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Mr Mike Young
Manager Mining Projects
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Dear Mr Young

Warkworth Continuation Project (SSD 6464)
Mt Thorley Continuation Project (SSD 6465)

The Department of Planning and Environment (DP&E) requested additional information under cover of a letter dated 21 November 2014 including:

1. the predictions for project-alone 24-hour PM_{10} concentrations for vacant land to allow the DP&E to determine the properties that may be entitled to acquisition in accordance with the NSW Government's Voluntary Land Acquisition and Mitigation Policy (VLAM Policy);

2. the additional project-level cost and benefit information requested by Deloitte Access Economics in its peer review of the economic assessment in the EIS; and

3. feasible options for further refinements to the final landform for the site, particularly in regard to reducing the size of the final void.

This letter provides a response to items 1 and 3. A separate response to the additional project-level cost and benefit information (item 2) was provided to DP&E on 10 December 2014.

In addition, the NSW Environment Protection Authority (EPA) has requested further clarification on aspects of the air quality assessment response to submissions. This clarification is also provided herein.

1. Project-alone 24-hour PM_{10} concentrations for vacant land

Further assessment has been completed to determine the privately-owned vacant lots that may be entitled to acquisition in accordance with the VLAM Policy, which was introduced in November 2014.

The assessment comprised two steps:

a) additional modelling of vacant lands, applying predictive/reactive mitigation as committed to under the proposal;

b) town planning permissibility considerations for the development of residences on vacant lands.

The additional modelling was completed by Todoroski Air Science (TAS) who also prepared the air quality and greenhouse gas assessment in the Environmental Impact Statement (EIS) for the proposals. The methodology and results are given in the TAS letter attached as **Appendix A** and summarised below.

1.1. Additional air quality modelling

The DP&E has requested predictions for project-alone 24-hour PM_{10} concentrations for privately-owned vacant land to determine if any of these properties are entitled to acquisition under the new VLAM Policy. The new VLMA Policy applies entitles vacant land owners acquisition rights where a proposal exceeds the stringent 24-hour PM_{10} criteria of 50µg/m^3 on greater than 25% of the property. Additional modelling was undertaken on vacant lands and applied the predictive/ reactive mitigation strategies committed to in the EIS.

Further details on predictive/ reactive dust management committed to under the proposals are provided in **Appendix A** and Sections 11.5 and 10.5 of the Warkworth Continuation 2014 EIS and Mount Thorley Operations 2014, respectively.

The outcomes of the modelling are presented in Figures 1 to 4 of **Appendix A**.

In regard to vacant land the VLAM Policy states voluntary acquisition rights should only be granted:

> *'If development contributes to exceedances of the acquisition criteria in Table 3 on more than 25% of any privately –owned land, <u>and a dwelling could be built on that land under existing planning controls</u>'.*

Accordingly, the outcomes of the TAS modelling were considered in the context of the permissibility (or ability) of dwelling house to be erected on the subject lands pursuant to the *Singleton Local Environmental Plan 2013*.

1.2. Permissibility considerations

Interrogation of cadastral information and the outcomes of the TAS modelling identified privately-owned vacant lots that are predicted to have greater than 25% of the land area affected under the proposals. These lots are zoned RU1 Primary Production and IN3 General Industrial, pursuant to the *Singleton Local Environmental Plan 2013* (LEP).

Of these zones, dwelling houses are only permissible with development consent on the lots zoned RU1. Therefore vacant lands under the IN3 General Industrial zone were removed from further assessment.

Pursuant to Clause 4.2A of the LEP, development consent cannot be granted for a dwelling house on certain rural zoned land (which includes the RU1 zone) unless it meets the minimum lot size shown on the LEP lot size map. All lots that have been identified in the RU1 zone have a minimum lot size requirement of 40 ha.

Table 1 presents the privately-owned vacant lots with more than 25% of the land area affected under the Warkworth Continuation 2014 proposal and the permissibility of constructing a dwelling under existing planning controls on the land, considering zoning and minimum lot size requirements. The location of the lots is given on Figure 1 in **Appendix B**. There are no privately-owned vacant lots with more than 25% of land predicted to be affected under the Warkworth Continuation 2014 proposal. Therefore, this clause of the VLAM Policy would not apply to the proposal.

Table 1 Vacant lands dwelling permissibility – Warkworth Continuation 2014 proposal

Lot/DP	Owner	Zoning permissibility	Minimum lot size requirement
12//843432	Telstra Corporation Limited – Not permissible	RU1	0.04ha – Not permissible
1//1171764	James Neal	RU1	0.28ha – Not permissible
372//1026537	Daracon Engineering Pty Limited	IN3 – Not permissible	-
2//90052	Telstra Corporation Limited – Not permissible	RU1	0.02ha – Not permissible
6//770904	Edward John Burley and Carol Lesley Anne Burley	RU1	0.1ha – Not permissible
84//1124139	Shane Keys, Glenn Keus	RU1	24.23ha – Not permissible
3//1171764	William Singleton	RU1	0.25ha - Not permissible

Table 2 presents the privately-owned vacant lots with more than 25% of the land area affected under the Mount Thorley Operations 2014 proposal and the zoning permissibility of constructing a dwelling. The location of these lots is given on Figure 2 in **Appendix B**. There are no privately-owned vacant lots with more than 25% of land predicted to be affected under the proposal where construction of dwelling is permissible. Therefore, this clause of the VLAM Policy would not apply to the proposal.

Table 2 Vacant lands dwelling permissibility – Mount Thorley Operations 2014 proposal

Lot/DP	Owner	Zoning permissibility
6//255730	Milbrodale Holdings Pty Limited	IN3 – Not permissible
78//260203	KOMATSU Australia Properties Pty Ltd	IN3 – Not permissible
2//255730	Andrew Peter Gent	IN3 – Not permissible
1//255730	Yolena Pty Limited, Estanza Pty Limited	IN3 – Not permissible
5//255730	Advance Petroleum Pty Ltd	IN3 – Not permissible
3//255730	P & J Rogers Investment Pty Limited	IN3 – Not permissible
1//860916	Liebherr-Australia Pty Ltd	IN3 – Not permissible
84//622193	Sunlea Investment Spty Limited	IN3 – Not permissible
79//260203	KOMATSU Australia Properties Pty Ltd	IN3 – Not permissible
86//622193	John Vince Cicciarello	IN3 – Not permissible
83//260203	JDR Holdings Pty Ltd, Botsky Pty Ltd	IN3 – Not permissible
821//1080620	Brett Richards Electrical Pty Limited	IN3 – Not permissible
822//1080620	CTM Training Solutions Pty Limited	IN3 – Not permissible
10//1126226	GA Hayward MT Thorley Pty Limited	IN3 – Not permissible
4711//1134486	Expressway Spares Pty Limited	IN3 – Not permissible
4712//1134486	Expressway Spares Pty Limited	IN3 – Not permissible
372//1026537	Daracon Engineering Pty Limited	IN3 – Not permissible

1.3. Conclusion

There are no privately-owned vacant lots with more than 25% of land predicted to be affected where construction of a dwelling is permissible under existing planning controls for either proposal.

2. Feasible options for refinement of final landform

2.1. Background

The final landform under the proposals has been developed with recognition of the pre-mining landform features and would incorporate the existing rehabilitated landforms to ultimately be consistent with the surrounding landscape features of both the Warkworth Mine and Mount Thorley Operations (MTO).

The conceptual final landform at Warkworth Mine and MTO are shown in Warkworth Continuation 2014 EIS Figures 2.15 and 2.16, respectively.

The disturbance area proposed under the Warkworth Continuation 2014 is not mapped as, nor does it meet the criteria for, biophysical strategic agricultural land (BSAL) to which the *Strategic Regional Land Use Policy* (NSW Government 2012) applies.

2.2. Mine planning

A range of options and alternatives for the final landform were canvassed during the extensive mine planning process completed for the proposal.

An important outcome of the mine planning process is an improved final landform under the proposals. The approved final landform at MTO, incorporated into the 1995 EIS, consists of a narrow deep valley leading to a final void. On either side of this valley is an elevated ridge that grades into the surrounding landform. Design of this final landform was constrained by the amount of overburden available within MTO. The ability to transfer overburden from Warkworth Mine to MTO removes the need for a final void and allows for the design of a more natural looking final landform which would integrate better with the final landform of Warkworth Mine and the Bulga Coal Complex.

A final void will remain at Warkworth Mine because there is no source for filling. A detailed consideration of the options for the final void was provided in Section 23.2.3 of the EIS and further discussed below.

The final void for the combined North and West Pit void (at Warkworth Mine) would be approximately 445ha in area and up to 250m to 300m deep, as noted in Section 16.3.2 viii of the EIS. The void would develop to be a local ‘sink’ with groundwater, surface runoff and rainfall inflows slowly filling the void forming a water body.

The surface area of the final void is measured from its post-mining water level (minus 10m AHD). It is noted that DP&E’s assessment report references a final void of 950ha. This figure is taken from a higher contour (approximately 60m AHD), well above the water level of final void, rather than the water level, which results in an area of 445ha.

The approved final voids under DA 300-9-2002-i and DA 34/95 across Mount Thorley Warkworth provides for a combined surface area of 491ha. The proposals allows for a net reduction in the final voids across MTW through filling of Loders Pit at MTO and a reduced final void footprint to 445ha. That is one less void with a reduction in area of approximately 46ha, or 9%, smaller than current approvals. Further, the proposal allows for an integrated landscape and undulation that is not currently afforded under current approvals.

2.3. Final void alternatives

Section 23.2.3 of the Warkworth Continuation 2014 EIS provides further background on the design of the final landform, including the final void. A number of options were considered in relation to its form, including:

a) backfilling the final void;
b) reduction in final profile bench slope;
c) reduction in highwall and endwall slopes.

An overview of these options is provided below. Additional alternatives considered in response to this information request are provided in item d) below.

a) Backfilling the final void

Backfilling the final void was considered during the mine planning process for the proposal. The removal of over 800 million bank cubic metres (Mbcm) of material would be required to fill the void to a similar level as the highwall crest. As under the proposal Warkworth Mine would complete mining in 2035, this material would need to be sourced from an alternative location.

One option would be to excavate the previously rehabilitated emplacements at Warkworth Mine. This process would take many years and use a large fleet of excavating equipment and trucks after mining was completed. This would initially increase the disturbance footprint of Warkworth Mine, as well as prolong its environmental impacts particularly those related to dust and noise, and would be prohibitively expensive.

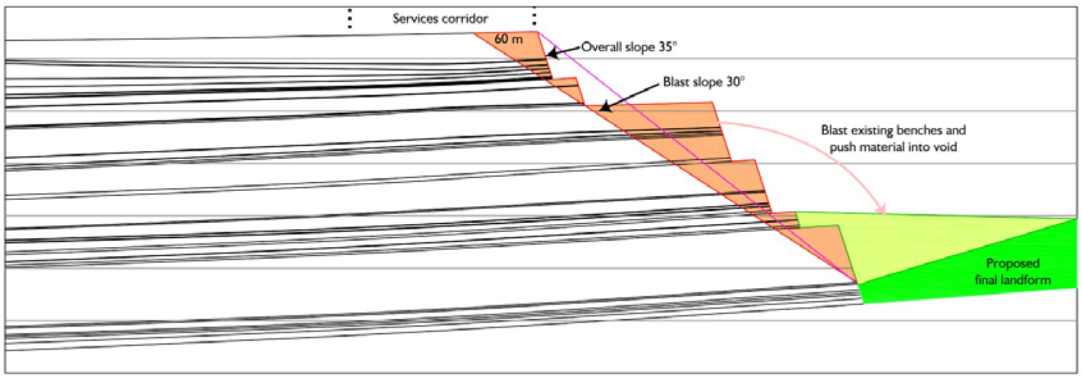
Alternatively, material could be transported from elsewhere in the Hunter Valley. This would require considerable truck movements on public roads for several years that are not feasible. Similar to the above, this option is not considered desirable from a social, environmental or economic perspective (i.e. key objectives of the proposal) and, accordingly, was also discounted.

b) Reduction in final profile bench slope

The reduction in final profile bench slope was considered during the mine planning process for the proposal. This option comprised the blasting of the final profile benches to produce a reduced slope overall when compared to the preferred option that could be more conducive to rehabilitation. As shown in Figure 1, a typical final highwall profile at Warkworth Mine with an overall slope of approximately 35°, could be blasted to create a slope of approximately 30°. However, a 30° slope would be too steep to establish rehabilitated vegetation due to erosion of topsoil on such angles and does not accord with the mine's final landform objectives. The slopes would only enable aerial seeding. There would also be a risk of ongoing spontaneous combustion from coal seams disrupted by blasting.

Under the proposal the highwalls and endwalls have been left in their final mining profile to avoid further increases to the footprint of the operation being necessitated. It is noted that there is an opportunity for the final highwall and endwall benches to be re-vegetated as part of rehabilitation of Warkworth Mine. This vegetation would be classified as within the final void footprint due to the steep nature of the walls between benches and, therefore, has not been considered in calculations for on-site re-vegetation.

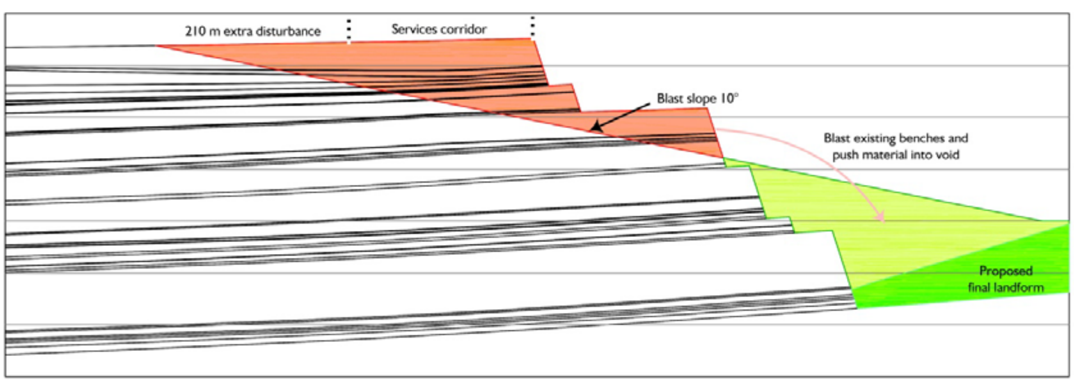
Figure 1 Representative cross-section of final highwall in North Pit showing minimal blasting of benches to achieve a shallower final void slope



c) Reduction in highwall and endwall slopes

Reshaping highwalls and endwalls to final landform slopes of 10° was considered during the mine planning process for the proposal. This option is shown in Figure 2. Under this option additional disturbance outside of the services corridor would be required. The disturbance would encroach on biodiversity offset areas to the north, various endangered ecological communities (EEC) to the west, and Putty Road to the south. The final landform would still contain a depression that would capture and store water. This option would prolong the rehabilitation process and, therefore, increase closure costs. For the preceding reasons, this option was discounted.

Figure 2 Representative cross-section of final highwall in North Pit overlaid with a final landform wall of 100 slope



d) Additional alternatives

Subsequent to DP&E's request for additional information, further scenarios considered during the mine planning process but not described in the EIS are documented below. Investigations considered the rehandling of 40 and 56Mbcm, respectively, from the emplacement areas adjacent to North and West Pit at Warkworth Mine for placement within the pit. An overview of these options is provided below. These provide further justification for the proposed final void demonstrating that alternatives are cost prohibitive, would result in the removal of significant areas of rehabilitation, and would provide little reduction in void surface area.

Option 1

Figure 1 in **Appendix C** provides a typical cross-section of North Pit showing the currently proposed and modified final landform that would result from the removal of 40Mbcm of material from emplacement areas adjacent to the pit and emplacement in the void. The figure also shows the resultant landform. This process would take approximately five years following the completion of mining using one EX5500 excavator. The depth of the void would be approximately 200m under this option. This option was discounted as:

- it would prolong the rehabilitation process and, therefore, increase closure costs;
- it requires the removal of 107ha of rehabilitation; and
- it results in only a minor reduction of the void surface area by approximately 19ha (at RL20).

Option 2

Figure 2 in **Appendix C** provides a typical cross-section of North Pit showing the currently proposed and landform resulting from the removal of 56Mbcm of material from emplacement areas adjacent to the pit being emplaced in the void. The figure also shows the resultant landform. This would take approximately seven years following the completion of mining using one EX5500 excavator. The depth of the void would be approximately 250m under this option.

This option was discounted as:

- it requires the removal of 107ha of rehabilitation;
- it would prolong the rehabilitation process, delaying 43ha of rehabilitation from the period 2028 to 2035 due the excavation of emplacements as opposed to reshaping them prior to 2035;
- it is cost prohibitive occurring at the cessation of mining when no revenue is generated by the mine; and
- it does *not* result in a reduction of the void surface area at RL20.

2.4. Summary

The proposals provide a feasible reduction in final voids across Mount Thorley Warkworth, by using overburden material extracted from Warkworth Mine to fill the final void at MTO. The net result is a one less void and reduction in currently approved final void surface area from 491ha to 445ha.

Further options were considered in the EIS and additional considerations have been undertaken in response to this information request, however are not feasible. Notwithstanding this, opportunities for further refinements will be considered as part of the mine closure plan that would be developed in advance of closure.

3. EPA air quality assessment clarifications

The EPA has requested further clarification on aspects of the air quality assessment response to submissions (RTS). This clarification is provided as follows:

- The air dispersion models operate using Eastern Standard Time (EST) and presented in the EIS in this format. Monitoring data presented in the EIS is based on unedited data (for transparency) in the Australian Eastern Daylight Time (AEDT) format.

- Predicted project and cumulative levels are presented in Section 9 and Appendix E of the EIS. The 24-hour PM10 predictions were based on future years relative to 2012. This is applied in Section 9.5 only of the EIS to assess cumulative levels for this particular parameter in strict accordance with EPA guidelines.

- The full year of data was applied to determine the cumulative 24-hour average PM10 level, and the complete results are presented and described in the EIS/RTS, as required per the guidelines. Although not required by the guidelines, the 2012 emissions inventory and modelling results are provided in Appendix D along with monitoring data in a graphical format.

There are no changes to the outcomes of the air quality assessments associated with the abovementioned clarifications.

Should you wish to further discuss this matter, please do not hesitate to contact the undersigned or Nicola Proctor on 02 6575 5925.

Yours sincerely

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Enc.

Appendix A	Air quality vacant land modelling
Appendix B	Privately-owned vacant lots
Appendix C	Alternative final void profile
Appendix D	Monitoring data & emission inventory

Appendix A

Air quality vacant land modelling

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12 December 2014

Luke Stewart
Director
EMGA Mitchell McLennan
Via email: lstewart@emgamm.com

RE: Warkworth Continuation and Mount Thorley Operations – Dust mitigation strategy for short-term dust impacts

Dear Luke,

Todoroski Air Sciences have quantitatively assessed the effectiveness of the predictive/reactive dust mitigation strategies proposed by the Warkworth Continuation and Mount Thorley Operations to minimise potential short-term dust levels due to the proposed mining operations. This letter provides an update to the previous modelling results which did not quantify the dust levels that would arise from the use of predictive/ reactive dust management strategies.

In November 2014, the NSW Government changed its policy, making the air quality criteria for mining projects more stringent. Per the new policy, (draft Voluntary Land Acquisition and Mitigation Policy) there is now potential scope that the predicted elevated levels in the AQIA may exceed the new criteria, which does not permit any 24-hour average PM_{10} level above 50µg/m^3 due to the mine in isolation at sensitive receptor locations and on greater than 25% of vacant privately-owned land parcels. Thus it is considered prudent to quantify whether the new criteria would be met by the proposed Project when the originally proposed strategies are considered in the modelling results.

The dispersion modelling predictions presented in the *Air Quality and Greenhouse Gas Assessment Warkworth Continuation 2014* (**Todoroski Air Sciences, 2014a**) and the *Air Quality and Greenhouse Gas Assessment Mount Thorley Operations 2014* (**Todoroski Air Sciences, 2014b**) indicated the potential for elevated dust levels to occur in areas in particular to the northwest of Warkworth Mine and to the northeast of MTO.

Incremental 24-hour average PM_{10} impacts are predicted to occur at some privately-owned receptor dwellings in Warkworth Village and is considered that acquisition is afforded to these properties. Applying the new policy, it is determined that there are no new impacts at any other privately owned sensitive receptor, however may be some impacts on greater than 25% of vacant privately-owned land parcels.

Predictive/ reactive mitigation strategies that would reduce these short term elevated dust levels were proposed in the AQIA, and the mine committed to implementing the strategies. Thus revised modelling was conducted to incorporate these proposed mitigation measures, and to determine its effect in reducing short-term dust impacts on privately owned vacant land.

As stated in the respective AQIA's, Warkworth Mine and MTO have an integrated air quality management plan that include a range of air quality mitigation measures to achieve a standard of mine operation consistent with current best practice for the control of dust emissions from coal mines in NSW and includes the use of predictive/ reactive dust management strategies.

Predictive/ reactive dust mitigation strategies can be used to manage these short-term potential elevated dust levels. Such systems can predict the expected conditions on any given day and identify where and when over the coming day(s) that potentially elevated levels of dust may occur. This information means that the day's mining activities can be adjusted to minimise potential dust impacts by positioning fleet and restricting activities at certain times and/or within certain locations when meteorological conditions are adverse.

In conjunction with the predictive systems, real-time air quality monitoring systems are also used to implement reactive dust management measures. Reactive measures are in response changing operations, air dispersion and other factors which may lead to elevated dust levels. Reactive measures are used when pre-set dust rigger levels are recorded via the real-time dust monitoring.

The predictive system provides forewarning to the mine of a potential issue, and allows the mine to take pre-emptive actions to prevent dust emissions occurring in the first instance. The reactive system acts as a fail-safe, such that if a real-time response trigger level is exceeded, the Project would be required to undertake management actions such as relocating or shutting down plant until monitoring indicates that dust levels have fallen below the real-time response trigger.

To assess the effectiveness of these measures in mitigating the predicted worst case elevated dust levels, air dispersion modelling was conducted similarly to that used in the air quality assessment (**Todoroski Air Sciences, 2014a & 2014b**), except that the operation of a predictive/ reactive strategy was applied in the model.

This was coded conservatively in the modelling, generally per a likely reactive strategy, whereby mining activities were temporarily ceased after an elevated one-hour average or rolling 24-hourt average level arose. It is important to note that:

- the modelling and analysis does not "erase" dust already in the air and allows this airborne dust to continue to travel towards receptors well after any mitigation actions are taken (as may occur in reality);
- the modelling is conservative, in that full operations continue for one hour after an elevated trigger level is reached. This is done to reflect the potential for delays in reacting to a trigger. (Note that a predictive strategy would have mitigation actions in place before the elevated level occurs, resulting in even lower levels than those presented in the analysis);
- the modelling does not simply remove high dust values from the predicted results, rather it considers the diurnally varying dust emissions correctly, adjusting only the mine sources that can be controlled by the mine, in response to elevated levels at monitors;

- dust emissions due to wind erosion from the active areas and all activities associated with the CHPP were assumed to continue to operate at all times.

This modelling and analysis serves to demonstrate the proposed reactive dust mitigation measures that include cessation of activities associated with mining operations, whereas in reality Warkworth Mine and MTO would investigate and cease and/or relocate specific fleet as pro-actively and/or reactively required to minimise potential adverse dust impacts based on the predicted levels and/or real-time dust measures.

A comparison of the predicted 24-hour average PM_{10} levels with and without the implementation of a reactive dust mitigation strategy is presented in **Figures 1** to Figure **4** for Year 3, 9 and 14 for Warkworth Mine and Year 9 for MTO respectively. For each of these figures, the predicted 24-hour average PM_{10} isopleth from the AQIA (without mitigation effects considered in the modelling) is overlaid with the revised isopleth (with consideration of mitigation effects) in order to clearly show the effects of implementing the proposed dust mitigation strategy.

The modelling results demonstrate that with the use of a predictive/ reactive mitigation strategy the short-term dust levels in areas to the northwest of Warkworth Mine and the northeast of MTO can be effectively reduced. It is therefore reasonable to conclude that the Projects can minimise and prevent the potential for adverse dust levels occurring at these locations.

Please feel free to contact us if you need to discuss (or require clarification on) any aspect of this report.

Yours faithfully,

Todoroski Air Sciences

Aleks Todoroski | Philip Henschke

References

Todoroski Air Sciences (2014a)

Air Quality and Greenhouse Gas Assessment Warkworth Continuation 2014", prepared for EMGA Mitchell McLennan by Todoroski Air Sciences, June 2014

Todoroski Air Sciences (2014b)

Air Quality and Greenhouse Gas Assessment Mount Thorley Operations 2014", prepared for EMGA Mitchell McLennan by Todoroski Air Sciences, June 2014

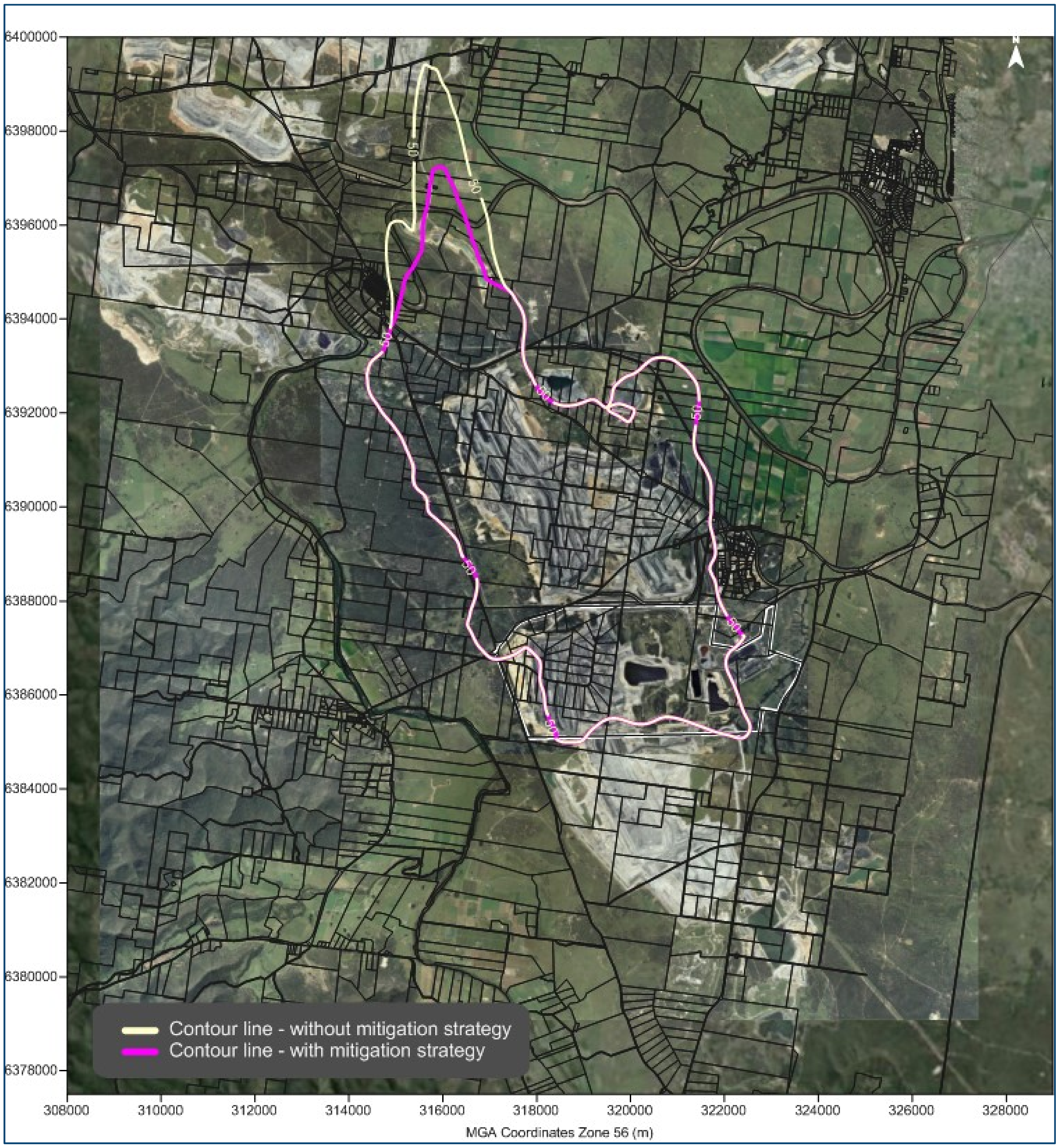


Figure 1: Comparison of predicted 24-hour PM_{10} levels due to Warkworth for Year 3

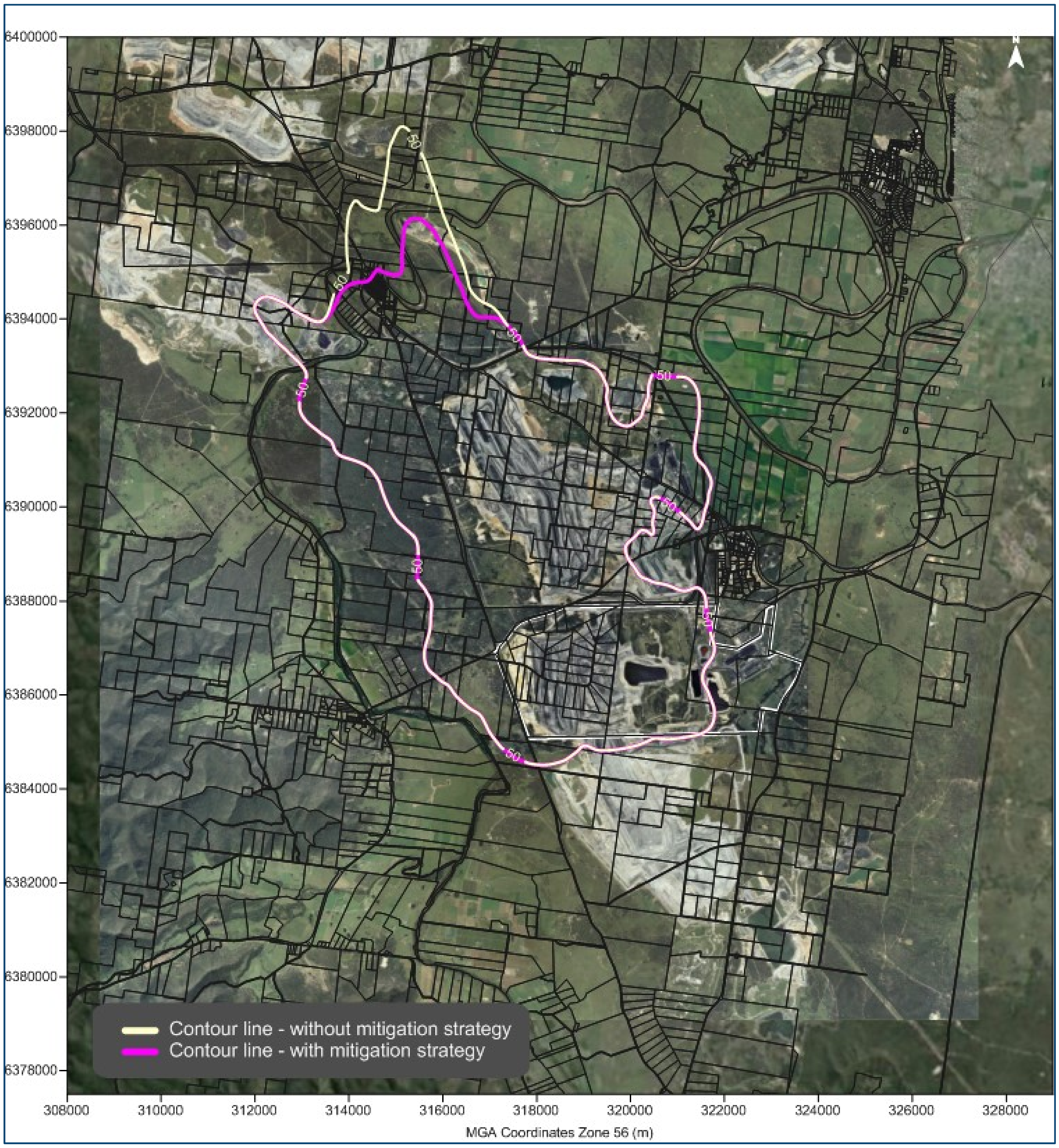


Figure 2: Comparison of predicted 24-hour PM_{10} levels due to Warkworth for Year 9

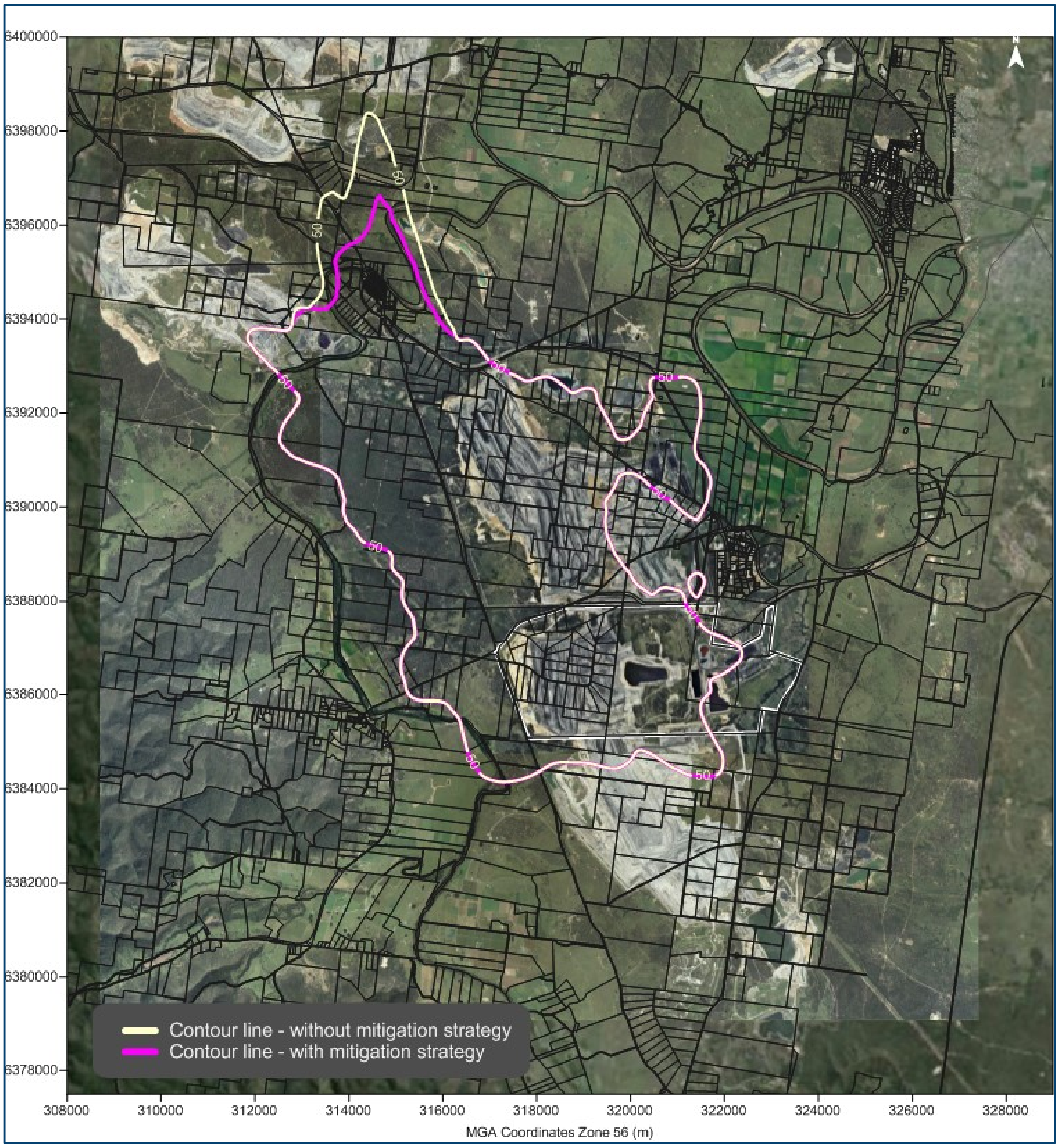
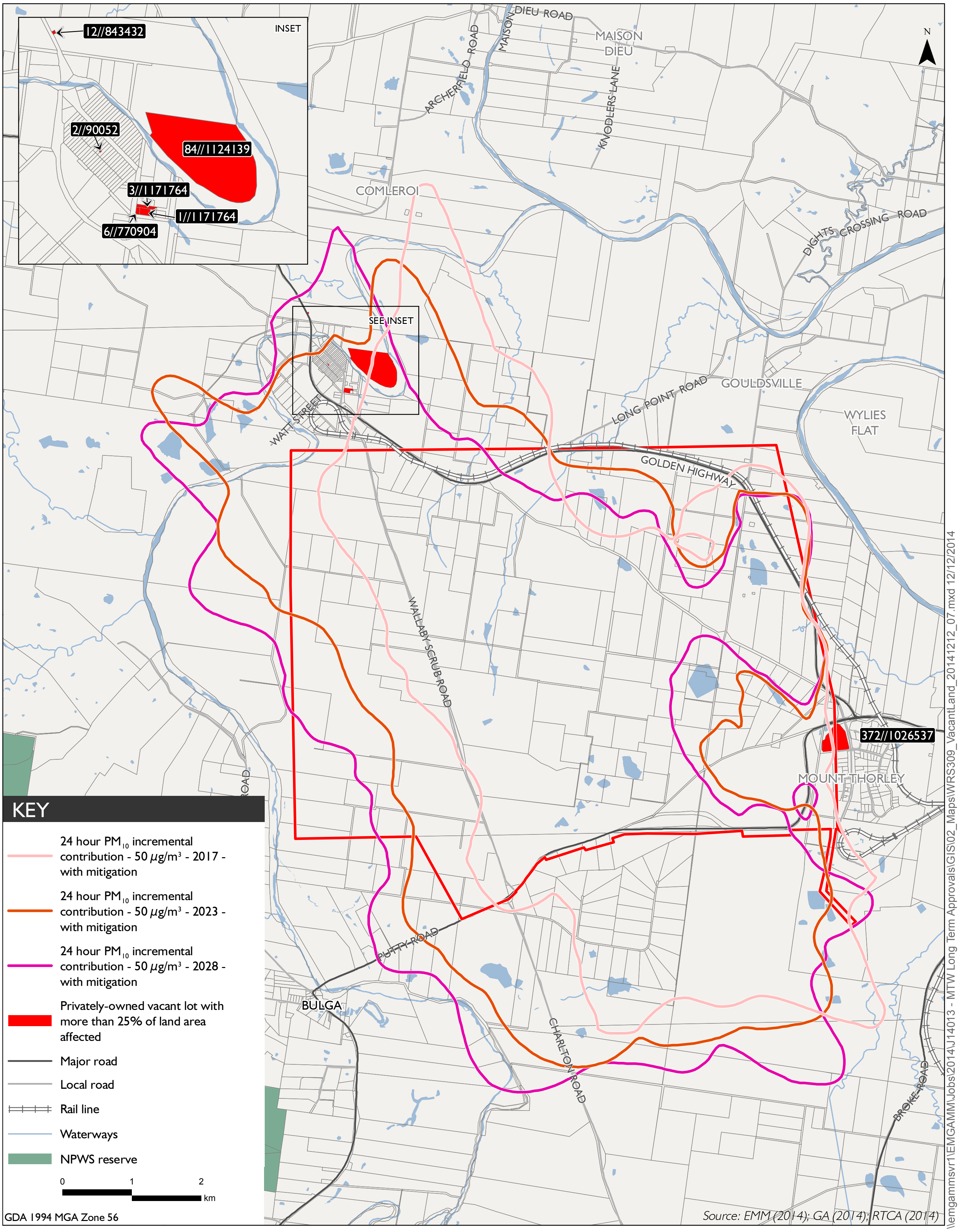


Figure 3: Comparison of predicted 24-hour PM_{10} levels due to Warkworth for Year 14

Figure 4: Comparison of predicted 24-hour PM_{10} levels due to Mount Thorley for Year 9

Appendix B

Privately-owned vacant lots



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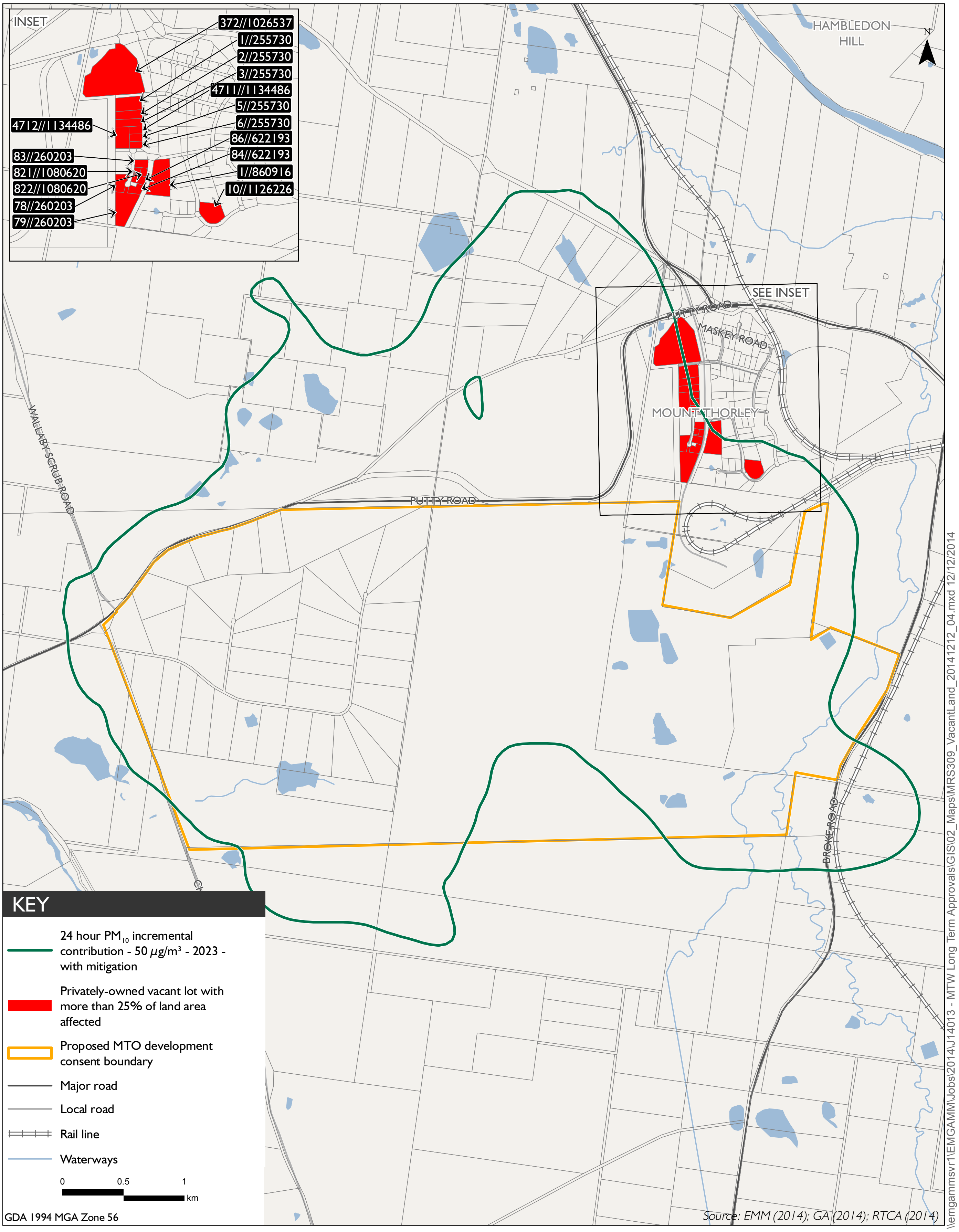
Warkworth 25% vacant land assessment

Warkworth Continuation 2014
Environmental Impact Statement

Figure 1.1



Mount Thorley 25% vacant land assessment

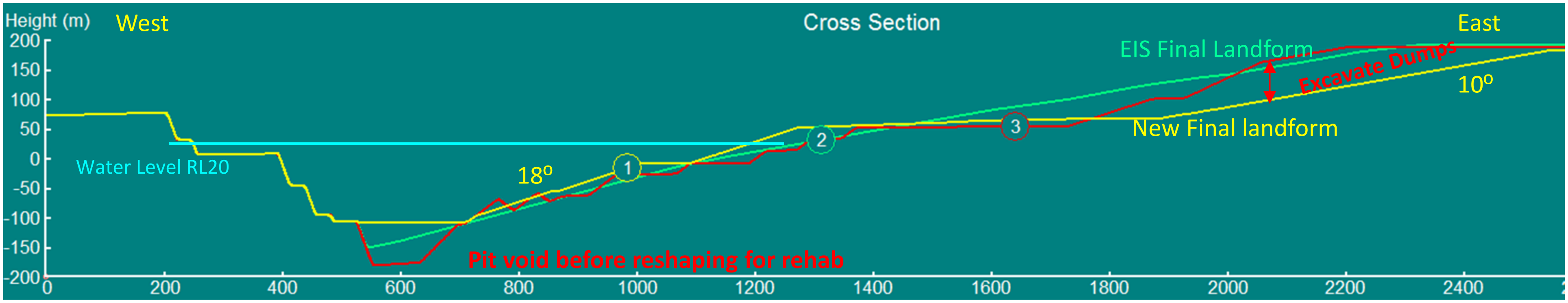
Mount Thorley Operations 2014

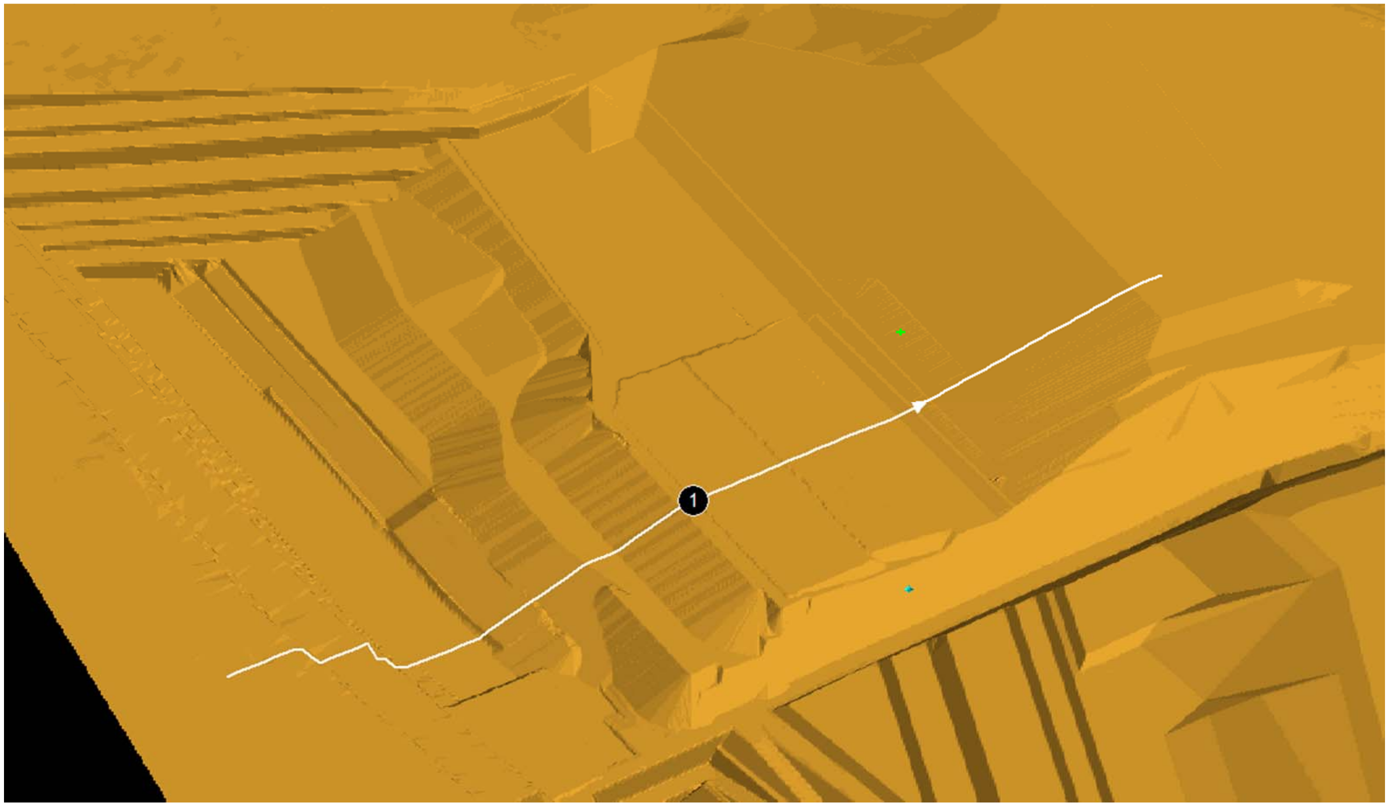
Environmental Impact Statement

Figure 1.1

Appendix C

Alternative final void profile


Height (m)
West
Cross Section
East
EIS Final Landform
Excavate Dumps
10º
New Final landform
Water Level RL20
18º
Pit void before reshaping for rehab
1
2
3
200
150
100
50
0
-50
-100
-150
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400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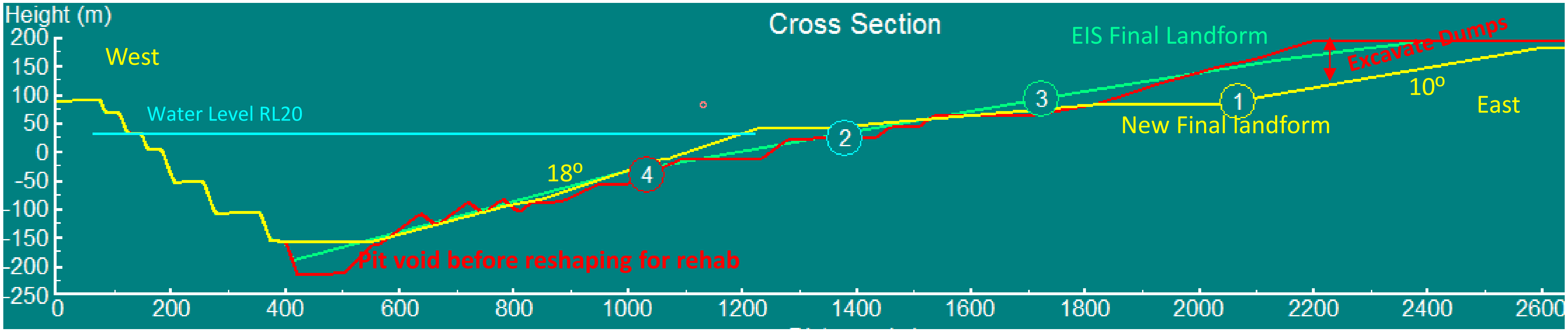

Height (m)
Cross Section
West
East
Water Level RL20
EIS Final Landform
Excavate Dumps
10º
18º
New Final landform
Pit void before reshaping for rehab
1
2
3
4
200
150
100
50
0
-50
-100
-150
-200
-250
0
200
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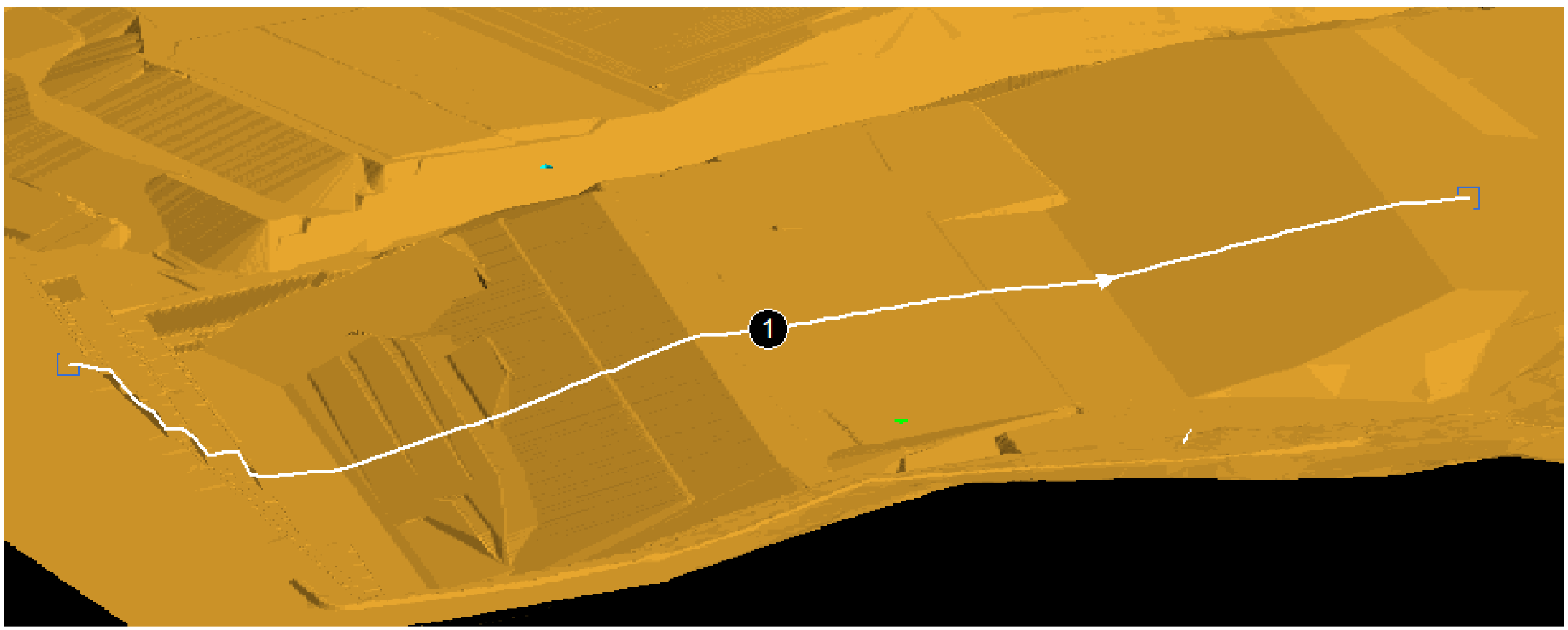
2000
2200
2400
2600



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Appendix D

Monitoring data & emission inventory

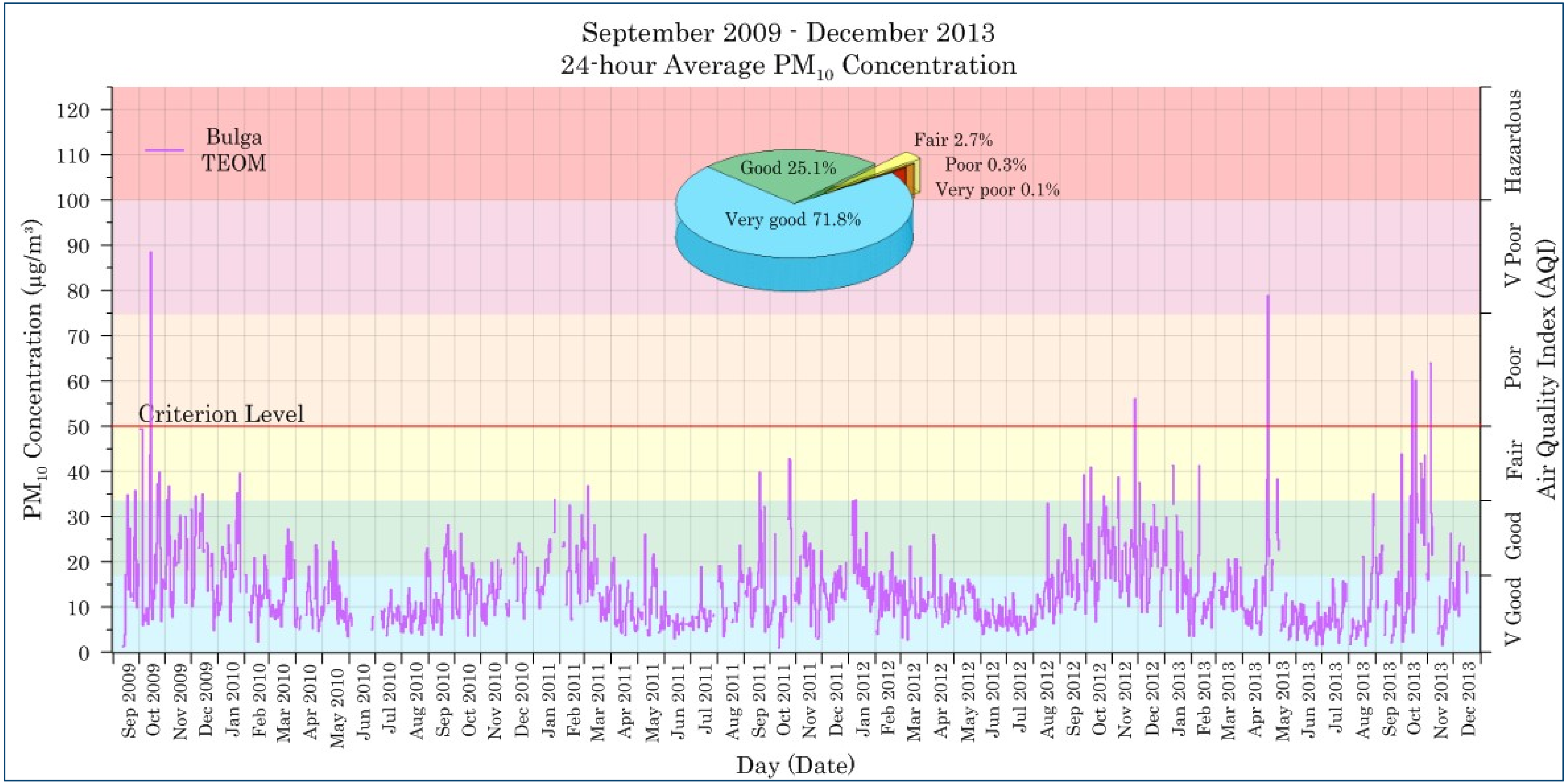

Figure 1: Measured 24-hour average PM_{10} concentrations at MTW Bulga TEOM monitor

ACTIVITY	TSP emission (kg/y)	Intensity	Units	Emission Factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Variable 5	Units	Variable 6	Units
Warkworth																	
OB - Dozers stripping topsoil	1,674	100	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
OB - Drilling	8,059	45,532	holes/year	0.59	kg/hole											70	% Control
OB - Blasting	377,241	330	blasts/year	1143	kg/blast	30,000	Area of blast in square metres										
OB - Dragline	994,907	31,313,090	bcm/year	0.032	kg/m³	7	drop height in m	2	moisture content in %								
OB - Loading OB to haul truck	149,895	88,431,507	tonnes/yea	0.00170	kg/t	1.432	average of (wind speed/2.2)^1	2	moisture content in %								
OB - Hauling to emplacement area	1,399,208	88,431,507	tonnes/yea	0.079	kg/t	240	tonnes/load	6.5	km/return trip	2.9	kg/VKT	1.8	% silt c	275	Ave GMV (to	80	% Control
OB - Emplacing at area	149,895	88,431,507	tonnes/yea	0.00170	kg/t	1.432	average of (wind speed/2.2)^1	2	moisture content in %								
OB - Dozers in pit	561,547	33,554.56	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
OB - Dozers on dump and rehab	198,474	11,860	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
CL - Drilling	818	27,265	holes/year	0.10	kg/hole											70	% Control
CL - Blasting	11,620	53	blasts/year	220	kg/blast	10,000	Area of blast in square metres										
CL - Dozers ripping/pushing/clean-up	146,608	4,262	hours/year	34.4	kg/h	8	silt content in %	7	moisture content in %								
CL - Loading ROM coal to haul truck	605,896	10,791,643	tonnes/yea	0.056	kg/t	7	moisture content in %										
CL - Hauling ROM to hopper - Warkworth CHPP	143,253	7,159,880	tonnes/yea	0.100	kg/t	190	tonnes/load	7.0	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CL - Hauling ROM to hopper - Mt Thorley CHPP	74,739	3,631,763	tonnes/yea	0.103	kg/t	190	tonnes/load	7.2	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CHPP - Unloading ROM to hopper - Warkworth CHPP	60,299	7,159,880	tonnes/yea	0.056	kg/t	7	moisture content in %									85	% Control
CHPP - Rehandle ROM at hopper - Warkworth CHPP	12,060	1,431,976	tonnes/yea	0.056	kg/t	7	moisture content in %									85	% Control
CHPP - Dozer pushing ROM coal - Warkworth CHPP	42,997	1,250	hours/year	34.4	kg/h	8	silt content in %	7	moisture content in %								
CHPP - Dozer pushing Product coal - Warkworth CHP	13,593	1,250	hours/year	10.9	kg/h	5	silt content in %	11	moisture content in %								
CHPP - Loading Product coal to stockpile - Warkwort	538	4,602,780	tonnes/yea	0.00016	kg/t	1.432	average of (wind speed/2.2)^1	11	moisture content in %							25	% Control
CHPP - Loading Product coal to train - Warkworth C	215	4,602,780	tonnes/yea	0.00016	kg/t	1.432	average of (wind speed/2.2)^1	11	moisture content in %							70	% Control
CHPP - Loading rejects - Warkworth CHPP	451	2,531,357	tonnes/yea	0.00018	kg/t	1.432	average of (wind speed/2.2)^1	10	moisture content in %								
CHPP - Hauling rejects - Warkworth CHPP	43,411	2,531,357	tonnes/yea	0.086	kg/t	190	tonnes/load	6.0	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CHPP - Unloading rejects - Warkworth CHPP	451	2,531,357	tonnes/yea	0.00018	kg/t	1.432	average of (wind speed/2.2)^1	10	moisture content in %								
CHPP - Conveying to Redbank from Warkworth CHPP	1,047	1.0	ha	3,504	kg/ha/year											70	% Control
CHPP - Conveying to train load out from Warkworth C	732	0.7	ha	3,504	kg/ha/year											70	% Control
WE - Overburden emplacement areas - Warkworth	1,393,880	795.6	ha	3,504	kg/ha/year											50	% Control
WE - Open pit - Warkworth	1,715,532	489.6	ha	3,504	kg/ha/year												
WE - ROM stockpiles - Warkworth	34,269	19.6	ha	3,504	kg/ha/year											50	% Control
WE - Product stockpiles - Warkworth	14,839	8.5	ha	3,504	kg/ha/year											50	% Control
Grading roads	110,784	180,000	km	0.62	kg/VKT	8	speed of graders in km/h										
Subtotal	8,268,931																
Mt Thorley																	
OB - Dozers stripping topsoil	1,674	100	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
OB - Drilling	4,963	28,039	holes/year	0.59	kg/hole											70	% Control
OB - Blasting	232,313	203	blasts/year	1143	kg/blast	30,000	Area of blast in square metres										
OB - Dragline	479,104	15,079,024	bcm/year	0.032	kg/m³	7	drop height in m	2	moisture content in %								
OB - Loading OB to haul truck	92,309	54,458,031	tonnes/yea	0.00170	kg/t	1.432	average of (wind speed/2.2)^1	2	moisture content in %								
OB - Hauling to emplacement area	742,355	54,458,031	tonnes/yea	0.068	kg/t	240	tonnes/load	5.6	km/return trip	2.9	kg/VKT	1.8	% silt c	275	Ave GMV (to	80	% Control
OB - Emplacing at area	92,309	54,458,031	tonnes/yea	0.00170	kg/t	1.432	average of (wind speed/2.2)^1	2	moisture content in %								
OB - Dozers in pit	345,813	20,664	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
OB - Dozers on dump and rehab	122,224	7,303	hours/year	16.7	kg/h	10	silt content in %	2	moisture content in %								
CL - Drilling	454	15,147	holes/year	0.10	kg/hole											70	% Control
CL - Blasting	6,455	29	blasts/year	220	kg/blast	10,000	Area of blast in square metres										
CL - Dozers ripping/pushing/clean-up	81,449	2,368	hours/year	34.4	kg/h	8	silt content in %	7	moisture content in %								
CL - Loading ROM coal to haul truck	336,609	5,995,357	tonnes/yea	0.056	kg/t	7	moisture content in %										
CL - Hauling ROM to hopper - Mt Thorley CHPP	198,780	5,995,357	tonnes/yea	0.166	kg/t	190	tonnes/load	11.6	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CL - Hauling Warkworth ROM to hopper - Mt Thorley	47,750	3,631,763	tonnes/yea	0.066	kg/t	190	tonnes/load	4.6	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CHPP - Unloading ROM to hopper - Mt Thorley CHPP	50,491	5,995,357	tonnes/yea	0.056	kg/t	7	moisture content in %									85	% Control
CHPP - Unloading Warkworth ROM to hopper - Mt Th	30,586	3,631,763	tonnes/yea	0.056	kg/t	7	moisture content in %									85	% Control
CHPP - Rehandle ROM at hopper - Mt Thorley CHPP	16,215	1,925,424	tonnes/yea	0.056	kg/t	7	moisture content in %									85	% Control
CHPP - Dozer pushing ROM coal - Mt Thorley CHPP	42,997	1,250	hours/year	34.4	kg/h	8	silt content in %	7	moisture content in %								
CHPP - Dozer pushing Product coal - Mt Thorley CHP	13,593	1,250	hours/year	10.9	kg/h	5	silt content in %	11	moisture content in %								
CHPP - Loading Product coal to stockpile - Mt Thorle	723	6,188,863	tonnes/yea	0.00016	kg/t	1.432	average of (wind speed/2.2)^1	11	moisture content in %							25	% Control
CHPP - Loading Product coal to train - Mt Thorley C	289	6,188,863	tonnes/yea	0.00016	kg/t	1.432	average of (wind speed/2.2)^1	11	moisture content in %							70	% Control
CHPP - Loading rejects - Mt Thorley CHPP	606	3,403,643	tonnes/yea	0.00018	kg/t	1.432	average of (wind speed/2.2)^1	10	moisture content in %								
CHPP - Hauling rejects - Mt Thorley CHPP	33,077	3,403,643	tonnes/yea	0.049	kg/t	190	tonnes/load	3.4	km/return trip	2.7	kg/VKT	1.8	% silt c	234	Ave GMV (to	80	% Control
CHPP - Unloading rejects - Mt Thorley CHPP	606	3,403,643	tonnes/yea	0.00018	kg/t	1.432	average of (wind speed/2.2)^1	10	moisture content in %								
CHPP - Conveying to train load out from Mt Thorley C	318	0.3	ha	3,504	kg/ha/year											70	% Control
WE - Overburden emplacement areas - Mt Thorley	503,874	287.6	ha	3,504	kg/ha/year											50	% Control
WE - Open pit - Mt Thorley	720,420	205.6	ha	3,504	kg/ha/year												
WE - ROM stockpiles - Mt Thorley	30,748	17.6	ha	3,504	kg/ha/year											50	% Control
WE - Product stockpiles - Mt Thorley	24,743	14.1	ha	3,504	kg/ha/year											50	% Control
Grading roads	22,157	36,000	km	0.62	kg/VKT	8	speed of graders in km/h										
Subtotal	4,276,004																
Total TSP emissions (kg/yr)	**12,544,935**																