between the viewpoint and the two pits.

The increase to the total area of rehabilitated land at the greater RL 240 within the Southern Pit will be visible from this viewpoint. Given the distance, however, change to the landform would almost be indistinguishable from this location.

4.1.3 Lighting impacts of modification

Additional night lighting impacts in this sector are likely to be minimal due to the distance; however, some sky glow from OCMA and associated infrastructure is likely to be present. It is considered that this would not be significantly greater than that experienced with current operations.

4.2 VP2 – Mangoola Road (approximately 3,000 m north of Roxburgh road): 150 m RL

4.2.1 Viewpoint type and context

The relevant viewing direction from VP2 in relation to Mangoola Coal is facing west and this view is shown in Photograph 4.2 and Figure 4.1. Viewers would typically be motorists travelling north or south along Mangoola Road. There are no private residential properties along this section of Mangoola Road. Viewer distance is approximately 2 km from Mangoola Coal. Two private residences are further east of VP2 at a viewing distance of approximately 4 km.

The visual character of this viewpoint is dominated by the alluvial plains east and south-east of Mangoola Coal. Topography of the land in this area is essentially undulating rural lands that have been heavily cleared for grazing.

The visual landscape has been modified primarily by the presence of rural residential dwellings, farm sheds, roads powerlines and fence lines. The scenic quality and visual absorption capacity of this visual landscape is considered to be moderate.

Photograph 4.2 View from VP2 – obscured by ridgeline to the west

4.2.2 Visual impacts of modification

At RL 150, VP2 has an inferior viewing elevation to the ridgeline to the west at 220 m RL. This ridgeline is shown in Photograph 4.2. This ridgeline prevents views to any parts of the project from this VP2. Consequently, the proposed modification will not create additional visual impact from this viewpoint.

Of the two private residences further west from this viewpoint, the northern residence has an inferior viewing elevation of 160 m RL. As with VP2, views to the project would be similarly obscured by the ridgeline to the west of the receptor. The more southern of the two private residences has a slightly higher viewing elevation at 206 m RL. Whilst views toward the Southern Pit may be possible, intervening topography and vegetation will likely screen the majority of views to this area. Some views to OCMA, OEA and rehabilitation works in the Southern Pit may be possible in Year 5, at a viewing distance of greater than 4 km. The proposed modification will not result in any additional visual impact as compared to the current operations.

4.2.3 Lighting impacts of modification

Night lighting impacts in this sector are likely to be reduced under the proposed modification as mining operations in the Northern Pit may be completed by Year 5 rather than Year 15 under the current operations. Some increased sky glow may be experienced during this reduced time period due to additional infrastructure and mobile mine machinery. Any increase in sky glow would be minimal in nature and the visual impacts experienced by viewers at VP2 would be reduced with respect to night lighting.

4.3 VP3 – Corner of Mangoola Road and Roxburgh Road: 180 m RL

4.3.1 Viewpoint type and context

The relevant viewing direction from VP3 in relation to Mangoola Coal is facing west and this view is shown in Photograph 4.3 and Figure 4.1. Viewers would typically be private residences in the vicinity of this viewpoint as well as motorists travelling west along Roxburgh Road or north along Mangoola Road. Viewer distance to the main infrastructure area is approximately 3 km.

Photograph 4.3 View from VP3 – dominated by alluvial flood plains and undulating foot hills

Views are typically rural/ scenic in nature with the foreground dominated by a large expanse of alluvial floodplains. This area represents cleared rural farmland and rural residential landholdings. The middle ground exhibits undulating foothills which define the eastern edge of the mine disturbance area. Densely vegetated ridgelines create a prominent silhouette in the distant background. Limb of Addy Hill and Anvil Hill are dominant features from this viewpoint.

The visual landscape has been modified by the presence of the 500 kV ETL which transects the view. The realignment of these transmission lines will effectively remove it from the viewscape. Other infrastructure visible in this landscape includes the rail loader and distant glimpses of the CHPP which is visible generally only on clear days. Other non-mine related infrastructure which are visible include rural residential dwellings, sheds, power poles and fence lines. The overall visual absorption capacity of this viewpoint is considered to be moderate.

4.3.2 Visual impacts of modification

The impacts of the modification on viewers from VP3 may be reduced should the increased maximum rate of extraction be sustained, which will result in a reduced period over which disturbance will be visible. The pre-stripping and initial box cut for the Southern Pit may occur in Year 3 instead of Year 5 under the current operations. By Year 5 the OEA will be rehabilitated and will screen any views of OCMA in the Southern Pit as it progresses in a westerly direction.

Similarly, the increased maximum rate of extraction will greatly reduce the viewer's exposure to temporal visual elements of the Northern Pit. As with the current operations, the viewer will be exposed to the upper portions of the OCMA as it progresses south; however, mining of the Northern Pit will be completed and rehabilitated by Year 5. Under the current operations, active mining of this pit continues until Year 15.

For viewers at VP3, impacts due to changes to the OEA and final landform will increase. The additional areas in the Northern and Southern pits to be rehabilitated at 240 m RL will be visible from this viewpoint. The increased area is approximately 20 m above the existing ridgeline and will present as a modified horizontal edge in the middle ground, at a viewing distance of approximately 3 to 5 km. This would represent a minimal increase in the landform when viewed from this distance and would further be softened by the ridgelines in the distant background which would blend with this altered landform.

As required under the current project approval, a vegetative buffer has been planted along Mangoola Road in front of VP3 stretching to VP4. Although this vegetation will not have established significantly enough under the proposed modification to offer any visual buffer to mine activities by Year 5 should the increased maximum extraction rate be sustained, it will offer long-term screening that will soften any change in the final landform from this viewpoint.

4.3.3 Lighting impacts of modification

Night lighting in this sector is likely to be largely similar to the current operations; however, additional mobile mine machinery and mobile coal crushing plant associated with the increased maximum extraction rate may result in some additional direct light impact and sky glow. Any additional lighting impact would be compensated by the reduced exposure given the increased rate of extraction. Lighting impacts from this viewpoint, which would have existed for the majority of the current approved 15 year mine life, may now be reduced by more than half. Direct lighting impacts to this viewpoint as a result of overburden and rehabilitation works are likely to be visible until approximately Year 6. Lighting impacts at this viewpoint will be minimised by the commitment in the project approval requiring night works to be restricted to lower levels on the OEAs.

4.4 VP4 – Mangoola Road (1,200m north of Bells Lane): 180 m RL

4.4.1 Viewpoint type and context

The relevant viewing direction from VP4 in relation to Mangoola Coal is facing north and shown in Photograph 4.4 and Figure 4.1. Viewers would typically be motorists travelling north-east along Mangoola Road and residences along this road. The viewing location, as seen in Photograph 4.4, has been shifted approximately 800 m north east along Mangoola Road as the original VP4 location now sits behind the noise attenuation barrier constructed for the rail spur.

Photograph 4.4 View from VP4 – train loader and CHPP in distant background

Views are partially rural in nature, with large areas of cleared rural farmland in the fore and middle grounds, and undulating vegetated ridgelines of hills in the background.

From this receptor, the rail loader is visible in the middle ground and glimpses of the CHPP are possible. With a distance of approximately 3 km to the rail loader and 4 km to the CHPP, it is almost undiscernible and not a prominent feature in the viewscape.

The landscape has been in this view has been modified with the presence of the existing 500 kV ETL, Mangoola Coal's rail loader and rail spur and noise attenuation screen. The proposed new alignment of the ETL will mean it will be even more prominent in the visual landscape. As a consequence, it is considered that VP4 has a high visual absorption capacity.

4.4.2 Visual impacts of modification

The proposed modification will result in a negligible impact to viewers at VP4. Views of mining activities from VP4, in particular views to open cut faces, are screened by way of existing vegetation and ridgelines to the east of Limb of Addy Hill. Mining activity associated with OEA and rehabilitation of the Southern Pit may be visible from this viewpoint between Year 5 and Year 10. Mining of the Southern Pit may commence several years earlier under the proposed modification which will expose viewers to the mining activities sooner than under the current operations. As mining progresses to the west the rehabilitation of mined land will progressively reduce the views of mining activity from this viewpoint.

The increased area that will be rehabilitated to 240 m RL in the Southern Pit will be visible from VP4 at a distance of approximately 4 km. This element will present as a modified horizontal edge against the horizon, as no distant views beyond the middle ground are possible due the inferior viewing elevation. At

this viewer distance, it is considered that the finished scale and size of this modified element would be minimal and not significantly impact on the final landscape.

4.4.3 Lighting impacts of modification

Lighting impacts from the modification may reduce due to the increased maximum rate of extraction and subsequent reduced mine life. Some additional sky glow may be visible due to an increase in infrastructure and mobile mine machinery, although this is considered to be minimal and would be offset by the reduced mine life.

4.5 VP5 - Denman Road: 140 m RL

4.5.1 Viewpoint type and context

The relevant viewing direction from VP5 in relation to Mangoola Coal is facing north-west and this view is shown in Photograph 4.5 and Figure 4.1. Viewers would typically a number of private residences in the vicinity of this viewpoint and motorists travelling north-east along Denman Road. Viewer distance is approximately 5 km to the Southern Pit.

Photograph 4.5 View from VP5 – toward coal loader and CHPP

Views are dominated by the alluvial flood plains exhibiting scattered vegetation in the foreground and ridgelines of undulating foothills in the background. The landscape character has been modified with the 500 kV ETL in the background at a distance of greater than 2 km. Elements of the mine infrastructure can be seen on clear days, including the rail loader, product stockpiles and conveyor; however, due to viewer distance these features are not easily discernable. This landscape is considered to have a moderate scenic quality and a moderate visual absorption capacity.

4.5.2 Visual impacts of modification

Visual impacts to VP5, as a result of the proposed modification, are considered to be similar to current operations. Much of the mine infrastructure is obscured from this receptor due to the undulating topography and existing vegetation. Views of the Southern Pit are attainable from this viewpoint and some pre stripping, OEA and rehabilitation work will be visible. At a distance of approximately 5 km, mining activity will be almost indiscernible from this location.

The increase in rehabilitated land at the greater RL of 240 m may be visible from this viewpoint. Given the distance of approximately 5 km, it is considered that it would be difficult to distinguish the changed landform and the impact of this modified visual element is, therefore, considered to be low. Some nearby private residences have a slightly superior viewing location to that shown in Photograph 4.5; however, viewer distance would mean that these residences would have minimal visual impacts.

4.5.3 Lighting impacts of modification

Night lighting impacts in this sector are likely to be minimal due to the distance; however, some sky glow from mine activities and associated infrastructure is likely. The proposed modification will not result in any additional night lighting impacts from this viewpoint than would be experienced under the current operations.

4.6 VP6 – Wybong Road (1,900 m north of Reedy Creek Road junction): 165 m RL

4.6.1 Viewpoint type and context

A site inspection of VP6 determined that views of any mining infrastructure or mining operations were not possible due to topographical and vegetative screening. Therefore, no visual assessment of this viewpoint is considered to be required. Photograph 4.6 shows the view toward the mine from VP6.

Photograph 4.6 View from VP6 – mine activities not visible

4.7 VP7 – End of Anvil ROW (private road) adjacent to Bellevue: 180 m RL

4.7.1 Viewpoint type and context

All properties along Anvil Hill ROW have now been acquired by Mangoola Coal and the ROW has been closed to public access. As this viewpoint is no longer accessible, it is no longer considered relevant in terms of this visual assessment.

4.8 VP8 – Wybong Road (1,200 m north of Wybong bridge): 145 m RL

4.8.1 Viewpoint type and context

The relevant viewing direction from VP8 in relation to Mangoola Coal is facing east and south-east and this view is shown in Photograph 4.7 and Figure 4.1. Viewers would typically be motorists travelling north-east along Wybong Road. Some private residences located further to the north-west of this viewpoint may experience similar, albeit more distant, views. View distance to the Main Pit is approximately 400 m from VP8.

Photograph 4.7 **View from VP8 – mine activities are screened by vegetation dependant on viewer location**

The landscape character of VP8 is that of relatively flat, alluvial floodplain lands meeting undulating foothills to the east of Wybong road. Remnant vegetation can be found lining Big Flat Creek between Wybong Road and the foothills. This vegetation can have a significant screening effect looking toward mine areas depending on exact viewer location.

The landscape character in this visual landscape will become heavily modified with the approval to relocate the existing 500 kV ETL along the western side of Mangoola Coal. The proposed new alignment passes directly in front of this viewpoint and will become the major visual element in the foreground of this landscape. Similarly, as mining of the main pit extends south-west this viewpoint will become a heavily modified landscape unit. As a consequence, it is considered that VP8 has a high visual absorption capacity.

4.8.2 Visual impacts of modification

Impacts of the proposed modification to the mine staging will be negligible for viewers at VP8. Mining in the Main Pit will commence in Year 4 and be fully rehabilitated by Year 10. Additional mobile mine machinery may also be visible as mining activity in the Main Pit commences around Year 5. Under the current operations, mining in the Main Pit will commence in Year 5 and be completed in Year 15. Much of the mine infrastructure is obscured from this receptor due to the undulating topography and existing vegetation.

4.8.3 Lighting impacts of modification

The impact of night lighting in this sector is likely to increase as mining in the Main Pit progresses toward Anvil Hill. Viewers from this viewpoint are likely to be experience additional sky glow as the open cut face progresses south. Lighting impacts at this viewpoint will be minimised by the commitment in the project approval requiring night works to be restricted to lower levels on the OEAs.

4.9 VP9 – Wybong Road (1,100 m south of Wybong Post Office Road): 145 m RL

4.9.1 Viewpoint type and context

The relevant viewing direction from VP9 in relation to Mangoola Coal is facing south and this view is shown in Photograph 4.8 and Figure 4.1. Viewers would typically be motorists travelling north-east along Wybong Road. Viewing distance to the Main Pit is approximately 400 m.

The landscape character of VP9 is similar to VP8 where relatively flat, alluvial floodplain lands meet undulating foothills to the east of Wybong Road. Remnant vegetation can be found lining Big Flat Creek between the road and foothills. This vegetation can have a screening effect when looking toward mine areas depending on exact viewer location.

The character of this visual landscape will become heavily modified with the approval to relocate the existing 500 kV ETL along the western side of Mangoola Coal. The proposed new alignment will become a major visual element of the middle ground of this landscape. Similarly, as mining of the Main Pit extends south-west this viewpoint will be exposed to OCMA. As a consequence, it is considered that VP9 has a high visual absorption capacity.

Photograph 4.8 **View from VP9 – vegetation lining Big Flat Creek offers screening of mining activities**

4.9.2 Visual impacts of modification

The proposed modification will have negligible impact on viewers at VP9. Views to open cut faces and OEA of the Main and Southern pits will be present around Year 4 and fully rehabilitated around Year 10. Additional mobile mine machinery may also be visible as part of increased mining activity in Main Pit. Exposure to mining operations will be greatly reduced than under the current operations should the increase maximum extraction rate be sustained as, from approximately Year 5 onward, active mine activities will no longer be visible and only works associated with overburden emplacement and rehabilitation to final landform will be evident. Under the current operations, mining in the Main Pit will commence in Year 5 and completed in Year 15. Much of the mine infrastructure is obscured from this receptor due to the undulating topography and existing vegetation.

4.9.3 Lighting impacts of modification

The impact of night lighting in this sector will be reduced in duration should the increased maximum rate of extraction be sustained. Additional mobile mine machinery may create added sky glow from this viewpoint as the open cut face of the main pit progresses south towards Anvil Hill. Lighting impacts at this viewpoint will be minimised by restrictions on night work to lower levels on the OEAs.

4.10 VP10 – Wybong Post Office Road: 200 m RL

4.10.1 Viewpoint type and context

The relevant viewing direction from VP10 in relation to the mine operations is facing south-east and this view is shown in Photograph 4.9 and Figure 4.1. Viewers would typically be motorists travelling south-east along Wybong Post Office Road. Additionally, there are a few private residences in the vicinity of this viewpoint that would experience similar views. Viewing distance is approximately 2 km to the Main Pit and 4 km to Anvil Hill.

Photograph 4.9 View from VP10 – scattered vegetation screens views to Anvil Hill and beyond

Views are dominated by the significant tree plantings and other vegetation in the foreground and ridgelines of hills in the background. Anvil Hill is a dominant feature from this viewpoint. The landscape character of this area is one of rural residential holdings in a well vegetated/scenic setting. The visual absorption capacity of this viewpoint is considered to be moderate.

4.10.2 Visual impacts of modification

Mine infrastructure, such as the CHPP, ROM and product stockpile, rail loader and conveyor, is not visible from this viewpoint due to the existing topography and vegetation. Views of mining mobile machinery will become visible as OCMA and OEA works in the Main and Southern pits progress west and around Anvil Hill.

The proposed modification will result in the mine having the greatest exposure from this viewpoint in Years 5 to 10. It is possible that some of the final landform that is proposed to be rehabilitated land at 240 m RL in the Northern Pit area will be visible from this viewpoint. Due to the viewer distance of approximately 4 km and given the substantial foreground vegetation that exists, any views to this increased area of the final landform would be negligible. Anvil Hill will remain the dominant feature in the final landform and it is considered that the proposed modification is generally consistent with the current operations.

4.10.3 Lighting impacts of modification

Night lighting in this sector is likely to be minimal due to viewer distance; however, some sky glow from mine activities and associated infrastructure is likely.

Additional mobile mine machinery will create some added lighting impacts to this viewpoint as mining progresses toward and around Anvil hill in Years 5 to 10. Lighting impacts to this viewpoint will be minimised by the commitment in the project approval requiring night works to be restricted to lower levels on the OEAs.

4.11 VP11 – Ridgelands Road: 180 m RL

4.11.1 Viewpoint type and context

The relevant viewing direction from VP11 in relation to the mine operations is facing south and this view is shown in Photograph 4.10 and Figure 4.1. Viewers would typically be motorists travelling east or west along Ridgelands Road. There are no private residences in the vicinity of VP11.

Photograph 4.10 View from VP11 – rehabilitation of inactive overburden areas has commenced in the Northern Pit

Views are dominated by open farmland in the foreground. The overburden emplacement is visible in the middle ground. Progressive rehabilitation has commenced along this OEA. Anvil Hill is also a visible feature from this viewpoint at a distance of approximately 4 km. Viewers have been exposed to the early stages of mining which has modified the landscape. The visual absorption capacity of this viewpoint is considered to be moderate.

4.11.2 Visual impacts of modification

Much of the mine infrastructure is obscured from this viewpoint due to mining activities having been completed at this northern end of the Northern Pit. Some views of mine operations may be visible as mining in the Main Pit progresses. As mining continues south views to mobile mine machinery and OCMA will reduce progressively. By Year 5 views of mining activities will no longer be possible. The increased rate of extraction will accelerate the rate at which mining activities move away and the final rehabilitated landform established. Consequently, the modification with respect to mine staging will reduce the visual impacts from this viewpoint.

The proposed modification will result in greater area of rehabilitated land at 240 m RL, which will be visible from this viewpoint. Anvil Hill, which is the dominant landform in this visual landscape, has a maximum height of 285 m RL. The increase in the amount of area at 240 m RL will reduce the prominence of Anvil Hill in this visual landscape. The final landform will create a modified horizontal ridgeline element set against the backdrop of Anvil Hill. At a distance of between 2 and 4 km the impact of the altered landform is not considered to have a significant impact; however, careful consideration should be given in design of final landform to avoid straight horizontal edges which would portray an artificial landform.

4.11.3 Lighting impacts of modification

Night lighting in this sector is likely to be minimal due to the fact that mining and rehabilitation works have been completed at the northern end of the Northern Pit. Some sky glow from mine activities and associated infrastructure is likely; although, this impact is considered minimal from this viewpoint.

4.12 VP12 – Golden Highway (1,500 m east of Rosemount Road intersection): 175 m RL

4.12.1 Viewpoint type and context

The relevant viewing direction from VP12 in relation to mine operations is facing north-east and this view is shown in Photograph 4.11 and Figure 4.1. Viewers would typically be motorists travelling south-east or north-west along the Golden Highway. There are also a number of private residences in the vicinity of this viewpoint that would have a similar aspect.

Views are typically rural/ scenic in nature and are dominated by cleared rural farmland in the foreground and densely vegetated regions in the middle ground. Limb of Addy Hill is a dominant feature in the background.

The foreground exhibits modified elements within the visual landscape in the form of roads, fence lines and power lines. Beyond these elements the landscape is one of a natural setting with scenic qualities. The dark tones of the dense middle ground vegetation frame the slopes of Limb of Addy Hill. Consequently, the visual absorption capacity of the viewpoint is considered to be moderate to low.

Photograph 4.11 View from VP12 – toward Limb of Addy Hill

4.12.2 Visual impacts of modification

No mine infrastructure or machinery would be visible from this viewpoint. The distance of 4 km to the Southern Pit, the presence of Limb of Addy Hill, and the screening provided by the densely vegetated area, would likely make any mining activity indiscernible.

It is possible that the proposed increase in rehabilitated area at the maximum 240 m RL in the Northern Pit may result in this area being visible from VP12. If so, this would present as a thin horizontal element above the tree line in the middle ground. The impact on the visual landscape of such a change is considered minimal given the viewer distance to the site.

4.12.3 Lighting impacts of modification

Night lighting in this sector is likely to be minimal due to viewer distance; however, some sky glow from mine activities and associated infrastructure is likely. The impact from night lighting would be similar to that experienced under the current mine operations.

5 Management and mitigation

5.1 Final landform design

The increase to rehabilitated area at an RL of 240 m under the proposed modification will increase the visual effect of the conceptual final landform at several viewpoints. The final landform will present as an altered horizontal ridgeline and, when viewed against the backdrop of Anvil Hill, have a moderate impact on reducing the visual prominence of this landform. Careful consideration in designing the final landform of this area is necessary to ensure it is as natural as possible in appearance by eliminating straight edges and unnatural features. As discussed in Section 3.2.5, Xstrata Mangoola remains committed to continual improvement and is currently working creating a more natural landform design to achieve sustainability outcomes, improve habitat values, and restore ecological function.

5.2 Management and mitigation measures

Night lighting as a result of the modification will have an increased impact in terms of direct lighting to viewpoints from mine machinery and sky glow from additional infrastructure. Viewpoints where direct light impacts will be moderately increased is limited to VP3. Additional sky glow may be experienced by all viewpoints, particularly those with superior viewing elevations; however, the overall additional impact is considered to be minimal.

The existing statement of commitments for Mangoola Coal in PA06_0014 contains a number of measures to reduce the visual impact of the mine on surrounding viewers. These include:

- 6.13.2 – Final revegetation of disturbed areas will consider the reduction of visual impacts;
- 6.13.8 – All floodlights in the open cut area will be shielded to the maximum extent practicable;
- 6.13.10 – Where safe to do so, trucks on access roads will make use of portable visual edge markers to increase drivers' visibility of road edges when driving with dipped headlamps; and
- 6.13.11 – At night, work will restricted to lower levels on the overburden emplacements areas to reduce noise impacts which will also reduce potential direct lighting effects from random elements such as truck headlights and flashing beacons.

In addition to the above, condition 54 of PA06_0014 requires the preparation of report which identified residences that were going to experience significant visual impact from the proposal and *'describes (in general terms) the additional mitigation measures that could be implemented to reduce the visibility of the mine from the residences*'. This report was prepared by Hanson Bailey in 2008 and recommended a number of additional mitigation measures to those in PA06_0014. The measures, where relevant to the proposed modification, are listed below:

- within the infrastructure areas use approximately 15 - 20 m high light columns and low brightness floodlights with the floodlight body horizontal and the floodlight reflector designed to provide sharp cut-off and restrict stray light;
- shield all floodlights in the OCMA to the maximum extent practicable and where safe to do so;

- work programmes should be arranged so that work can be carried out on surfaces of the OEA visible from outside the lease area only during daytime hours as defined by the EPA or only at lower levels of emplacement at night; and

- restriction of work to daylight hours or only at lower levels at night on the OEA would significantly reduce potential direct lighting effects from random elements such as truck headlights and flashing beacons moving on the OEAs and haul roads at night This would maintain the night time ambience for rural residential properties north, east and south of the OEAs.

The above commitments and mitigation measures are considered relevant to the proposed modification and should be implemented under the modified mine plan to minimise any impacts of the increase to the maximum extraction rate and changes to the final landform.

6 Conclusion

The proposed modification involves an increase to the maximum extraction rate of ROM coal which would reduce the timeframe for active recovery of coal within the approved project disturbance boundary from 15 years to 12 years should the maximum extraction rate be sustained. The resultant change in the mine staging plan will alter the timing at which individual viewpoints will be exposed to mining activities. In general, the proposed modification will expose viewpoints to mining activities earlier than under the current operations. However, the increased rate of extraction would significantly reduce the temporal effects of the mine elements which would have a positive impact on the visual landscape from any given viewpoint by returning the mine disturbance area to a rehabilitated landform in a reduced timeframe.

To enable the increased rate of extraction an increase in mine infrastructure is proposed. Mobile machinery working on OCMA, OEA and rehabilitation areas may be visible when working at the additional upper levels. Exposure to these additional mine vehicles will be increased at several viewpoints, though impacts would be mitigated through the requirement for machinery to work at lower levels at night-time. Further, the additional visual impacts of additional machinery are considered minimal when compared to the benefits of a reduced mine life.

Overall, the proposed modifications to the Mangoola Coal are considered to have an overall positive impact on viewers in areas surrounding areas given the reduced timeframe which viewers from all viewpoints will be exposed to mining activity associated with the project.

References

Hansen Bailey 2008, *Anvil Coal Mine Visual Impact Mitigation Report*. Report prepared for Xstrata Mangoola Pty Ltd.

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