

7 IMPACTS, MANAGEMENT AND MITIGATION

The potential environmental impacts of this Modification has been assessed as part of this SEE. The findings of this assessment as well as a description of the measures that will be implemented to manage and mitigate potential impacts are presented below.

7.1 VISUAL ASSESSMENT

7.1.1 Impact Assessment

A Visual Impact Assessment has been undertaken for this Modification by VPA Visual Planning & Assessment and is provided in **Appendix B**. The purpose of the visual assessment completed for this Modification was to identify the character of the existing surrounding visual landscape and to quantify any additional visual impacts when compared to the existing approved final landform.

The existing Main OEA is the major mine component visible from surrounding viewing locations and has a currently approved maximum height of up to RL 270. The primary element of this Modification assessed as part of the Visual Impact Assessment is associated with the development of the Visual Relief Areas to change the level appearance of part of the Main OEA when viewed from primary viewing locations in and surrounding the township of Muswellbrook and Denman Road. The Visual Relief Areas located on the existing Main OEA are proposed to be constructed to a height greater than the levels previously approved including:

- The Northern Relief Area constructed to a maximum height of RL 300; and
- The Southern Relief Area constructed to a maximum height of RL 290.

The changes to the height of part of the Main OEA when compared to the currently approved landform (up to RL 270) represent a 30 m and 20 m increase for the Northern and Southern Visual Relief Areas respectively. It has been determined by the visual experts that this quantum of change in relief is required to accentuate relief at distance (4 km to 6 km) from the identified key viewing locations (see **Section 3.9**).

Background

The Primary Visual Catchment (PVC) represents the area where the majority of views of this Modification will occur. The visual settings surrounding this Modification are characterised by a range of different landscapes which vary as a result of topography, vegetation cover and land use types. This can create screening or visual buffers, or alternatively provide a viewing corridor to specific areas within the Project Boundary. The *Visual Impact Assessment* (JVP Planning and Design, 2013) undertaken for the Bengalla EIS (Hansen Bailey, 2013) characterised the local visual landscape within the vicinity of Bengalla as being that of a rural setting dominated by mining activities and agricultural activities associated with the Hunter River Floodplain.

This Modification PVC sits within the ranges to the west and north of the Project Boundary, Aberdeen 10 km to the north-east, Muswellbrook 4 km to the east, the hills behind the town and by the existing Mt Arthur Coal Mine to the south (see **Figure 12**). The small ridge located in the centre of Mt Arthur Coal Mine marks the south-eastern corner of the PVC. The PVC is strongly defined by the Hunter River Floodplain and the existing and approved mining operations in the area.

The Main OEA has two primary faces, the active face to the west and the outer edge to the south and east. The active face is unshaped, steep, angular and contains raw overburden material creating a high visual contrast and low integration with the environment, due to colour, form and scale. The outer edge has both rehabilitated and ongoing rehabilitation faces which are graded to a slope of approximately 10 degrees are revegetated and has less visual impact on the surrounding environment.

Methodology

The visual effect and sensitivity of the landscape was determined by considering the existing landscape settings and how those settings are seen from the various viewing locations. The visual effect of this Modification were assessed by considering the visual characteristics of this Modification in the context of the landscape within which it is seen. The overall visual impact of this Modification was then determined by assessing the interaction between visual sensitivity and visual effects (see **Table 8**).

The visual effect of this Modification elements will vary as seen from different locations around Bengalla. The visual effects were considered from a number of viewing locations in the Northern, Eastern, Southern and Western Sectors. Views from the Eastern and Southern sectors were subject to additional focus as Northern and Western view sectors have limited views from private receivers.

Visual Sensitivity

Visual sensitivity is a measure of how a change to the landscape is perceived by persons occupying the surrounding land. Viewing locations situated in residential, tourist and recreation areas generally have a higher visual sensitivity than locations in industrial, agricultural or transport areas. This is due to land being used as part of a leisure experience, making use of the scenic amenity values of the surrounding landscape and often over extended viewing periods.

Visual sensitivity may range from high to low and is affected by factors such as screening, distance and orientation of the receiver in relation to the Project. However, if views are completely shielded from a particular location, a visual sensitivity score will not be assigned.

Table 8
Visual Impact Assessment Matrix

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

Visual Effect

Visual effect measures the visual contrast and integration of this Modification with the existing environment; and the proportion of the Primary View Zone (PVZ) that is occupied by elements of this Modification. The PVZ is the critical part of a view.

If there is significant contrast between the elements of this Modification and surrounding landscape and a high percentage of this Modification in the PVZ, the visual effect will be high. Conversely, if the elements of this Modification can be substantially integrated into the existing landscape and the area occupied by the development forms only a small percentage of the total view, the visual effect will be low. The existing landscape contains visual elements of form, shape, line, colour and texture. In the case of this Modification the landscape includes the existing approved mining operations.

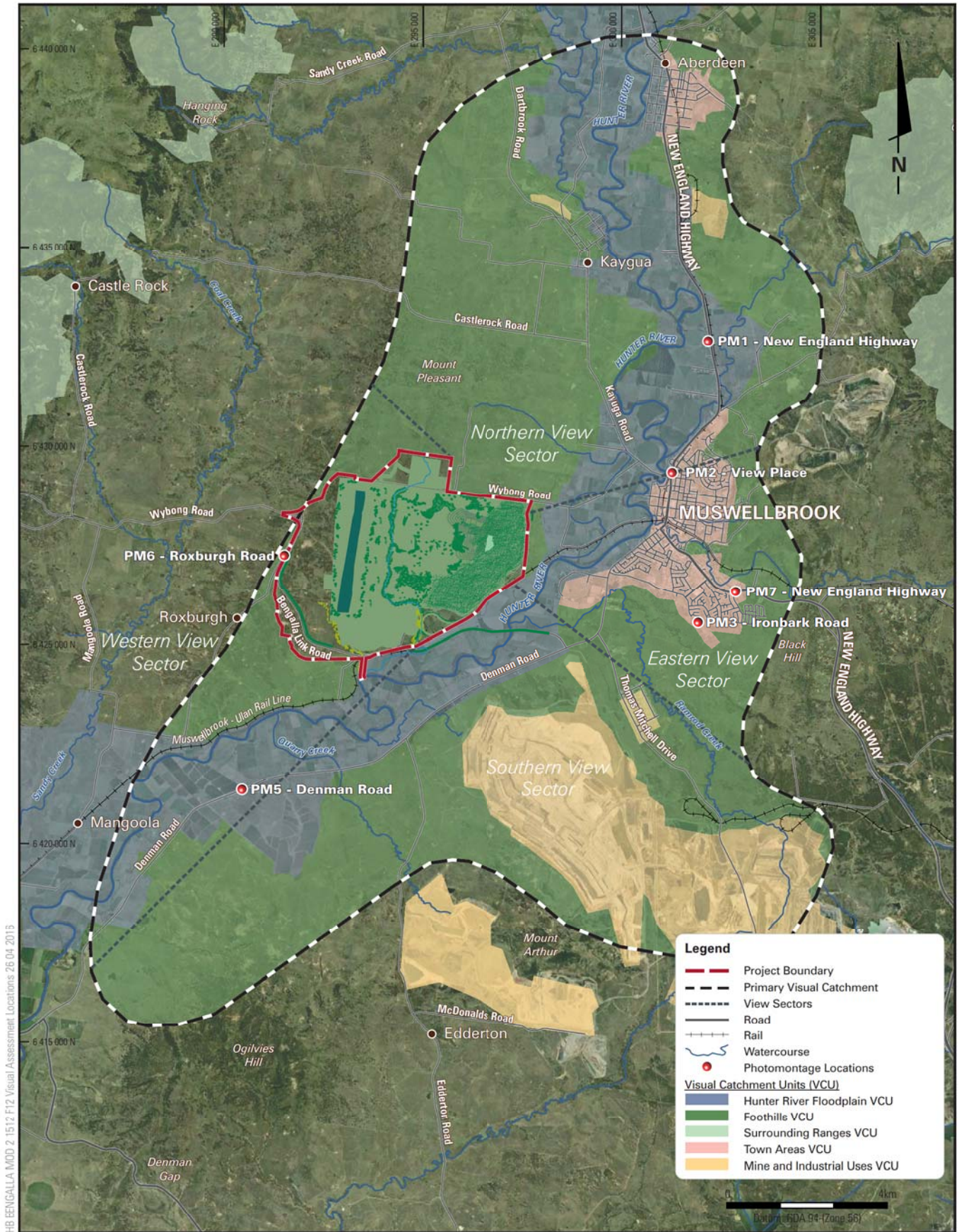
Representative Viewing Locations

In order to illustrate the views associated with this Modification, representative locations were selected where photomontages were developed including:

- New England Highway north of Muswellbrook (PM1);
- View Place (PM 2);
- New England Highway east of Muswellbrook (PM7);
- Ironbark Road view from the Ironbark Estate (PM3);
- Denman Road (PM5); and
- Roxburgh Road (PM6);

Photomontage locations are presented on **Figure 12**.

All photomontages are indicative. Actual results will depend on positions taken by various regulatory authorities on management plans and MOP, timing of commencement of rehabilitation and factors affecting rehabilitation establishment.



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Visual Assessment Locations

FIGURE 12



All photomontages produced with the exception of New England Highway (PM7) east of Muswellbrook were locations previously utilised and assessed in the Bengalla EIS (Hansen Bailey, 2013). As a result, there is a suitable base case to compare this Modification to the already approved landform.

A new photomontage location situated on the New England Highway (PM7) in east Muswellbrook was also selected as it provides for a suitable westerly view directly towards the approved Bengalla Main OEA and this Modification Visual Relief Areas. It is also selected to represent primary views from Muswellbrook and stakeholders driving northbound on the New England Highway as they slow to 50 km per hour upon entry to the residential sector of town.

Northern View Sector

Views in the Northern View Sector include views from receptors along Wybong, Kayuga and St Heliers roads (and other minor roads) along with Aberdeen and the New England Highway. The visual effects of this Modification on the Northern View Sector are illustrated in a photomontage from PM1 New England Highway (see **Figure 13** and **Figure 14**).

Sensitive views to this Modification Visual Relief Areas will be limited due to distance and intermittent screening.

Eastern View Sector

To the east of Bengalla are the rural lands of the Hunter River floodplain. The Eastern View Sector contains the most sensitive land uses and is dominated by Muswellbrook. This sector has critical view locations and is representative of the greatest population.

Photomontage locations within the Eastern Sector include View Place (PM 2), New England Highway east of Muswellbrook (PM7) and Ironbark Ridge (PM3). Photomontages for all these viewing locations are provided in **Figure 15** to **Figure 20**.

The existing views from all photomontage locations in this sector contain a moderate portion of the approved rehabilitated OEA eastern face. These views towards the eastern face illustrates the progressive rehabilitation to the approved Main OEA. The photomontage from Ironbark Road (see **Figure 19**) shows the formation of the existing southern faces of the OEA, with visible mining activities further to the west.

At approximately Year 4 the Northern and Southern Relief Areas on top of the approved OEA begin to take shape and the undulating profile begins to emerge. Rehabilitation is visible on the lower parts of the Visual Relief Areas.

By approximately Year 8, the undulating profile becomes more defined as the Visual Relief Areas reach their maximum heights (see **Figure 16**, **Figure 18** and **Figure 20**). The eastern face is rehabilitated with grass cover and trees planted on lower slopes. By Year 24 views from View Place, New England Highway and Ironbark Road toward the Main OEA present as dense vegetation which includes the Northern and Southern Visual Relief Areas.

The long term outcome better blends with surrounding rural areas. The requirement to achieve high density woody vegetation on the eastern face will provide moderate levels of visual integration as dense woodland vegetation contrasts with surrounding vegetation patterns which more reflect more open woodland.



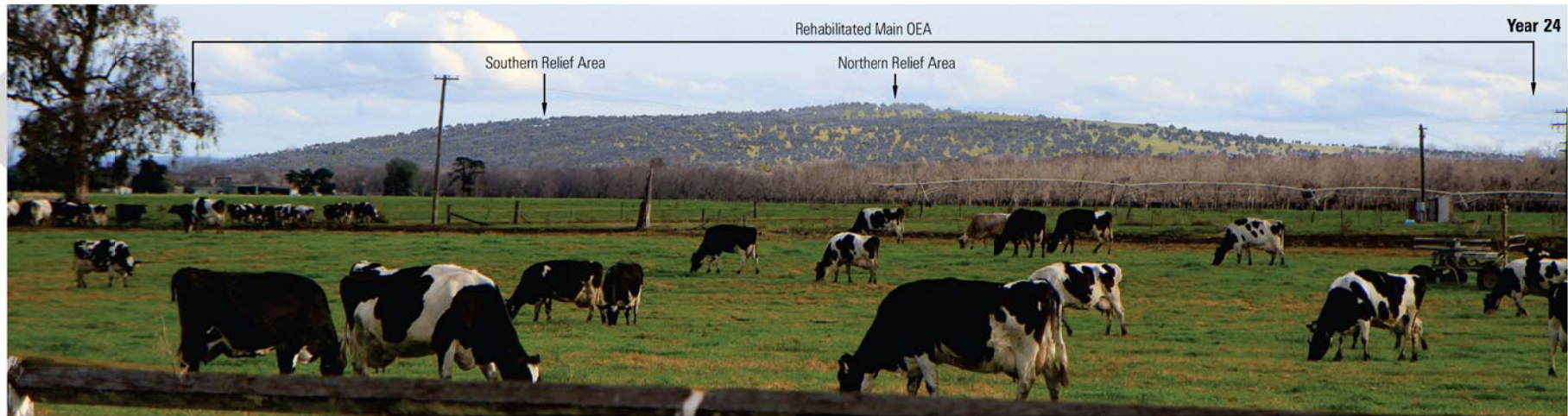
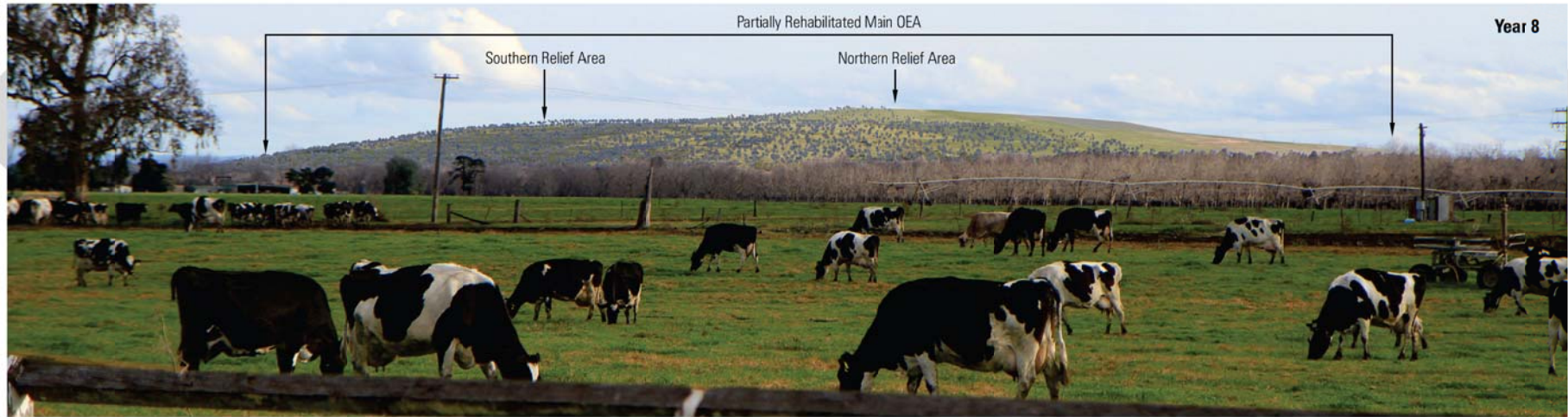
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Photomontage Location PM1 New England Highway Existing and Year 4



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FIGURE 13



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Photomontage Location PM1 New England Highway Year 8 and Year 24



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FIGURE 14



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Photomontage Location PM2 View Place Existing and Year 4

FIGURE 15



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Photomontage Location PM2 View Place Year 8 and Year 24

FIGURE 16



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Photomontage Location PM7 New England Highway Existing and Year 4

FIGURE 17



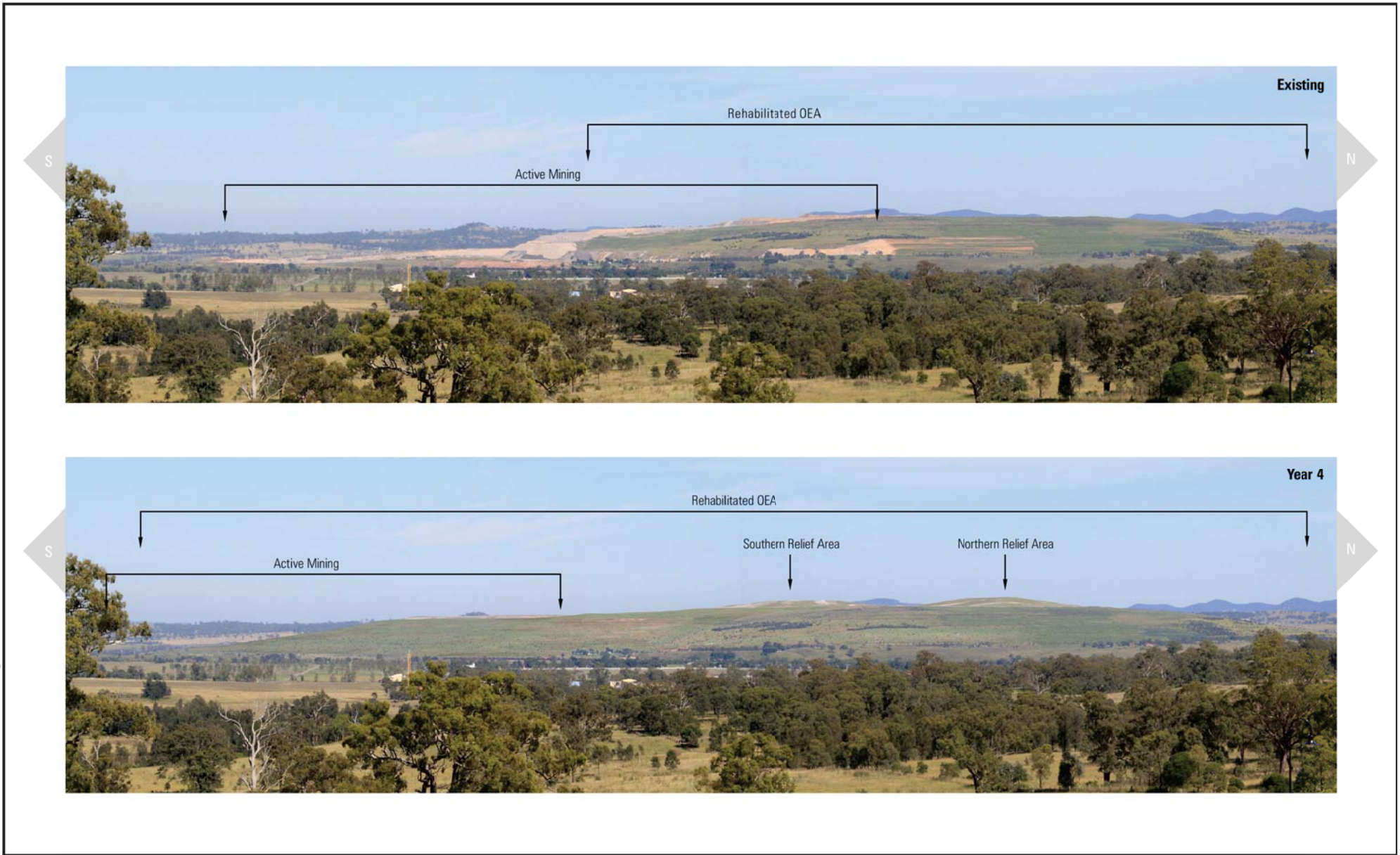
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Photomontage Location PM7 New England Highway Year 8 and Year 24



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FIGURE 18



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Photomontage Location PM3 Ironbark Road Existing and Year 4



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FIGURE 19



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Photomontage Location PM3 Ironbark Road Year 8 and Year 24

FIGURE 20

Southern View Sector

The Southern View Sector is dominated by rural lands. Along the Hunter River floodplain, improved pasture cropping and dairying are prominent with an olive tree orchard also occurring in this locality. The rolling rural hills to the south of Denman Road and west of Mt Arthur Coal support some vineyards and open grazing lands. There are a limited number of private residences within this sector and they occur in the western edge of the sector along Denman Road.

The visual effects on the Southern View Sector vary. The visual effects of this Modification on the Southern View Sector are illustrated in photomontage form from PM3 - Denman Road (see **Figure 21** and **Figure 22**). Views onto the approved operations in the western part of the sector remain unchanged with the view from this location onto existing operations having moderate to high visual effect. This view of the Southern Relief Area will be progressively rehabilitated leading to low visual effect (see **Figure 22**).

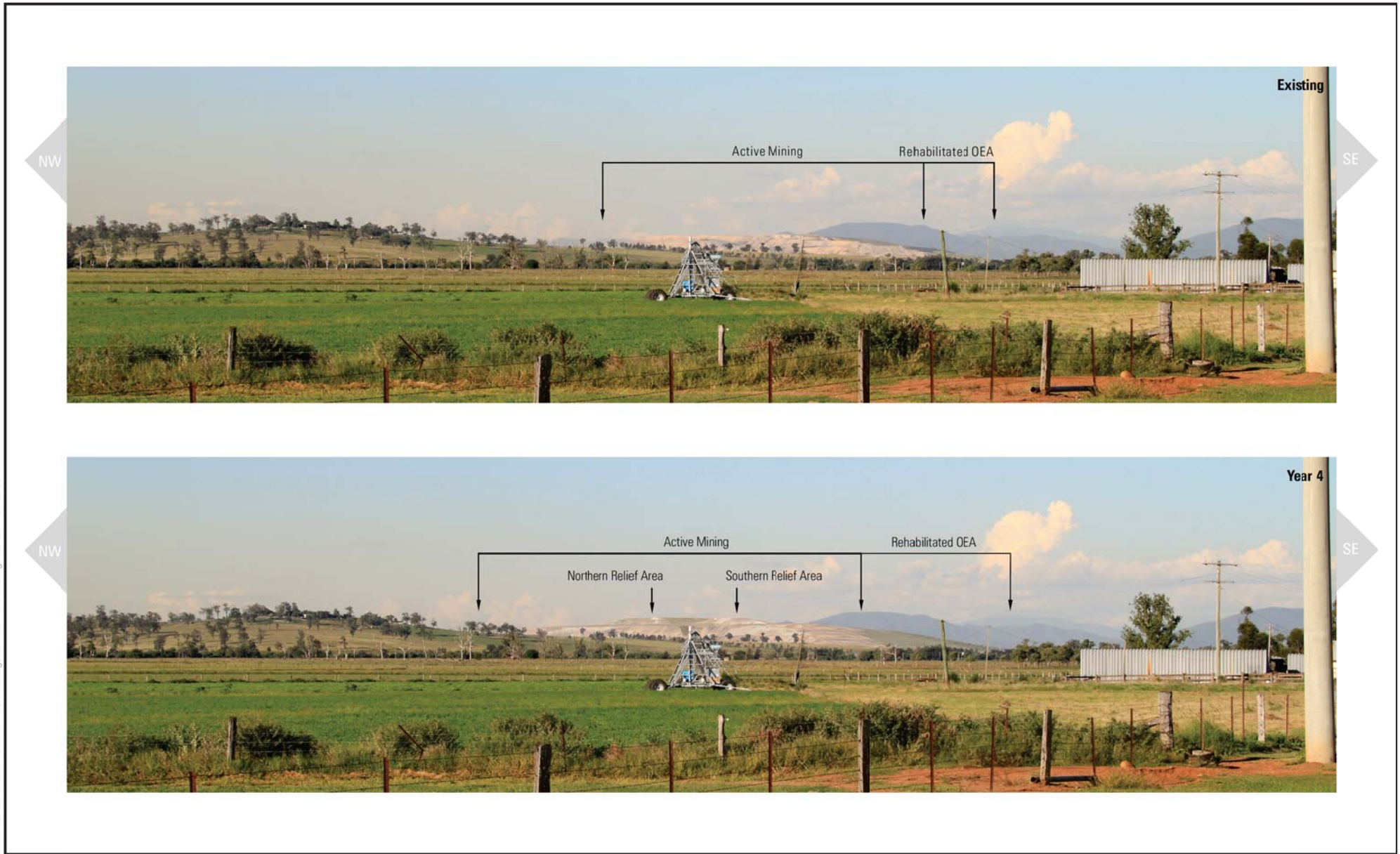
At approximately Year 4 the Southern Relief Area profile is visible above the approved Main OEA with areas of rehabilitation lowering the visual contrast and visual effect. Visual effect levels are low to moderate.

By Year 24 the conceptual final landform is achieved. The visual impact is further decreased as views are screened by intervening ridges and rehabilitated areas of the Southern Relief Area and Main OEA.

The long term outcome better blends with the surrounding rural areas. The requirement to achieve high density woody vegetation on the eastern face will provide moderate levels of visual integration as dense woodland vegetation contrasts with surrounding vegetation patterns which reflect more open woodland.

Western View Sector

Views in the Western View Sector are confined to views along Roxburgh Road, Wybong Road and Denman Road. The visual effects of this Modification on the Western View Sector are illustrated in a photomontage from PM6 Roxburgh Road (see **Figure 23** and **Figure 24**).



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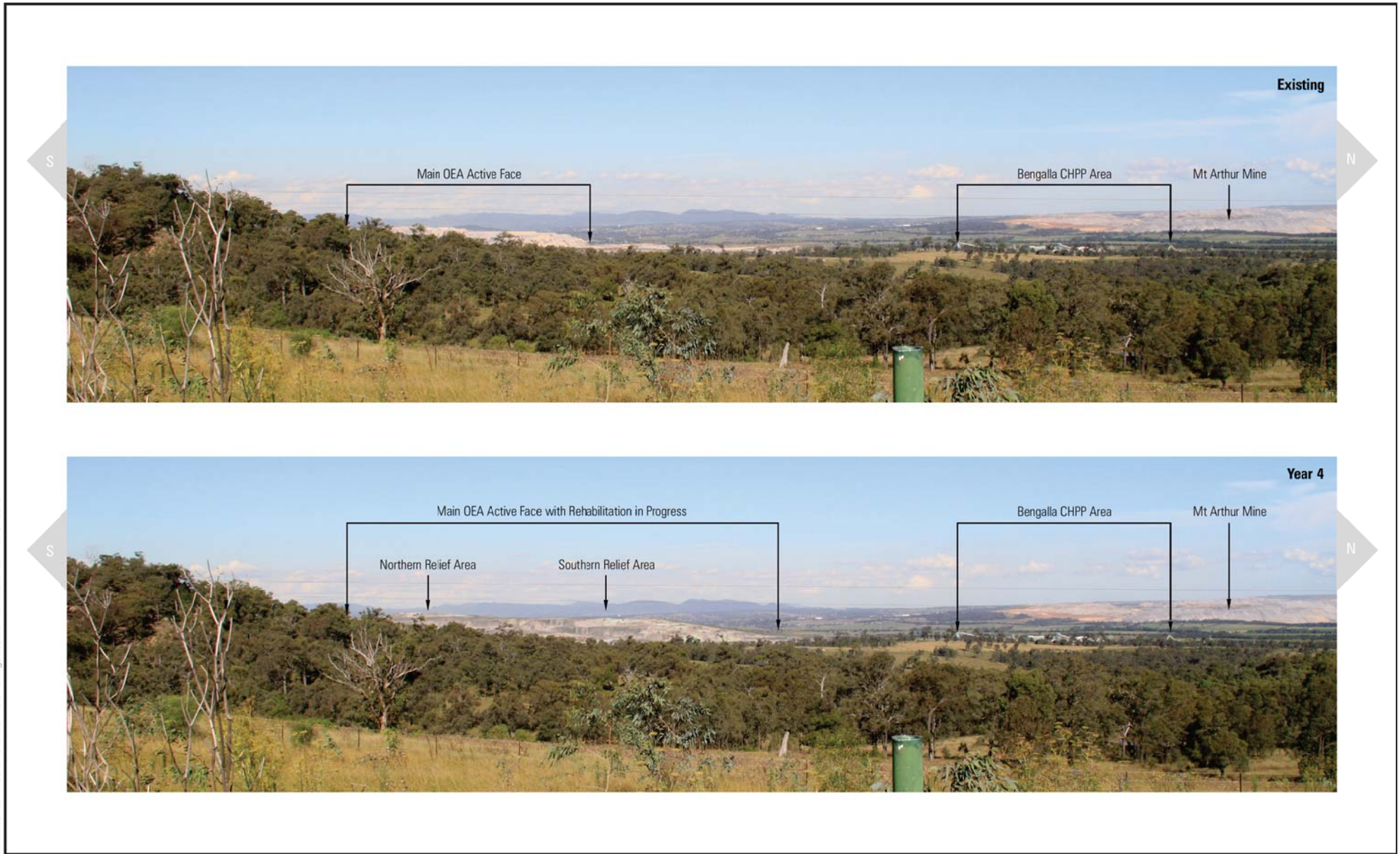


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Photomontage Location PM5 Denman Road Existing and Year 4

FIGURE 21





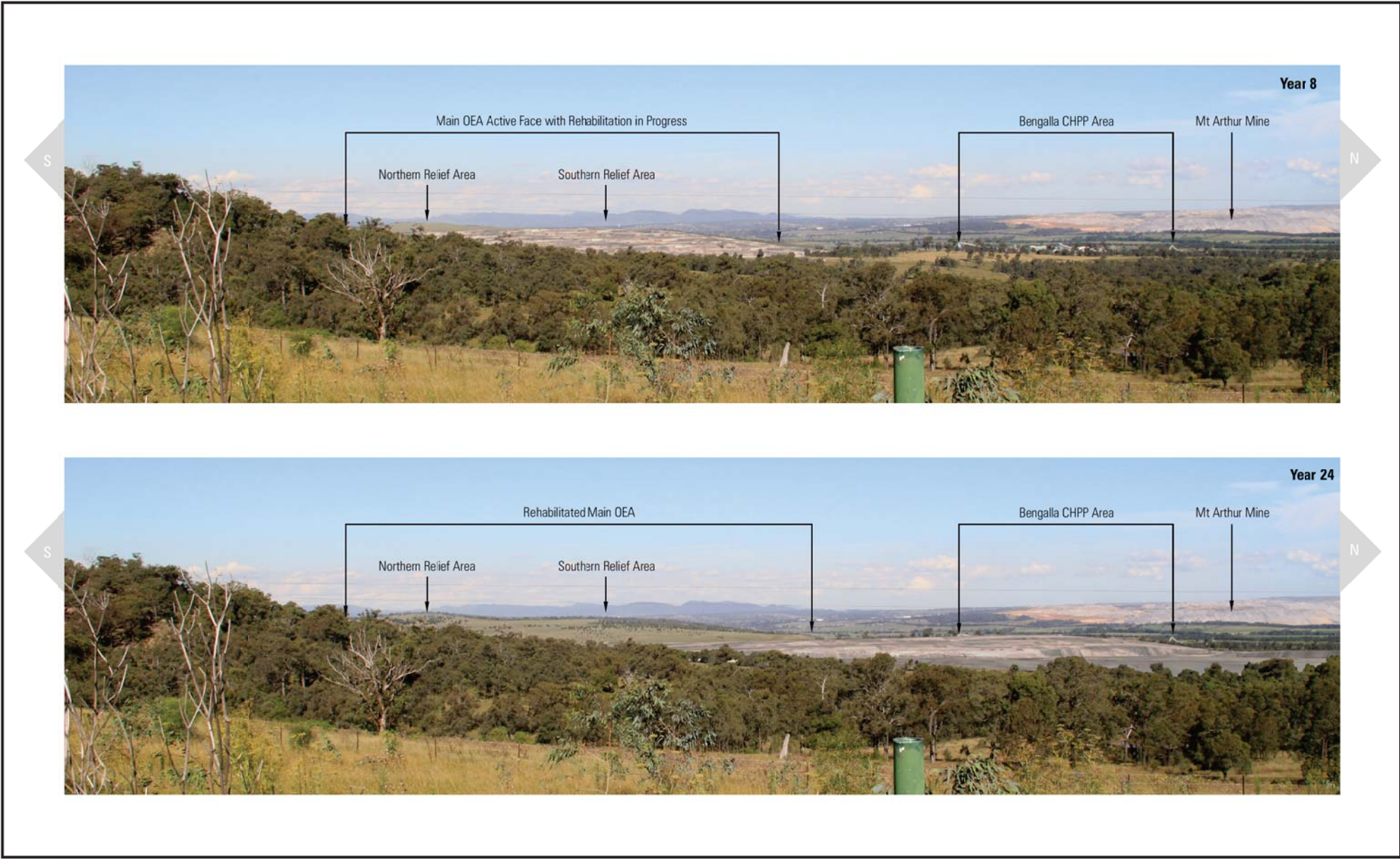
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Photomontage Location PM6 Roxburgh Road Existing and Year 4



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FIGURE 23



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Photomontage Location PM6 Roxburgh Road Year 8 and Year 24

FIGURE 24

Visual Impact Summary

The primary visual element of this Modification is the alterations to the maximum approved height of the Main OEA in two distinct Visual Relief Areas. The visual impacts associated with the Visual Relief Areas are generally low to moderate on View Sectors as a result of the following:

- Scale of the new Visual Relief Areas in relation to the overall existing and approved Main OEA and surrounding mining activities is minor;
- Visual effects will lessen following rehabilitation; and
- Final landform of the modified OEA has a higher, more undulating natural profile which provides for improved visual integration with surrounding landscape elements and landforms.

The Visual Impact Assessment completed for this Modification has concluded that the Visual Relief Areas improve the appearance of the finished Main OEA profile from most sensitive receptors in the north-east, east and south-east.

Views to the Homestead Access are limited to elevated areas of Roxburgh Road and are consistent in character in relation to the overall scale and disturbance associated with the approved operations and no additional visual impact is anticipated.

7.1.2 Mitigation and Management

The progressive rehabilitation of the Main OEA is the most significant element in relation to visual effects and impacts on the surrounding landscape. The progressive rehabilitation will decrease the visual contrast of the operation relevant to the existing landscape which is in addition to rehabilitation strategies that seek to emulate patterns, shapes, line and colour of the existing landscape.

As currently required by SSD-5170 Schedule 3, Condition 44 the approved Main OEA will continue to be rehabilitated to achieve high density woody vegetation on the eastern face of the Main OEA exposed to Muswellbrook and Denman Road. This development consent requirement to achieve high density woody vegetation on the eastern face will provide moderate levels of visual integration as dense woodland vegetation contrasts with surrounding vegetation patterns which reflect more open woodland.

Schedule 3, Condition 37 of SSD-5170 requires development of additional visual impact mitigation plans for listed receivers located within the western and southern view sectors that may have views of Bengalla. This assessment will identify receivers that are likely to have significant views of the development and recommend site specific mitigation measures that could be implemented to reduce visual impacts.

BMC will also continue to implement all rehabilitation activities in accordance with the approved *Bengalla Rehabilitation Management Plan* (as Modified) and *Bengalla Mining Operations Plan* (BMC, 2015) (as Modified) which will be updated pending approval of this Modification. Relevant to this Modification the following on site rehabilitation and visual screening treatments will continue to be maintained:

- The implementation of dense woody vegetation across the eastern face of the Main OEA exposed to Muswellbrook and Denman Road;
- Progressive establishment and rehabilitation of the outer faces of the Main OEA, particularly the southern slopes adjacent to the Muswellbrook- Ulan Rail Line;
- Maintenance of existing tree planting areas; and
- Design drainage to vary with the topographic form of the Main OEA and avoid straight line drop downs where reasonable and feasible.

7.2 AIR QUALITY

7.2.1 Impact Assessment

An Air Quality Impact Assessment was completed by Todoroski Air Sciences for this Modification and is presented in **Appendix C**. The objective of the assessment was to quantify any change in air quality emissions associated with the proposed Modification. The assessment focused on the activity required for the alteration to the approved height of the Main OEA in comparison to the previous assessment completed in the *Bengalla EIS Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013).

Further comparison was also completed for this Modification to the predictions presented in a letter report to the DP&E titled *Bengalla Continuation Project (SSD-5170) Additional Information Request* (Hansen Bailey, 2014b) which was supported by *Bengalla Continuation – Dust mitigation strategy for short-term dust impacts* (Todoroski Air Sciences, 2014). Todoroski Air Sciences (2014) demonstrated that with the aid of appropriate dust mitigation measures, short term dust impacts can be further reduced.

The development of the Visual Relief Areas involves the staged emplacement of approximately 10 Mbcm of overburden material across two locations. No additional overburden material would be moved in any one year as a result of this Modification, material would only be redirected from that assessed in the *Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013).

As the Visual Relief Areas construction occurs over an approximate six year period only changes to the approved Years 4 and Year 8 mine plan are necessary. The modelling results associated with the existing approved Years 1, 15 and 24 will remain consistent with the predicted impacts in the *Bengalla EIS* (Hansen Bailey, 2013) *Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013) and as included in SSD-5170 (as Modified).

The Air Quality Assessment completed for this Modification included air dispersion modelling using the site specific model previously developed for the Bengalla EIS (Hansen Bailey, 2013). This model was updated to reflect the proposed features of this Modification to enable direct comparison to approved air quality predictions.

A comparison of the estimated total annual dust emissions in Year 4 and Year 8 for the approved mining operation and this proposed Modification indicate that emissions would increase by approximately 2.0% and 2.5% respectively relative to the approved operations in those two years of operations. The small increase in total annual dust emissions are primarily attributable to the additional haulage distances and the dozer activity required for shaping in the Visual Relief Areas. This change in dust emissions is considered to be within the degree of daily or annual variation that naturally occurs in background dust levels and the modelling accuracy. A detailed list of the emissions inventory utilised for this Modification is provided in **Appendix C**.

The predicted dust emission contours due to the proposed Modification for both Year 4 and Year 8 were overlaid with the predictions associated with the worst case all years from the *Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013). Overlaying these contours allows for a direct comparison of the change associated with the proposed Modification.

Results for $PM_{2.5}$, annual average total suspended particulates (TSP) and annual average dust deposition are unlikely to change significantly at any privately-owned receiver as a result of the proposed Modification in comparison with the results presented in Todoroski Air Sciences, 2013 which are presented as **Appendix C** of this SEE.

Results for project alone PM_{10} 24-hour average were overlaid on the predictions presented in *Bengalla Continuation – Dust mitigation strategy for short-term dust impacts* (Todoroski Air Sciences, 2014).

A discussion in regard to PM_{10} annual and 24-hour average for both modelled years is provided below.

Year 4 Results Discussion

The dispersion modelling results showing the predicted project alone maximum 24-hour average and cumulative annual average PM_{10} for Year 4 are presented on **Figure 25** and **Figure 26**.

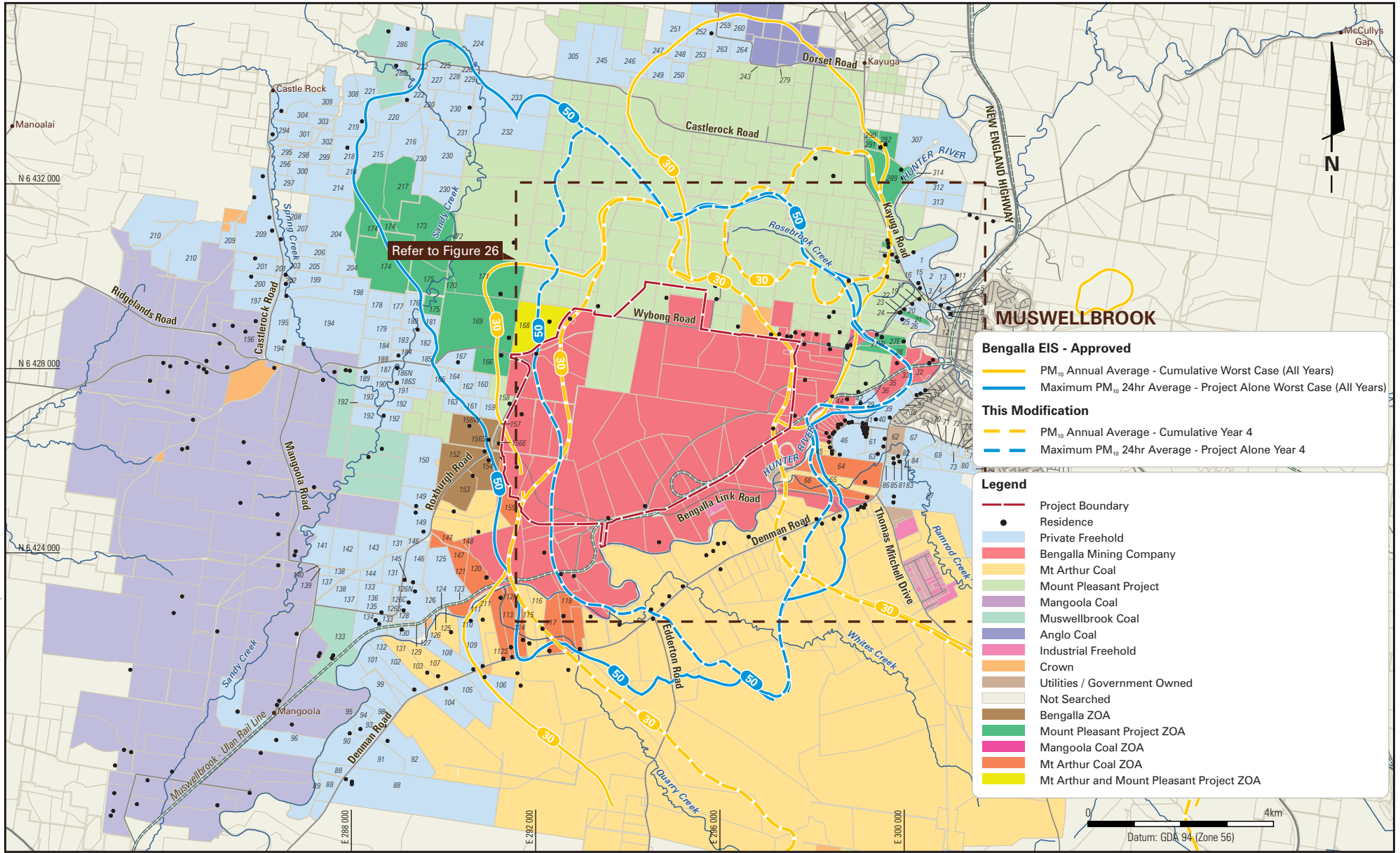
Results indicate that the predicted project alone maximum 24-hour average extent of short-term PM_{10} dust impacts for the proposed Modification would largely remain within the existing approved maximum envelope, with the exception of a relatively small area directly to the north and north-east of Bengalla. The small addition to the air quality impact envelope as a result of this Modification does not result in any exceedances of the maximum 24-hour average impact criteria at private receivers.

The results indicate that predicted cumulative annual average PM₁₀ dust levels are unlikely to change significantly at any privately-owned receiver as a result of the proposed Modification in comparison with the results presented in the *Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013).

Figure 27 presents a comparison of the predicted maximum project alone PM₁₀ 24-hour average impacts during Year 4 of this Modification and the maximum Year 4 Bengalla EIS envelope. Both scenarios include consideration of the dust mitigation strategy for short-term dust impacts (Todoroski Air Sciences, 2014).

No additional privately-owned receivers to those already predicted to be impacted as listed in SSD-5170 are predicted to exceed any of the relevant air quality criterion as a result of this Modification during Year 4.

HB BENGALLA MOD 2 - 1512 F25 Year 4 PM10 24hr Air Quality Contours 22 04 2016



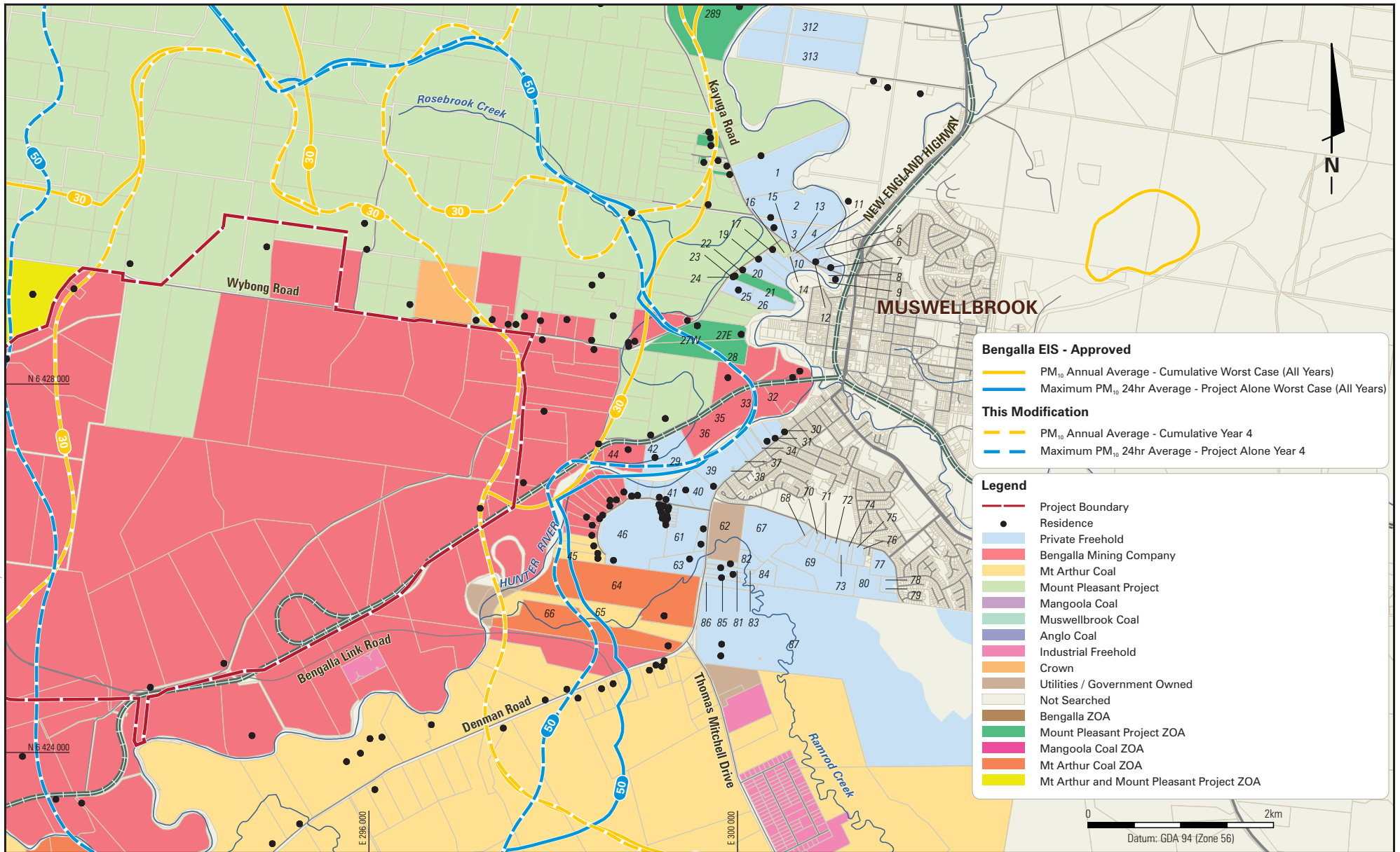
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Air Quality Impacts – Year 4 Analysis

FIGURE 25



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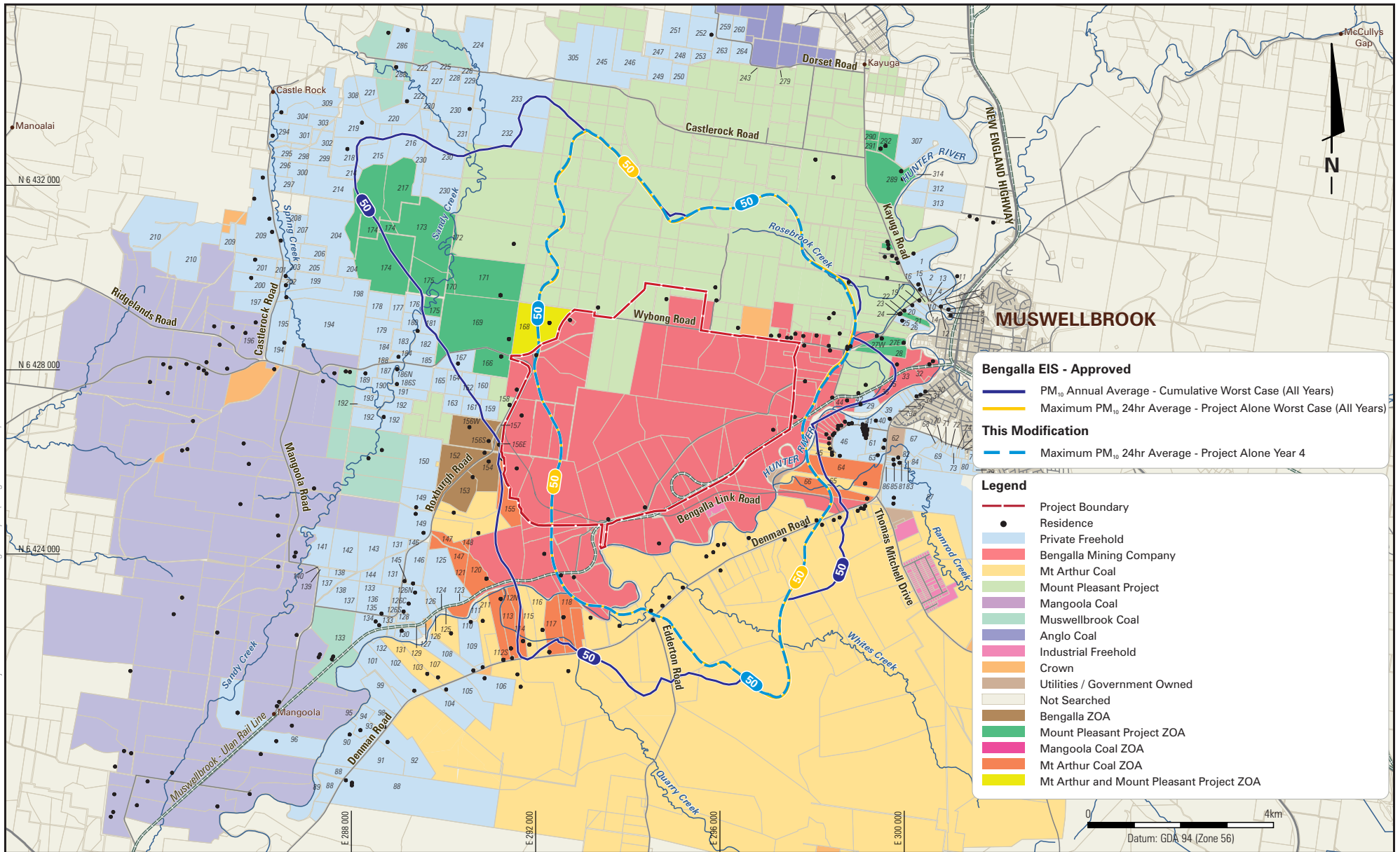
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Air Quality Impacts – Year 4 Analysis (Inset)

FIGURE 26



HB BENGALLA MOD 2 - 1512 E27 Year 4 Project Alone PM10 24hr Average Analysis (Mitigated Scenario) 26 04 2016



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Air Quality Impacts - Year 4 Project Alone PM₁₀ 24hr Average Analysis (Mitigated Scenario)

FIGURE 27

Year 8 Results Discussion

The dispersion modelling results showing the predicted project alone maximum 24-hour average and cumulative annual average PM₁₀ for Year 8 are presented on **Figure 28** and **Figure 29**.

Results indicate that the predicted project alone maximum 24-hour average extent of short-term PM₁₀ dust impacts for the proposed Modification would largely remain within the existing approved maximum envelope, with the exception of a small area directly to the east of Bengalla, close to the proposed activity. The small addition to the air quality impact envelope as a result of this Modification does not result in any exceedances of the maximum 24-hour average impact criteria at private receivers.

The cumulative annual average PM₁₀ results indicate that there is negligible change in the predicted impacts at any privately-owned receiver locations as a result of the proposed Modification in comparison with the results presented in the *Air Quality and Greenhouse Gas Impact Assessment* (Todoroski Air Sciences, 2013).

Figure 30 presents a comparison of the predicted maximum project alone PM₁₀ 24-hour average impacts during Year 8 of this Modification and the maximum Year 8 Bengalla EIS envelope. Both scenarios include consideration of the dust mitigation strategy for short-term dust impacts (Todoroski Air Sciences, 2014).

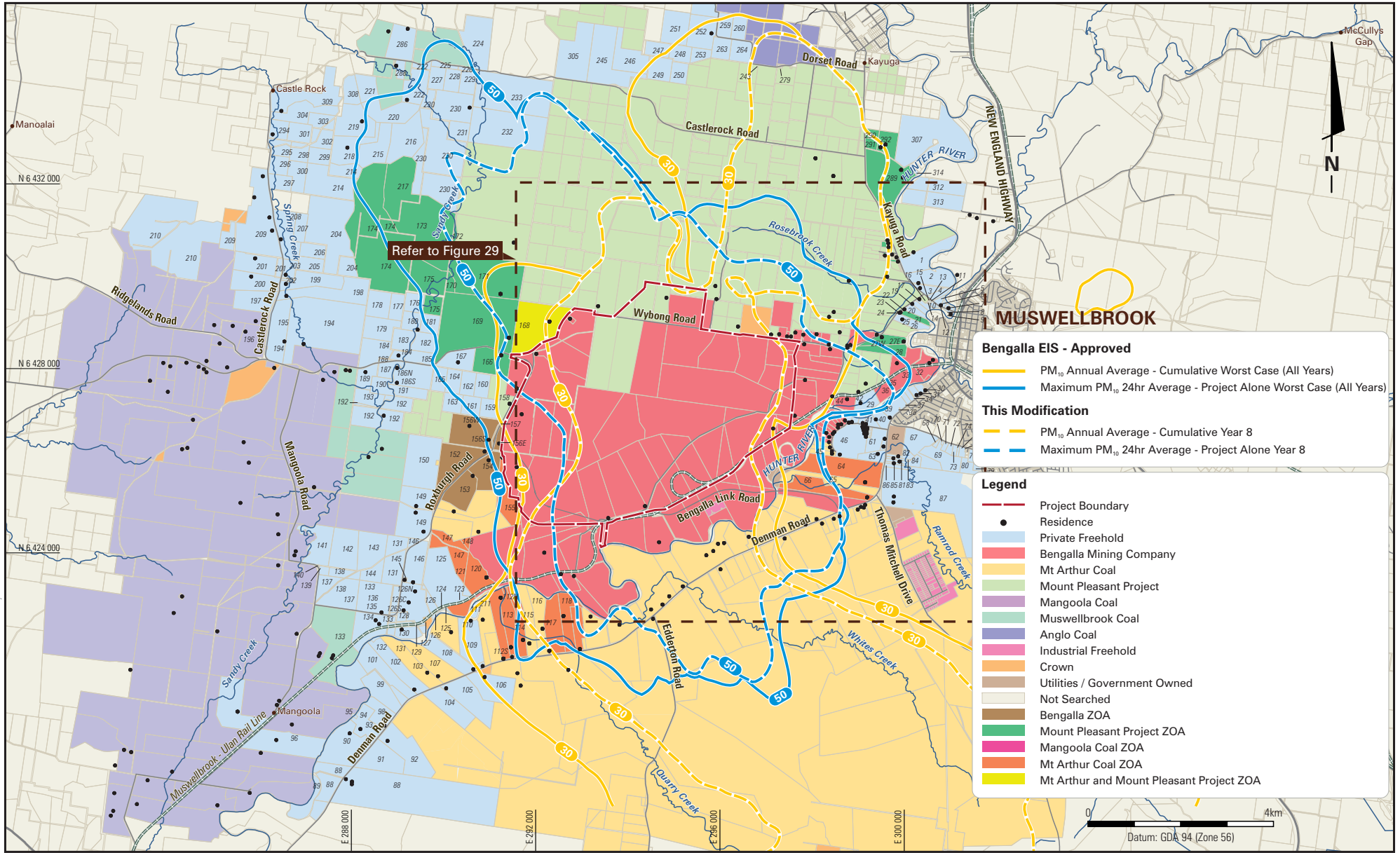
No additional privately-owned receivers to those already listed in SSD-5170 (as Modified) are predicted to exceed any of the relevant air quality criterion as a result of this Modification during Year 8.

7.2.2 Mitigation and Management

Existing BMC dust management techniques consistent with the approved Bengalla *Air Quality Management Plan* (as Modified) will be applied to this Modification.

Rehabilitation will be progressive and commence as soon as practicable following the completion of the forming of the Visual Relief Areas (see **Section 7.9**).

HB BENGALLA MOD 2 - 1512 F28 Year 8 PM10 24hr Air Quality Contours 22 04 2016



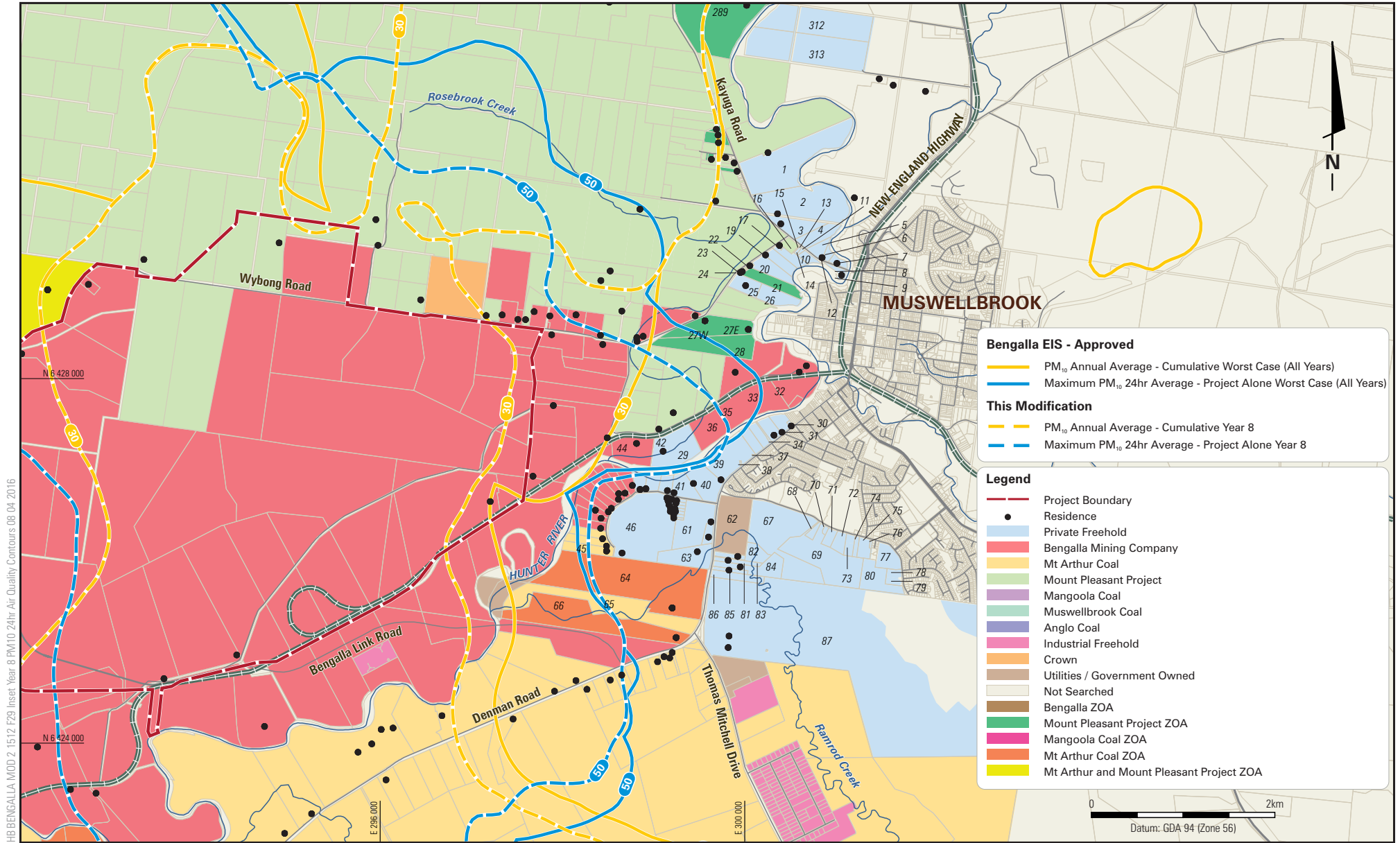
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Air Quality Impacts – Year 8 Analysis

FIGURE 28



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HB BENGALLA MOD 2 - 1512 F29 Inset Year 8 PM10 24hr Air Quality Contours 08 04 2016



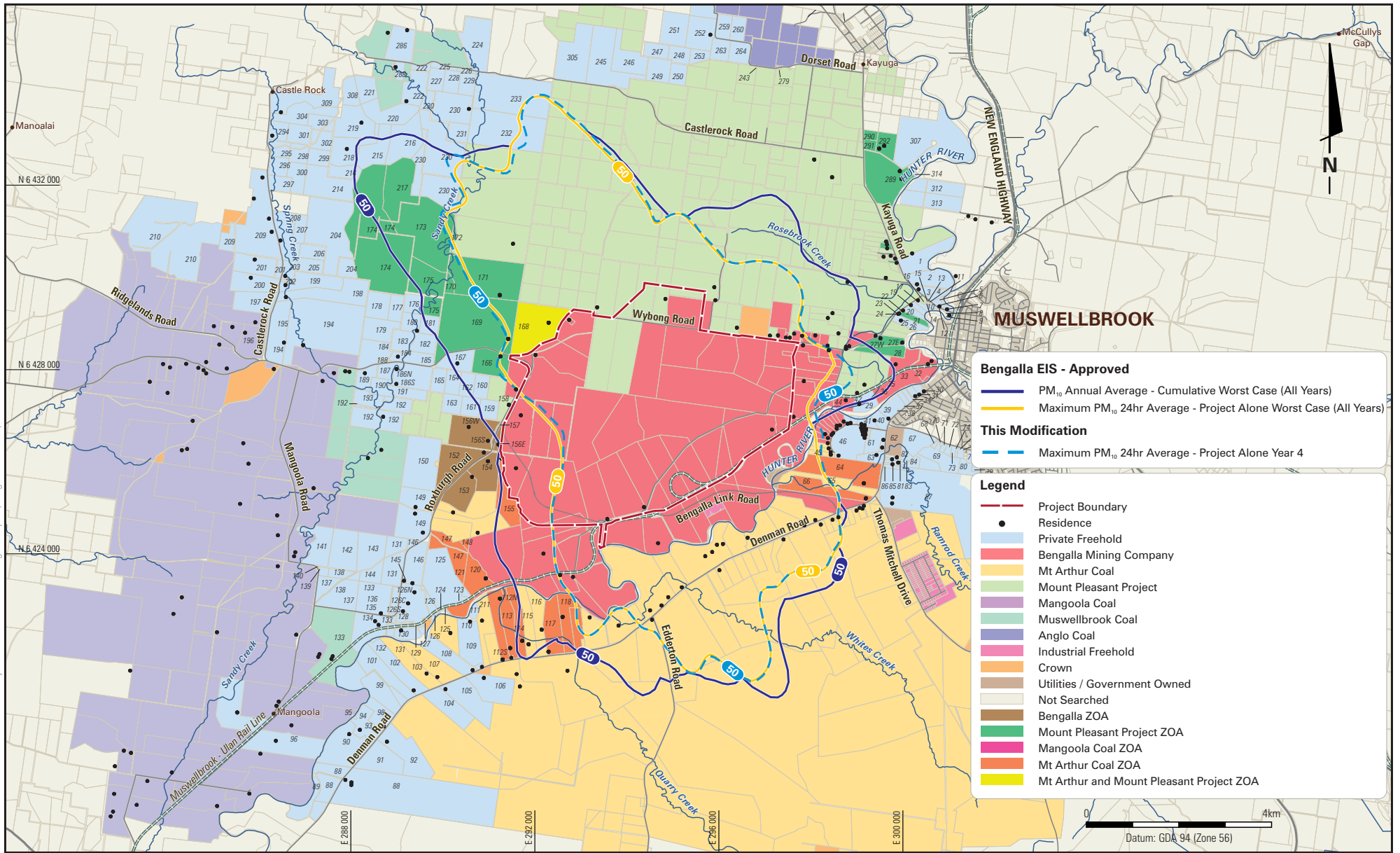
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Air Quality Impacts – Year 8 Analysis (Inset)

FIGURE 29

HB BENGALLA MOD 2 - 1512 F30 Year 8 Project Alone PM10 24hr Average Analysis (Mitigated Scenario) 26 04 2016



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Air Quality - Year 8 Project Alone PM₁₀ 24hr Average Analysis (Mitigated Scenario)



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FIGURE 30

7.3 ACOUSTICS

7.3.1 Impact Assessment

An Acoustic Impact Assessment was completed by Bridges Acoustics for this Modification and is presented in **Appendix D**. Specifically the Acoustic Impact Assessment provided a quantitative assessment of the potential change in construction and operational noise associated with this Modification in comparison to those presented in the Bengalla EIS (Hansen Bailey, 2013) *Acoustic Impact Assessment* (Bridges Acoustics, 2013). To achieve this the Bengalla EIS noise model was updated to include the Visual Relief Areas as sought in this Modification along with varied equipment operating locations.

Equipment locations associated with the modified terrain file were adjusted to suit this Modification terrain. As the terrain remained largely unaffected by this Modification except for sections of the Main OEA above RL 270, the majority of equipment locations remain consistent with the Bengalla EIS noise model. All other noise model parameters including CHPP equipment, mobile equipment fleet, source noise levels and prevailing weather conditions have remained unchanged from the Bengalla EIS noise model. Modelled weather conditions comply with relevant recommendations in the *NSW Industrial Noise Policy* (INP) and the *Draft Industrial Noise Guideline* (Draft ING) prepared by the EPA in September 2015.

Operational Noise Discussion

The Bengalla EIS *Acoustic Impact Assessment* (Bridges Acoustics, 2013) reported predicted noise levels for project years 1, 4, 8, 15 and 24. As the Visual Relief Area construction occurs over an approximate six year period only changes to the approved Years 4 and Year 8 mine plan are necessary. The relatively small sections of the OEA to be constructed above the currently approved RL 270 were the focus of this assessment. Noise levels in Year 1 would not be affected as the OEA would remain unchanged from the approved mine plan. Noise levels in the later Year 15 and Year 24 would be slightly lower at residences located generally east of Bengalla due to the increased OEA height acting as a more effective noise barrier.

Table 9 shows the maximum of predicted noise levels during Year 4 and Year 8. **Table 9** also shows the noise levels (at eastern receptors) reported in the Bengalla EIS, for all years, for direct comparison with the predicted noise levels as a result of this Modification. An analysis of the approved Bengalla EIS noise impacts indicate that the worst case all years noise levels are higher than the approved noise levels in Years 4 and Year 8 indicating the noise levels in Year 1 are higher than the noise level predictions relevant to this Modification.

A detailed analysis of modelled weather conditions was presented in the Bengalla EIS (Hansen Bailey, 2013) and remains relevant to this Modification. Further modelled weather conditions comply with relevant recommendations in the Draft ING. A summary of modelled weather conditions is presented in **Appendix D**.

Table 9
Predicted Noise Levels at Residences, LAeq,15min

Block ID	Approved (Bengalla EIS) All Assessed Years			Approved (Bengalla EIS) Years 4, 8 Only			Modification Years 4, 8 Only		
	Day	Day/ Evening	Night	Day	Day/ Evening	Night	Day	Day/ Evening	Night
	Neutral	Prevailing		Neutral	Prevailing		Neutral	Prevailing	
Applicable SSD-5170 (as Modified) Noise Criteria is presented in Section 2 of Appendix D									
19	25	37	34	21	36	33	25	36	33
25	25	38	34	21	36	33	25	36	33
22	25	38	34	21	37	33	26	37	33
23	25	38	34	21	37	33	26	37	33
24	25	38	34	21	37	33	26	37	33
27E*	24	37	34	22	36	33	25	36	33
27W*	25	39	34	22	37	33	26	37	33
29	31	38	35	28	36	33	28	36	33
43*	32	38	35	29	36	34	29	36	34
44*	32	38	35	30	36	34	30	36	34
64*	32	33	36	29	31	35	29	31	35
66*	32	32	36	29	30	36	29	30	36

*Denotes property is already subject to acquisition by another mining company upon request by the landowner.

The results indicate that this Modification will not result in any audible increase to the approved maximum predicted noise all assessed years at eastern receptors with only a 1 LAeq,15min increase predicted under neutral weather conditions at receptor ID 22, 23, 24, 27E and 27W.

There is a predicted noise level increase of 5 LAeq,15min or less due to this Modification at some receivers (consisting of receptors 19, 25, 22, 23, 24, 27E and 27W) under neutral weather conditions, when compared to the Bengalla EIS (Hansen Bailey, 2013) modelled Year 4 and Year 8 scenarios alone (see **Table 9**). However, these results are below the SSD-5170 day time criteria.

Under prevailing weather conditions, predicted noise levels from this Modification do not appreciably change from the currently approved noise levels and, in all cases, remain below the predicted noise levels in all years as reported in the Bengalla EIS. **Figure 31** to **Figure 34** present the combined worst case predicted noise levels for all modelled years from the Bengalla EIS in comparison to the Year 4 and Year 8 Modification noise levels during the day/evening and night prevailing periods respectively.

No additional privately-owned receivers to those already listed in SSD-5170 are predicted to exceed any of the relevant noise criterion as a result of this Modification.

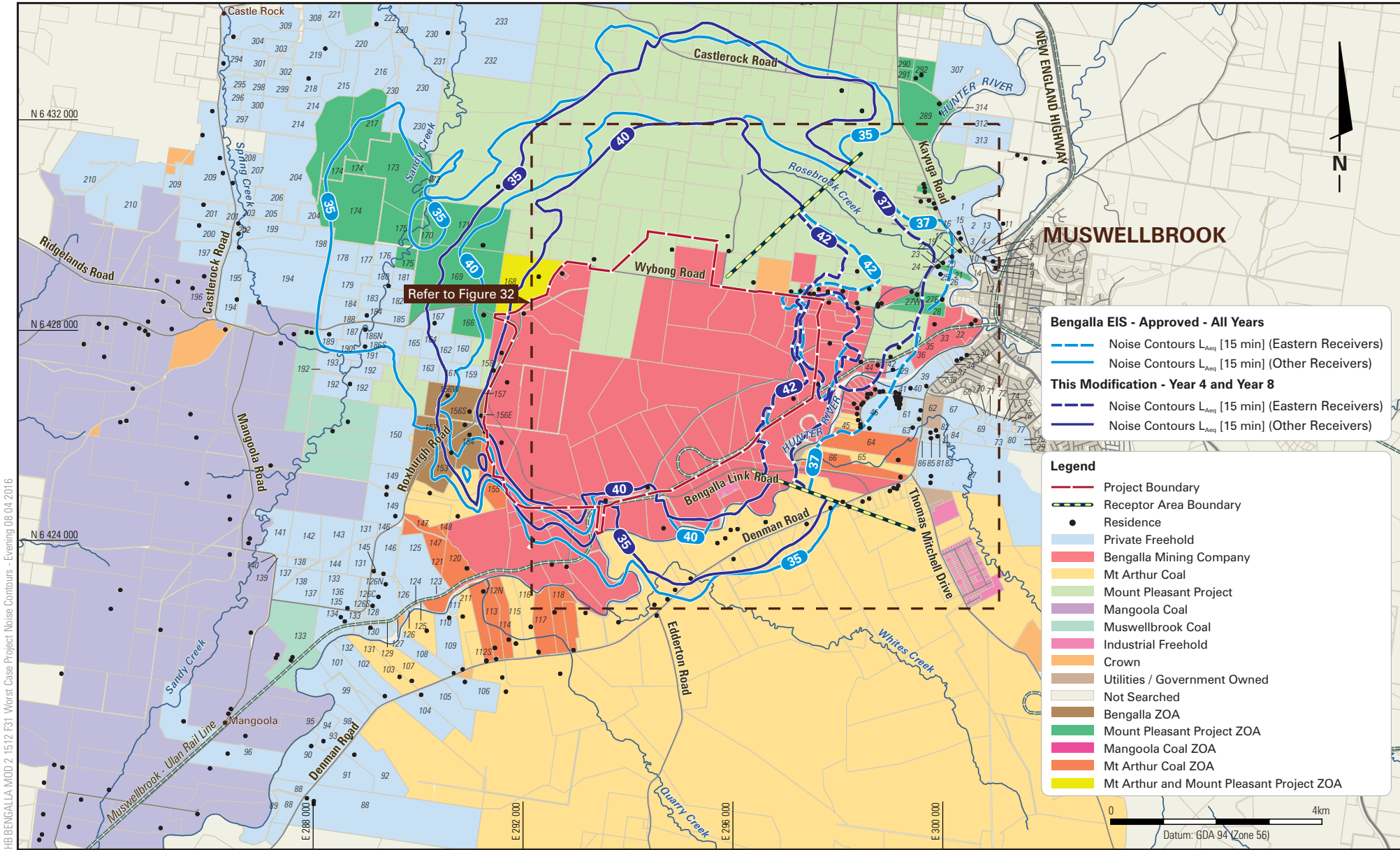
Construction Noise Discussion

The construction of the Homestead Access was assessed as part of this Modification. When compared to the already approved construction activities primarily associated with the Dry Creek Diversion Project and due to the minor nature of the Homestead Access road construction no significant noise impacts were predicted to occur to private receivers.

This Modification construction and operational noise levels are expected to remain consistent with the noise levels reported in the Bengalla EIS (Hansen Bailey, 2013). Based on the results of this assessment, this Modification is unlikely to have a significant effect on noise levels with all impacts anticipated to remain within the criteria presented in SSD-5170 (as Modified).

7.3.2 Mitigation and Management

Bengalla operates under the *Noise Management Plan (as Modified)*. The *Noise Management Plan (as Modified)* will be applied to this Modification to include the proactive management of mobile and mining equipment to operate on elevated or exposed sections of the overburden emplacement area (including surface work) during the day/evening periods and on more shielded sections (where required) of the overburden emplacement area during the night period.



HB BENGALLA MOD 2 - 1512 F31 Worst Case Project Noise Contours - Evening 08 04 2016

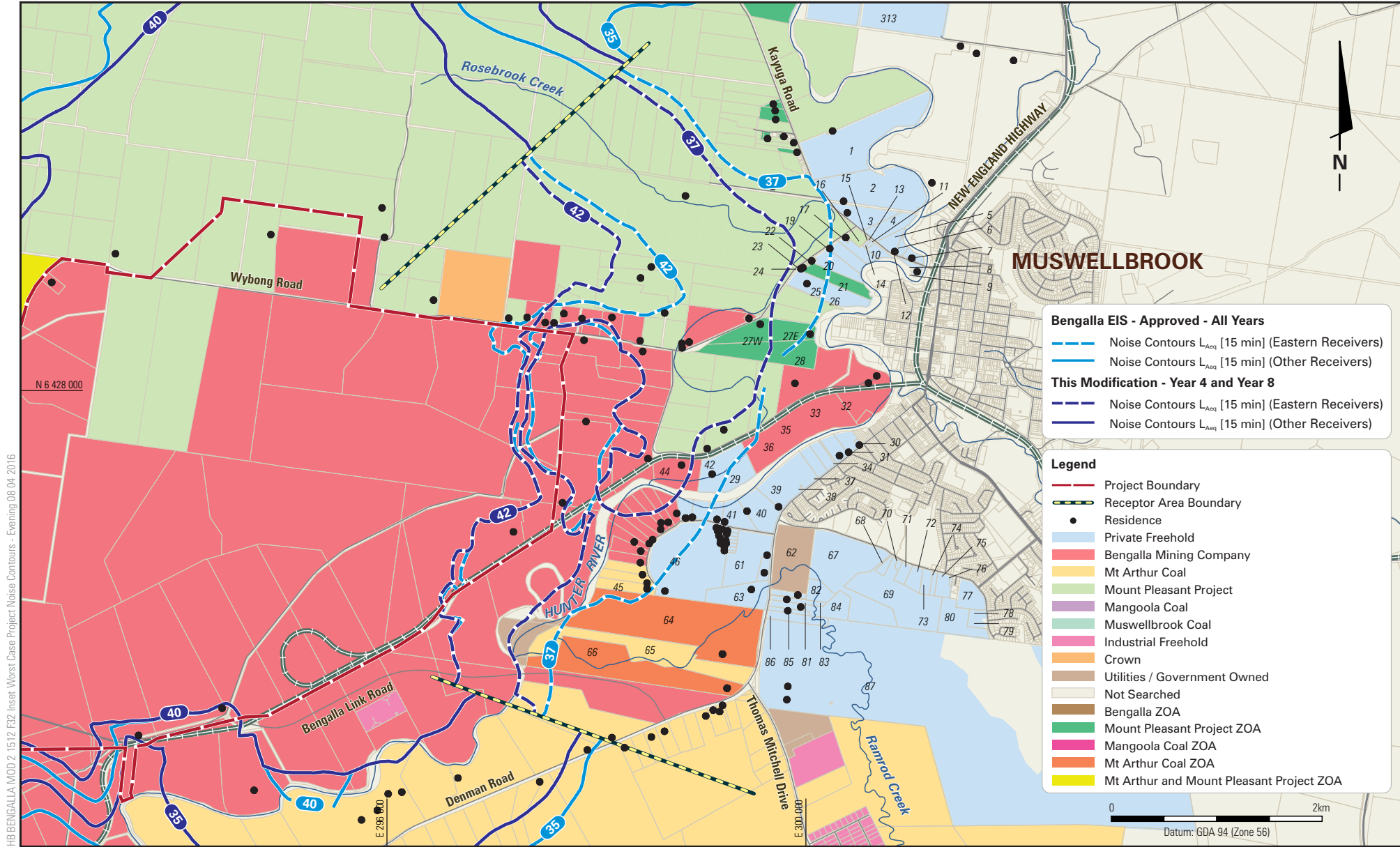


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Worst Case Noise Impacts - Day/Evening Prevailing Analysis

BENGALLA MINE

FIGURE 31



HB BENGALLA MOD 2 - 1512 F32 Inset Worst Case Project Noise Contours - Evening 08 04 2016

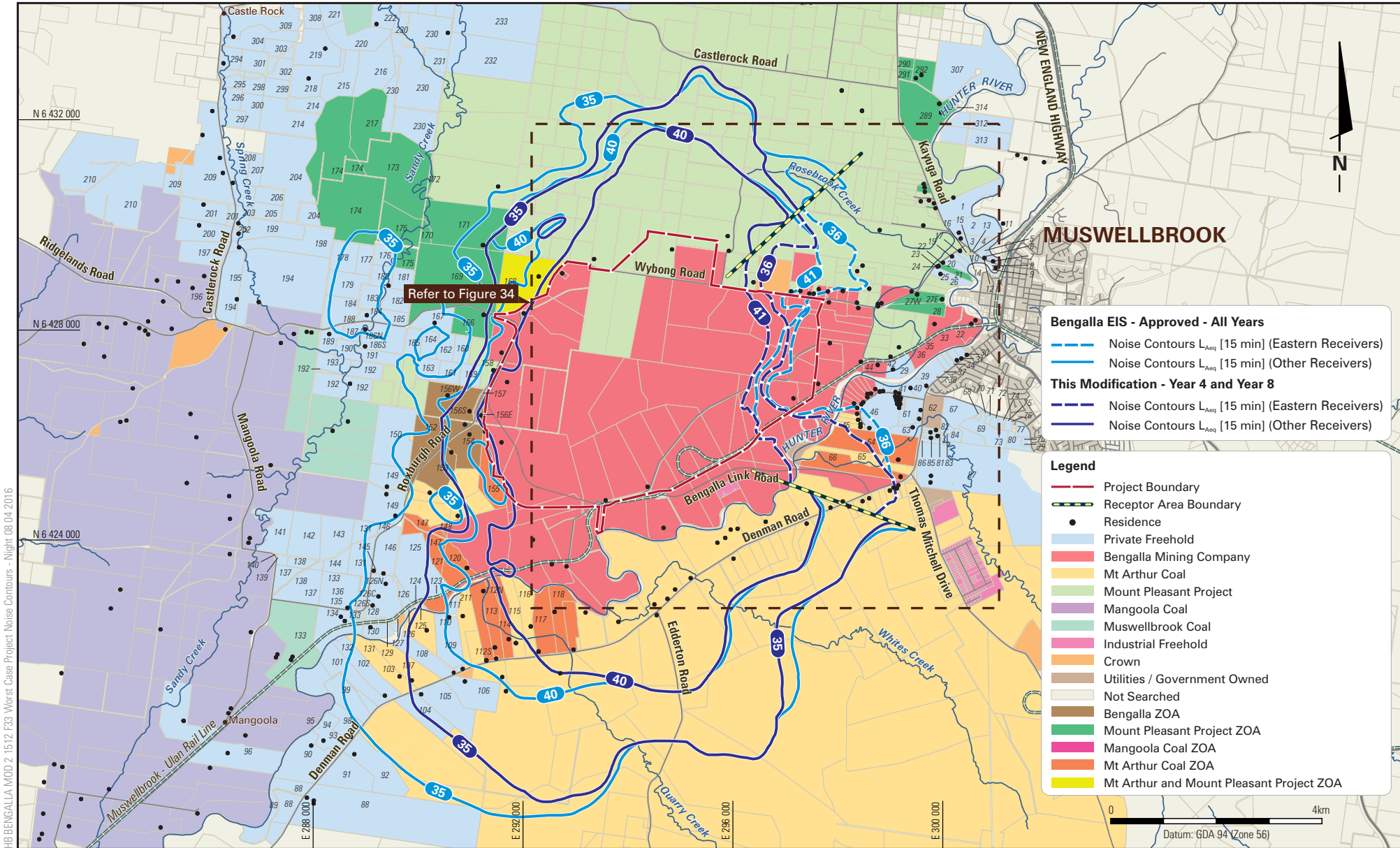
BENGALLA MINE

Worst Case Noise Impacts - Day/Evening Prevailing Analysis (Inset)



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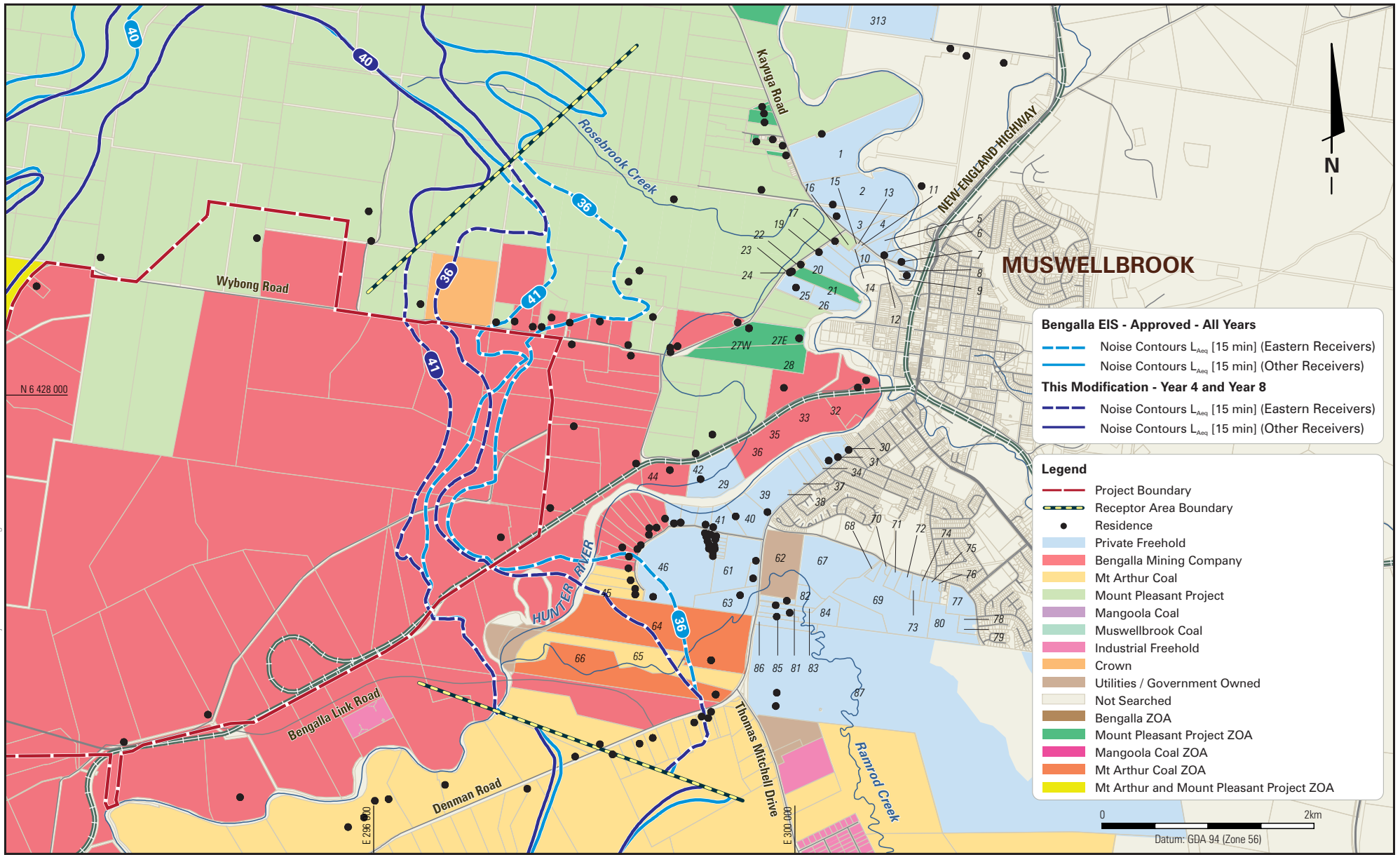
FIGURE 32



HB BENGALLA MOD 2 - 1512 F33 Worst Case Project Noise Contours - Night 08 04 2016

BENGALLA MINE

HB BENGALLA MOD 2 - 1512 F34 Inset - Worst Case Project Noise Contours - Night 08 04 2016



BENGALLA MINE

Worst Case Project Noise Impacts - Night Prevailing Analysis (Inset)



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FIGURE 34

7.4 WATER RESOURCES

7.4.1 Impact Assessment

This Modification will not result in any significant additional catchment areas nor does it propose any changes to the assumptions utilised in the previously completed surface water or groundwater modelling completed for the Bengalla EIS and Bengalla SEE. The results of the previous site water balance modelling show that the mine water management system can be operated in accordance with BMCs existing EPL 6538 conditions.

As this Modification will not result in an increase of the maximum approved water take from water sources regulated under the WM Act or Water Act no additional water access licences will be required. BMC will continue to hold all relevant licences, share component and allocation required to comply with the WM Act and Water Act at all times water is taken, whether during or after the life of the operation.

This Modification will not result in any significant changes to the currently approved water management regime at Bengalla. It is noted that the water management system will continue to evolve as the mine develops however the Visual Relief Areas will not significantly alter or require any additional water management structures to be constructed. As topography dictates surface water will either flow over rehabilitated areas into existing sediment dams or toward active mining areas where it will be captured in the mine water management system. All sediment dams and mine water dams will continue to be designed, constructed and operated in accordance with the requirements of SSD-5170 (as Modified) to facilitate this Modification.

7.4.2 Mitigation and Management

BMC will continue to manage water resources in accordance with the approved *Bengalla Water Management Plan* (BMC, 2015) (as Modified). The Visual Relief Areas will be designed, installed and maintained to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material.

Any erosion and sediment control structures required to facilitate the construction of the Visual Relief Areas will be designed and constructed in accordance with SSD-5170 (as Modified).

7.5 ECOLOGY

7.5.1 Impact Assessment

A desktop review of the previously completed Bengalla EIS *Ecological Impact Assessment* (Cumberland Ecology, 2013) and Bengalla SEE *Ecological Impact Assessment* (Cumberland Ecology, 2015) was completed for this Modification.

Both the Visual Relief Areas and the Homestead Access are located entirely within the existing Approved Disturbance Boundary. Therefore, no additional disturbance to any flora or fauna species, including any listed under the TSC Act and/or EPBC Act will occur.

7.5.2 Mitigation and Management

BMC will continue to manage all ecological matters on-site in accordance with the *Bengalla Biodiversity Management Plan* (as Modified).

7.6 ABORIGINAL ARCHAEOLOGY

7.6.1 Impact Assessment

A desktop review of the previously completed Bengalla EIS *Aboriginal Archaeological and Cultural Heritage Impact Assessment* (AECOM 2013a), Bengalla SEE *Aboriginal Archaeology Due Diligence Assessment* (AECOM 2015), and the Bengalla *Aboriginal Archaeology and Cultural Heritage Management Plan* (BMC, 2015) was completed for this Modification.

Results from the desktop review indicate that all previously identified Aboriginal artefacts located within the Approved Disturbance Boundary have been salvaged in accordance with relevant approvals. Recently BMC completed (October 2015) the final salvage excavation associated with Aboriginal Heritage Information Management System (AHIMS) site B10 (37-2-0579) in accordance with the methodology as described in the approved *Aboriginal Archaeology and Cultural Heritage Management Plan* (BMC, 2015) (as Modified). Following completion of these works it is determined that the entire area associated with the Approved Disturbance Boundary has been salvaged in accordance with approval of SSD-5170 (as Modified).

As elements relating to this Modification are wholly located within the Approved Disturbance Boundary, no impacts to any Aboriginal artefacts will occur.

7.6.2 Mitigation and Management

As this Modification is entirely situated within the Approved Disturbance Boundary and no impacts to any Aboriginal artefacts are predicted to occur no additional mitigation measures are proposed.

BMC will continue to manage items relating to Aboriginal cultural heritage in accordance with the approved *Aboriginal Archaeology and Cultural Heritage Management Plan* (BMC, 2015) (as Modified).

7.7 NON-ABORIGINAL HERITAGE

7.7.1 Impact Assessment

A review of the Non-Aboriginal Heritage items previously identified in the Bengalla EIS *Historic Heritage Impact Assessment* (AECOM, 2013b) was completed for this Modification. A total of four previously recorded Historic Heritage Sites were identified in proximity to the Project Boundary however all are located outside the Approved Disturbance Boundary.

7.7.2 Mitigation and Management

As this Modification is entirely situated within the Approved Disturbance Boundary none of the previously recorded sites will be impacted by this Modification and as a result no additional mitigation measures are proposed.

BMC will continue to manage items relating to non-Aboriginal cultural heritage in accordance with the approved *Historic Heritage Management Plan* (as Modified).

7.8 TRAFFIC

7.8.1 Impact Assessment

A desktop review of the previously completed Bengalla EIS *Traffic and Transport Impact Assessment* (DC Traffic Engineering, 2013) was completed for this Modification. Traffic related components associated with this Modification relate to the construction of an additional access point off Wybong Road for the Homestead Access (see **Figure 10**).

The Bengalla EIS and *Traffic and Transport Impact Assessment* (DC Traffic Engineering, 2013) indicated that Year 1 peak construction workforce associated with the construction of the Dry Creek Diversion Project would require up to 195 personnel. As no additional employees or contractor movements compared to those assessed in the Bengalla EIS are required to facilitate this Modification no additional impacts are predicted to occur.

7.8.2 Mitigation and Management

As this Modification will not result in any additional employees or contract personnel no additional mitigation measures are proposed.

As discussed in **Section 4.3.7** consent under section 138 of the Roads Act may be required to facilitate the construction of the Homestead Access. Since Wybong Road is a council road, this work may require the consent of MSC.

7.9 REHABILITATION & FINAL LANDFORM

7.9.1 Impact Assessment

Consistent with the Bengalla EIS, the primary objective of the final landform and rehabilitation at Bengalla is to develop an undulating, free-draining landform (excluding the final void) with a land capability to support the nominated final land use for the site. As discussed in **Section 3.1** this Modification proposes to alter the currently approved final landform as presented on **Figure 9**. It is anticipated that should this Modification be approved that the revised conceptual final landform presented on **Figure 9** will replace the existing conceptual final landform in Appendix 9 of SSD-5170.

The Visual Relief Areas and revised conceptual final landform have been designed to provide a landform that improves visual integration with the surrounding natural landscape.

As stated in **Section 3.4** the construction of the Visual Relief Areas has been designed to integrate with the existing operations from approximately Year 4 to approximately Year 9 as approved in SSD-5170 (as Modified). This integration will enable rehabilitation to be scheduled in line with the natural progression of mining rather than as a stand-alone component.

7.9.2 Mitigation Measures

The progressive rehabilitation of land within the Approved Disturbance Boundary will continue to be undertaken in accordance with the approved *Bengalla Rehabilitation Management Plan* (as Modified) and Bengalla MOP (BMC, 2015) (as Modified) where both will be updated after approval of this Modification.

As stated in **Section 3.3** this Modification has been designed to integrate with the existing operations from Year 4 to approximately Year 9 as approved in SSD-5170. Once established, the Visual Relief Areas will be shaped to allow the progressive implementation of rehabilitation as soon as reasonable and feasible. Rehabilitation development will include a range of measures, including topsoil management and relocation, establishment of erosion and sediment controls, habitat reinstatement and revegetation works. SSD-5170 Schedule 3, Condition 45 notes that rehabilitation should be conducted progressively as soon as practicable following disturbance.

Schedule 3 Condition 44 of SSD-5170 further requires the Main OEA exposed to Muswellbrook and Denman Road to be rehabilitated with dense woody vegetation as soon as reasonable and feasible following the completion of mining operations. This development consent requirement to achieve high density woody vegetation on the eastern face will provide moderate levels of visual integration as dense woodland vegetation contrasts with surrounding vegetation patterns which reflect more open woodland.

BMC has commenced the development of a strategy to assist in implementing Condition 44 of SSD-5170. The strategy will be prepared in consultation with DP&E and DRE. It is anticipated that the strategy, where appropriate, will apply to the eastern facing components of the Visual Relief Areas should this Modification be approved. The strategy will then be reflected in the *Bengalla Rehabilitation Management Plan (as Modified)* and the *Bengalla MOP (as Modified)*.

8 MANAGEMENT AND MONITORING SUMMARY

This section provides a summary of the environmental mitigation measures arising from this Modification.

8.1 SUMMARY OF MITIGATION MEASURES

BMC will continue to manage its operations (including this Modification) in accordance with the conditions of SSD-5170 and all associated strategies, plans and programs required under this consent which may be updated from time to time. In accordance with Condition 5, Schedule 5 of SSD-5170 (as Modified) the following management plans will be reviewed and, if necessary, updated to incorporate the mitigation measures identified in **Section 7** of this SEE:

- Noise Management Plan;
- Air Quality Management Plan; and
- Rehabilitation Management Plan.

The existing Bengalla MOP (BMC, 2015) will be updated in accordance with *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE, 2013) in consultation with the relevant agencies to incorporate changes arising from this Modification.

9 CONCLUSION

As part of the stakeholder consultation process undertaken during the assessment of the Bengalla EIS (Hansen Bailey, 2013), BMC committed to investigate further options to improve the level appearance of the top of the Main OEA toward primary viewing locations from Muswellbrook and Denman Road.

BMC acknowledged that if an improved outcome was identified then a Modification would be prepared and submitted for assessment.

BMC has now designed landform and rehabilitation improvements to achieve the desired final landform enhancements at Bengalla. This SEE has confirmed that the final landform changes proposed and the other minor Modification element sought will not have any material deleterious environmental impacts beyond those which are already approved.

BMC is now seeking to fulfil this prior commitment to improve the level appearance of the Main OEA through this Modification.

10 ABBREVIATIONS

Abbreviation	Description
ACHMP	Aboriginal Cultural Heritage Management Plan
ARI	Average Recurrence Interval
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BMC	Bengalla Mining Company Pty Limited
Bengalla 2008 EA	Bengalla Mine Development Consent Modification Environmental Assessment (Hansen Bailey, 2008)
Bengalla 2010 EA	Bengalla Mine Development Consent Modification Environmental Assessment (Hansen Bailey, 2010)
Bengalla 2006 SEE	Bengalla Mining Company Modifications to Mining Operations Statement of Environmental Effects (Hansen Bailey, 2006)
Bengalla 1993 EIS	Environmental Impact Statement for the Bengalla Coal Mine (Envirosciences, 1993)
Bengalla 2013 EIS	Continuation of Bengalla Mine Environmental Impact Statement (Hansen Bailey, 2013)
Bengalla SEE	Bengalla Mine Development Consent Modification Statement of Environmental Effects (SSD-5170 MOD1) (Hansen Bailey, 2015)
BCMP	Bengalla Continuation of Mining Project as described in the Bengalla 2013 EIS
BJV	Bengalla Joint Venture
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
DA	Development Application
DBH	Diameter at Base Height
DP&E	NSW Department of Planning and Environment
DoE	Department of the Environment
DRE	Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy
EA	Environmental Assessment
EEC	Endangered Ecological Community
EMP	Environmental Monitoring Program
EMS	Environmental Management Strategy
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>

Abbreviation	Description
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
LGA	Local Government Area
Mining Act	<i>Mining Act 1992</i>
ML	Mining Lease
WM Act	<i>Water Management Act 2000</i>
MNES	Matters of National Environmental Significance
MOP	Mining Operations Plan
Mtpa	Million tonnes per annum
Muswellbrook LEP	Muswellbrook Local Environment Plan 2009
NOW	NSW Office of Water
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
NV Act	<i>Native Vegetation Act 2003</i>
OEA	Overburden Emplacement Area
OEH	Office of Environment and Heritage
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PVC	Primary Visual Catchment
PVZ	Primary View Zone
ROM	Run of Mine
RL	Reduced Level
RTS	Continuation of Bengalla Mine Response to Submissions
SEE	Statement of Environmental Effects
TSC Act	<i>Threatened Species Conservation Act 1995</i>
WAL	Water Access Licence
Water Act	<i>Water Act 1912</i>
WSP	Water Sharing Plan

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