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17 June 2016

John Hindmarsh
Senior Environmental Officer
Rix's Creek Pty Limited
Via email: jhindmarsh@rixs.com.au

RE: Response to Agency Submissions for Rix's Creek Continuation of Mining Project

Dear John,

The following outlines additional information and clarification to address the New South Wales (NSW) Environment Protection Authority (EPA), Singleton City Council and NSW Health submissions relating to the Air Quality Assessment (AQA) for the Rix's Creek Continuation of Mining Project (the Project) (**Todoroski Air Sciences, 2015**).

There are five issues raised by the NSW EPA in its submission, one from Singleton City Council and one from NSW Health. Each of the issues for each of the submissions are addressed below.

NSW EPA Submissions

1. *Estimation of emissions from diesel engines*

"Based on the above emissions of particulate matter from diesel engines have not been adequately estimated, and the assessment does not appear to nominate controls for particulate emissions from diesel engines. The EPA requires the proponent determine and report the change to total emissions and resultant impact, and specify measures to minimise emissions from this source."

It is noted that EPA raised this issue previously, and were informed that the US EPA AP-42 emission factor equations used in the AQA for hauling activities include contributions from diesel exhaust emissions. The emission factor equations do not distinguish between separate sources of emissions from haul trucks as all of the emissions were measured when deriving the equations. The equations report reductions in total dust due to reduced silt content of surface roads (arising from regular watering to maintain a plastic, moist surface).

Direct measurements by Todoroski Air Sciences (TAS) which included exhaust and wheel generated particulate showed that regular watering was able to reduce total emissions by more than 85%. Thus whilst it would be correct (as EPA states), that watering only controls wheel generated dust, it does not follow that this underestimates the total emissions (as EPA assumes).

The EPA appears to be concerned that diesel exhaust particulate may not have been adequately estimated due to the use of the 85% control factor for haul road emissions, and requires this to be quantified.

To address the EPA requirement, some further hypothetical calculations were made, as outlined below.

To determine the level of impact of the haul truck diesel exhaust emissions, the potential diesel exhaust emissions were estimated separately and compared with the modelled emissions presented in the AQA. The worst-case, Year 2023 emission estimates are used to address the EPA request.

To estimate potential particulate matter (PM) emissions from the diesel powered equipment, the emission factor set out in the US EPA Federal Tier II standards of emissions for diesel equipment was applied for the number of haul road vehicles obtained from Table D-3 in Appendix D of the AQA, and assuming a load factor and average operational hours as those assumed in the NSW EPA Emissions Inventory (**NSW EPA, 2012**).

This resulted in an estimated amount of approximately 18,108 kg/year of total PM emissions from haul road vehicle exhaust in Year 2023.

$PM_{2.5}$ emissions from hauling operations are 43,455 kg/year when applying an 85% control factor per the US EPA emission factor equations (i.e. as modelled) or 58,847 kg/year when applying an 85% control factor only to the emissions due to mechanical processes.

The difference of approximately 15,392 kg/year is calculated to represent the potentially underestimated emissions as necessary to meet the EPA request to show further details, as outlined in **Table 1**.

Table 1: Summary of changes related to vehicle exhaust as requested by EPA

Parameter	TSP	PM_{10}	$PM_{2.5}$
Mass of emissions at mine			
Total emissions for Year 2023 (kg)	2,951,166	1,153,296	138,112
Hypothetically underestimated haul road vehicle exhaust PM emissions (kg)	15,392	15,392	15,392
Percentage of Total emissions (%)	0.5 %	1.3%	11.1%
Concentrations of emissions from mine at most impacted private receptors			
Maximum predicted annual average result at private receptor (µg/m³)	17	10	1
Potential change in predicted annual average result due to additional vehicle exhaust PM emissions (µg/m³)	0.09	0.13	0.11
Percentage of criteria of potential change in predicted annual average result (%)	0.1%	0.4%	1.4%

The estimated effect on total emissions from the mine is approximately 0.5% for TSP and 1.3% for PM_{10}.

The effect of this potential change in emissions would be a potential change in the maximum predicted concentrations at the most affected private receptors of 0.09µg/m^3 for TSP and 0.13µg/m^3 for PM_{10}, which is small and well within the accuracy of the modelling. Overall this indicates that even if there were any potential underestimation of emissions due to haul road vehicle exhaust, this would be negligible and would not affect the conclusions of the AQA.

It should also be noted that due to the purchase of the Integra Open Cut Mine by the Rix's Creek Mine, it is proposed that a scaling back of existing and proposed operations would occur, particularly during Year 2023. Thus predicted impacts would be significantly lower than presented in the AQA and shown in the above table.

Therefore to answer EPA's question; it is not expected that there would be any significant change in total emissions, nor in resultant impacts.

Control measures that would be used to ensure emissions from diesel engines are minimised where possible include the following measures that would be applied for the project:

- Where possible, the excess use of vehicles and plant should be minimised by scheduling operations to maximise efficiency (e.g. operating plant near capacity to minimise run time, kilometres travelled etc);
- When not in use, engines of on-site vehicles and plant would be switched off;
- Emissions performance will be one of the key factors considered when any new plant is purchased. Plant with low emissions will be given a higher preference rating;
- Any new plant or vehicles purchased will have appropriate pollution reduction devices fitted;
- Vehicles and plant will be maintained and serviced according to manufacturer's specifications; and,
- Fleet optimisation will be applied to reduce vehicle kilometres travelled.

2. Impacts of proposal

"The cumulative assessment finding that six non-mine receptors are expected to experience additional days above the 24-hour PM_{10} criterion should be included in the summary in section 16 and the Executive Summary"

Noted.

It is also relevant to point out that since the assessment was conducted, Rix's Creek have proposed to scale back operations due to their recent purchase of the Integra Coal Mine. The scaling back of production is proposed to occur during a five year period spanning approximately 2021 to 2025. This would see the peak production of the Project reduced to levels similar to the other years.

The revised production schedule for material handled during 2023 is outlined in **Table 2**. Total movement of material is proposed to be reduced by approximately 25% during this period which would lead to a reduction in total dust emissions of approximately 18%.

Table 2: Summary of revised schedule for Rix's Creek during 2023

	Project	Reduced Schedule	Difference	% Reduction
Waste Total (BCM)	28,349,739	20,960,000	7,389,739	26%
Coal Total (Tonnes)	4,127,857	3,594,140	533,717	13%
Total Movement (BCM)	31,298,208	23,527,243	7,770,965	25%
TSP emissions (kg/year)	2,951,116	2,432,562	518,554	18%

BCM – Bench cubic metres

The reduction in total dust emissions would also reduce impacts from the project in the surrounding environment. To demonstrate this potential reduction, air dispersion modelling for the reduced schedule during Year 2023 was conducted.

Table 3 and **Table 4** present the model predictions for the reduced schedule during Year 2023 at each of the privately-owned and mine-owned sensitive receptor locations respectively. The values presented in bold indicate predicted values above the relevant criteria.

The privately-owned receptor locations highlighted in orange are already identified in the acquisition zone for other mine operations. These receptors are impacted at levels above the criteria regardless of the Project.

It is noted that Rix's Creek have recently acquired receptors R172 and R174 and these are now considered as mine-owned receptors. The predicted results for these receptor locations are shown in **Table 4**.

Table 3: Modelling predictions for 2023 – privately-owned receptors

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project impact						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria / Advisory reporting standard									
	25*	-	50	-	-	2	8*	30	90	4
1	8	2	62	14	25	0.8	8	32	79	2.9
2	2	0	12	2	3	0.0	6	19	56	2.2
3	1	0	10	1	2	0.0	6	18	54	2.1
4	1	0	10	1	2	0.0	6	18	54	2.1
5	1	0	10	1	1	0.0	6	18	54	2.1
6	1	0	8	1	1	0.0	6	17	53	2.1
7	1	0	11	1	1	0.0	6	18	54	2.1
8	1	0	11	1	1	0.0	6	18	53	2.1
9	1	0	10	1	1	0.0	6	17	53	2.0
10	1	0	8	1	1	0.0	6	17	53	2.0
11	1	0	8	0	1	0.0	6	17	52	2.0
12	1	0	4	0	0	0.0	6	17	52	2.0
13	1	0	9	1	1	0.0	6	17	52	2.0
14	1	0	8	1	1	0.0	5	15	33	1.7
15	3	1	21	4	7	0.2	6	21	59	2.3
16	3	1	25	4	7	0.2	6	21	59	2.3
17	4	1	28	5	8	0.2	7	21	59	2.3
18	4	1	33	4	6	0.2	6	21	59	2.2
19	4	1	34	4	7	0.2	7	21	59	2.2
20	4	0	29	3	5	0.1	6	20	58	2.2
21	4	0	28	3	5	0.1	6	20	57	2.2
22	3	0	26	3	5	0.1	6	20	57	2.2
23	3	0	24	3	4	0.1	6	20	57	2.2
24	2	0	13	2	3	0.1	6	19	56	2.2
25	2	0	15	3	5	0.2	6	19	55	2.2
26	2	0	16	3	5	0.2	6	19	55	2.2
27	3	0	21	3	4	0.1	6	19	56	2.2
28	2	0	15	3	5	0.2	6	19	55	2.2
29	2	0	13	2	4	0.1	6	18	55	2.2
30	2	0	14	2	4	0.2	6	18	54	2.2
31	3	0	19	3	5	0.1	6	19	56	2.2
32	3	0	19	3	6	0.2	6	20	57	2.2
33	3	0	23	3	5	0.2	6	20	57	2.2
34	3	0	22	3	5	0.1	6	19	56	2.2
35	2	0	16	3	5	0.2	6	19	56	2.2
36	2	0	18	2	4	0.1	6	19	55	2.2
37	2	0	18	3	5	0.2	6	19	56	2.2
38	2	0	18	2	4	0.1	6	19	55	2.1
39	3	0	19	2	4	0.1	6	19	55	2.2
40	3	1	21	4	6	0.3	6	19	56	2.3
41	3	1	23	5	7	0.3	6	20	57	2.3

Receptor ID	PM$_{2.5}$ (µg/m³)		PM$_{10}$ (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM$_{2.5}$ (µg/m³)	PM$_{10}$ (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project impact						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria / Advisory reporting standard									
	25*	-	50	-	-	2	8*	30	90	4
42	3	1	24	5	8	0.3	6	20	58	2.3
43	3	1	22	4	6	0.2	6	19	56	2.3
44	3	1	25	5	8	0.3	6	21	58	2.4
45	2	0	18	3	5	0.2	6	18	55	2.2
46	3	0	20	4	6	0.2	6	19	55	2.2
47	3	1	26	6	10	0.4	7	21	60	2.5
48	3	1	25	6	9	0.5	7	21	60	2.5
49	3	1	24	5	9	0.4	6	21	59	2.5
50	3	1	22	5	8	0.4	6	20	57	2.4
51	2	0	17	3	5	0.2	6	18	54	2.2
52	2	0	19	4	6	0.3	6	19	55	2.3
53	3	1	22	5	8	0.5	6	20	58	2.5
54	3	1	26	6	10	0.5	7	22	60	2.5
55	4	1	27	6	11	0.5	7	22	61	2.6
56	2	0	14	4	6	0.5	6	19	55	2.6
57	3	1	20	5	9	0.8	6	21	59	2.9
58	3	1	22	6	10	0.9	7	22	60	3.0
59	3	1	20	5	8	0.5	6	21	59	2.6
60	2	1	18	4	7	0.6	6	20	57	2.7
61	5	1	36	8	14	0.7	7	25	65	2.7
62	3	1	21	5	8	0.4	6	21	59	2.5
63	2	1	16	4	7	0.6	6	19	56	2.6
64	2	1	17	4	7	0.6	6	19	56	2.7
65	4	1	32	8	13	0.9	7	24	64	3.0
66	2	1	17	4	6	0.5	6	19	56	2.5
67	2	1	18	4	7	0.6	6	20	57	2.6
68	2	1	17	4	7	0.6	6	19	56	2.6
69	2	1	16	4	6	0.5	6	19	55	2.6
70	2	0	15	3	6	0.4	6	18	54	2.5
71	3	1	20	5	8	0.8	6	21	58	2.9
72	3	1	22	5	9	0.8	6	21	59	2.9
73	2	1	17	4	6	0.4	6	19	55	2.5
74	2	1	18	5	8	0.8	6	20	58	2.8
75	2	1	16	4	7	0.6	6	19	56	2.7
76	3	1	26	6	11	0.5	7	23	62	2.6
77	2	1	18	4	7	0.5	6	20	58	2.6
78	3	1	25	6	10	0.9	7	22	61	3.0
79	3	1	28	7	11	0.7	7	23	62	2.8
80	3	1	25	6	10	0.8	7	22	61	2.9
81	2	0	16	3	5	0.4	6	18	54	2.4
82	2	0	16	3	5	0.4	6	18	54	2.4
83	2	0	13	2	3	0.2	6	17	52	2.1
84	2	0	15	3	4	0.2	6	17	53	2.2
85	2	0	15	4	6	0.5	6	19	55	2.6
86	2	0	14	3	5	0.4	6	18	54	2.4

Receptor ID	PM2.5 (µg/m³)		PM10 (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project impact						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria / Advisory reporting standard									
	25*	-	50	-	-	2	8*	30	90	4
87	2	0	14	3	5	0.4	6	18	55	2.5
88	2	0	13	3	4	0.3	6	18	54	2.3
89	2	0	15	3	6	0.4	6	19	55	2.5
90	2	0	15	4	6	0.5	6	19	55	2.6
91	2	0	16	4	6	0.5	6	19	56	2.6
92	2	0	14	3	5	0.3	6	18	54	2.3
93	2	0	12	3	5	0.3	6	18	54	2.3
94	2	0	15	3	5	0.3	6	19	55	2.4
95	2	0	14	3	5	0.4	6	19	55	2.4
96	2	0	16	2	3	0.1	6	17	52	2.0
97	2	0	18	3	5	0.2	6	18	54	2.1
98	2	0	18	3	4	0.1	6	18	54	2.1
99	2	0	16	3	4	0.1	6	18	53	2.1
100	2	0	16	2	4	0.1	6	18	53	2.1
101	2	0	15	2	3	0.1	6	17	52	2.0
102	2	0	15	2	4	0.1	6	17	53	2.1
103	2	0	14	2	3	0.1	6	17	52	2.0
104	3	0	20	3	5	0.2	6	19	55	2.1
105	2	0	18	3	4	0.1	6	18	54	2.1
106	2	0	18	3	4	0.1	6	18	53	2.0
107	2	0	17	2	4	0.1	6	18	53	2.1
108	2	0	17	2	4	0.1	6	18	53	2.0
109	2	0	16	2	4	0.1	6	17	53	2.0
110	2	0	16	2	3	0.1	6	17	53	2.0
111	2	0	15	2	3	0.1	6	17	52	2.0
112	2	0	14	2	3	0.0	6	17	52	2.0
113	2	0	15	2	3	0.0	6	17	52	2.0
114	2	0	14	2	3	0.0	6	17	52	2.0
115	2	0	15	2	3	0.0	6	17	52	2.0
116	2	0	14	2	3	0.0	6	17	52	2.0
117	2	0	16	2	3	0.0	6	17	53	2.0
118	2	0	16	2	3	0.1	6	18	53	2.0
119	2	0	14	2	3	0.0	6	17	52	2.0
120	2	0	15	2	3	0.0	6	17	53	2.0
121	2	0	17	2	3	0.0	6	18	53	2.0
122	2	0	17	2	3	0.0	6	18	53	2.0
123	1	0	7	1	1	0.0	6	17	52	2.1
124	1	0	6	0	1	0.0	6	17	52	2.1
125	1	0	7	1	1	0.0	6	17	52	2.1
126	1	0	6	1	1	0.0	6	16	51	2.0
127	1	0	6	1	1	0.0	6	16	51	2.0
128	1	0	7	1	1	0.0	6	16	51	2.0
129	1	0	6	1	1	0.0	6	16	51	2.0
130	1	0	9	1	1	0.0	6	16	51	2.0
131	2	0	12	1	2	0.0	6	16	51	2.0

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project impact						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria / Advisory reporting standard									
	25*	-	50	-	-	2	8*	30	90	4
132	1	0	9	1	2	0.0	6	16	50	2.0
133	1	0	6	1	1	0.0	6	15	50	1.9
134	1	0	7	0	1	0.0	6	17	52	2.1
135	1	0	7	0	1	0.0	6	17	53	2.1
136	3	0	23	4	6	0.1	6	18	36	1.8
137	3	1	26	4	6	0.1	6	20	57	2.1
138	4	1	27	4	7	0.1	6	20	57	2.1
139	3	0	23	4	6	0.1	6	18	36	1.8
140	4	1	32	6	9	0.2	7	22	60	2.2
141	2	0	11	2	2	0.0	6	17	52	2.0
142	1	0	9	1	1	0.0	6	17	52	2.0
143	2	0	11	1	2	0.0	6	17	52	2.0
144	2	0	11	1	2	0.0	6	17	52	2.0
145	1	0	10	1	1	0.0	6	17	52	2.0
146	2	0	12	1	2	0.0	6	17	52	2.0
147	1	0	10	1	1	0.0	6	17	53	2.1
148	2	0	11	1	1	0.0	6	18	54	2.1
149	3	0	20	2	3	0.0	6	18	36	1.8
150	2	0	14	1	2	0.0	6	19	56	2.2
151	2	0	13	1	1	0.0	6	19	56	2.2
152	3	0	23	3	5	0.1	6	19	56	2.1
153	3	0	21	3	5	0.1	6	19	55	2.0
154	3	0	21	3	5	0.1	6	19	55	2.0
155	3	0	24	3	5	0.1	6	19	56	2.1
156	3	0	21	3	4	0.1	6	19	54	2.0
157	3	0	23	3	5	0.1	6	19	55	2.0
158	3	0	20	3	4	0.0	6	18	54	2.0
159	3	0	23	3	5	0.1	6	19	55	2.0
160	2	0	18	2	4	0.0	6	18	54	2.0
161	2	0	17	2	3	0.0	6	18	54	2.0
162	2	0	16	2	3	0.0	6	18	53	2.0
163	3	0	20	2	2	0.0	6	18	53	2.0
164	3	0	22	2	3	0.0	6	20	56	2.1
165	2	0	15	1	2	0.0	6	20	56	2.2
166	2	0	18	2	3	0.0	6	18	53	2.0
167	2	0	17	2	3	0.0	6	19	56	2.1
168	2	0	17	2	3	0.0	6	19	56	2.1
169	2	0	16	2	2	0.0	6	19	56	2.1
170	5	1	36	9	13	0.2	16	101	219	5.3
171	5	1	36	10	16	0.3	8	33	77	2.4
173	5	1	38	8	12	0.1	9	37	82	2.4
175	2	0	14	2	3	0.0	8	35	82	2.6
176	3	1	20	4	5	0.1	9	37	85	2.5
177	2	0	14	2	2	0.0	9	43	98	2.8

*Advisory NEPM reporting standard applicable to the population as a whole

Table 4: Modelling predictions for 2023 – mine-owned receptors

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project impact						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria / Advisory reporting standard									
	25*	-	50	-	-	2	8*	30	90	4
M1	2	0	16	2	3	0.0	9	38	88	2.7
M2	3	0	19	3	4	0.0	10	53	120	3.2
M3	3	0	20	3	4	0.0	11	54	124	3.5
M4	4	1	30	6	9	0.1	10	45	99	2.7
M5	5	1	35	7	10	0.1	8	35	79	2.4
M6	5	1	36	7	10	0.1	9	38	85	2.5
M7	5	1	35	7	10	0.1	9	42	93	2.7
M8	3	0	21	2	2	0.0	6	18	53	2.0
M9	3	0	19	2	2	0.0	6	18	53	2.0
M10	2	0	17	2	2	0.0	6	17	52	2.0
M11	2	0	18	2	3	0.0	6	18	53	2.0
M12	2	0	15	2	2	0.0	6	17	52	2.0
M13	2	0	15	2	2	0.0	6	17	53	2.0
M14	2	0	15	2	3	0.0	6	17	53	2.0
M15	2	0	12	2	2	0.0	6	17	52	2.0
M16	6	1	47	10	17	0.9	7	26	68	3.0
M17	8	2	62	15	27	0.8	8	32	79	2.9
M18	8	2	63	16	29	0.9	8	33	81	2.9
M19	10	3	77	21	38	1.3	9	39	92	3.3
M20	10	3	80	22	39	1.4	9	39	93	3.4
M21	6	1	44	10	17	0.5	7	28	70	2.6
M22	9	2	69	17	30	1.0	8	35	83	3.1
M23	7	2	55	13	22	0.7	8	31	75	2.8
M24	1	0	12	1	1	0.0	6	18	54	2.1
M25	1	0	11	1	1	0.0	6	18	54	2.1
M26	1	0	11	1	1	0.0	6	17	53	2.1
M27	1	0	10	1	2	0.0	6	21	59	2.2
M28	1	0	4	0	1	0.0	7	27	68	2.2
M29	4	1	28	5	7	0.1	8	32	75	2.3
M30	4	1	29	5	7	0.1	8	33	77	2.3
M31	4	1	27	5	7	0.1	8	34	78	2.4
M32	1	0	9	1	1	0.0	7	24	64	2.4
M172	4	1	26	6	8	0.1	10	44	97	2.7
M174	4	1	27	5	8	0.1	8	35	80	2.4

*Advisory NEPM reporting standard applicable to the population as a whole

The results in **Table 3** and **Table 4** indicate that overall, the predicted air quality levels for all privately-owned and mine-owned receptors would be lower in comparison to the levels presented in the AQA for year 2023 (Section 9.3).

Table 5 summarises the privately-owned receptor locations where impacts are predicted to exceed relevant assessment criteria for the reduced schedule during Year 2023.

Table 5: Summary of modelled predictions where predicted impacts exceed assessment criteria – Privately-owned receptors

Receptor ID	$PM_{2.5}$	PM_{10}			TSP	DD	
	Total ann. ave	Project only 24-hour ave		Total ann. ave	Total ann. ave	Project only ann. ave	Total ann. ave
	Criterion 8$\mu g/m^3$	Criterion 50$\mu g/m^3$		Criterion 30$\mu g/m^3$	Criterion 90$\mu g/m^3$	Criterion 2g/m^2/mth	Criterion 4g/m^2/mth
	Level of impact - $\mu g/m^3$		No. of days > 50$\mu g/m^3$	Level of impact - $\mu g/m^3$		Level of impact – g/m^2/mth	
1	-	62	4	32	-	-	-
170	16	-	-	101	219	-	5.3
171	-	-	-	33	-	-	-
173	9	-	-	37	-	-	-
175	-	-	-	35	-	-	-
176	9	-	-	37	-	-	-
177	9	-	-	43	98	-	-

The reduced schedule during Year 2023 would also have an effect on minimising the overall potential impacts due to the Project which may extend over more than 25 per cent of any privately-owned land. Such an assessment can only be conducted approximately, based on the predicted pollutant dispersion contours.

The maximum extent of the 6th highest 24-hour average PM_{10} impact due to the Project in isolation with the predicted impact due to the reduced schedule during Year 2023 is presented in **Figure 1**. The result indicates that the conclusions presented in Section 9.7 of the AQA would not change.

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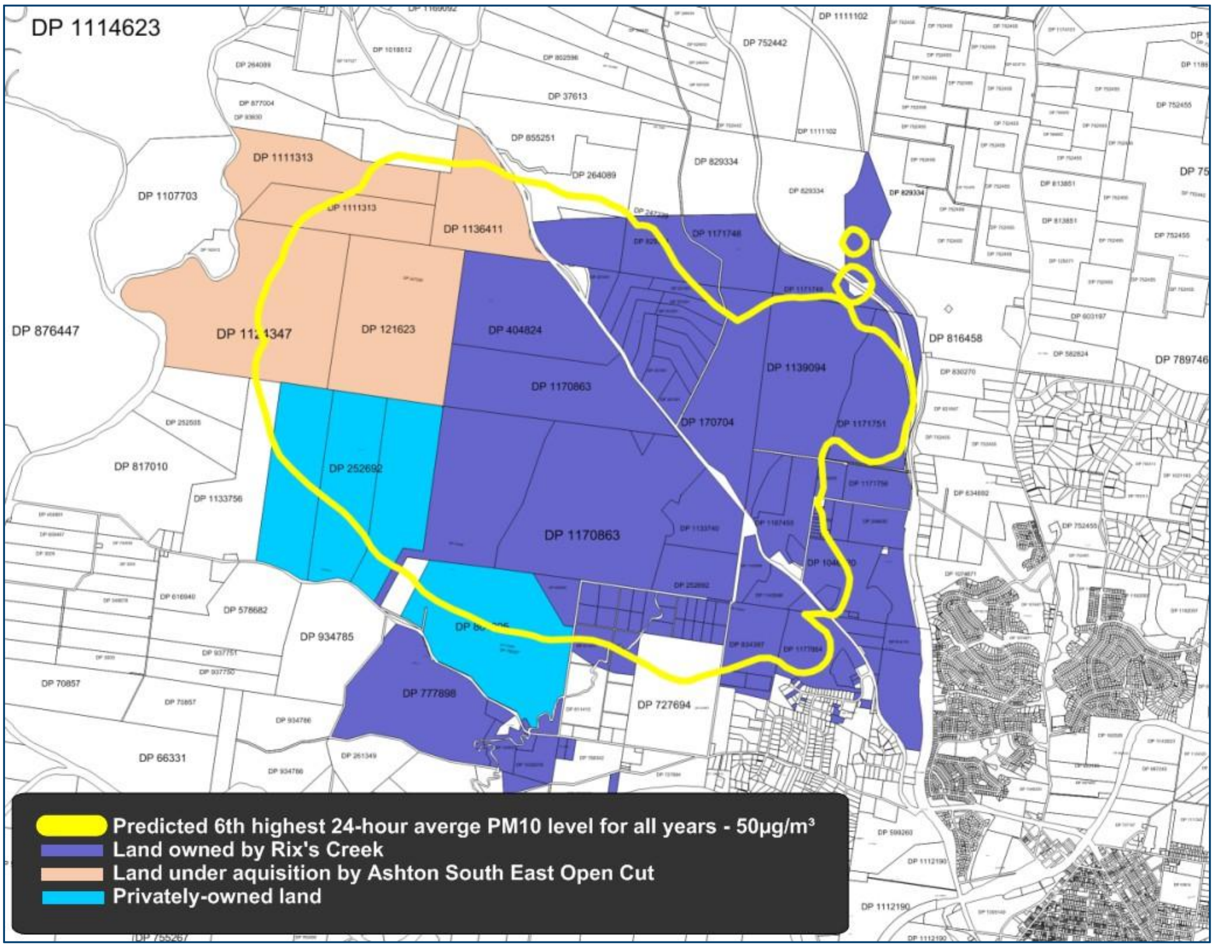

Figure 1: Predicted 6th highest 24-hour average PM_{10} level for all years assessed

A clarification of the AQA has been identified with regards to the sensitive receptor locations presented in Appendix B of the AQA. In Figure B-1 of Appendix B of the AQA, the mine owned receptors labelled as M5 to M33 are incorrect and should be labelled from M4 to M32.

The correct receptor labelling is presented in **Figure 2**.

We also note that the receptor labelling in the figures of Section 11 of the EIS are also incorrect.

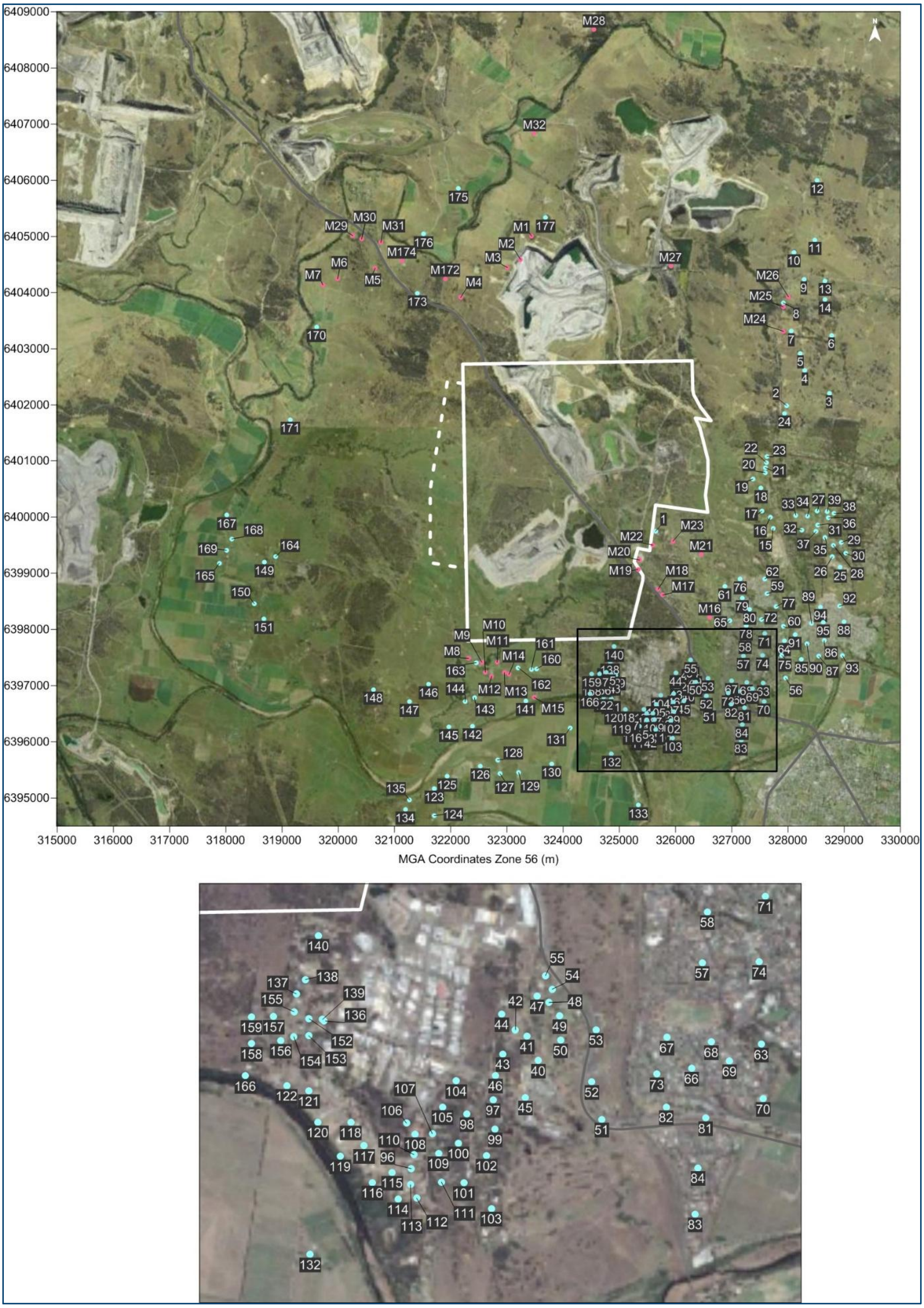

Figure 2: Sensitive receptor locations assessed in the AQA

3. Receptors assessed, including Maison Dieu

"Country Acres Caravan Park at 58 Maison Dieu Road lies to the south-west of the proposed pit expansion and within 500 metres. It does not appear to have been assessed as a receptor. Maitland Diesel Service is located on Rix's Creek Lane and also does not appear to have been assessed as a receptor. The EPA requires the potential impact at these receptors to be assessed."

This issue was previously raised by EPA, and it was informed that receptors in this area were assessed, including receptors even closer to the mine. However, the EPA is concerned that because the receptors closest to the mine were assessed as having potential impacts, other further receptors might have similar impacts and has requested an assessment of Country Acres Caravan Park located at 58 Maison Dieu Road, and Maitland Diesel Services.

As requested by the EPA, a further detailed assessment of the additional receptors in the area of Maison Dieu has been conducted. The analysis examines the Country Acres Caravan Park located at 58 Maison Dieu Road, (assessed in the AQA as privately-owned Receptor 45) and Maitland Diesel Services which is owned and operated by the Rix's Creek Mine, (assessed in the AQA as a mine-owned receptor, Receptor M20).

Maitland Diesel Services is a diesel engine service operation with a primary objective to service and maintain the diesel equipment used at the Rix's Creek Mine. This receptor is considered to be associated with the Rix's Creek Mine (as it would not exist without the mine), and hence no further analysis is performed on this receptor. The predicted air quality impacts at this receptor (M20) are presented in Section 9 of the AQA.

A contemporaneous PM_{10} assessment per the NSW EPA Approved Methods has been performed for the Country Acres Caravan Park (Receptor 45) to determine the extent of potential impacts at this location. A summary of the findings of the contemporaneous assessment is presented in **Table 6**. A time series plot of the 24-hour average PM_{10} concentrations is presented in **Figure 3** and **Figure 4**.

Table 6: NSW EPA contemporaneous assessment – maximum number of additional days above criteria (Country Acres Caravan Park – Receptor 45)

Receptor ID	2017	2020	2023	2026
45	0	1	4	3

The results indicate that the potential cumulative PM_{10} impact which could arise at this location may be between 1 to 4 additional days of impact. A comparison of these predictions with those predicted for Receptor 140 and Receptor 61, which are located closer to the Project than the Country Acres Caravan Park, show that the predicted number of impact days would be lower in only some years, indicating that the predicted levels for the surrounding area would be of a similar magnitude.

It is noted that with the recent purchase of the Integra Open Cut coal mine, the Rix's Creek mine is proposing to reduce the modelled mine schedule/ activity during Year 2023. This would reduce the level of dust emissions and hence the predicted impacts in the worst case year 2023 would be less than shown in the EIS.

The time-series plots presented in **Figure 3** and **Figure 4** indicate that **Table 6** is not an optimal indicator of potential impact. The plots show a general decline in overall impacts over time.

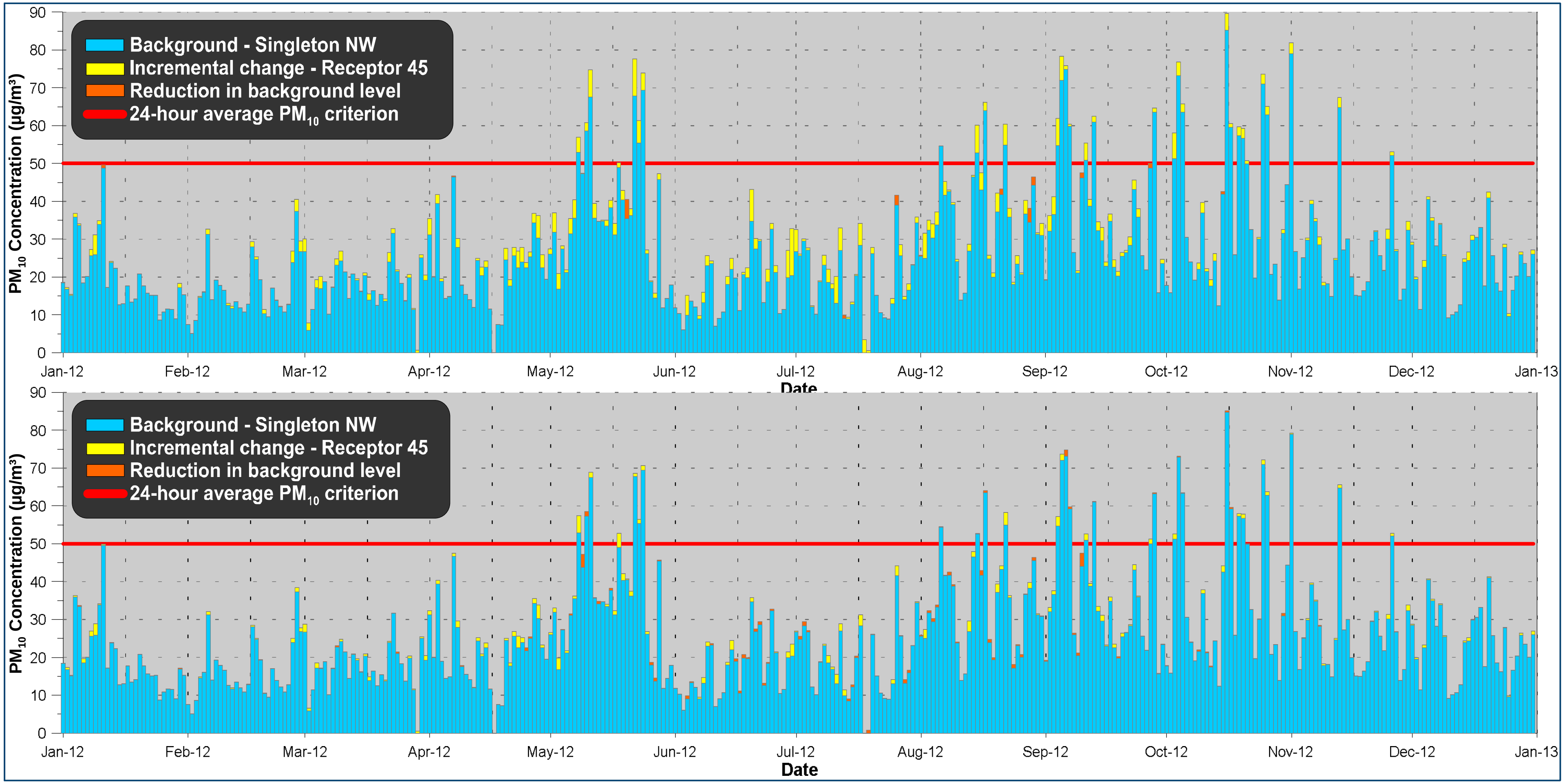

Figure 3: Predicted 24-hour average PM_{10} concentrations for Receptor 45 in Year 2017 and 2020

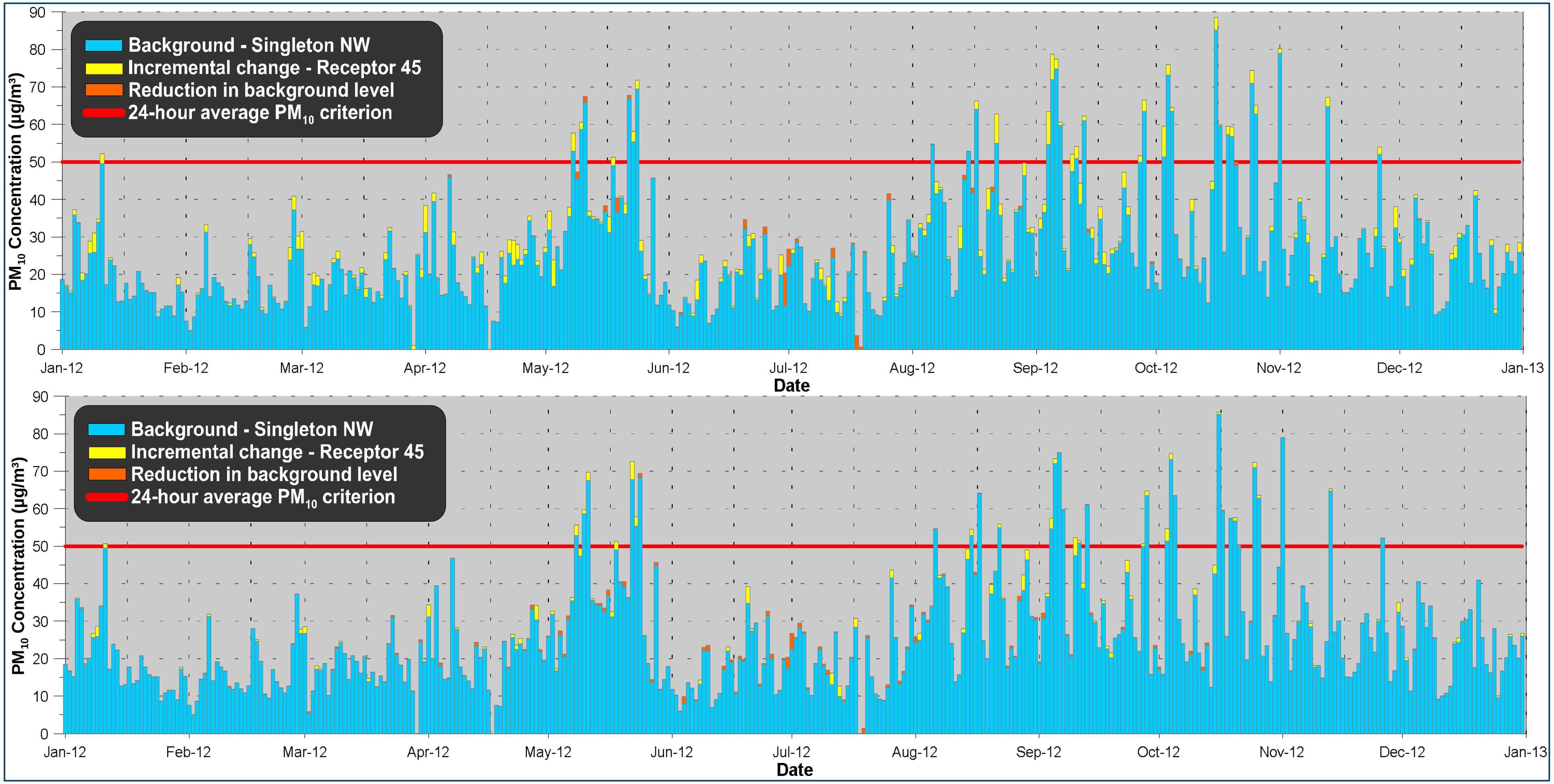

Figure 4: Predicted 24-hour average PM_{10} concentrations for Receptor 45 in Year 2023 (reduced schedule) and 2026

4. *Emissions from wind erosion – stabilised areas*

"Based on the above, all bare areas across the site are subject to wind erosion and should be included in the emissions inventory for the proposal. Active maintenance is needed to maintain stabilisation."

The EPA raised this issue previously, and appear to take the comments in the Pollution Reduction Program (PRP) report (**Rix's Creek, 2015**) out of context. The EPA is not correct to imply that the entire bare surface at Rix's Creek Mine would produce dust due to wind erosion, and that this should be modelled as such. As it is normal to have rainfall in the Hunter Valley, it is not clear why the EPA would imply that rain or inactivity on a bare surface should be considered as an extraordinary factor and not a normal circumstance that leads to reductions in wind erosion emissions. The PRP clearly shows that the bare surfaces on the site become stabilised after rainfall and also actions by Rix's Creek to ensure that inactive areas remain untouched. This is the situation for the majority of the site and also large fractions of bare areas of the site at any one time.

Dust emissions due to wind erosion from the active areas in the AQA have been estimated using an emission factor of 0.4 kg/ha/hour. This emission factor is four times higher than the generally applied emission factor of 0.1 kg/ha/hour set out in the Katestone document *NSW Coal Mining Benchmarking Study: International Best Practise Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (**Katestone, 2011**).

For the same modelled quantity of emissions arising from wind erosion, **Table 7** presents the area that would be exposed to wind erosion when applying the emission factor of 0.4 as modelled and 0.1 kg/ha/hour per the standard emission factor. On this basis, the modelling results are equivalent to having wind erosion from an exposed area four times larger than the active exposed area that is specified in the inventory, so it is not clear why the EPA considers that there is any underestimation of this source of dust.

Table 7: Wind erosion areas for Rix's Creek Mine (ha)

Year	Inventory active exposed overburden area	Inventory active exposed pit area	Inventory total active exposed area, per 0.4kg/ha/year	Equivalent total exposed wind erosion area, per 0.1kg/ha/year
2012	44	34	78	312
2017	45	21	66	262
2020	32	25	58	230
2023	94	38	133	530
2026	58	62	120	481

The right hand column in the table shows what EPA may be accustomed to seeing, i.e. large wind erosion areas based on modelling using low emission rates. The table shows that the modelled emissions from wind erosion from active exposed areas in the AQA are representative of large exposed areas, up to 530 ha.

We trust that this alleviates the EPA's concern in this regard.

Rix's Creek apply various measures to minimise dust emissions due to wind erosion including:

- Minimising the area of disturbance;
- Rehabilitating inactive, completed areas as soon as feasible;
- Applying interim stabilisation on areas inactive for long periods; and,
- Trafficable areas being clearly marked; and vehicle movements restricted to these areas.

5. Nitrogen dioxide emissions from blasting

"It is not clear how the proponent has derived the value of 63.3 kg...

…The EPA requests the proponent provide further details on the derivation of the emission rate of NO_2 from blasting, including the amount of explosive assumed and the emission flux or equivalent information."

The emission rate of NO_2 was derived on the basis of the maximum mass of NO_2 emitted from any measured blast in the CSIRO study of Hunter Valley blasts (**Attala et al., 2008**). This value is 63.3kg and was obtained from Table 1 of the study. The maximum mass of NO_2 was measured on 1 March 2006 (see **Figure 5** below).

7880 M.I. Attalla et al. / Atmospheric Environment 42 (2008) 7874–7883

Table 1
Through plume measurement results

Date	Total ANFO charge (t)	Peak NO_2 Conc (ppm)	Plume volume ($m^3 \times 10^{-6}$)	Mass of NO_2 (kg)	Emission flux ($kg\,t^{-1}$ ANFO)		
					NO	NO_2	NO_x
12/12/2005	281	3.7	1.4	9.9	0.5	0.03	0.6
13/12/2005	150	0.4	5.3	3.7	0.4	0.03	0.4
14/12/2005	119	0.0	0.0	0.0	0.0	0.00	0.0
21/12/2005	229	1.0	4.4	7.9	0.6	0.04	0.6
22/12/2005	211	0.0	0.0	0.0	0.0	0.00	0.0
23/12/2005	222	0.0	0.0	0.0	0.0	0.00	0.0
5/01/2006	177	1.0	0.2	0.4	0.0	0.00	0.0
6/01/2006	275	1.1	15.3	30.6	1.8	0.12	1.9
12/01/2006	225	1.6	6.2	18.3	1.3	0.08	1.4
18/01/2006	169	1.3	1.7	0.2	0.4	0.02	0.4
23/01/2006	139	2.1	4.2	16.7	1.9	0.12	2.0
25/01/2006	155	0.4	4.4	2.9	0.3	0.02	0.4
30/01/2006	132	0.7	5.3	7.1	0.8	0.05	0.9
22/02/2006	224	0.0	0.00	0.0	0.0	0.00	0.0
1/03/2006	194	1.6	20.6	63.3	5.0	0.32	5.3
12/05/2006	362	6.5	1.9	23.3	1.0	0.06	1.1
15/05/2006	131	0.3	3.2	1.7	0.2	0.01	0.2
19/05/2006	168	0.0	0.00	0.0	0.0	0.00	0.0
30/05/2006	100	0.8	0.00	1.0	0.0	0.00	0.0
1/06/2006	365	0.7	3.5	4.9	0.2	0.01	0.2
6/06/2006	145	0.8	11.5	17.5	1.9	0.12	2.0
15/06/2006	60	0.0	0.00	0.0	0.0	0.00	0.0
26/06/2006	254	4.3	0.3	2.1	0.1	0.01	0.2
27/06/2006	212	5.6	0.9	10.0	0.7	0.04	0.7
28/06/2006	241	0.0	0.00	0.0	0.0	0.00	0.0
6/07/2006	565	2.8	2.7	14.0	0.4	0.03	0.4
13/07/2006	184	7.0	1.0	12.6	1.1	0.07	1.2

Source: (**Attalla et al., 2008**)

Figure 5: Extract of Table 1 from CSIRO study of Hunter Valley blast

The emission rate for NO_2 was derived on the basis of this mass of emitted NO_2, consideration of other corroborating information from confidential studies, and the assumptions set out in the AQA for modelling the release of the NO_2 emissions from any blast.

Specifically, these assumptions were to increase the maximum measured rate by a factor of approx. 1.6 and to release all of the NO_2 emissions within a 5-minute period, i.e. 63.3 kg x 1.6 / 5 mins = emission rate (mass per unit time).

The EPA may be incorrectly assuming that the emission rates of NO_2 from blasts were calculated in the AQA on the basis of the amount of explosive used (perhaps because the CSIRO study examines whether there is any such relationship.) The data contained in the CSIRO study (**Attala et al., 2008**) suggest that there is no significant correlation between the amount of explosive used and the generation of NO_2 from a blast. The CSIRO and other contemporary studies show that blast fume emissions can vary greatly depending on a number of factors but largely depend on the tendency of a particular blast (or holes within the shot) to generate significant NO_2 emissions.

Accordingly, no assumptions were made in regard to the amount of explosive used, nor was any assumption or calculation made in regard to the emission flux per unit of explosive used.

Singleton Council

"Council is currently considering a Planning Proposal seeking to rezone land to residential in North Singleton, west of Bridgeman Road and north of Gardner Circuit. While it is acknowledged mining operations are moving away from Singleton it is not clear from the EA the extent of, if any, noise impact on this area having regard to future residential land uses."

Figure 6 shows that for the worst case year assessed, the impacts from the mine would increase in the area proposed to be subdivided.

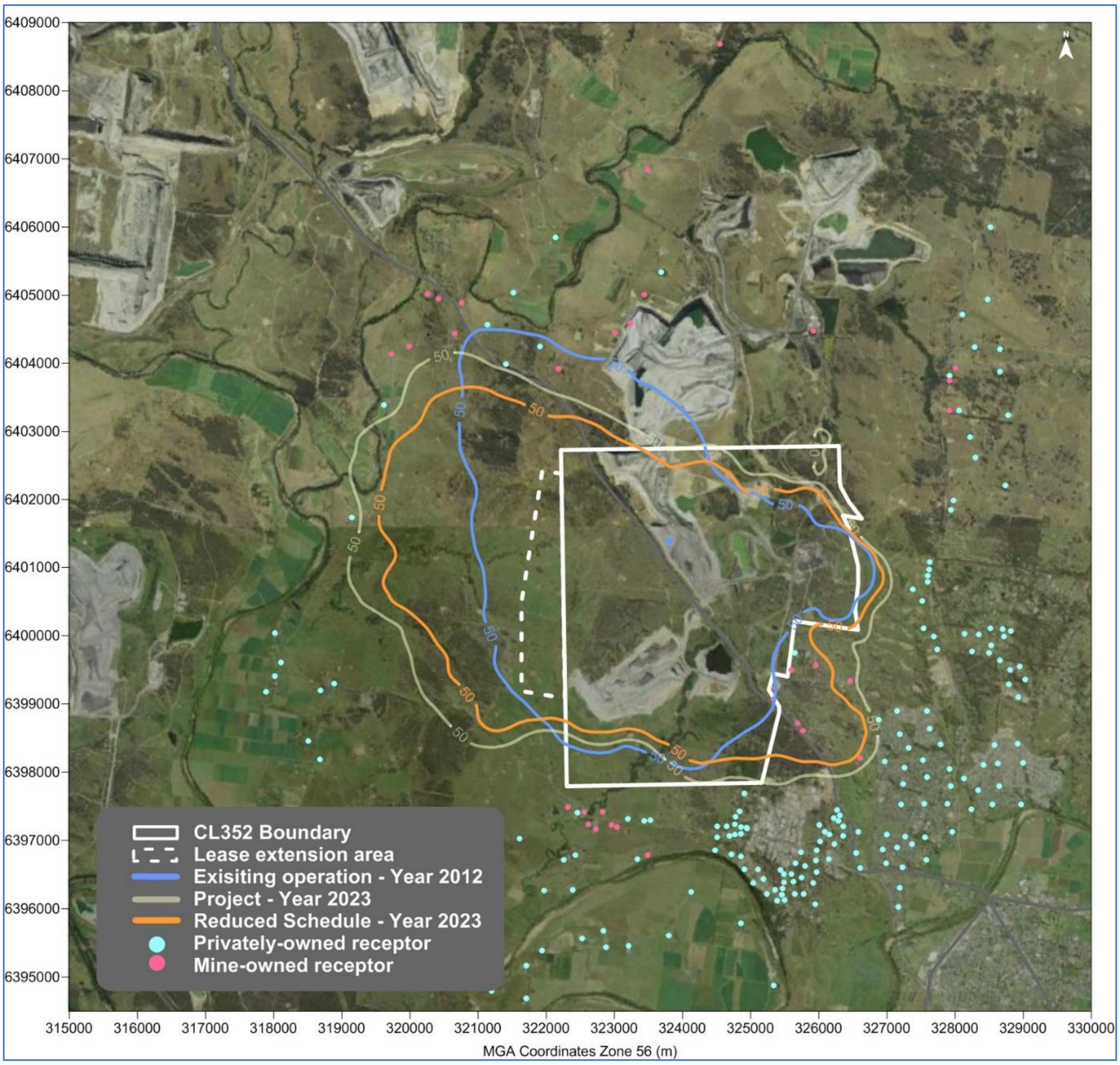

Figure 6: Incremental 24-hour average PM_{10}, existing mine 2012 (blue) vs. Project worst case year 2023 (faded yellow) vs. Project reduced schedule year 2023 (orange)

Figure 7 shows the predicted extent of air quality effects with regard to the:

- maximum 24-hour average PM_{10} level due to only the operation of the mine;
- the change in annual average $PM_{2.5}$ level due to only the change in the mine; and,

- the cumulative annual average PM_{10} level for all years assessed due to the project and estimated background levels combined.

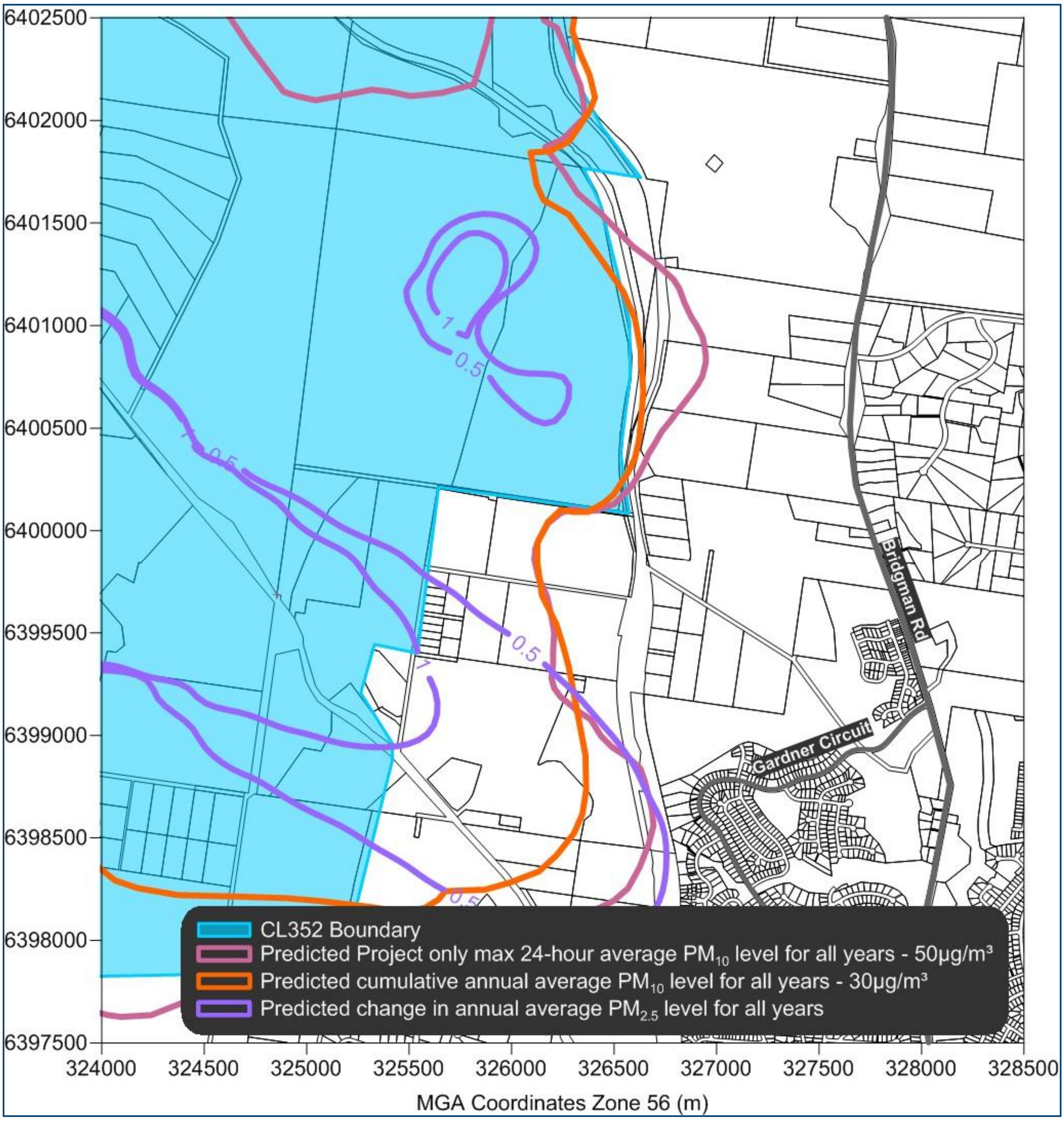

Figure 7: Extent of air quality impacts associated with the Project with reduced schedule year 2023

Note that for 24-hour average PM_{10} there are three NSW criteria that are all set at $50\mu g/m^3$. These criteria are;

- DP&E mitigation criterion for the maximum due only to the operation of the mine (as shown in red);
- DP&E acquisition criterion for the 6th highest due only to the operation of the mine (inside the line shown in red and west of the rail corridor);

- EPA impact assessment criteria for the cumulative level. (Cannot be reasonably shown as a contour as the background level varies daily and is a large component of the cumulative level. Please refer to the discussion below.)

Unfortunately there is no clear published guidance for making the most appropriate planning decisions in this situation. Obviously it is desirable to avoid potential land use conflict and it is imperative to make decisions which would prevent avoidable health impacts.

Therefore, as a guide for making planning decisions in regard to air quality, by reference to **Figure 7** it should be considered that:

1. The annual average PM_{10} and $PM_{2.5}$ impacts are able to be predicted more reliably than short term 24-hour PM_{10} impacts. The reason for this is that the short term weather conditions and mine dust contributions will each vary independently and greatly from time to time and this variation cannot be known with a high degree of certainty far into the future. Annual conditions tend to be more stable and hence more reliably predictable.

2. The cumulative annual average PM_{10} impact contour shown in orange, and the purple change in annual average $PM_{2.5}$ contour at 1µg/m^3 are reliable indicators of the areas where unacceptable dust and health impacts would likely occur and it would not be appropriate to permit any new residential use in these areas.

3. The maximum 24-hour average impact contour is shown in red and provides an indication of the area where short term PM_{10} impacts are likely to arise due to the mine alone. It is not appropriate to permit increased residential habitation within this known impact zone for maximum 24-hour PM_{10}.

   The 24-hour PM_{10} impact per EPA assessment criteria, which include background dust levels would also occur beyond this area (red contour line), the extent of this is dependent on how high the background dust level happens to be at any given time.

   As the background level will increase the size of the mine only 24-hour PM_{10} impact zone (red contour line), it is also good practice to provide a suitable buffer beyond this zone.

4. Although only the total maximum impact line for all years is shown in the Figure, the coal handling and preparation plant will remain in the same location, and so the zone of impact will remain relatively constant near this plant. Mining impacts will progressively reduce, then rise to a maximum in approximately 2023 (+/- 2 to 3 years) and then progressively reduce again as mining moves further west.

Specifying a suitable buffer distance between the mining activities and the proposed residential subdivision would be an appropriate planning strategy. Our suggestion is that the following be considered;

- No new residential development should be permitted west of the railway line.

- No new residential development should be permitted within 400m of the red 24-hour PM_{10} impact contour around the coal handling area. (This is the area in the northern part of the proposed subdivision area where the red 24-hour PM_{10} contour extends over the rail line.) A buffer distance of approximately 400m around this “bulge” in the 24-hour PM_{10} contour is recommended because the coal handling operations would stay in place and not move further west over time.

- For the remainder of the proposed residential development site south, south east of this “bulge” around the coal preparation plant, the area east of a hypothetical dividing line between Bridgman Road and the rail corridor or the red 24-hour PM_{10} impact line may be suitable (but not ideal) for residential use.
- If the land is to be developed this should be done progressively from east to west. New residential development to the west of the hypothetical middle line described above should be avoided until at least 2026 in order to minimise potential land use conflict related to air quality. The reason for this is that after 2026 the potential dust impacts are likely to progressively reduce as mining moves further west. (Note the need for a buffer around the fixed coal handling plant).

NSW Health Submission

"It is important that the EIS should address the likely future air quality standard for annual average PM10 of between 20 and 25 µg/m3 and annual average PM2.5 of 8 µg/m3 as flagged in the Proposed variation to the Ambient Air Quality NEPM. While the EIS states (on page 102) that the "Air quality impacts were assessed having regard to the World Health Organisation (WHO) Air Quality Guidelines (2005) for particulate matter", the EIS did not use the annual goal of 20 µg/m3 recommended by WHO in the document. Our focus in this review is on average annual particulate levels because this measure is most predictive of health impacts and PM2.5 is considered to have more significant health impacts than PM10."

NSW Health is referring to the summary of the AQA in the main body of the EIS. The complete AQA report is included as Appendix L to the EIS and addresses the likely future annual average $PM_{2.5}$ and PM_{10} impacts that may arise due to the project.

The predicted impact at each location is explicitly tabled, and contour diagrams are provided.

Overall, the assessment shows that the project would reduce impacts on the population as it moves further away from the main population areas. In 2023, impacts were assessed to have the potential to increase temporarily above the decreasing trend, before decreasing again in the future, however this period of increased activity (in 2023) is no longer proposed, and the impacts in 2023 would be less than those assessed.

In Section 11 of the AQA, a comparison of the proposed project impacts with the approved impact zone shows that the proposed project would have a greatly reduced zone of impact. It must also be noted that reduced impacts would occur due to improvements in mining methods (i.e. since the original approval), and also the proposed project design.

The assessment explicitly considers the most relevant health metric (annual average $PM_{2.5}$) and makes an assessment per the NEPM advisory reporting standard in this regard.

It is important to note that NEPM air quality standards are not designed to be applied to specific projects. The NEPM standards apply to the average exposure to air pollutants of the general population, in each state. The NEPM requires that the states report to the Commonwealth on the trends in air quality by way of reference to the standards.

Potential air quality impacts from individual projects on individual residents are assessed per impact assessment criteria.

Whilst at the time of preparing the assessment it was known that the NEPM was under review, the NEPM goals were not known or agreed, and it is not presently known if any revised goals might be applied in some form as future impact assessment criteria.

On page 104 in the main body of the EIS, in the section outlining the criteria applied, under the subheading of health impacts, it is stated that: *"Assessment of potential human health impacts has been carried out by reference to the WHO criteria and NEPM reporting standard for $PM_{2.5}$."*

This is consistent with NSW Health's focus in its review, and the AQA does include PM_{10} impact contours at the 20 µg/m^3 level.

The WHO considers that health impacts are most closely correlated with $PM_{2.5}$ levels, and has set health based criteria of 10µg/m^3 for annual average $PM_{2.5}$. The WHO promulgates PM_{10} criteria as a surrogate for its $PM_{2.5}$ health criteria as measuring $PM_{2.5}$ is costly and measurement is not as widespread as for PM_{10}.

This allows the larger number of existing and generally more reliable PM_{10} monitors to be used to manage $PM_{2.5}$ levels, and protect health over a wider area.

The WHO PM_{10} criterion is set at 20 µg/m^3 (twice the level of the health based $PM_{2.5}$ criterion) as PM_{10} levels are generally twice the $PM_{2.5}$ levels in most jurisdictions that the WHO has assessed (mainly urban areas in the Northern Hemisphere).

The WHO states that where $PM_{2.5}$ and PM_{10} levels are known, the PM_{10} criteria can be adjusted to reflect the known fraction of $PM_{2.5}$. This means that in areas such as the Hunter Valley, where the $PM_{2.5}$ level is generally less than half of the PM_{10} level, a higher PM_{10} criterion would apply to manage health.

In the Hunter Valley, approximately 35%[1] of the PM_{10} in the ambient air is comprised of $PM_{2.5}$, hence the applicable WHO criterion for annual average PM_{10} would be approximately 29µg/m^3. If only the monitors outside of the three urban areas of Singleton, Muswellbrook and Denman are considered, $PM_{2.5}$ comprises approximately 33% of the PM_{10} and the annual average PM_{10} criteria that the WHO would apply to manage health effects would be 31 µg/m^3. Either way, a level close to the NSW EPA criterion of 30µg/m^3 would be appropriate for the Hunter Valley.

"The village of Camberwell is inside the contours for modelled worst case annual PM2.5 and PM10 goals (using 30 µg/m3 as the goal) (Figures 11.7, 11.8, 11.9, 11.10). Figures 11.9 and 11.10 depicting modelled worst case annual average PM10 only provide a 30 µg/m3 contour. Displaying a 20 µg/m3 and 25 µg/m3 contour (as relevant to the goal promoted in the variation to the Australian NEPM) would be of great use in assessing the impact on the nearby settlements such as McDougalls Hill and Singleton Heights. While the Rix's Creek project may only contribute a small (but not insignificant) proportion of particulate emission to the local communities, it is the total impact that is important from a cumulative impact assessment perspective. The intensive mining in this area will likely exceed current and particularly future air quality goals making it difficult to argue that increased particulate emissions are acceptable from a cumulative impact perspective. There are multiple and significant impacts on receptors 170 – 177. The EIS appears to dismiss these impacts because the properties are eligible for acquisition, however, rights to acquisition do not diminish or negate the cumulative impact to these communities (page 111)"

NSW Health is referring to the summary of the AQA in the main body of the EIS. The complete AQA report is included as Appendix L to the EIS.

The AQA includes incremental and cumulative contours that have significantly more figures containing considerably more detail than shown in the summary figures which NSW Health is referring to and which are in the main body of the EIS.

The impacts at residences in Camberwell and other properties in the vicinity are not intended to be "dismissed" because the properties are eligible for acquisition. The impacts at these locations arise due to the existing situation, irrespective of the Project, and the intention is to be clear that the impacts from all mines have been modelled, and to also show that these cumulative impacts are properly represented in the assessment. The project makes very little difference to the levels of impact at these locations and the predicted change due to the project would be well within any natural variation in the background levels of the ambient environment, or the modelling precision. This should not be misinterpreted as construing a dismissal of the properties that are already affected. The intention is to reasonably assess the predicted impacts in the context of the receiving environment.

[1] The $PM_{2.5}/PM_{10}$ ratio (up to 2015) at all of the thirteen Hunter $PM_{2.5}$ monitors where PM_{10} data are also collected.

Further analysis was also conducted in regard to the cumulative air quality impacts for the receptors outside of but near the village of Camberwell. **Table 8** to **Table 11** present a breakdown of predicted annual average PM_{10} impacts for each of the modelled years. The tables show the predicted contribution from Rix's Creek, the other mine operations and the applied background concentrations.

It should be noted that the predicted impacts due to the other mining operations cannot be as accurate as those for Rix's Creek as it is necessary to make various assumptions about these other mine operations without the benefit of detailed site specific information.

Table 8: Breakdown of predicted annual average PM_{10} impacts – Year 2017

Receptor ID	Rix's Creek	Other mine operation	Background	Total
170	6.7	60.6	11.5	78.8
171	9.1	8.8	11.5	29.4
173	8.2	23.5	11.5	43.2
175	2.1	22.6	11.5	36.2
176	3.5	22.5	11.5	37.5
177	1.5	67.2	11.5	80.3

Table 9: Breakdown of predicted annual average PM_{10} impacts – Year 2020

Receptor ID	Rix's Creek	Other mine operation	Background	Total
170	8.1	80.9	11.5	100.5
171	7.1	10.4	11.5	29.0
173	9.0	18.5	11.5	39.1
175	2.3	22.1	11.5	35.9
176	4.4	22.6	11.5	38.5
177	1.7	29.7	11.5	42.9

Table 10: Breakdown of predicted annual average PM_{10} impacts – Year 2023

Receptor ID	Rix's Creek	Other mine operation	Background	Total
170	9.0	80.3	11.5	100.9
171	10.2	11.4	11.5	33.2
173	7.9	17.3	11.5	36.7
175	2.2	21.7	11.5	35.4
176	3.9	21.7	11.5	37.1
177	1.7	29.4	11.5	42.6

Table 11: Breakdown of predicted annual average PM_{10} impacts – Year 2026

Receptor ID	Rix's Creek	Other mine operation	Background	Total
170	7.1	80.1	11.5	98.7
171	6.8	11.3	11.5	29.6
173	5.7	17.1	11.5	34.3
175	1.6	21.6	11.5	34.7
176	2.8	21.6	11.5	36.0
177	1.2	29.3	11.5	42.0

It can be seen from the tables that the predicted annual average PM_{10} impact due to Rix's Creek is relatively small in comparison to the other mining operations, with the exception of Receptor 171, where the contribution due to Rix's Creek in future years may be similar to the other mining operations. This receptor is currently afforded acquisition rights by other mining operations, and Rix's Creek would also offer such acquisition rights due to impact on more than 25% of the large land parcel, refer to **Figure 1**.

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

Yours faithfully,

Todoroski Air Sciences

Aleks Todoroski

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