APPENDIX C

Revised Air Quality Modelling

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

9 April 2013

Daniel Sullivan
Hansen Bailey on behalf of Anglo American Metallurgical Coal

Re: Drayton South modelling with revised assumptions.

Dear Daniel,

1 INTRODUCTION AND BACKGROUND

Following the recent public exhibition of the Drayton South Coal Project Environmental Assessment (EA), dated November 2012, a range of public submissions were received raising concerns with regard to the potential air quality impacts associated with the Project. In order to appropriately consider and address the concerns raised Anglo American investigated the feasibility of making further commitments to impose additional controls into the Project design in order to attempt and reduce the potential air quality impacts. In addition to this, in order to further improve the accuracy of the air quality modelling for the Project, Anglo American has completed site specific monitoring at the existing Drayton Mine for silt and moisture content percentages associated with the major dust sources including overburden, coal and haul roads. The requirement for site specific monitoring and data has been requested by recent Planning Assessment Commissions for other major coal mining projects and hence has been undertaken in part to pre-empt this contemporary requirement for air quality assessments.

The additional controls proposed for the Project and updated silt and moisture data for the Projects major dust sources have been incorporated into a revised run of the Project's air quality modelling for the worst case scenarios in years 10 and 15.

This letter provides a summary of the new assumptions, emission estimates and updated modelling results for the Project.

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2 EMISSION ESTIMATES

The Air Quality Assessment (AQA) completed for the EA (**PAEHolmes, 2012**) showed that Year 10 and Year 15 are predicted to result in the highest ground-level concentrations. All other years as modelled for the EA showed no impacts above the relevant assessment criteria at private receptors. As such, the emissions estimates have been revised and remodelled for years 10 and 15 only. The following modifications have been applied to the emission calculations and subsequent dispersions modelling:

- 80% control for all in-pit roads consistent with the latest requirements of the Drayton Coal mine Environmental Protection Licence (EPL) conditions (compared with the previously modelled 75%). All out of pit roads remain at 85% for Dust-a-side.
    - Including an additional 85% control on all in-pit haul roads within the Redbank mine area.
- Aerial seeding of all exposed surfaces at Houston from Year 5 to Year 11, while Houston is dormant
    - 70% control on Houston exposed area
- Revised silt and moisture content %'s based on measured values from samples collected at the existing Drayton operations (see **Table 2-1**)
    - A copy of the analysis of samples collected at Drayton is provided in **Appendix A**.

Table 2-1: Silt and moisture contents - previously modelled compared with measured at Drayton Coal Mine

Source	Silt		Moisture	
	Modelled	Measured	Modelled	Measured
Active OB	10	1.8	2.5	10.9
Inactive OB	N/A	0.5	N/A	6.4
Reject Coal	5	0.2	9	3.9
Product Coal	N/A	0.8	11	5.4
ROM coal	5	1.1	9	6.6
Haul Roads Main	3	0.4	N/A	2.8
Haul Roads In-pit	3	4.1	N/A	2

Table 2-2 presents the emission estimates for each year for both the EA modelling and new assumptions. Whilst emissions from individual activities show an increase or decrease due to these new assumptions (which is dependent on the emission factor equation and the issue of silt and /or moisture values), total emissions are reduced by approximately 28% for both years.

Detailed emission estimates are provided in **Appendix B.**

Table 2-2: Summary of estimated TSP emissions from the Project (kg/y)

ACTIVITY	TSP emissions (kg/y)			
	Year 10		Year 15	
	Original	Revised	Original	Revised
WHYNOT				
Topsoil removal & Site preparation - Dozers on Whynot	30,319	30,319	26,181	26,181
Topsoil removal - Sh/Ex/FELs loading topsoil - Whynot	174	174	119	119
Topsoil removal - Hauling topsoil to emplacement area (east) - Whynot	2,499	2,488	1,586	1,579
Topsoil removal - Hauling topsoil to emplacement area (west) - Whynot	1,666	1,659	1,052	1,047
Topsoil removal - Emplacing topsoil at emplacement area - Whynot	349	349	238	238
OB - Drilling - Whynot	4,596	4,596	3,571	3,571
OB - Blasting - Whynot	30,981	30,981	18,590	18,590
OB - Dozers on Dragline OB in-pit - Whynot	40,707	767	31,819	599
OB - Dragline removal of OB - Whynot	327,232	210,383	305,709	196,545
OB - Dozers on Excavator OB in-pit - Whynot	36,851	694	60,308	1,136
OB - Excavator loading OB to haul truck - Whynot	33,197	4,225	28,513	3,629
OB - Hauling excavator OB to emplacement area (east) - Whynot	325,304	323,849	259,230	258,071
OB - Hauling excavator OB to emplacement area (west) - Whynot	216,831	215,862	171,878	171,109
OB - Dozers on OB haul roads (east) - Whynot	16,713	315	13,676	258
OB - Dozers on OB haul roads (west) - Whynot	16,713	315	13,676	258
OB - Emplacing excavator OB at emplacement area - Whynot	33,197	4,225	28,513	3,629
OB - Dozers on OB emplacement area - Whynot	77,558	1,461	92,128	1,735
OB - Dozers in-pit ancillary tasks - Whynot	89,698	1,690	74,194	1,398

ACTIVITY	TSP emissions (kg/y)			
	Year 10		Year 15	
	Original	Revised	Original	Revised
OB - Dozers ripping/pushing/clean-up Partings - Whynot	32,241	607	24,386	459
OB - Loading partings to haul trucks - Whynot	2,175	277	1,787	227
OB - Hauling partings to emplacement area (east) - Whynot	21,313	21,218	16,244	16,171
OB - Hauling partings to emplacement area (west) - Whynot	14,206	14,143	10,770	10,722
OB - Emplacing Partings at emplacement area - Whynot	2,175	277	1,787	227
CL - Drilling coal and partings - Whynot	2,410	2,410	2,517	2,517
CL - Blasting coal and partings - Whynot	1,257	1,257	2,038	2,038
CL - Dozers ripping/pushing/clean-up ROM in-pit - Whynot	116,553	28,349	88,164	21,444
CL - Sh/Ex/FELs loading open coal to trucks - Whynot	127,591	185,122	98,394	142,760
CL - Hauling open coal in-pit roads (east) - Whynot	53,618	53,378	43,269	43,076
CL - Hauling open coal to ROM pad (east) - Whynot	197,781	48,266	126,527	30,877
CL - Hauling open coal in-pit roads (middle) - Whynot	32,041	31,898	25,559	25,445
CL - Hauling open coal to ROM pad (middle) - Whynot	209,433	51,110	168,644	41,156
CL - Unloading ROM to ROM stockpiles/hopper - Whynot	9,217	9,217	23,694	7,108
CL- Handle coal at CHPP - Whynot	645	995	497	767
CL - Rehandle ROM coal at stockpiles/hopper - Whynot	3,072	3,072	2,369	2,369
BLAKEFIELD				
Topsoil removal & Site preparation - Dozers on Blakefield	5,989	5,989	2,654	2,654
Topsoil removal - Sh/Ex/FELs loading topsoil - Blakefield	65	65	10	10
Topsoil removal - Hauling topsoil to emplacement area - Blakefield	1,062	1,057	117	117
Topsoil removal - Emplacing topsoil at emplacement area - Blakefield	131	131	21	21
OB - Drilling - Blakefield	1,039	1,039	415	415
OB - Blasting - Blakefield	7,002	7,002	2,160	2,160
OB - Dozers on Dragline OB in-pit - Blakefield	8,349	157	4,153	78
OB - Dragline removal of OB - Blakefield	136,395	87,691	64,652	41,566
OB - Dozers on Excavator OB in-pit - Blakefield	1,185	22	-	-
OB - Excavator loading OB to haul truck - Blakefield	1,067	136	-	-
OB - Hauling excavator OB to emplacement area - Blakefield	11,847	11,794	-	-
OB - Dozers on OB haul roads - Blakefield	1,075	20	-	-
OB- Emplacing excavator OB at emplacement area - Blakefield	1,067	136	-	-
OB - Dozers on OB emplacement area - Blakefield	9,534	180	4,153	78
OB - Dozers in-pit ancillary tasks -Blakefield	8,525	161	3,074	58
OB - Dozers ripping/pushing/clean-up Partings - Blakefield	461	9	546	10
OB - loading partings to trucks - Blakefield	134	17	94	12
OB - Hauling partings to emplacement area - Blakefield	1,482	1,475	736	733
OB - Emplacing partings to emplacement area - Blakefield	134	17	94	12
CL - Drilling coal - Blakefield	229	229	104	104
CL - Blasting coal - Blakefield	119	119	84	84
CL - Dozers ripping/pushing/clean-up ROM in-pit - Blakefield	5,923	1,441	2,452	596
CL - Sh/Ex/FELs loading open coal to trucks - Blakefield	12,126	17,593	4,076	5,914
CL - Hauling open coal in-pit roads - Blakefield	5,849	5,823	1,320	1,315
CL - Hauling open coal to ROM pad - Blakefield	50,177	12,245	16,700	4,075
CL - Unloading ROM to ROM stockpiles/hopper - Blakefield	876	2,920	982	294
CL - Handle coal at CHPP - Blakefield	61	61	21	32
CL - Rehandle ROM coal at stockpiles/hopper - Blakefield	292	292	98	98
REDBANK				
Topsoil Removal - Dozers/Excavators stripping topsoil - Redbank	11,928	11,928	13,220	13,220
Topsoil removal - Sh/Ex/FELs loading topsoil - Redbank	89	89	76	76
Topsoil removal - Hauling topsoil to emplacement area (north) - Redbank	1,767	1,319	1,464	1,093
Topsoil removal - Hauling topsoil to emplacement area (south) - Redbank	700	522	601	449
Topsoil removal - Emplacing topsoil at emplacement area - Redbank	178	178	153	153
OB - Drilling for excavator removal - Redbank	1,814	1,814	1,814	1,814
OB - Blasting for excavator removal - Redbank	12,227	12,227	9,442	9,442
OB - Dozers on Excavator OB in-pit - Redbank	34,145	643	72,556	1,367
OB - Excavator loading OB to haul truck - Redbank	30,759	3,915	34,303	4,366
OB - Hauling to emplacement area (north) - Redbank	416,599	311,052	449,777	335,824
OB - Hauling to emplacement area (south) - Redbank	164,914	123,132	184,735	137,932
OB - Dozers on OB haul roads (north) - Redbank	15,486	292	15,517	292
OB - Dozers on OB haul roads (south) - Redbank	15,486	292	15,517	292
OB - Emplacing at emplacement area - Redbank	30,759	3,915	34,303	4,366
OB - Dozers on OB emplacement area -Redbank	34,145	643	72,556	1,367
OB - Dozers in-pit ancillary tasks - Redbank	46,138	869	43,486	819
OB - Dozers ripping/pushing/clean-up Partings - Redbank	12,912	243	9,217	174
OB - Loading partings to trucks - Redbank	1,178	150	1,115	142
OB - Hauling partings to emplacement area (north) - Redbank	15,958	11,915	14,614	10,911
OB - Hauling partings to emplacement area (south) - Redbank	6,317	4,716	6,002	4,482
OB - Emplacing partings at emplacement area - Redbank	1,178	150	1,115	142
CL - Highwall transfer point - Redbank (Y8)	206	318	-	-
CL - Highwall conveyor - Redbank	17	17	-	-
CL - Drilling coal - Redbank	1,240	1,240	1,475	1,475
CL - Blasting coal - Redbank	646	646	1,194	1,194
CL - Dozers ripping/pushing/clean-up ROM in-pit - Redbank	50,472	12,276	41,423	10,075
CL - Sh/Ex/FELs loading open coal to trucks - Redbank	103,004	149,449	57,670	83,674
CL - Hauling open coal in-pit roads - Redbank	214,592	160,224	111,553	83,290
CL - Hauling open coal to ROM pad - Redbank	362,812	88,540	207,755	50,700

ACTIVITY	TSP emissions (kg/y)			
	Year 10		Year 15	
	Original	Revised	Original	Revised
CL - Unloading ROM to ROM stockpiles/hopper - Redbank	7,441	7,441	4,166	4,166
CL - Handle coal at CHPP - Redbank	520	803	291	450
CL - Rehandle ROM coal at stockpiles/hopper - Redbank	2,480	2,480	1,389	1,389
HOUSTON				
Topsoil removal - Dozers/Excavators stripping topsoil - Houston	-	-	6,181	6,181
Topsoil removal - Sh/Ex/FELs loading topsoil - Houston	-	-	29	29
Topsoil removal - Hauling topsoil to emplacement area (east) - Houston	-	-	128	127
Topsoil removal - Hauling topsoil to emplacement area (west) - Houston	-	-	154	154
Topsoil removal - Emplacing topsoil at emplacement area - Houston	-	-	59	59
OB - Drilling - Houston	-	-	836	836
OB - Blasting - Houston	-	-	4,353	4,353
OB - Dozers on Dragline OB in-pit - Houston	-	-	8,293	156
OB - Dragline removal of OB - Houston	-	-	82,210	52,854
OB - Dozers on Excavator OB in-pit - Houston	-	-	11,497	217
OB - Excavator loading OB to haul truck - Houston	-	-	5,436	692
OB - Hauling to emplacement area (east) - Houston	-	-	16,188	16,116
OB - Hauling to emplacement area (west) - Houston	-	-	19,571	19,483
OB - Dozers on OB haul roads (east) - Houston	-	-	2,607	49
OB - Dozers on OB haul roads (west) - Houston	-	-	2,607	49
OB- Emplacing at emplacement area - Houston	-	-	5,436	692
OB - Dozers on OB emplacement area - Houston	-	-	19,790	373
OB - Dozers in-pit ancillary tasks - Houston	-	-	23,607	445
OB - Dozers ripping/pushing/clean-up Partings - Houston	-	-	4,146	78
OB - Loading partings to trucks - Houston	-	-	242	31
OB - Hauling partings to emplacement area (east) - Houston	-	-	721	718
OB - Hauling partings to emplacement area (west) - Houston	-	-	872	868
CL - Emplacing partings at emplacement area - Houston	-	-	242	31
CL - Dozers ripping/pushing/clean-up ROM (in-pit) - Houston	-	-	32,124	7,813
CL - Sh/Ex/FELs loading open coal to trucks - Houston	-	-	31,307	45,423
CL - Hauling open coal in-pit roads (east) - Houston	-	-	7,668	7,634
CL - Hauling open coal in-pit roads (west) - Houston	-	-	4,454	4,434
CL - Hauling open coal to ROM pad (east) - Houston	-	-	45,818	11,181
CL - Hauling open coal to ROM pad (west) - Houston	-	-	50,000	12,202
CL - Unloading ROM to ROM stockpiles/hopper - Houston	-	-	2,262	2,262
CL - Handle coal at CHPP - Houston	-	-	158	244
CL - Rehandle ROM coal at stockpiles/hopper - Houston	-	-	754	754
ROM/REJECTS HANDLING				
CL - Dozers ROM Coal Handling & Rejects - ROM stockpile	81,371	19,792	81,371	19,792
CL - Loading rejects	0	0	0	0
CL - Transporting rejects	71,644	71,324	56,510	56,257
CL - Unloading rejects	0	0	0	0
PRODUCT COAL				
CL - Loading product stockpile	417	1,129	408	1,106
CL - Loading product coal to trains	556	1,505	545	1,475
WIND EROSION				
WE - OB dump & disturbed area - Uncontrolled	1,202,360	1,202,360	1,306,674	1,306,674
WE - OB dump & disturbed area - Controlled	66,798	66,798	72,593	72,593
WE - Open mining area - Whynot	420,545	420,545	397,444	397,444
WE - Open mining area - Blakefield	157,717	157,717	34,361	34,361
WE - Open mining area - Redbank	215,110	215,110	254,412	254,412
WE - Open mining area - Houston	86,880	26,064	97,717	97,717
WE - ROM stockpiles	7,358	7,358	7,358	7,358
WE - Product stockpiles	52,560	52,560	52,560	52,560
TOTAL EMISSION	**6,343,931**	**4,599,468**	**6,036,547**	**4,360,917**

3 MODELLING RESULTS

3.1 Assessment Approach

The annual average dust concentrations and deposition rates for Years 10 and 15 have been presented as isopleth diagrams showing the following:

- Predicted 24 hour averagePM_{10} concentrations from the Project alone and with other sources.
- Predicted annual average PM_{10} concentrations from the Project alone and with other sources.
- Predicted annual average TSP concentrations from the Project alone and with other sources.
- Predicted annual average dust deposition concentrations from the Project alone and with other sources.

Rather than provide a detailed discussion of each isopleth figure, the results have been summarised in tabular form for each year. The nearby residences are listed, with those that are predicted to experience particulate matter deposition or concentration levels above the NSW EPA's assessment criteria highlighted. The contour plots of dust concentrations and deposition levels show the areas of land that are affected by dust at different levels. However, concentration and deposition levels at residences are of particular interest.

Whilst there are currently no impact assessment criteria for $PM_{2.5}$, **Appendix C** provides an assessment compared with the current advisory reporting standard.

3.2 PM_{10} 24-hour average predictions

3.2.1 Project only

Figure 3-1 to **Figure 3-2** present contour plots for the predicted maximum 24-hour PM_{10} concentrations for the Project-only for Year 10 and 15. The isopleth for the 24-hour average assessment criterion of 50 $\mu g/m^3$ is shown in red. It is important to note that the EPA impact assessment criterions are applied to the cumulative impacts of the Project and other sources.

The 24-hour PM_{10} contours presented in **Figure 3-1** to **Figure 3-2** do not represent a single worst case day, but rather represent the potential worst case 24-hour PM_{10} concentration that could be reached at any particular location across the entire modelling year.

A summary of the predicted particulate concentrations at each of the individual residences for the original and revised modelling are provided in **Table 3-1**. The residences that are predicted to experience 24-hour average PM_{10} levels above the assessment criterion of 50 $\mu g/m^3$ are highlighted in bold red.

With the incorporation of site specific silt and moisture values into the emission factor equations, there is a reduction in the maximum predicted 24-hour average concentrations at all the residences modelled. A discussion on the number of receptors where the predicted concentration is above 50 $\mu g/m^3$, is presented below this table.

Table 3-1: 24-hour PM_{10} concentrations ($\mu g/m^3$) for each modelling year due to Project only

ID	Project Only			
	Maximum 24-hour Average PM_{10} ($\mu g/m^3$)			
	Assessment criteria = N/A			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	16	6	16	6
3	17	7	16	6
24A	22	7	18	6
24B	22	7	18	6
25	23	7	19	7
172	18	8	18	9
207	17	8	16	8
209	21	9	21	9
211	20	9	20	9
217A	27	12	26	11
217B	21	9	20	9
219A	24	12	28	11
219B	27	14	29	12
219C	25	12	29	11
219D	23	11	28	11
226A	**94**	50	**90**	43
226B	**106**	**57**	**102**	50
226C	**100**	**54**	**96**	46
226D	**72**	36	**71**	32

ID	Project Only Maximum 24-hour Average PM_{10} (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
227A	43	18	41	16
227B	42	17	39	15
227C	42	18	40	15
227D	42	18	40	16
227E	42	18	41	16
227F	**52**	26	**55**	25
228A	33	13	29	10
228B	33	13	29	10
228C	33	13	29	10
228D	34	13	30	11
228E	34	13	30	11
228F	34	13	31	11
228G	34	14	31	11
228H	35	14	31	11
228I	27	10	24	8
228J	34	13	30	11
228K	43	18	38	14
228L	47	19	41	16
228M	**54**	24	48	19
230	22	8	20	7
238A	18	6	16	5
238B	17	6	15	5
238C	18	6	15	5
238D	18	6	15	5
238E	18	6	15	5
238F	18	6	15	5
239A	17	6	15	5
239B	18	6	16	5
239C	18	6	15	5
239D	18	6	15	5
239E	18	6	15	5
239F	17	6	15	5
239G	17	6	15	5
239H	18	6	16	5
239I	19	6	16	5
240A	26	9	22	7
240B	30	10	26	8
240C	30	10	26	8
240D	30	10	26	8
240E	29	10	25	8
250A	30	11	26	9
250B	31	11	26	9
253	22	7	19	6
254A	22	7	19	6
254B	22	7	19	6
254C	22	7	19	6
255	20	7	17	5
279	17	6	15	4
284	19	6	17	5
285	18	6	15	5
287	18	6	16	5
288	16	5	13	4
298A	26	9	22	7
298B	25	9	21	7
299	23	8	19	6
306	20	6	17	5
Drayton Mine				
384	7	2	6	2
385	8	3	7	3
386	9	3	8	2

ID	Project Only Maximum 24-hour Average PM_{10} (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
387	11	5	9	4
390	14	6	13	5
398	13	6	12	5
399	11	5	10	4
400	10	4	9	3
401	10	4	9	4
402	11	5	10	4
403	12	6	11	5
411	23	9	20	7
418	22	8	19	7
419	19	7	17	6
420	18	7	16	6
421	15	6	12	5
423	12	5	9	4
424	10	4	8	3
425	11	5	9	4
427	8	4	7	3
429	8	3	7	3
432	6	3	6	2
433A	6	2	5	2
433B	5	2	5	2
435	5	2	5	2
438	7	3	6	2
440	9	4	7	3
441	7	3	5	2
443	10	4	8	3
444	13	5	11	4
446A	13	5	11	4
446B	7	3	6	2
451	5	2	4	2
455	5	2	5	2
456	6	3	5	2
460	8	3	6	3
Mine owned residences				
57	**69**	27	**64**	23
58A	**79**	42	**101**	**51**
58B	**69**	36	**84**	41
60	**61**	34	**52**	32
145A	31	19	32	18
145B	31	19	34	17
145C	35	21	35	20
145D	33	20	34	19
388	12	5	11	5
389	14	6	13	5
404	10	5	9	4
410	23	9	20	7

[a] 50 µg/m³ refers to the cumulative criterion and should not be applied to Project alone results. This is shown here for reference only.

The number of days that the 24-hour average PM_{10} assessment criterion is exceeded at each residence for the original EA and revised modelling is presented in **Table 3-2**. The revised modelling shows a decrease in both the number of receptors and the number of days predicted to exceed ground level concentrations 50 µg/m³ when compared to the original modelling.

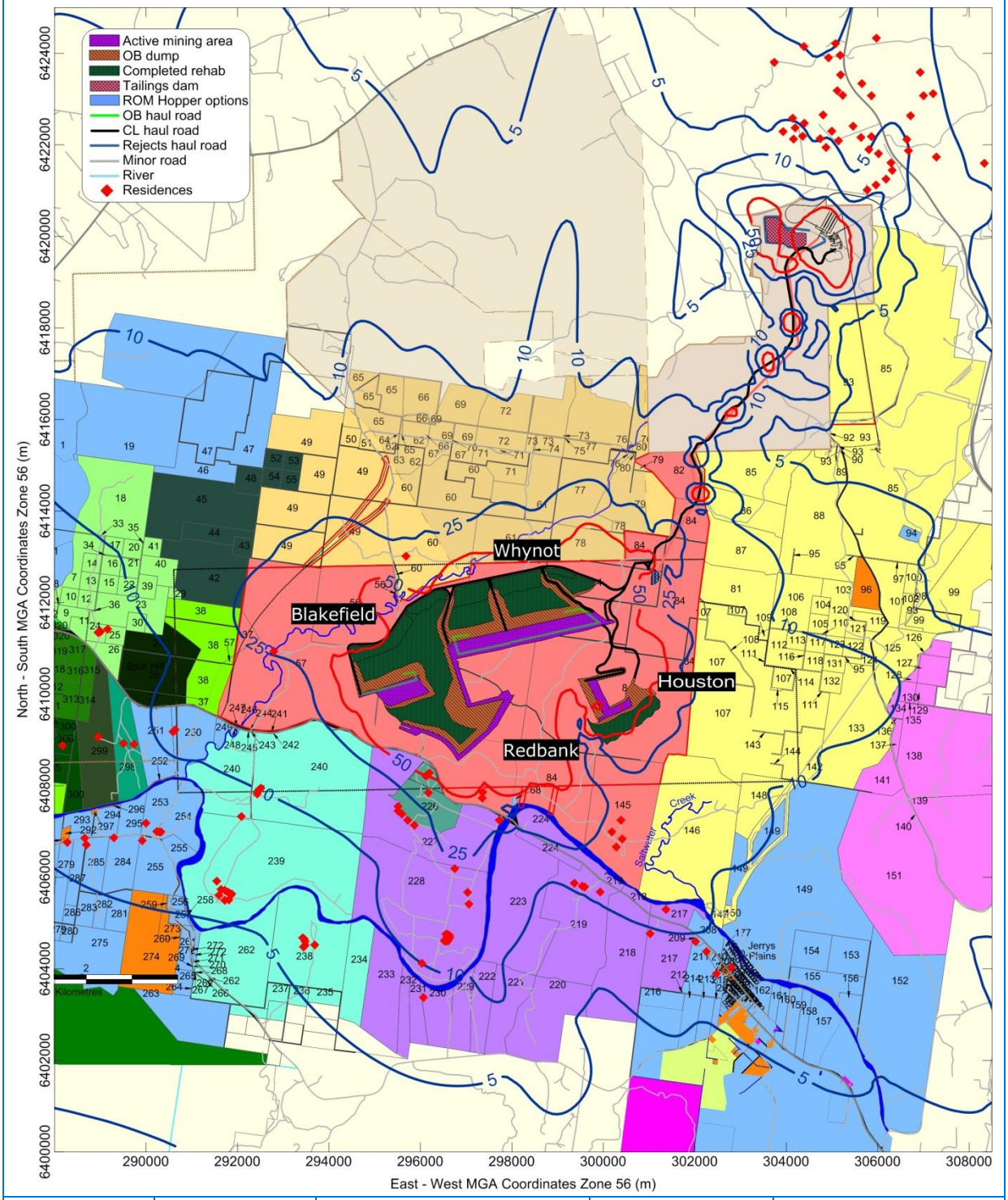
Mine owned residence 58A, to the northwest of the Project, is predicted to experience one exceedance of the 24-hour average PM_{10} criterion during operational Year 15 of the mine.

Residences 226 (B and C) are predicted to experience exceedances of the 24-hour average PM_{10} assessment criterion during Year 10 of the Project operations. The number of days over the 24-hour average PM_{10} criterion at each of these residences is predicted to be between 2-3 days during Year 10, and no days in Year 15. It is proposed that the impacts at these locations would be managed via a real-time and/or predictive monitoring system where operations could be modified (or temporarily shut down in extreme cases) under certain meteorological conditions to minimise the impacts (refer to **Section 9** of the AQA of the EA). No other residences are predicted to experience 24-hour average PM_{10} concentrations above the assessment criterion due to emissions from the Project alone.

Table 3-2: Number of days exceeding 24-hour PM_{10} assessment criterion for each modelling year

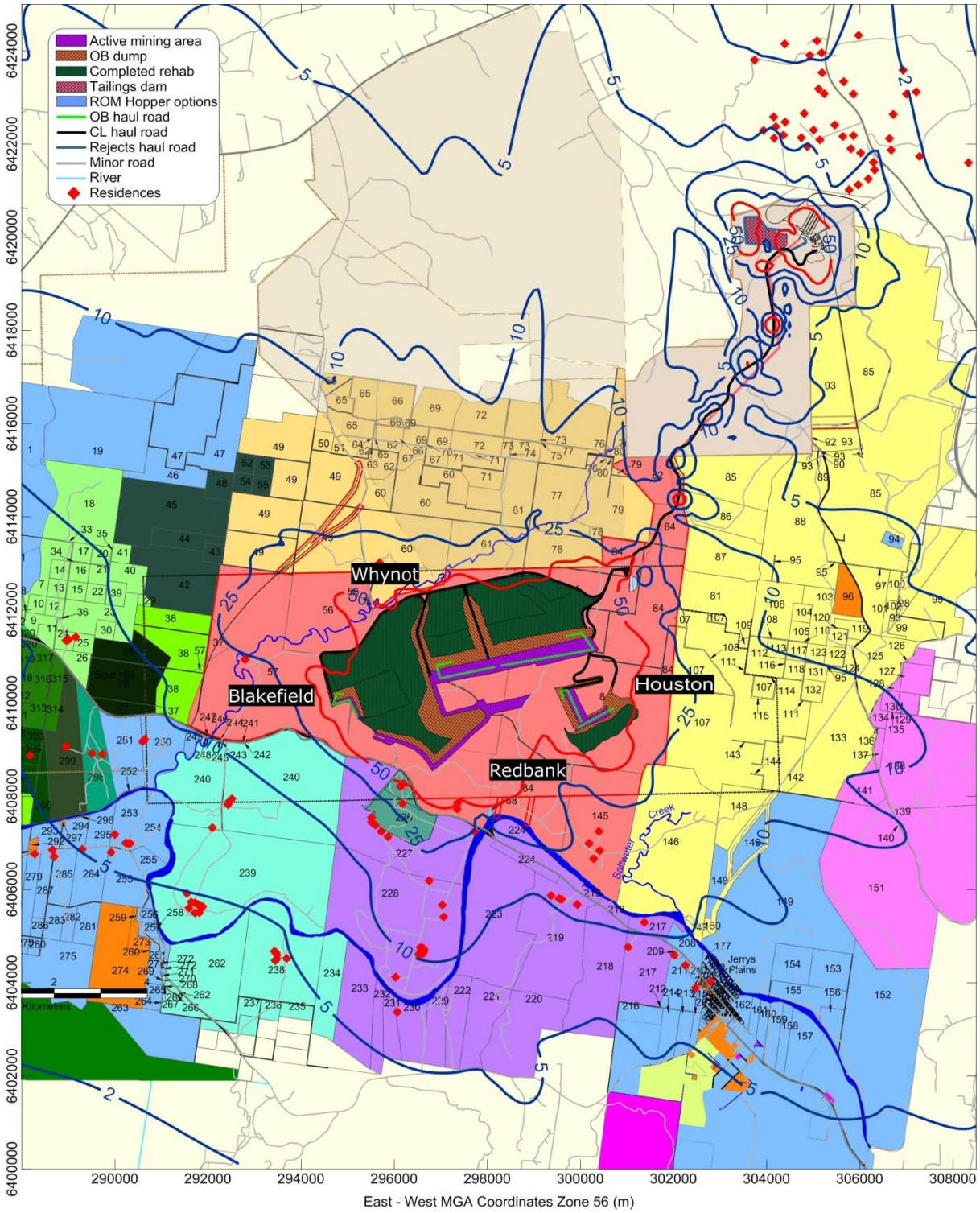
ID	Cumulative Maximum 24-hour Average PM_{10} (µg/m³) *Assessment criteria = 50 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
226B	23	3	19	0
226C	17	2	12	0
Mine owned residences				
58A	1	0	1	1

[a] 50 µg/m³ refers to the cumulative criterion and should not be applied to Project alone results. This is shown here for reference only.



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 10 (The Project only)	Maximum	24-hour
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	DP&I =50 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-1: Maximum predicted 24-hour average PM_{10} concentrations due to emissions from Drayton South only - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 15 (The Project only)	Maximum	24-hour
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	DP&I =50 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-2: Maximum predicted 24-hour average PM_{10} concentrations due to emissions from Drayton South only - Year 15

3.2.2 Cumulative

3.2.3 Introduction

There are no available continuous 24-hour PM_{10} data for the area that match the year of meteorological data year (2005). HVAS data are available every sixth day, however, these data are insufficient to provide a representative background for each day of the model simulation.

Therefore, an alternative statistical approach (using a Monte Carlo Simulation) is presented, to achieve the objectives of a Level 2 cumulative assessment. The cumulative assessment focuses on representative residences in key areas in the vicinity of the Project. Thirteen locations were selected to provide an indication of worst case cumulative 24-hour PM_{10} concentrations (see **Figure 3-3**) from these key areas:

- South/south-west of Drayton South – residences 57, 58A, 145A, 226B, 226D, 227A, 227F, 240A and 250A
- South-east of proposed Drayton South – residences 209 and 217
- North-east of existing Drayton – residences 410 and 411.

3.2.4 Level 2 assessment based on Monte Carlo simulation

The Monte Carlo Simulation is a statistical modelling approach that combines the frequency distribution of one data set (in this case background 24-hour PM_{10} concentration) with the frequency distribution of another data set (the Project's modelled impacts at a given point). This is achieved by repeatedly randomly sampling and combining values with the two data sets to create a third, 'cumulative' data set and associated frequency distribution.

As discussed in **Section 4.1** of the AQA for the EA (**PAEHolmes 2012**) there are a number of monitors operating in the area. **Figure 3-3** shows the location of the monitors deemed to be representative of the key areas selected.

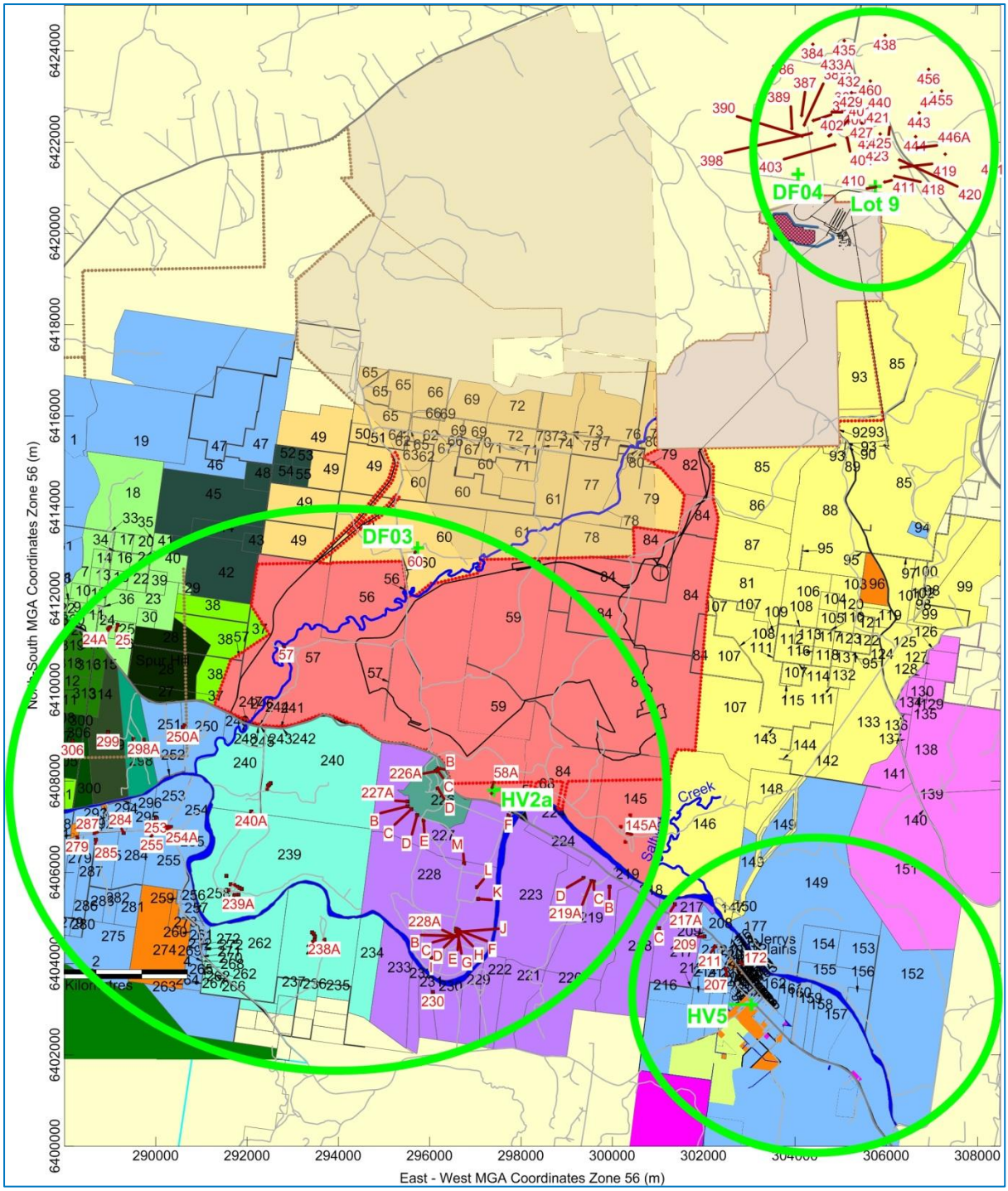


Figure 3-3: Representative residences and monitoring locations – cumulative 24-hour PM_{10} assessment

The process assumes that a randomly selected background value from the real dataset would have a chance equal to that of any other background value from the dataset of occurring on the given 'model day'. Over sufficient time this would yield a good statistical estimate of the combined and independent effects of varying background and Project contributions to total PM_{10}.

To generate greater confidence in the statistical robustness of the results, the Monte Carlo Simulation was repeated 250,000 times for each of the residences. In other words, the same 1-year set of predicted (modelled) 24-hour PM_{10} concentrations due to the Project were added to 250,000 variations of the randomly selected background concentrations at each representative receiver (i.e. a different random background concentration is selected each time).

The 24-hour PM_{10} cumulative analysis for these 13 residences has been completed for Year 10 as this modelled year has the largest predicted impacts for the Project alone.

The results of this analysis are presented graphically in **Figure 3-4** to **Figure 3-6** for groups based on the monitored background used i.e. south/south west and measurements at DF03 and HV2a. The plots show the number of days that the predicted 24-hour PM_{10} cumulative concentrations would likely reach a certain ground level concentration. For comparison the number of days that the '*Background Only*' would reach a certain concentration is shown with the '*Mine plus Background*' probability.

The results show varying degrees of impact from the Project emissions depending on the location. At all sites, the statistics indicate some probability of days per year with PM_{10} concentrations above 50 µg/m³. This is the case for both '*Background Only*' (because the background data already has values above this level) and the '*Mine plus Background*'.

Table 3-3 presents a summary of the number of days exceeding the EPA criteria for each of the selected residences for both the project alone and cumulative. A comparison with the previous modelling results has also been included.

It is also noted that the actual number of exceedances per year cannot be predicted precisely and will depend on actual Project activities, weather conditions, implementation of real-time controls and predictive meteorological forecasting and background levels in the future. These results are therefore a probability of exceedance.

For each grouping the background alone is predicted to exceed the EPA assessment criteria between 7 to 25 days per year.

The greatest increase above background is expected at residences close to the southern boundary of the Project. From **Figure 3-4** it is apparent that at residences 58A, 226B, 226D and 227F PM_{10} are likely to exceed 50 µg/m³ for a number of days due to cumulative impacts. Whilst the actual number of exceedances per year cannot be predicted with certainty, the analysis shows that when cumulative impacts are considered, the probability of exceedance beyond the background for the south-south-western residences ranges from approximately less than 1 day to 36 days. It is important to note that the maximum predicted 24-hour PM_{10} concentrations due to the Project alone are greater than 50 µg/m³ at 226B, as discussed in **Section 3.2**.

When locations further south are considered (see 227A and 240A), the predicted number of days with cumulative concentrations greater than 50 µg/m³ decreases to come closer to the '*background only*' estimations. The same applies to residences to the south-east (see **Figure 3-5)** and those to the north of the existing Drayton Mine (see **Figure 3-6**).

Comparison with the previous EA modelling shows a decrease in the number of days predicted to exceed the assessment criterion and no longer any exceedances of the acquisition criteria of 150 µg/m³.

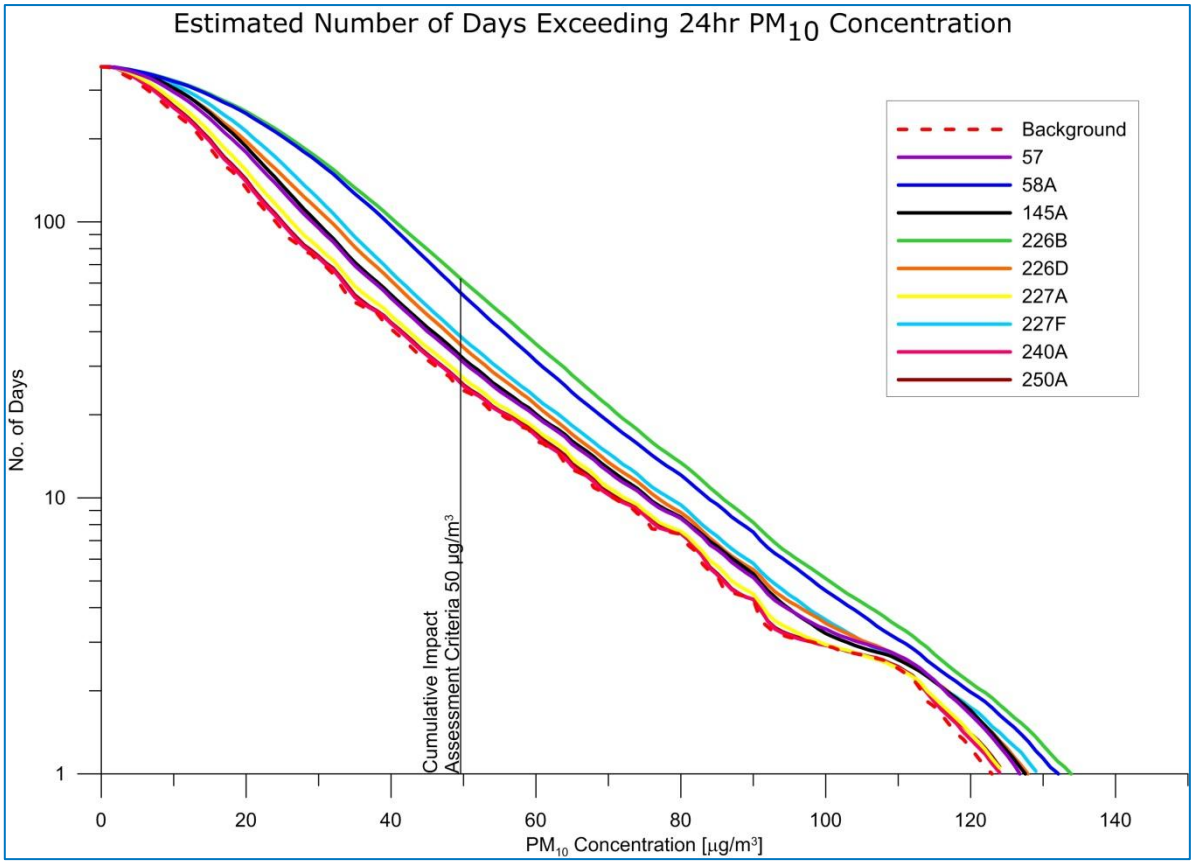


Figure 3-4: Year 10 – Number of days likely to exceed cumulative maximum 24-hr average PM_{10} concentration (50 µg/m³) for south/south-west residences

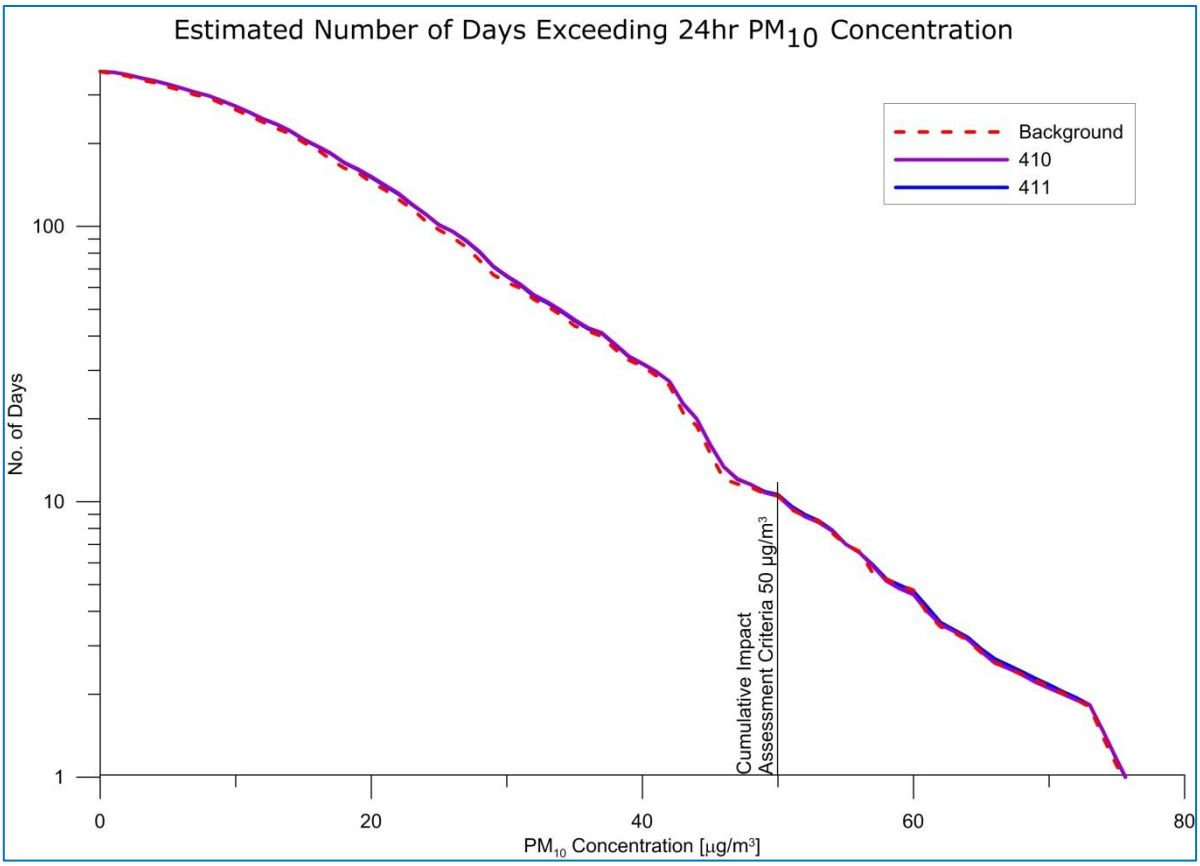


Figure 3-5: Year 10 – Number of days likely to exceed cumulative maximum 24-hr average PM_{10} concentration (50 µg/m³) for residences north east of Drayton Mine

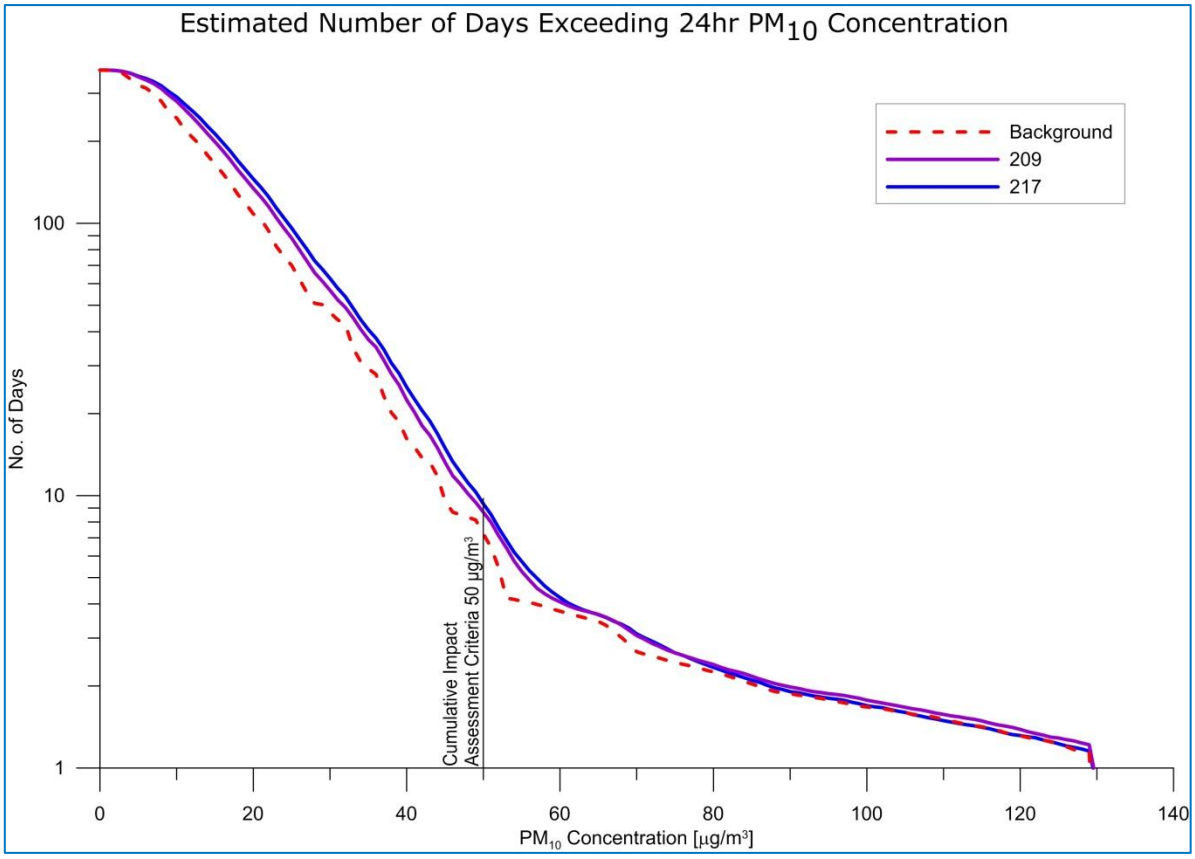


Figure 3-6: Year 10 – Number of days likely to exceed cumulative maximum 24-hr average PM_{10} concentration (50 µg/m³) for south east residences

Table 3-3: Summary of days exceeding 50 µg/m³ – Year10 project alone and cumulative

Receptor ID	Maximum predicted PM_{10} 24-hour concentrations		Predicted number of days exceeding 50 µg/m³ cumulative criteria							Predicted number of days exceeding 150 µg/m³ Acquisition criteria	
	Project Alone		Project Alone		Cumulative		Background	days more than background		Cumulative	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling		Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Units	µg/m³		Number of days								
Privately owned residences											
226B	**106**	**57**	23	**3**	**102**	61	25	77	36	1	0
226D	**72**	36	3	0	50	35	25	25	11	0	0
227A	43	18	0	0	30	27	25	6	3	0	0
227F	**52**	26	1	0	**53**	38	25	29	13	0	0
240A	26	9	0	0	26	25	25	2	<1	0	0
250A	30	11	0	0	28	26	25	3	1	0	0
209	21	9	0	0	10	10	11	<1	<1	0	0
217A	27	12	0	0	12	11	11	2	<1	0	0
411	23	9	0	0	11	9	7	4	2	0	0
Mine owned residences											
57	**69**	27	4	0	43	31	25	19	6	0	0
58A	**79**	42	11	0	**92**	54	25	67	30	0	0
145A	31	19	0	0	38	32	25	13	7	0	0
410	23	9	0	0	11	9	7	4	1	0	0

Note: Totals may differ to the sum of the columns due to rounding and significant figures.

3.3 Annual average predictions

3.3.1 Project only PM10

A summary of the Project-only predicted annual average PM_{10} concentrations at each of the individual residences for the original and revised modelling are provided in **Table 3-4**, and the revised modelling only in **Figure 3-7** to **Figure 3-8** for each modelled year.

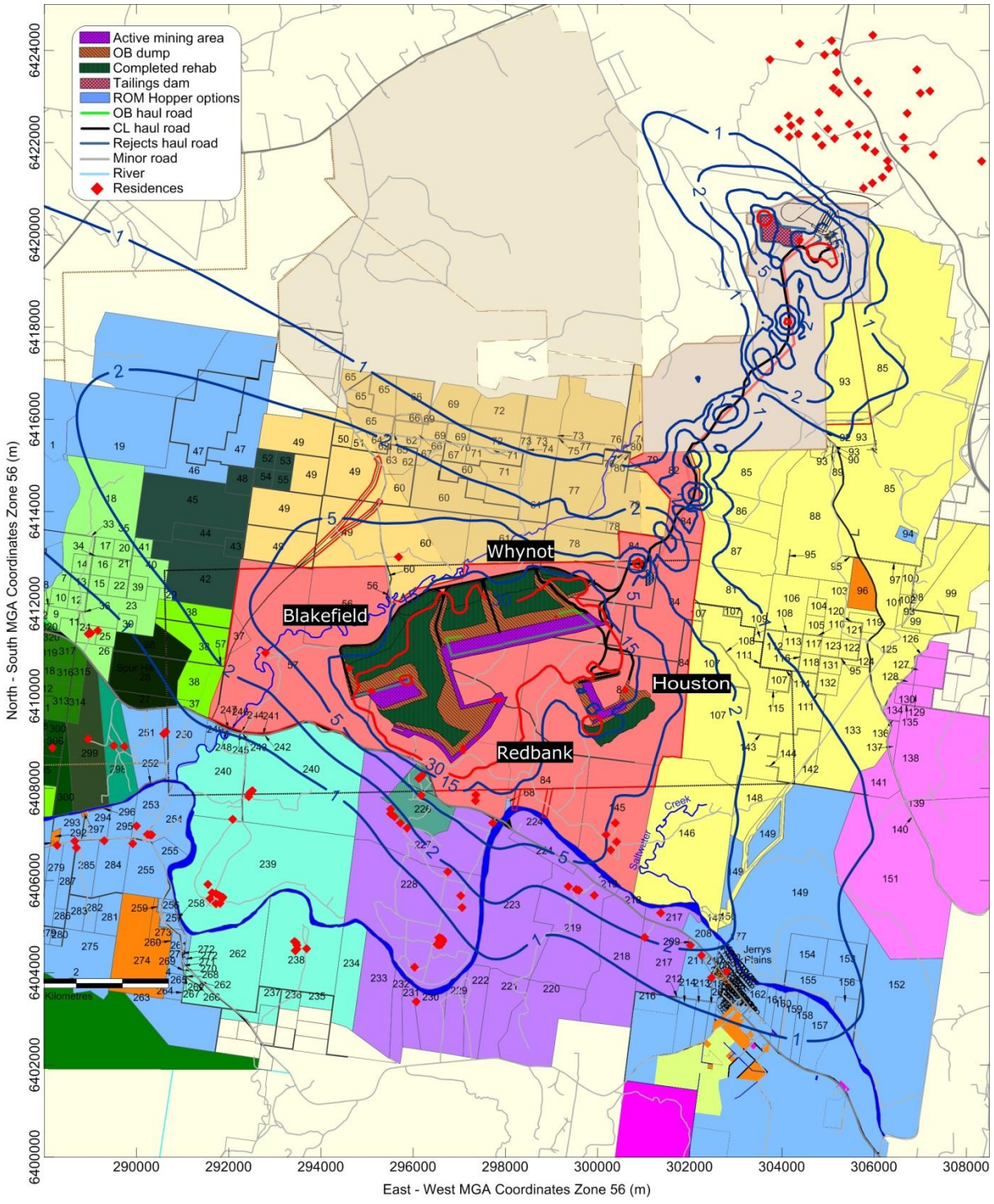
There are no privately owned residences that are predicted to experience annual average PM_{10} concentrations above the assessment criteria due to emissions from the Project-only. There is a reduction in the predicted annual average concentrations of PM_{10} at all the residences compared with the EA.

Table 3-4: Annual PM_{10} concentrations (µg/m³) at nearby residences for each modelling year – Project Only

ID	Project Only			
	Annual Average PM_{10} (µg/m³)			
	Assessment criteria = N/A			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	1	1	1	1
3	2	1	1	1
24A	1	1	1	1
24B	1	1	1	1
25	2	1	1	1
172	3	2	3	2
207	3	1	3	1
209	3	2	4	2
211	3	2	3	2
217A	5	3	5	3
217B	3	2	3	2
219A	5	3	4	3
219B	5	3	5	3
219C	5	3	5	3
219D	4	3	4	2
226A	15	9	13	8
226B	19	12	16	10
226C	17	11	15	9
226D	9	6	8	5
227A	3	2	3	2
227B	3	2	3	1
227C	3	2	3	1
227D	3	2	3	2
227E	3	2	3	2
227F	10	7	10	6
228A	1	1	1	1
228B	1	1	1	1
228C	1	1	1	1
228D	1	1	1	1
228E	1	1	1	1
228F	1	1	1	1
228G	1	1	1	1
228H	1	1	1	1
228I	1	0	1	0
228J	1	1	1	1
228K	2	1	2	1
228L	3	2	3	1
228M	3	2	3	2
230	1	0	1	0
238A	1	0	1	0

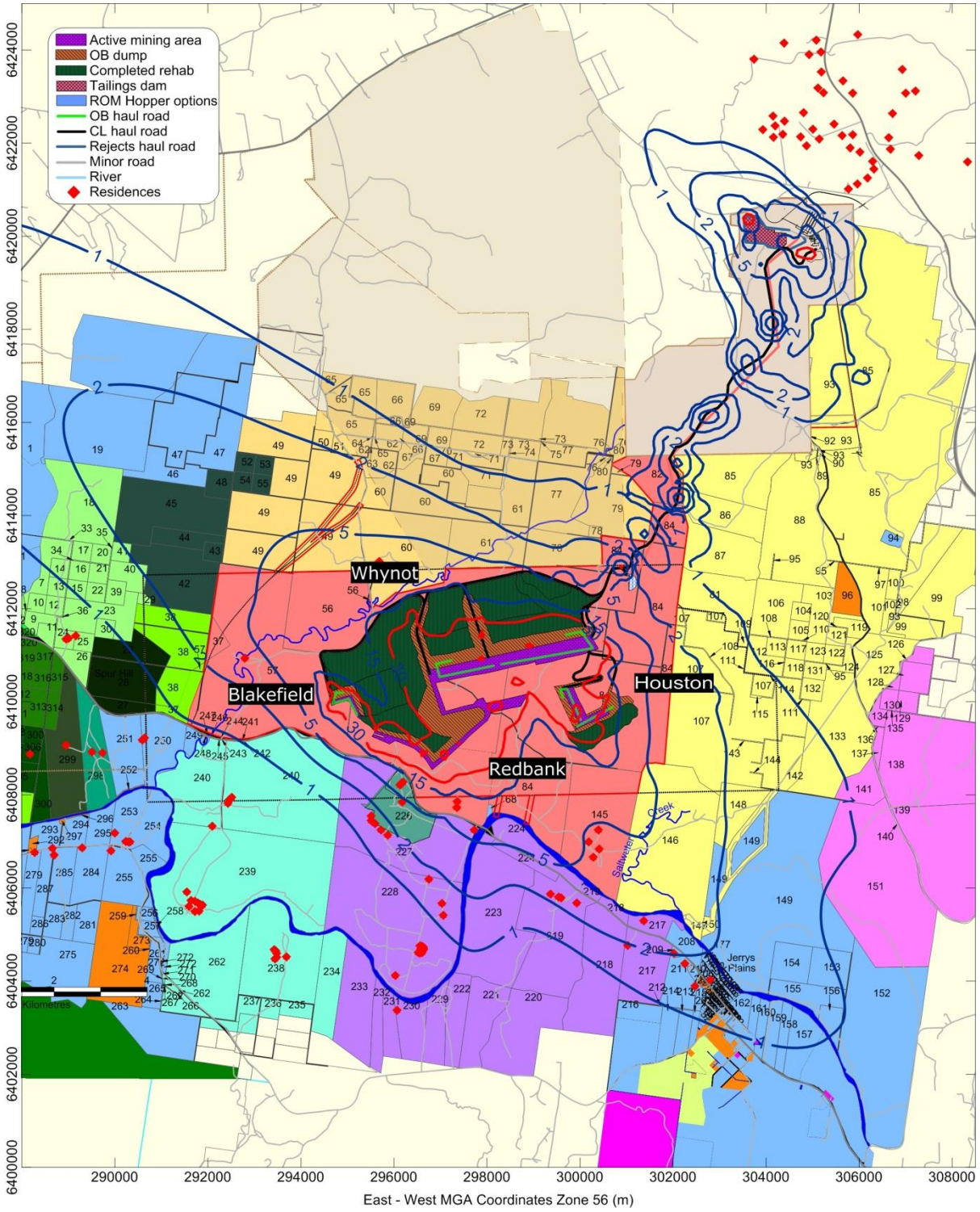
ID	Project Only Annual Average PM_{10} (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238B	1	0	1	0
238C	1	0	1	0
238D	1	0	1	0
238E	1	0	1	0
238F	1	0	1	0
239A	1	0	1	0
239B	1	0	1	0
239C	1	0	1	0
239D	1	0	1	0
239E	1	0	1	0
239F	1	0	1	0
239G	1	0	1	0
239H	1	0	1	0
239I	1	0	1	0
240A	1	1	1	0
240B	1	1	1	1
240C	1	1	1	1
240D	1	1	1	1
240E	1	1	1	1
250A	2	1	2	1
250B	2	1	2	1
253	1	0	1	0
254A	1	0	1	0
254B	1	0	1	0
254C	1	0	1	0
255	1	0	1	0
279	1	0	1	0
284	1	0	1	0
285	1	0	1	0
287	1	0	1	0
288	1	0	1	0
298A	1	1	1	1
298B	1	1	1	0
299	1	0	1	0
306	1	0	1	0
Drayton Mine				
384	0	0	0	0
385	0	0	0	0
386	0	0	0	0
387	1	0	1	0
390	1	0	1	0
398	1	0	1	0
399	1	0	1	0
400	0	0	0	0
401	1	0	0	0
402	1	0	1	0
403	1	0	1	0
411	1	0	1	0
418	1	0	1	0
419	1	0	1	0
420	1	0	1	0
421	1	0	0	0
423	1	0	0	0
424	0	0	0	0
425	0	0	0	0
427	0	0	0	0
429	0	0	0	0
432	0	0	0	0
433A	0	0	0	0
433B	0	0	0	0

ID	Project Only Annual Average PM_{10} (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
435	0	0	0	0
438	0	0	0	0
440	0	0	0	0
441	0	0	0	0
443	0	0	0	0
444	0	0	0	0
446A	0	0	0	0
446B	0	0	0	0
451	0	0	0	0
455	0	0	0	0
456	0	0	0	0
460	0	0	0	0
Mine owned residences				
57	7	4	6	4
58A	17	11	17	10
58B	13	9	14	8
60	14	9	12	8
145A	7	4	7	4
145B	7	5	8	5
145C	8	5	8	5
145D	7	5	7	4
388	1	0	1	0
389	1	0	1	0
404	1	0	0	0
410	1	0	1	0



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 10 (The Project only)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	N/A	CALMET	K. Hill

Figure 3-7: Predicted annual average PM_{10} concentrations due to emissions from Drayton South only - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 15 (The Project only)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	N/A	CALMET	K. Hill

Figure 3-8: Predicted annual average PM_{10} concentrations due to emissions from Drayton South only - Year 15

3.3.2 Cumulative PM10

A summary of the cumulative predicted annual average PM_{10} concentrations at each of the individual residences for the original and revised modelling are provided in **Table 3-5** and the revised modelling only in **Figure 3-9** to **Figure 3-10** for each modelled year.

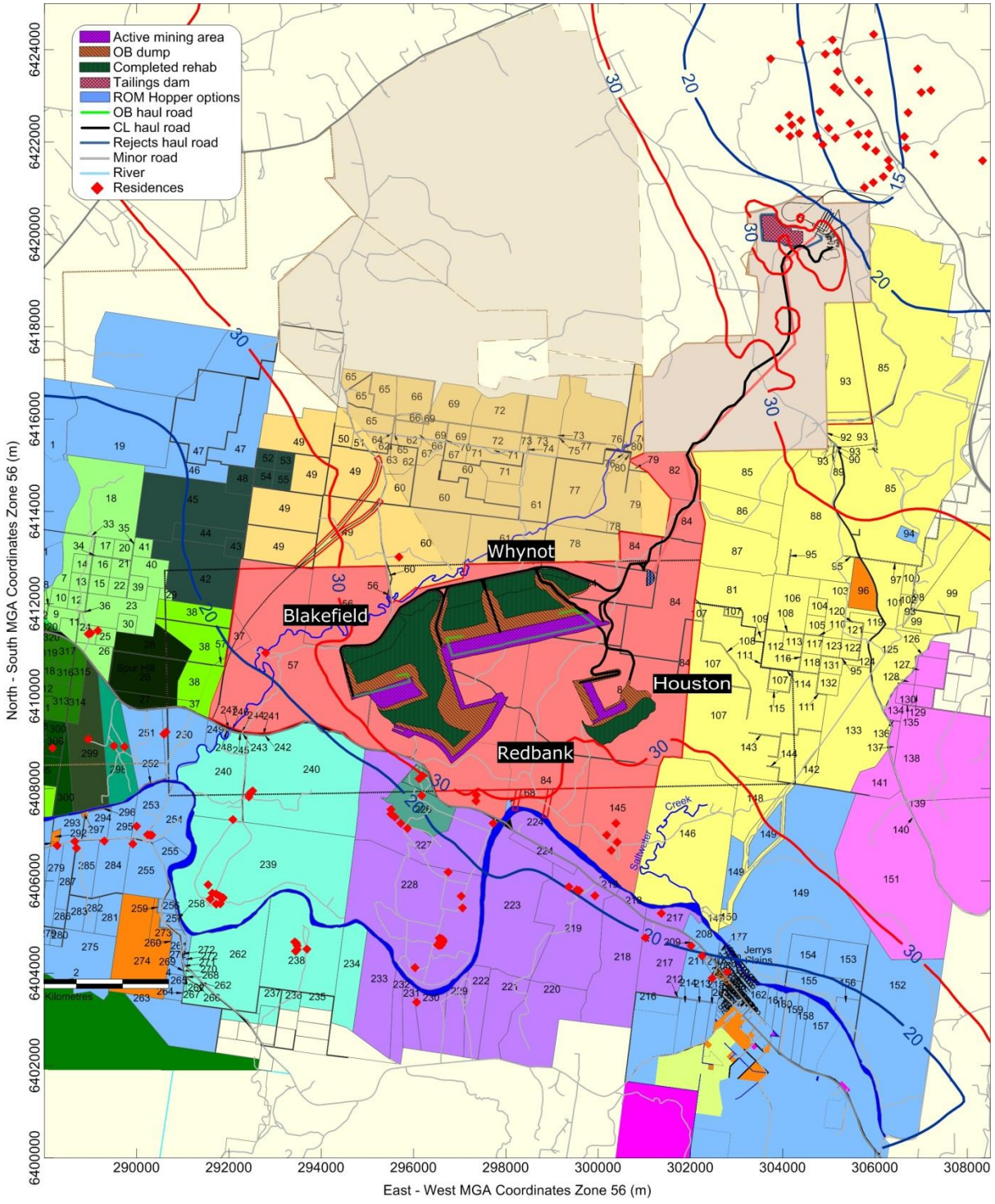
There are no privately owned residences that are predicted to experience annual average PM_{10} concentrations above the assessment criteria, due to emissions from the Project plus background concentrations or cumulative sources. There is a reduction in the predicted annual average PM_{10} concentrations at all modelled residences due to the new emission estimates.

Table 3-5: Annual PM_{10} concentrations ($\mu g/m^3$) at nearby residences for each modelling year – Cumulative

ID	Cumulative Annual Average PM_{10} ($\mu g/m^3$) *Assessment criteria = 30 $\mu g/m^3$*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	19	18	18	17
3	19	18	17	17
24A	18	17	17	16
24B	18	17	17	16
25	18	17	17	16
172	20	19	19	17
207	20	19	18	17
209	22	20	20	18
211	21	20	19	18
217A	23	22	21	19
217B	21	20	19	18
219A	22	20	20	18
219B	23	21	21	19
219C	22	21	20	18
219D	22	20	20	18
226A	**32**	26	29	23
226B	**36**	29	**32**	25
226C	**34**	28	**30**	24
226D	25	22	23	20
227A	19	18	18	17
227B	19	18	18	16
227C	19	18	18	16
227D	19	18	18	17
227E	19	18	18	17
227F	28	24	25	21
228A	18	17	17	16
228B	18	17	17	16
228C	18	17	17	16
228D	18	17	17	16
228E	18	17	17	16
228F	18	17	17	16
228G	18	17	17	16
228H	18	17	17	16
228I	18	17	17	16
228J	18	17	17	16
228K	19	18	18	17
228L	19	18	18	17
228M	20	18	18	17
230	18	17	17	17
238A	17	17	16	16
238B	17	17	16	16
238C	17	17	16	16
238D	17	17	16	16

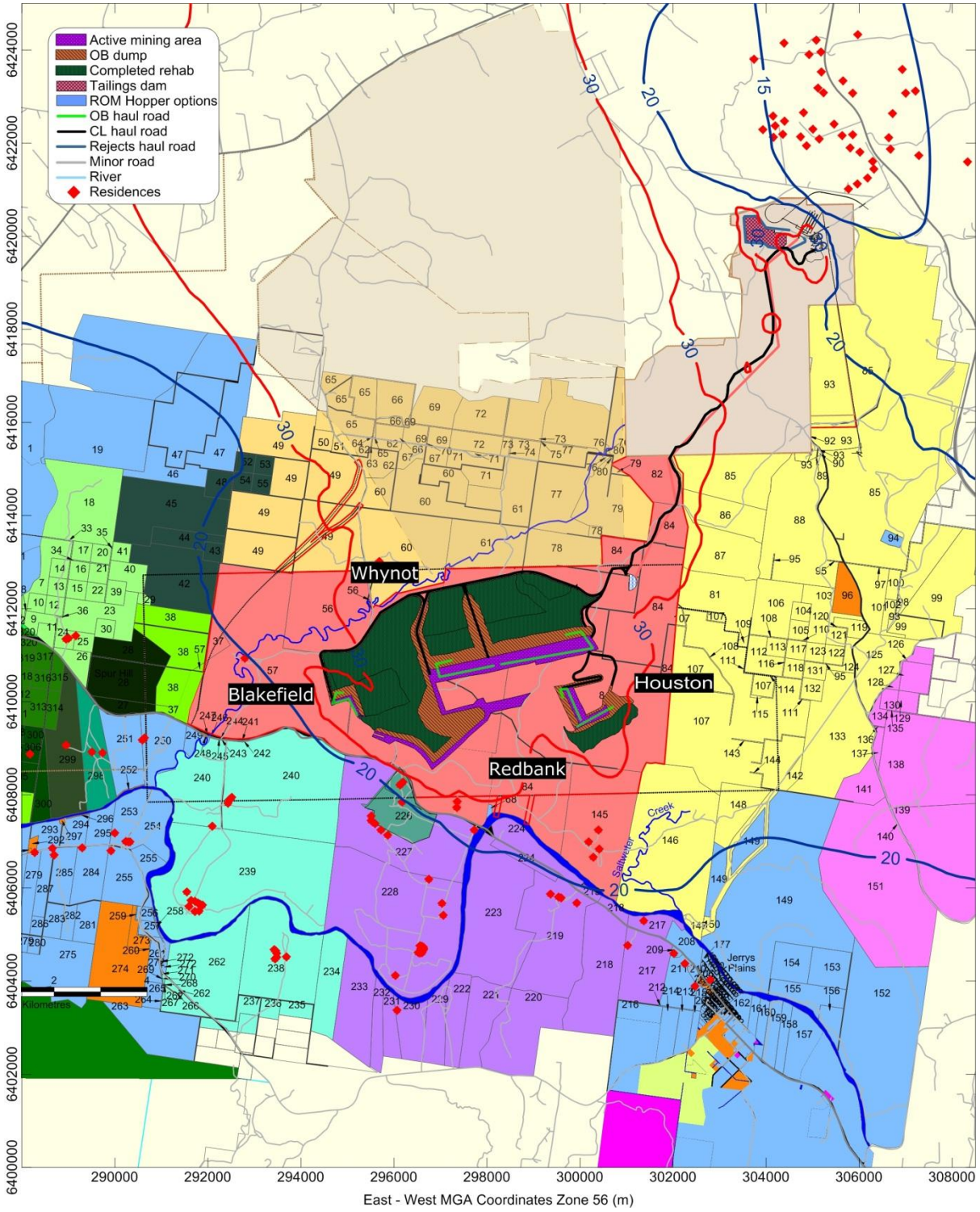
ID	Cumulative Annual Average PM_{10} (µg/m³) *Assessment criteria = 30 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	17	17	16	16
238F	17	17	16	16
239A	17	17	16	16
239B	17	17	16	16
239C	17	17	16	16
239D	17	17	16	16
239E	17	17	16	16
239F	17	17	16	16
239G	17	17	16	16
239H	17	17	16	16
239I	17	17	16	16
240A	18	17	16	16
240B	18	17	17	16
240C	18	17	17	16
240D	18	17	17	16
240E	18	17	17	16
250A	18	17	17	16
250B	18	17	17	16
253	17	17	17	16
254A	17	17	17	16
254B	17	17	17	16
254C	17	17	17	16
255	17	17	17	16
279	17	17	17	16
284	17	17	17	16
285	17	17	17	16
287	17	17	17	16
288	17	17	17	16
298A	18	17	17	16
298B	18	17	17	16
299	17	17	16	16
306	17	17	16	16
Drayton Mine				
384	15	15	14	14
385	15	15	14	14
386	17	16	16	15
387	16	16	15	15
390	17	16	15	15
398	16	16	15	14
399	16	16	15	14
400	15	15	14	14
401	15	15	14	13
402	15	15	14	14
403	15	15	14	14
411	15	14	13	13
418	15	15	14	13
419	15	15	14	14
420	15	15	14	14
421	15	15	14	13
423	15	14	14	13
424	15	14	14	13
425	15	15	14	13
427	15	14	14	13
429	15	15	14	14
432	15	15	14	14
433A	15	15	14	14
433B	15	15	14	14
435	15	15	14	14
438	15	15	14	14
440	15	15	14	14

ID	Cumulative Annual Average PM_{10} (µg/m³) *Assessment criteria = 30 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	16	15	15	15
443	15	15	15	14
444	15	15	14	14
446A	15	15	14	14
446B	16	16	15	15
451	17	17	16	16
455	16	16	15	15
456	16	15	15	15
460	15	15	14	14
Mine owned residences				
57	25	22	22	20
58A	**34**	28	**33**	26
58B	**31**	26	29	24
60	**49**	**44**	**45**	**40**
145A	27	24	24	21
145B	27	25	25	22
145C	27	25	24	21
145D	27	24	24	21
388	16	16	15	15
389	17	17	16	15
404	15	14	14	13
410	15	14	13	13



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 10 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	EPA =30 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-9: Predicted annual average PM_{10} concentrations due to emissions from Drayton South and other sources - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
PM_{10}	Drayton South	Year 15 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	EPA =30 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-10: Predicted annual average PM_{10} concentrations due to emissions from Drayton South and other sources - Year 15

3.3.3 Project only TSP

A summary of the Project-only predicted annual average TSP concentrations at each of the individual residences for the original and revised modelling are provided in **Table 3-6** and the revised modelling only in **Figure 3-11** to **Figure 3-12** for each modelled year.

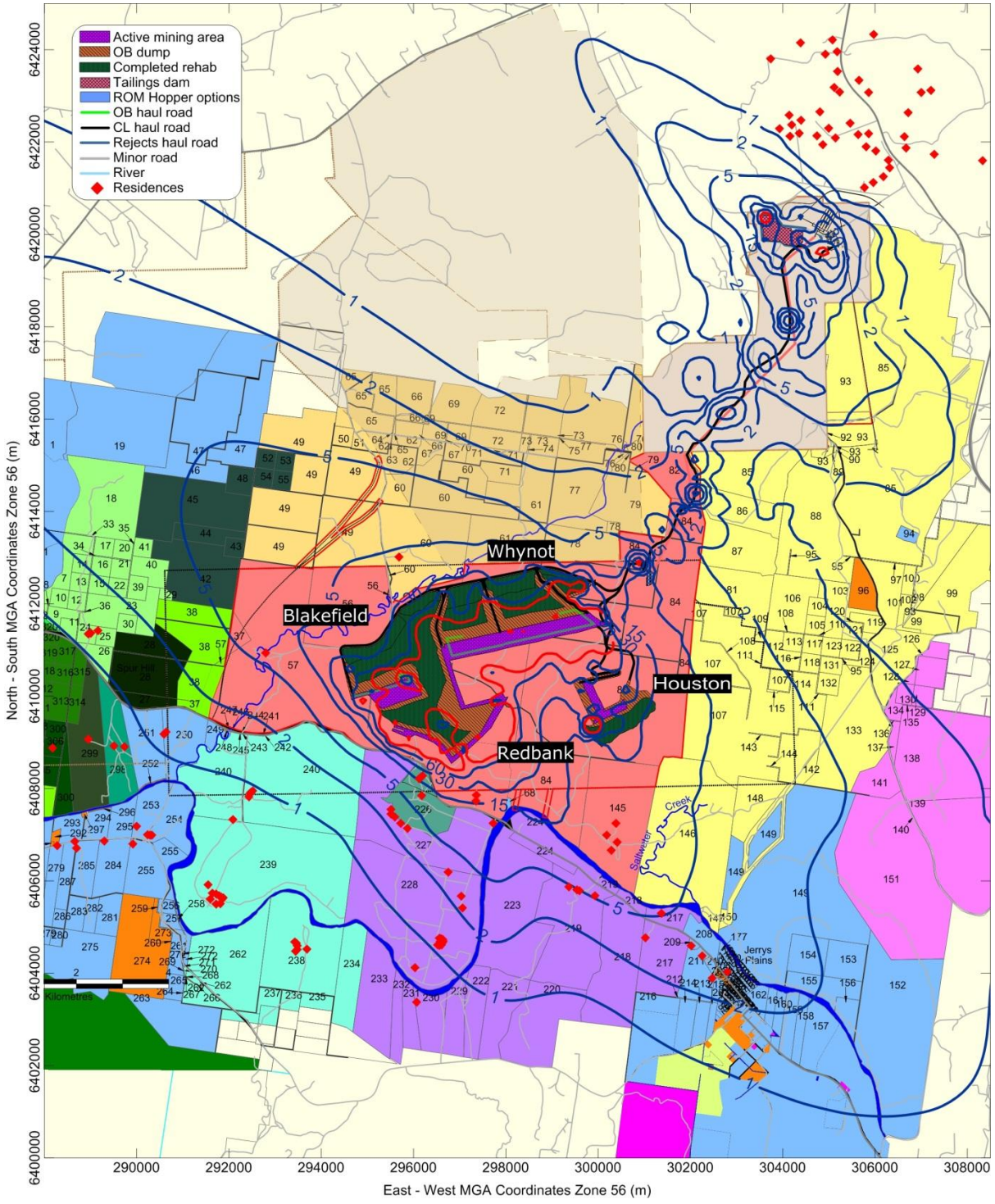
There are no privately owned residences that are predicted to experience annual average TSP concentrations above the assessment criteria, due to emissions from the Project-only. There is a reduction in the predicted annual average TSP concentrations at all other modelled residences due to the new emission estimates.

Table 3-6: Annual TSP concentrations (µg/m³) at nearby residences for each modelling year – Project Only

ID	Project Only Annual Average TSP (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	4	1	4	1
3	4	2	4	1
24A	4	1	4	1
24B	4	1	4	1
25	4	1	4	1
172	7	3	7	3
207	6	3	6	2
209	9	4	9	3
211	8	3	8	3
217A	12	5	12	5
217B	9	4	9	3
219A	12	5	11	4
219B	13	5	13	5
219C	12	5	12	4
219D	11	5	11	4
226A	38	17	34	13
226B	48	22	42	17
226C	43	19	38	15
226D	22	9	21	8
227A	8	3	8	2
227B	7	3	7	2
227C	7	3	7	2
227D	7	3	7	2
227E	8	3	8	2
227F	27	12	25	10
228A	4	1	3	1
228B	4	1	3	1
228C	4	1	3	1
228D	4	1	4	1
228E	4	1	4	1
228F	4	1	4	1
228G	4	1	4	1
228H	4	1	4	1
228I	3	1	2	1
228J	4	1	4	1
228K	6	2	6	2
228L	7	3	7	2
228M	8	3	7	2
230	2	1	2	0
238A	2	0	2	0
238B	2	0	2	0
238C	2	0	2	0
238D	2	0	2	0

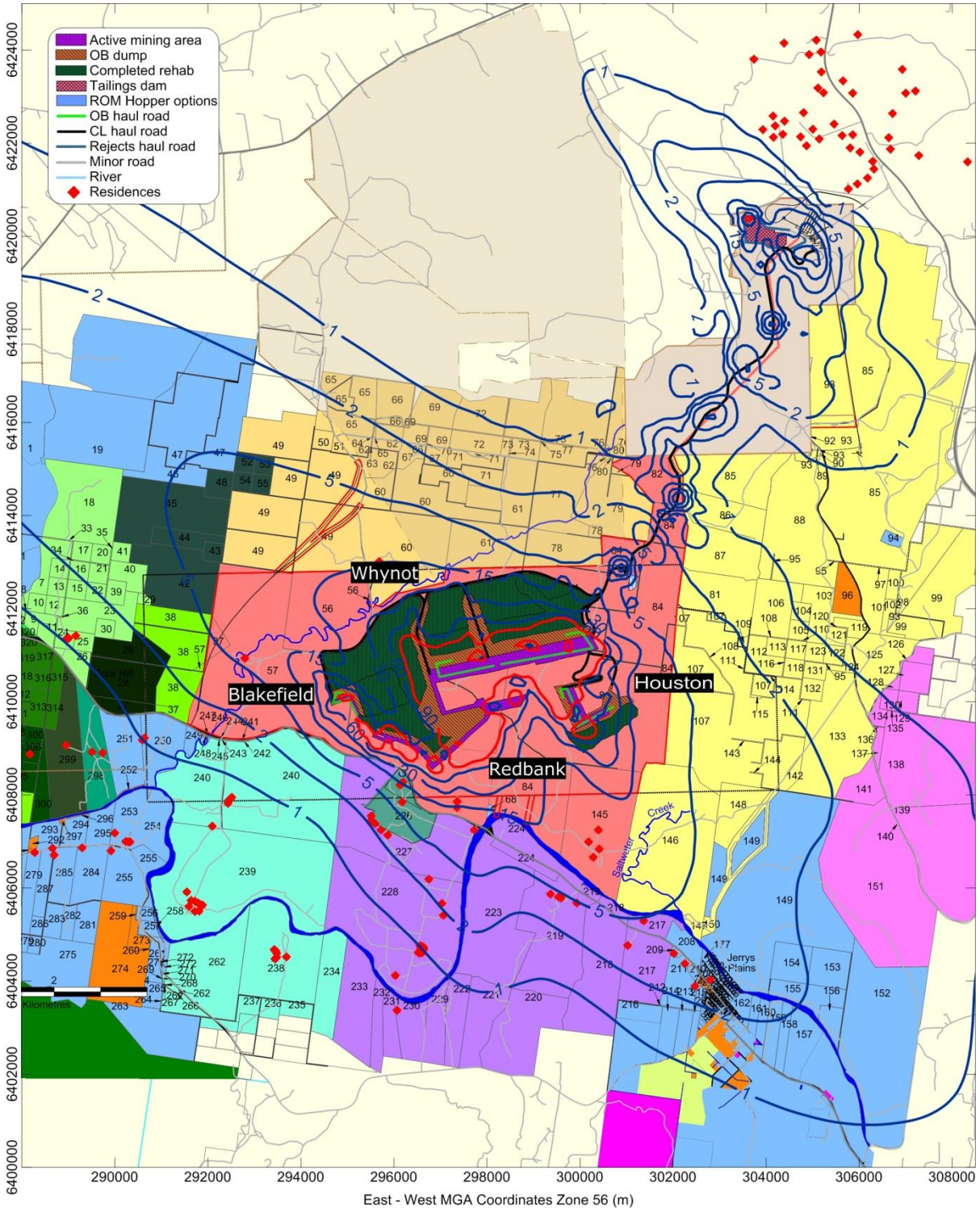
ID	Project Only Annual Average TSP (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	2	0	2	0
238F	2	0	2	0
239A	2	0	2	0
239B	2	0	2	0
239C	2	0	2	0
239D	2	0	2	0
239E	2	0	2	0
239F	2	0	2	0
239G	2	0	2	0
239H	2	0	2	0
239I	2	0	2	0
240A	3	1	3	1
240B	3	1	3	1
240C	3	1	3	1
240D	3	1	3	1
240E	3	1	3	1
250A	4	1	4	1
250B	4	1	4	1
253	2	1	2	0
254A	2	1	2	0
254B	2	1	2	0
254C	2	1	2	0
255	2	0	2	0
279	2	0	2	0
284	2	0	2	0
285	2	0	2	0
287	2	0	2	0
288	2	0	1	0
298A	3	1	3	1
298B	3	1	3	1
299	3	1	3	1
306	2	1	2	0
Drayton Mine				
384	1	0	1	0
385	1	0	1	0
386	1	0	1	0
387	2	0	2	0
390	3	1	2	1
398	2	1	2	0
399	2	0	1	0
400	1	0	1	0
401	1	0	1	0
402	2	0	1	0
403	2	0	1	0
411	2	1	2	0
418	2	0	2	0
419	2	0	2	0
420	2	0	1	0
421	1	0	1	0
423	1	0	1	0
424	1	0	1	0
425	1	0	1	0
427	1	0	1	0
429	1	0	1	0
432	1	0	1	0
433A	1	0	1	0
433B	1	0	1	0
435	1	0	1	0
438	1	0	1	0
440	1	0	1	0

ID	Project Only Annual Average TSP (µg/m³) *Assessment criteria = N/A*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	1	0	1	0
443	1	0	1	0
444	1	0	1	0
446A	1	0	1	0
446B	1	0	1	0
451	1	0	1	0
455	1	0	1	0
456	1	0	1	0
460	1	0	1	0
Mine owned residences				
57	17	7	16	6
58A	43	20	45	19
58B	34	16	35	14
60	37	17	30	15
145A	18	8	18	8
145B	18	8	19	8
145C	20	9	20	8
145D	19	8	19	8
388	2	1	2	0
389	3	1	2	1
404	1	0	1	0
410	2	1	2	0



Species:	Location:	Scenario:	Percentile:	Averaging Time:
TSP	Drayton South	Year 10 (The Project only)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	N/A	CALMET	K. Hill

Figure 3-11: Predicted annual average TSP concentrations due to emissions from Drayton South only - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
TSP	Drayton South	Year 15 (The Project only)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	N/A	CALMET	K. Hill

Figure 3-12: Predicted annual average TSP concentrations due to emissions from Drayton South only - Year 15

3.3.4 Cumulative TSP

A summary of the cumulative predicted annual average TSP concentrations at each of the individual residences for the original and revised modelling are provided in **Table 3-7** and the revised modelling only in **Figure 3-13** to **Figure 3-14** for each modelled year.

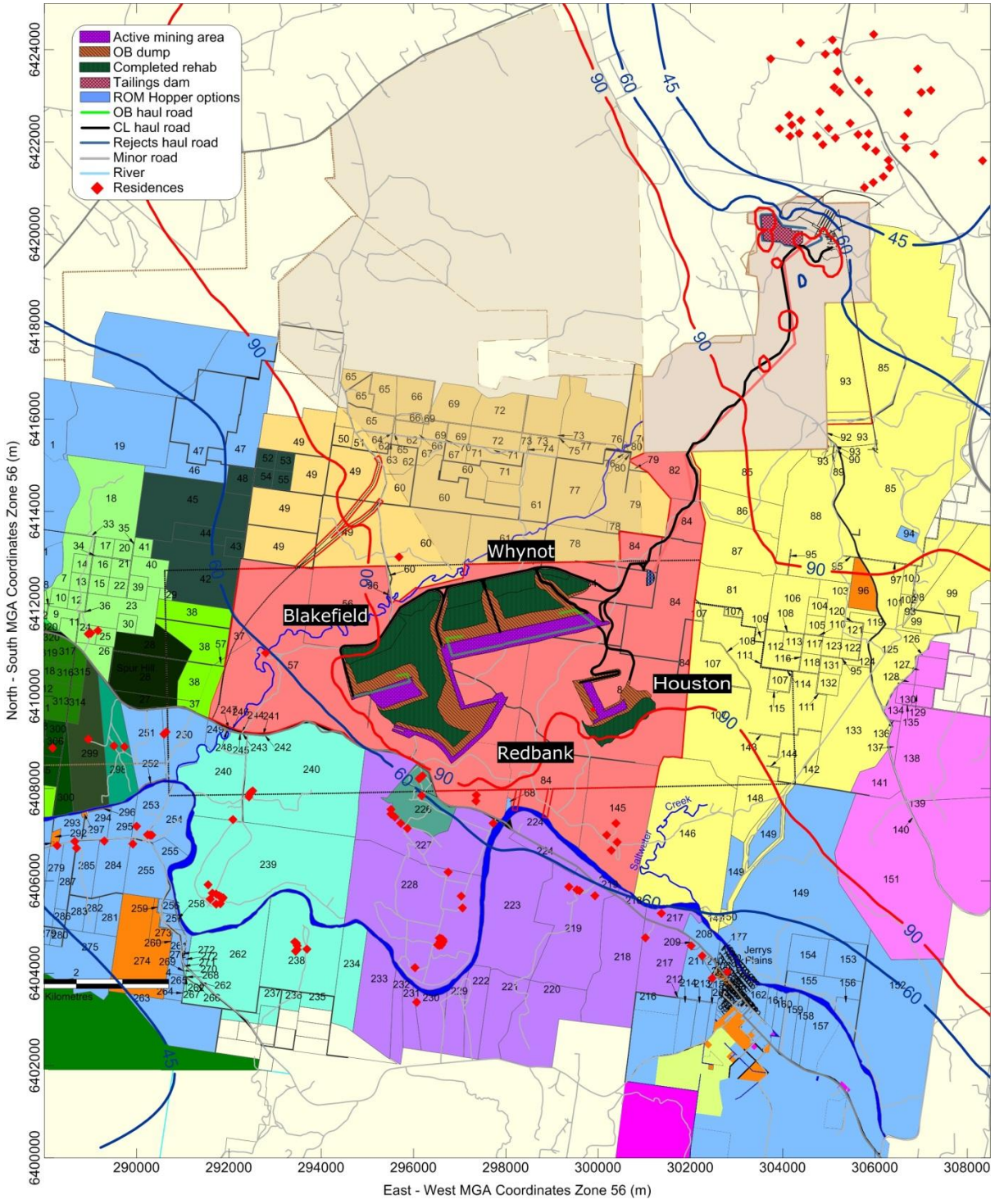
There are no privately owned residences that are predicted to experience annual average TSP concentrations above the assessment criteria, due to emissions from the Project plus background concentrations or cumulative sources. There is a reduction in the predicted annual average TSP concentrations at all other modelled residences due to the new emission estimates.

Table 3-7: Annual TSP concentrations (µg/m³) at nearby residences for each modelling year - Cumulative

ID	Cumulative			
	Annual Average TSP (µg/m³)			
	Assessment criteria = 90 µg/m³			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	52	49	48	46
3	52	49	49	46
24A	50	48	47	45
24B	50	48	47	45
25	51	48	48	45
172	57	53	53	48
207	56	52	52	48
209	61	55	55	50
211	59	54	54	49
217A	66	59	60	52
217B	60	55	55	49
219A	63	57	58	51
219B	65	58	59	52
219C	63	57	58	51
219D	63	56	58	51
226A	88	68	81	60
226B	**99**	73	90	64
226C	**94**	70	85	62
226D	72	59	67	54
227A	56	51	53	48
227B	56	51	52	47
227C	56	51	52	47
227D	56	51	52	47
227E	56	51	53	48
227F	79	65	73	58
228A	51	48	48	46
228B	51	48	48	46
228C	51	48	48	46
228D	51	49	48	46
228E	51	49	48	46
228F	51	49	48	46
228G	51	49	48	46
228H	51	49	48	46
228I	49	47	47	45
228J	51	48	48	46
228K	55	51	51	47
228L	56	51	52	48
228M	57	52	53	48
230	48	47	46	45
238A	47	46	45	44
238B	47	46	45	44
238C	47	46	45	44
238D	47	46	45	44

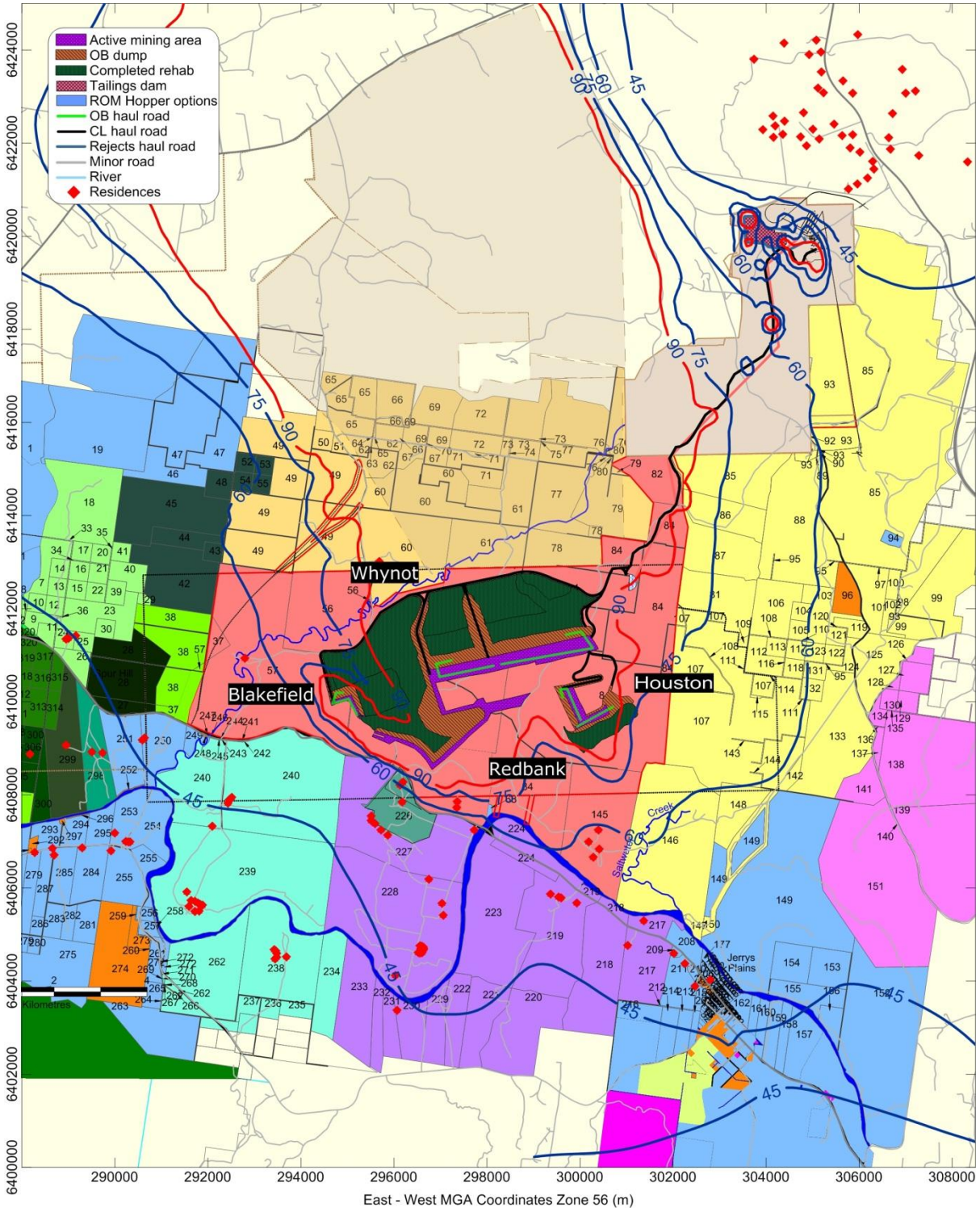
ID	Cumulative Annual Average TSP (µg/m³) *Assessment criteria = 90 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	47	46	45	44
238F	47	46	45	44
239A	47	46	45	44
239B	47	46	45	44
239C	47	46	45	44
239D	47	46	45	44
239E	47	46	45	44
239F	47	46	45	44
239G	47	46	45	44
239H	47	46	45	44
239I	48	46	45	44
240A	49	47	47	45
240B	50	48	48	45
240C	50	48	48	45
240D	51	48	48	45
240E	50	48	47	45
250A	51	48	48	45
250B	51	48	48	45
253	48	46	46	44
254A	48	46	46	44
254B	48	46	46	44
254C	48	46	46	44
255	48	46	46	44
279	47	45	45	44
284	47	46	45	44
285	47	46	45	44
287	47	46	45	44
288	46	45	45	43
298A	49	47	47	44
298B	49	47	47	44
299	49	46	46	44
306	48	46	45	44
Drayton Mine				
384	32	31	30	29
385	34	33	31	30
386	32	31	29	28
387	32	31	29	28
390	33	31	29	28
398	33	31	29	28
399	33	31	29	28
400	33	32	30	30
401	34	33	31	30
402	34	32	30	29
403	34	33	31	30
411	40	38	36	35
418	40	38	36	35
419	39	38	36	35
420	39	38	36	35
421	38	37	35	34
423	37	36	34	33
424	36	35	33	32
425	37	36	34	33
427	35	34	32	32
429	34	33	32	31
432	34	33	31	31
433A	33	32	31	30
433B	33	33	31	31
435	33	32	31	30
438	35	34	33	33
440	36	35	33	33

ID	Cumulative Annual Average TSP (µg/m³) *Assessment criteria = 90 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	38	38	36	36
443	38	37	36	35
444	39	38	36	35
446A	39	38	36	36
446B	41	40	38	37
451	43	43	41	41
455	39	38	37	36
456	38	37	36	35
460	35	34	33	32
Mine owned residences				
57	70	59	65	55
58A	**94**	73	**92**	67
58B	87	69	84	63
60	**136**	**117**	**125**	**109**
145A	75	65	68	58
145B	77	67	70	59
145C	77	66	70	58
145D	75	65	68	57
388	33	31	29	28
389	34	32	30	28
404	35	34	32	31
410	40	38	36	35



Species:	Location:	Scenario:	Percentile:	Averaging Time:
TSP	Drayton South	Year 10 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	EPA =90 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-13: Predicted annual average TSP concentrations due to emissions from Drayton South and other sources - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
TSP	Drayton South	Year 15 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	µg/m³	EPA =90 µg/m³ (shown as a bold red line)	CALMET	K. Hill

Figure 3-14: Predicted annual average TSP concentrations due to emissions from Drayton South and other sources - Year 15

3.3.5 Project only dust deposition

A summary of the Project-only predicted annual average dust deposition at each of the individual residences for the original and revised modelling provided in **Table 3-8** and the revised modelling only in **Figure 3-15** to **Figure 3-16** for each modelled year.

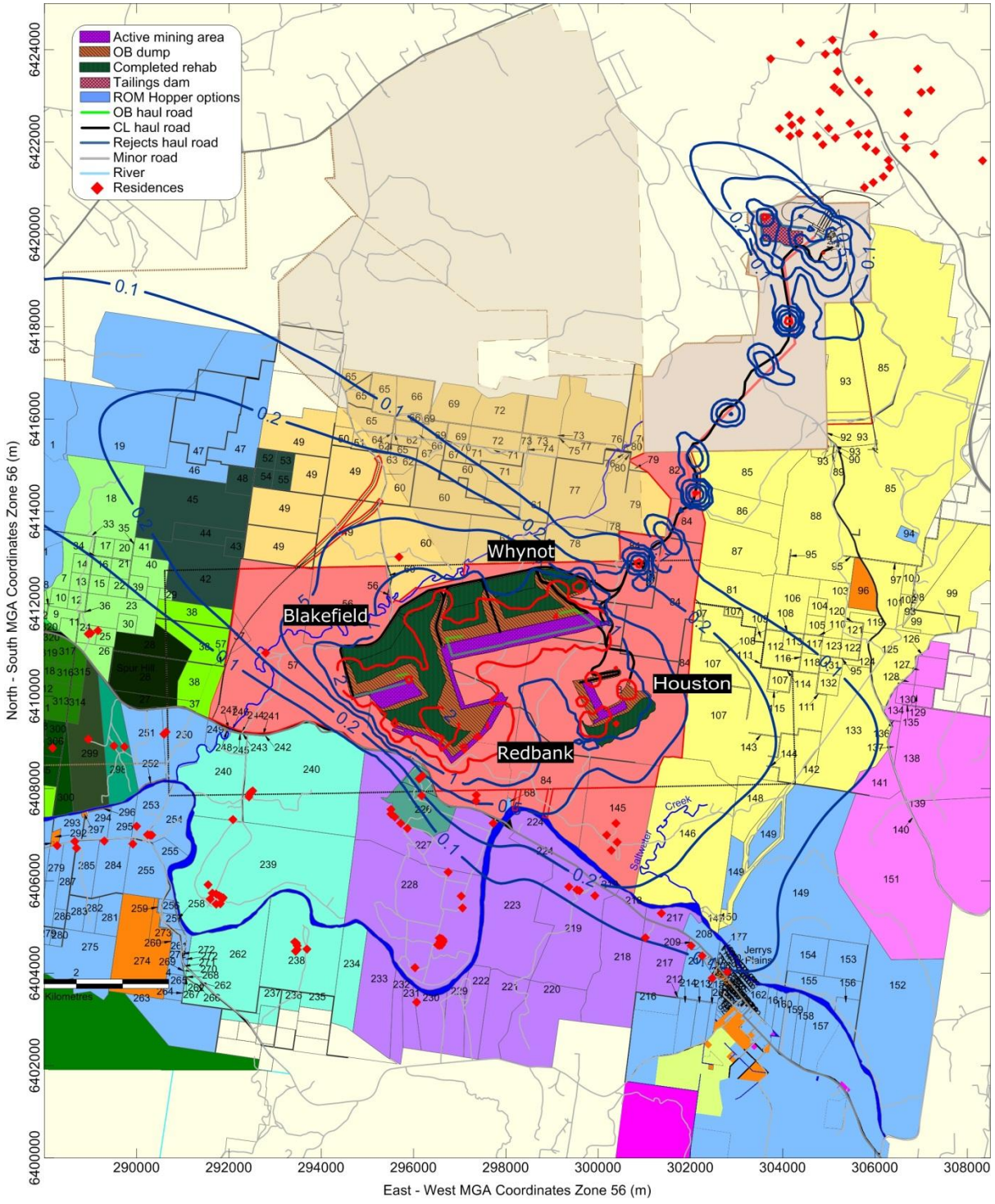
There are no privately owned residences that are predicted to experience annual average dust deposition above the assessment criteria, due to emissions from the Project-only. There is a reduction in the predicted annual average deposited dust at all other modelled residences due to the new emission estimates.

Table 3-8: Annual dust deposition concentrations (g/m²/month) at nearby residences for each modelling year – Project Only

ID	Project Only Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 2 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	0.1	0.1	0.1	0.1
3	0.1	0.1	0.1	0.1
24A	0.0	0.0	0.0	0.0
24B	0.0	0.0	0.0	0.0
25	0.1	0.0	0.1	0.0
172	0.1	0.1	0.1	0.1
207	0.1	0.1	0.1	0.1
209	0.1	0.1	0.1	0.1
211	0.1	0.1	0.1	0.1
217A	0.2	0.2	0.2	0.1
217B	0.1	0.1	0.1	0.1
219A	0.2	0.1	0.2	0.1
219B	0.2	0.2	0.2	0.1
219C	0.2	0.1	0.2	0.1
219D	0.2	0.1	0.2	0.1
226A	0.4	0.3	0.4	0.3
226B	0.6	0.5	0.5	0.4
226C	0.5	0.4	0.5	0.3
226D	0.3	0.2	0.2	0.2
227A	0.1	0.0	0.1	0.0
227B	0.0	0.0	0.0	0.0
227C	0.1	0.0	0.0	0.0
227D	0.1	0.0	0.1	0.0
227E	0.1	0.0	0.1	0.0
227F	0.4	0.3	0.4	0.3
228A	0.0	0.0	0.0	0.0
228B	0.0	0.0	0.0	0.0
228C	0.0	0.0	0.0	0.0
228D	0.0	0.0	0.0	0.0
228E	0.0	0.0	0.0	0.0
228F	0.0	0.0	0.0	0.0
228G	0.0	0.0	0.0	0.0
228H	0.0	0.0	0.0	0.0
228I	0.0	0.0	0.0	0.0
228J	0.0	0.0	0.0	0.0
228K	0.1	0.0	0.0	0.0
228L	0.1	0.0	0.1	0.0
228M	0.1	0.1	0.1	0.0
230	0.0	0.0	0.0	0.0
238A	0.0	0.0	0.0	0.0
238B	0.0	0.0	0.0	0.0
238C	0.0	0.0	0.0	0.0
238D	0.0	0.0	0.0	0.0

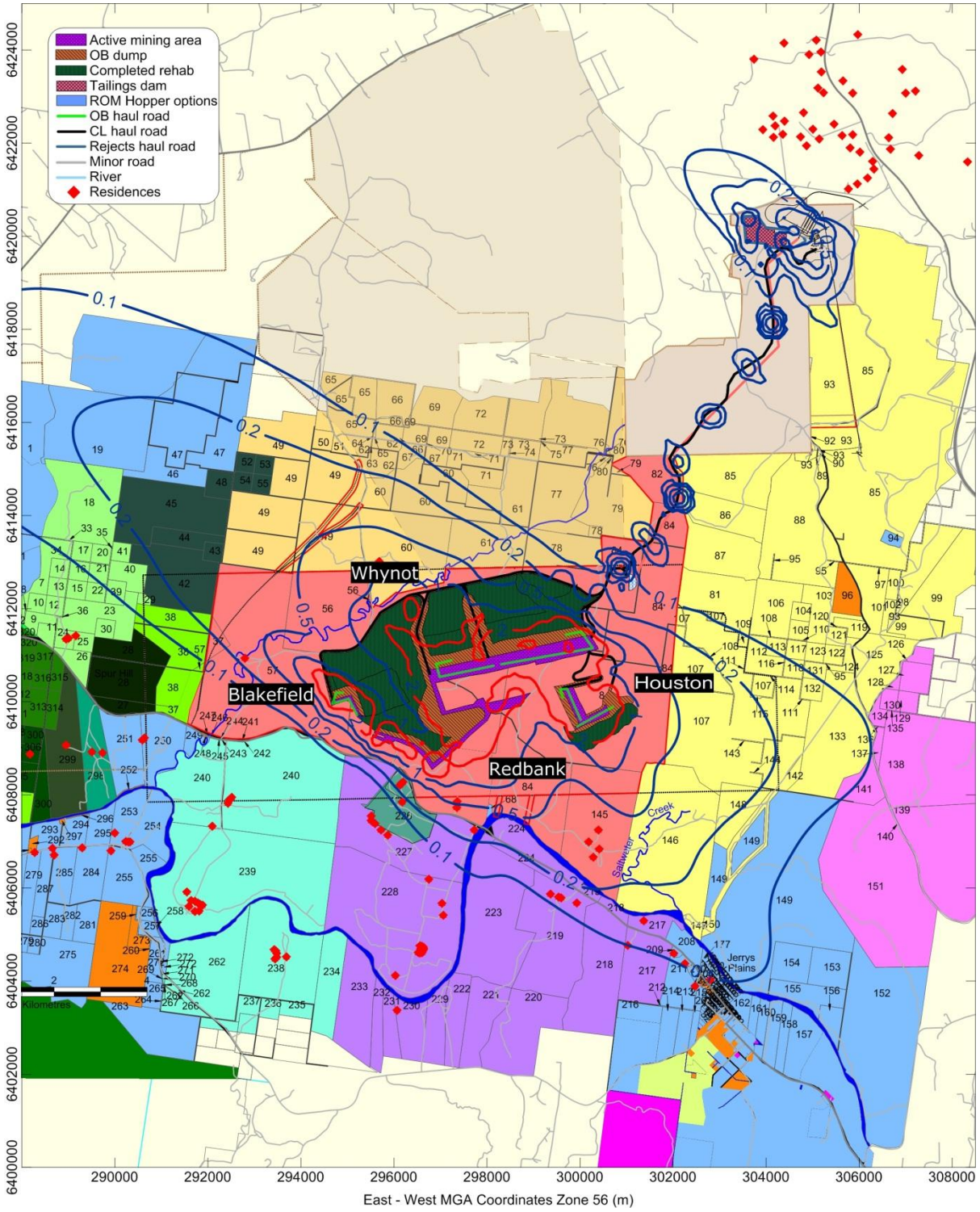
ID	Project Only Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 2 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	0.0	0.0	0.0	0.0
238F	0.0	0.0	0.0	0.0
239A	0.0	0.0	0.0	0.0
239B	0.0	0.0	0.0	0.0
239C	0.0	0.0	0.0	0.0
239D	0.0	0.0	0.0	0.0
239E	0.0	0.0	0.0	0.0
239F	0.0	0.0	0.0	0.0
239G	0.0	0.0	0.0	0.0
239H	0.0	0.0	0.0	0.0
239I	0.0	0.0	0.0	0.0
240A	0.0	0.0	0.0	0.0
240B	0.0	0.0	0.0	0.0
240C	0.0	0.0	0.0	0.0
240D	0.0	0.0	0.0	0.0
240E	0.0	0.0	0.0	0.0
250A	0.0	0.0	0.0	0.0
250B	0.0	0.0	0.0	0.0
253	0.0	0.0	0.0	0.0
254A	0.0	0.0	0.0	0.0
254B	0.0	0.0	0.0	0.0
254C	0.0	0.0	0.0	0.0
255	0.0	0.0	0.0	0.0
279	0.0	0.0	0.0	0.0
284	0.0	0.0	0.0	0.0
285	0.0	0.0	0.0	0.0
287	0.0	0.0	0.0	0.0
288	0.0	0.0	0.0	0.0
298A	0.0	0.0	0.0	0.0
298B	0.0	0.0	0.0	0.0
299	0.0	0.0	0.0	0.0
306	0.0	0.0	0.0	0.0
Drayton Mine				
384	0.0	0.0	0.0	0.0
385	0.0	0.0	0.0	0.0
386	0.0	0.0	0.0	0.0
387	0.0	0.0	0.0	0.0
390	0.0	0.0	0.0	0.0
398	0.0	0.0	0.0	0.0
399	0.0	0.0	0.0	0.0
400	0.0	0.0	0.0	0.0
401	0.0	0.0	0.0	0.0
402	0.0	0.0	0.0	0.0
403	0.0	0.0	0.0	0.0
411	0.0	0.0	0.0	0.0
418	0.0	0.0	0.0	0.0
419	0.0	0.0	0.0	0.0
420	0.0	0.0	0.0	0.0
421	0.0	0.0	0.0	0.0
423	0.0	0.0	0.0	0.0
424	0.0	0.0	0.0	0.0
425	0.0	0.0	0.0	0.0
427	0.0	0.0	0.0	0.0
429	0.0	0.0	0.0	0.0
432	0.0	0.0	0.0	0.0
433A	0.0	0.0	0.0	0.0
433B	0.0	0.0	0.0	0.0
435	0.0	0.0	0.0	0.0
438	0.0	0.0	0.0	0.0
440	0.0	0.0	0.0	0.0

ID	Project Only Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 2 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	0.0	0.0	0.0	0.0
443	0.0	0.0	0.0	0.0
444	0.0	0.0	0.0	0.0
446A	0.0	0.0	0.0	0.0
446B	0.0	0.0	0.0	0.0
451	0.0	0.0	0.0	0.0
455	0.0	0.0	0.0	0.0
456	0.0	0.0	0.0	0.0
460	0.0	0.0	0.0	0.0
Mine owned residences				
57	0.3	0.3	0.3	0.3
58A	0.9	0.7	0.8	0.6
58B	0.7	0.5	0.6	0.4
60	1.1	0.8	1.0	0.8
145A	0.4	0.3	0.4	0.3
145B	0.4	0.3	0.4	0.3
145C	0.4	0.3	0.4	0.3
145D	0.4	0.3	0.4	0.3
388	0.0	0.0	0.0	0.0
389	0.0	0.0	0.0	0.0
404	0.0	0.0	0.0	0.0
410	0.0	0.0	0.0	0.0



Species: Dust deposition	**Location:** Drayton South	**Scenario:** Year 10 (The Project only)	**Percentile:**	**Averaging Time:** Annual
Model Used: CALPUFF	**Units:** g/m²/month	**Guideline:** EPA =2 g/m²/month (shown as a bold red line)	**Met Data:** CALMET	**Plot:** K. Hill

Figure 3-15: Predicted annual average dust deposition concentrations due to emissions from Drayton South only - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
Dust deposition	Drayton South	Year 15 (The Project only)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	g/m²/month	EPA =2 g/m²/month (shown as a bold red line)	CALMET	K. Hill

Figure 3-16: Predicted annual average dust deposition concentrations due to emissions from Drayton South only - Year 15

3.3.6 Cumulative dust deposition

A summary of the cumulative predicted dust deposition at each of the individual residences for the original and revised modelling are provided in **Table 3-9** and the revised modelling only in **Figure 3-17** to **Figure 3-18** for each modelled year.

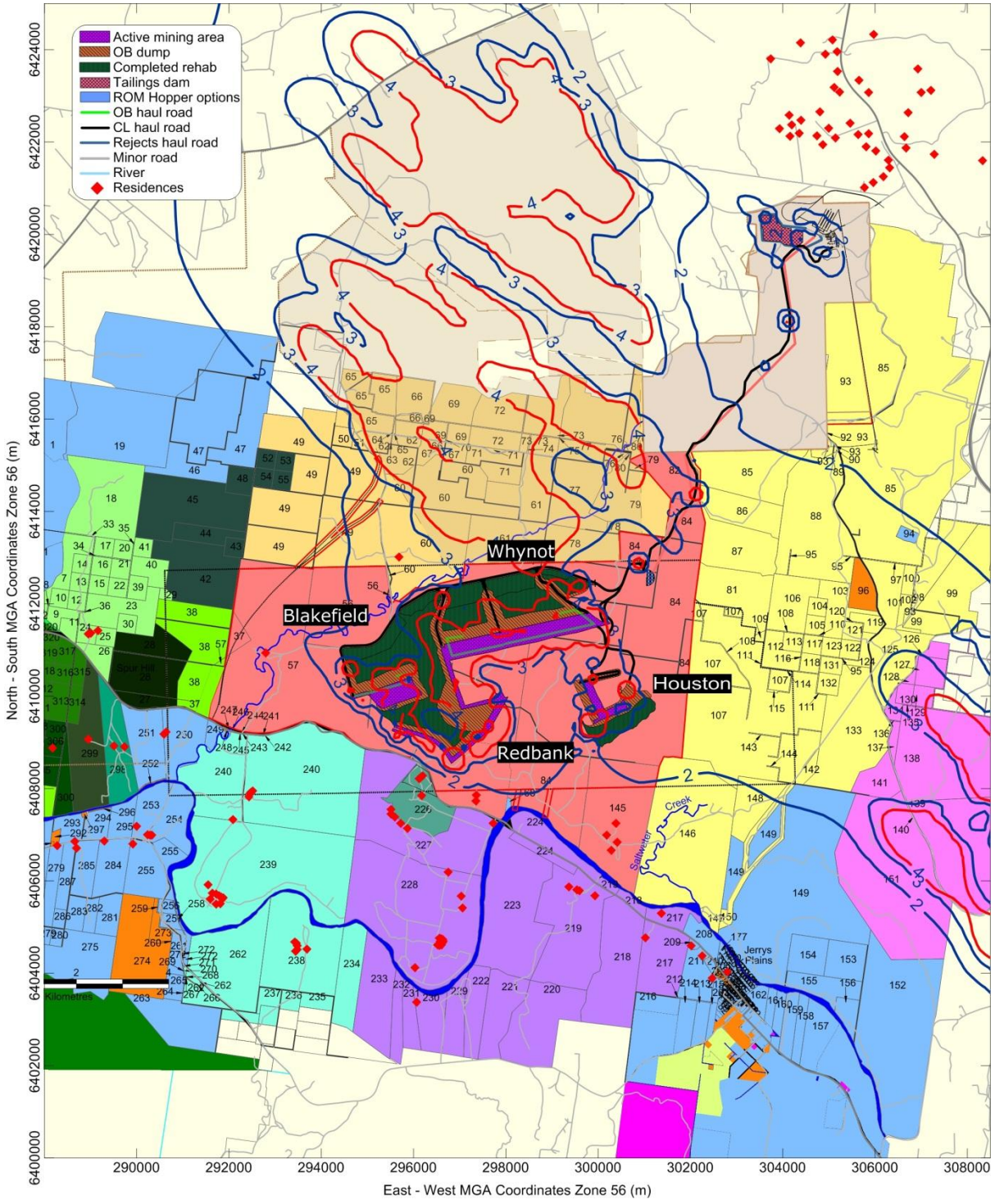
There are no privately owned residences that are predicted to experience annual average dust deposition above the assessment criteria, due to emissions from the Project plus background or cumulative sources. There is a reduction in the predicted annual average deposited dust at all other modelled residences due to the new emission estimates.

Table 3-9: Annual Dust Deposition concentrations (g/m²/month) at nearby residences for each modelling year - Cumulative

ID	Cumulative Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 4 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	1.2	1.2	1.1	1.1
3	1.2	1.2	1.1	1.1
24A	1.1	1.1	1.1	1.1
24B	1.1	1.1	1.1	1.1
25	1.1	1.1	1.1	1.1
172	1.3	1.3	1.2	1.2
207	1.3	1.2	1.2	1.2
209	1.3	1.3	1.3	1.2
211	1.3	1.3	1.3	1.2
217A	1.4	1.3	1.3	1.3
217B	1.3	1.2	1.2	1.2
219A	1.3	1.3	1.3	1.2
219B	1.4	1.3	1.3	1.3
219C	1.3	1.3	1.3	1.2
219D	1.3	1.3	1.3	1.2
226A	1.6	1.4	1.5	1.4
226B	1.7	1.6	1.6	1.5
226C	1.6	1.5	1.5	1.4
226D	1.4	1.3	1.3	1.2
227A	1.1	1.1	1.1	1.1
227B	1.1	1.1	1.1	1.1
227C	1.1	1.1	1.1	1.1
227D	1.1	1.1	1.1	1.1
227E	1.1	1.1	1.1	1.1
227F	1.6	1.5	1.5	1.4
228A	1.1	1.1	1.1	1.1
228B	1.1	1.1	1.1	1.1
228C	1.1	1.1	1.1	1.1
228D	1.1	1.1	1.1	1.1
228E	1.1	1.1	1.1	1.1
228F	1.1	1.1	1.1	1.1
228G	1.1	1.1	1.1	1.1
228H	1.1	1.1	1.1	1.1
228I	1.1	1.1	1.0	1.0
228J	1.1	1.1	1.1	1.1
228K	1.1	1.1	1.1	1.1
228L	1.1	1.1	1.1	1.1
228M	1.2	1.1	1.1	1.1
230	1.1	1.0	1.0	1.0
238A	1.0	1.0	1.0	1.0
238B	1.0	1.0	1.0	1.0
238C	1.0	1.0	1.0	1.0
238D	1.0	1.0	1.0	1.0

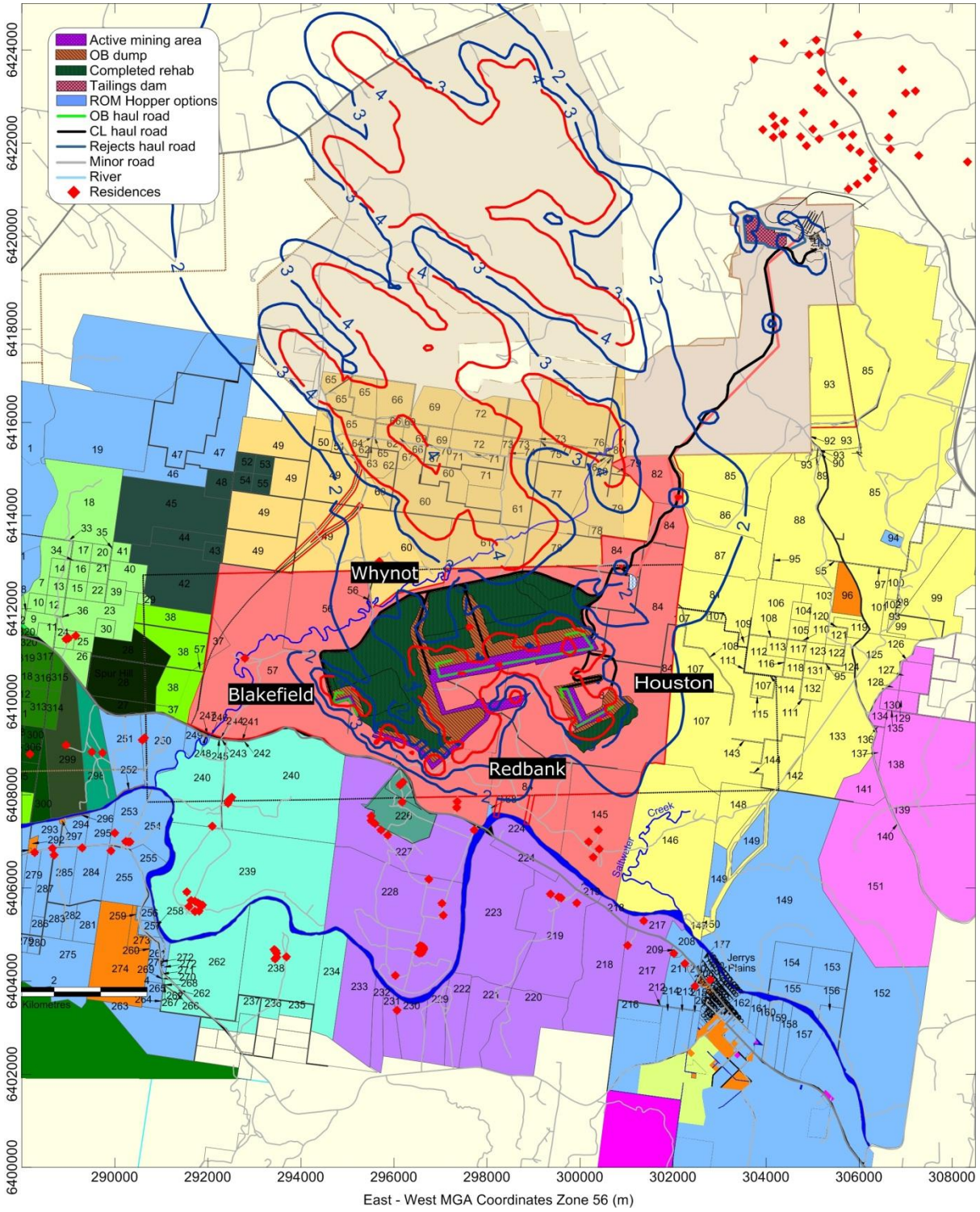
ID	Cumulative Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 4 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	1.0	1.0	1.0	1.0
238F	1.0	1.0	1.0	1.0
239A	1.1	1.0	1.0	1.0
239B	1.1	1.0	1.0	1.0
239C	1.1	1.0	1.0	1.0
239D	1.1	1.0	1.0	1.0
239E	1.1	1.0	1.0	1.0
239F	1.1	1.0	1.0	1.0
239G	1.1	1.0	1.0	1.0
239H	1.1	1.0	1.0	1.0
239I	1.1	1.1	1.0	1.0
240A	1.1	1.1	1.1	1.0
240B	1.1	1.1	1.1	1.1
240C	1.1	1.1	1.1	1.1
240D	1.1	1.1	1.1	1.1
240E	1.1	1.1	1.1	1.1
250A	1.1	1.1	1.1	1.1
250B	1.1	1.1	1.1	1.1
253	1.1	1.1	1.0	1.0
254A	1.1	1.1	1.0	1.0
254B	1.1	1.1	1.0	1.0
254C	1.1	1.1	1.0	1.0
255	1.1	1.1	1.0	1.0
279	1.0	1.0	1.0	1.0
284	1.1	1.0	1.0	1.0
285	1.0	1.0	1.0	1.0
287	1.0	1.0	1.0	1.0
288	1.0	1.0	1.0	1.0
298A	1.1	1.1	1.1	1.1
298B	1.1	1.1	1.1	1.1
299	1.1	1.1	1.1	1.0
306	1.1	1.1	1.0	1.0
Drayton Mine				
384	1.2	1.2	1.2	1.2
385	1.2	1.2	1.2	1.2
386	1.2	1.2	1.2	1.2
387	1.3	1.3	1.3	1.3
390	1.4	1.4	1.3	1.3
398	1.3	1.3	1.3	1.3
399	1.3	1.3	1.3	1.3
400	1.3	1.3	1.2	1.2
401	1.3	1.3	1.2	1.2
402	1.3	1.3	1.3	1.3
403	1.3	1.3	1.3	1.3
411	1.3	1.3	1.3	1.2
418	1.3	1.3	1.2	1.2
419	1.3	1.2	1.2	1.2
420	1.2	1.2	1.2	1.2
421	1.2	1.2	1.2	1.2
423	1.3	1.2	1.2	1.2
424	1.2	1.2	1.2	1.2
425	1.2	1.2	1.2	1.2
427	1.2	1.2	1.2	1.2
429	1.2	1.2	1.2	1.2
432	1.2	1.2	1.2	1.2
433A	1.2	1.2	1.2	1.2
433B	1.2	1.2	1.2	1.2
435	1.2	1.2	1.2	1.2
438	1.2	1.1	1.1	1.1
440	1.2	1.2	1.2	1.2

ID	Cumulative Annual Average Dust Deposition (g/m²/month) *Assessment criteria = 4 g/m²/month*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	1.2	1.2	1.1	1.1
443	1.2	1.2	1.2	1.2
444	1.2	1.2	1.2	1.2
446A	1.2	1.2	1.2	1.2
446B	1.2	1.2	1.2	1.2
451	1.2	1.2	1.2	1.2
455	1.1	1.1	1.1	1.1
456	1.1	1.1	1.1	1.1
460	1.2	1.2	1.2	1.2
Mine owned residences				
57	1.5	1.4	1.4	1.4
58A	2.0	1.8	1.9	1.7
58B	1.9	1.7	1.7	1.6
60	2.9	2.6	2.7	2.5
145A	1.6	1.6	1.6	1.5
145B	1.7	1.6	1.6	1.6
145C	1.7	1.6	1.6	1.5
145D	1.6	1.5	1.5	1.5
388	1.3	1.3	1.3	1.3
389	1.4	1.4	1.4	1.3
404	1.3	1.3	1.3	1.2
410	1.3	1.3	1.3	1.3



Species:	Location:	Scenario:	Percentile:	Averaging Time:
Dust deposition	Drayton South	Year 10 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	g/m²/month	EPA =4 g/m²/month (shown as a bold red line)	CALMET	K. Hill

Figure 3-17: Predicted annual average dust deposition concentrations due to emissions from Drayton South and other sources - Year 10



Species:	Location:	Scenario:	Percentile:	Averaging Time:
Dust deposition	Drayton South	Year 15 (Cumulative)		Annual
Model Used:	**Units:**	**Guideline:**	**Met Data:**	**Plot:**
CALPUFF	g/m²/month	EPA =4 g/m²/month (shown as a bold red line)	CALMET	K. Hill

Figure 3-18: Predicted annual average dust deposition concentrations due to emissions from Drayton South and other sources - Year 15

4 CONCLUSIONS

Pacific Environment has assessed modelling results for the revised emission estimates for Years 10 and 15 as part of the RTS process in order to attempt and address key concerns raised within the public submissions process. The results of this modelling show a reduction in the predicted ground level concentrations due to the additional air quality controls and commitments applied and inclusion of silt and moisture contents from onsite measurements at Drayton Coal Mine.

The results show a significant reduction in the maximum predicted 24-hour average PM_{10} ground level concentrations at a number of privately owned residences compared with the original EA modelling.

One private receiver (226B) is predicted to experience exceedances of the 24-hour average PM_{10} assessment criterion during Year 10 of the Project operations. The number of days over the 24-hour average PM_{10} criterion is predicted to be up to 3 days which represents a significant reduction from the predictions in the EA where up to 23 days were predicted to be in exceedance for this receiver.

The annual average PM_{10}, TSP and dust deposition ground level concentrations are not predicted to exceed the relevant criteria from the project alone at any private residences. The cumulative assessment resulted in exceedances at one mine owned residence (both PM_{10} and TSP) and no private residences compared with the original EA modelling, which predicted exceedances at 6 private and 8 mine owned. There is an overall reduction in the predicted annual average concentrations at all other modelled residences due to the revised emission estimates.

Overall the predicted contribution of dust to the Hunter Valley air shed has been further reduced due to the application of actual site monitoring data for silt and moisture content from the existing Drayton Mine, thereby improving the accuracy of the Project air quality model and Anglo American's commitment to impose additional controls into the Project design in order to reduce the Project's air quality impacts.

Residence ID	Potential Impact
Privately owned residences	
226B	24-hour PM_{10} impacts above 50 µg/m³ occur up to 3 days from the Project alone in Year 10.
226C	24-hour PM_{10} impacts above 50 µg/m³ occur up to 2 days from the Project alone in Year 10.
Mine owned residences	
58 A	24-hour PM_{10} impacts above 50 µg/m³ occur up to 1 day from the Project alone in Year 15.
60	Cumulative annual average PM_{10} concentrations above 30 µg/m³ and TSP concentrations above 90 µg/ m³ based on conservative worst case assessment.

Do not hesitate to contact the undersigned should you have any queries on the above.

Sincerely,

Judith Cox
Principal Air Quality Consultant (NSW)
Pacific Environment Limited

Khali Hill
Atmospheric Scientist
Pacific Environment Limited

5 REFERENCES

PAEHolmes (2012)
"Drayton South Air Quality and Greenhouse Gas Impact Assessment", prepared for Hansen Baily on behalf of Anglo American Metallurgical Coal. October 2012

Appendix A. DRAYTON COAL MINE SAMPLING REPORT

Environmental - Dust Emissions

Client Pacific Environment
Job No 13-087
Report number 1
Sample point Coal Mine

Date sampled 26/02/2013
Date sample received 27/02/2013
Sampled in accordance with AS4264.1 NA
Sampled by: *** Client

Sample date	Client Sample Identification	Moisture In Analysis* % EPA AP42 C2	Silt Content* % EPA AP42 C2	Threshold Friction Velocity* cm/s EPA AP 42 13.2.5			Macgeo sample no.
26/02/2013	Sample 01 Active OB	10.9	1.8	>100			L13-5999
26/02/2013	Sample 02 Inactive OB	6.4	0.5	>100			L13-6000
26/02/2013	Sample 03 Reject Coal	3.9	0.2	>100			L13-6001
26/02/2013	Sample 04 Product Coal	5.4	0.8	>100			L13-6002
26/02/2013	Sample 05 ROM Coal	6.6	1.1	>100			L13-6003
26/02/2013	Sample 06 Main Haul Road	2.8	0.4	>100			L13-6004
26/02/2013	Sample 07 In Pit Haul Road	2.0	4.1	>100			L13-6005

* Non accredited tests
*** MacQuarie Geotech takes no responsibility for correctness of sampling if sampled by client

Authorised signatory _____
R. Cox
Date 28/02/2013

NATA Accredited Laboratory Number: 14874

MACQUARIE GEOTECH

Macquarie Geotechnical
Unit 5/1 Castlereagh Hwy
Lidsdale NSW 2790
phone 02 6355 7991
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Appendix B. ESTIMATION OF DUST EMISSIONS

Drayton South Mine Project

For each stage of the mine a corresponding emissions inventory has been developed. The modelled scenarios are considered to be representative of worst-case operations; for example where coal and waste material amounts are highest, where extraction or wind erosion areas are largest or where operations are located closest to residences.

Table A.5-1: Year 10 – Drayton South Emissions Calculations

ACTIVITY	TSP emissions (kg/y)	Intensity	units	Emission factor	units	Variable 1	units	Variable 2	units	Variable 3	units	Variable 4	Units	Variable 5	Units	CONTROL	Units
WHYNOT	NEW (all)																
Topsoil removal & Site preparation - Dozers on Whynot	30,319	3,623	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Whynot	174	185,253	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area (east) - Whynot	2,488	92,626	t/y	0.13432	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Hauling topsoil to emplacement area (west) - Whynot	1,659	92,626	t/y	0.08953	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.8	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Emplacing topsoil at emplacement area - Whynot	349	185,253	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Whynot	4,596	25,964	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Whynot	30,981	128	blasts/y	241	kg/blast	10638	Area of blast in square metres									0	% control
OB - Dozers on Dragline OB in-pit - Whynot	767	3,251	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dragline removal of OB - Whynot	210,383	11,012,155	bcm/y	0.0191	kg/m3 (loose	7	drop distance in m	10.9	moisture content in %							0	% control
OB - Dozers on Excavator OB in-pit - Whynot	694	2,943	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Whynot	4,225	24,110,314	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling excavator OB to emplacement area (east) - Whynot	323,849	12,055,157	t/y	0.13432	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling excavator OB to emplacement area (west) - Whynot	215,862	12,055,157	t/y	0.08953	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.8	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Dozers on OB haul roads (east) - Whynot	315	1,335	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers on OB haul roads (west) - Whynot	315	1,335	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Emplacing excavator OB at emplacement area - Whynot	4,225	24,110,314	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Whynot	1,461	6,194	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Whynot	1,690	7,164	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Whynot	607	2,575	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Loading partings to haul trucks - Whynot	277	1,579,656	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area (east) - Whynot	21,218	789,828	t/y	0.13432	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling partings to emplacement area (west) - Whynot	14,143	789,828	t/y	0.08953	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.8	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Emplacing Partings at emplacement area - Whynot	277	1,579,656	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Drilling coal and partings - Whynot	2,410	13,615	holes/y	0.5900	kg/hole											70	% control
CL - Blasting coal and partings - Whynot	1,257	65	blasts/y	19.4495	kg/blast	1985	Area of blast in square metres									0	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Whynot	28,349	8,257	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Whynot	185,122	3,072,435	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads (east) - Whynot	53,378	1,536,217	t/y	0.17373	kg/t	70	t/load	65.0	Vehicle gross mass (t)	4	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad (east) - Whynot	48,266	1,536,217	t/y	0.20946	kg/t	70	t/load	65.0	Vehicle gross mass (t)	28	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Hauling open coal in-pit roads (middle) - Whynot	31,898	1,536,217	t/y	0.10382	kg/t	70	t/load	65.0	Vehicle gross mass (t)	3	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad (middle) - Whynot	51,110	1,536,217	t/y	0.22180	kg/t	70	t/load	65.0	Vehicle gross mass (t)	29.2	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Whynot	9,217	3,072,435	t/y	0.010	kg/t											70	% control
CL- Handle coal at CHPP - Whynot	995	3,072,435	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Whynot	3,072	307,243	t/y	0.01	kg/t											0	% control
BLAKEFIELD																	
Topsoil removal & Site preparation - Dozers on Blakefield	5,989	716	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Blakefield	65	69,475	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area - Blakefield	1,057	69,475	t/y	0.07607	kg/t	222	t/truck load	275.0	Vehicle gross mass (t)	3.2	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Emplacing topsoil at emplacement area - Blakefield	131	69,475	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Blakefield	1,039	5,868	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Blakefield	7,002	29	blasts/y	241	kg/blast	10638	Area of blast in square metres									0	% control
OB - Dozers on Dragline OB in-pit - Blakefield	157	667	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dragline removal of OB - Blakefield	87,691	4,590,029	bcm/y	0.0191	kg/m3 (loose	7	drop distance in m	10.9	moisture content in %							0	% control
OB - Dozers on Excavator OB in-pit - Blakefield	22	95	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Blakefield	136	775,190	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling excavator OB to emplacement area - Blakefield	11,794	775,190	t/y	0.07607	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.2	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Dozers on OB haul roads - Blakefield	20	86	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB- Emplacing excavator OB at emplacement area - Blakefield	136	775,190	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Blakefield	180	761	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks -Blakefield	161	681	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Blakefield	9	37	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - loading partings to trucks - Blakefield	17	96,964	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area - Blakefield	1,475	96,964	t/y	0.07607	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.2	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Emplacing partings to emplacement area - Blakefield	17	96,964	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Drilling coal - Blakefield	229	1,294	holes/y	0.59	kg/hole											70	% control
CL - Blasting coal - Blakefield	119	6	blasts/y	19.4495	kg/blast	1985	Area of blast in square metres									0	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Blakefield	1,441	420	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Blakefield	17,593	291,991	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads - Blakefield	5,823	291,991	t/y	0.09971	kg/t	70	t/load	65.0	Vehicle gross mass (t)	2.6	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad - Blakefield	12,245	291,991	t/y	0.27958	kg/t	70	t/load	65.0	Vehicle gross mass (t)	36.7	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Blakefield	2,920	291,991	t/y	0.010	kg/t	70	% control									0	% control
CL - Handle coal at CHPP - Blakefield	61	291,991	t/y	0.0002	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	9	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Blakefield	292	29,199	t/y	0.01	kg/t											0	% control

ACTIVITY	TSP emissions (kg/y)	Intensity	units	Emission factor	units	Variable 1	units	Variable 2	units	Variable 3	units	Variable 4	Units	Variable 5	Units	CONTROL	Units
REDBANK																	
Topsoil Removal - Dozers/Excavators stripping topsoil - Redbank	11,928	1,425	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Redbank	89	94,757	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area (north) - Redbank	1,319	71,068	t/y	0.12377	kg/t	222	t/truck load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
Topsoil removal - Hauling topsoil to emplacement area (south) - Redbank	522	23,689	t/y	0.14698	kg/t	222	t/truck load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
Topsoil removal - Emplacing topsoil at emplacement area - Redbank	178	94,757	t/y	0.0019	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling for excavator removal - Redbank	1,814	10,246	holes/y	0.59	kg/hole											70	% control
OB - Blasting for excavator removal - Redbank	12,227	51	blasts/y	241	kg/blast	10638	Area of blast in square metres									0	% control
OB - Dozers on Excavator OB in-pit - Redbank	643	2,727	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Redbank	3,915	22,339,534	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling to emplacement area (north) - Redbank	311,052	16,754,651	t/y	0.12377	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Hauling to emplacement area (south) - Redbank	123,132	5,584,884	t/y	0.14698	kg/t	222	t/load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Dozers on OB haul roads (north) - Redbank	292	1,237	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers on OB haul roads (south) - Redbank	292	1,237	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Emplacing at emplacement area - Redbank	3,915	22,339,534	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area -Redbank	643	2,727	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Redbank	869	3,685	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Redbank	243	1,031	h/y	0.2	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Loading partings to trucks - Redbank	150	855,701	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area (north) - Redbank	11,915	641,776	t/y	0.12377	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Hauling partings to emplacement area (south) - Redbank	4,716	213,925	t/y	0.14698	kg/t	222	t/load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Emplacing partings at emplacement area - Redbank	150	855,701	t/y	0.0002	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Highwall transfer point - Redbank (Y8)	318	900,000	kg/t	0.0004	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Highwall conveyor - Redbank	17	0.0048	ha	0.4	kg/ha/h	8760	h/y									0	% control
CL - Drilling coal - Redbank	1,240	7,003	holes/y	0.59	kg/hole											70	% control
CL - Blasting coal - Redbank	646	33	blasts/y	19.4495	kg/blast	1985	Area of blast in square metres									-	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Redbank	12,276	3,576	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Redbank	149,449	2,480,375	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads - Redbank	160,224	2,480,375	t/y	0.43065	kg/t	70	t/load	65.0	Vehicle gross mass (t)	11.1	km/return trip	2.72	kg/VKT	4.1	% silt content	85	% control
CL - Hauling open coal to ROM pad - Redbank	88,540	2,480,375	t/y	0.23797	kg/t	70	t/load	65.0	Vehicle gross mass (t)	31.3	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Redbank	7,441	2,480,375	t/y	0.010	kg/t											70	% control
CL - Handle coal at CHPP - Redbank	803	2,480,375	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Redbank	2,480	248,038	t/y	0.01	kg/t											0	% control
ROM/REJECTS HANDLING																	
CL - Dozers ROM Coal Handling & Rejects - ROM stockpile	19,792	5,765	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Loading rejects	-	1,461,200	t/y	Rejects very wet therefore no dust												0	% control
CL - Transporting rejects	71,324	1,461,200	t/y	0.24406	kg/t	91	t/load	117.9	Vehicle gross mass (t)	6.2	km/return trip	3.55	kg/VKT	4.1	% silt content	80	% control
CL - Unloading rejects	-	1,461,200	t/y	Rejects very wet therefore no dust												0	% control
PRODUCT COAL																	
CL - Loading product stockpile	1,129	3,508,997	t/y	0.0004	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	5.4	moisture content in %							25	% control
CL - Loading product coal to trains	1,505	3,508,997	t/y	0.0004	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	5.4	moisture content in %							0	% control
WIND EROSION																	
WE - OB dump & disturbed area - Uncontrolled	1,202,360	343	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - OB dump & disturbed area - Controlled	66,798	38	ha	0.4	kg/ha/h	8760	h/y									50	% control
WE - Open mining area - Whynot	420,545	120	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Blakefield	157,717	45	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Redbank	215,110	61	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Houston	26,064	25	ha	0.4	kg/ha/h	8760	h/y									70	% control
WE - ROM stockpiles	7,358	6	ha	0.4	kg/ha/h	8760	h/y									65	% control
WE - Product stockpiles	52,560	15	ha	0.4	kg/ha/h	8760	h/y									0	% control
TOTAL	**4,599,468**																

Table A.5-2: Year 15 – Drayton South Emissions Calculations

ACTIVITY	TSP emissions (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
WHYNOT	NEW (All)																
Topsoil removal & Site preparation - Dozers on Whynot	26,181	3,129	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Whynot	119	126,612	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area (east) - Whynot	1,579	63,306	t/y	0.12471	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Hauling topsoil to emplacement area (west) - Whynot	1,047	63,306	t/y	0.08268	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.5	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Emplacing topsoil at emplacement area - Whynot	238	126,612	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Whynot	3,571	20,175	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Whynot	18,590	112	blasts/y	166.0857	kg/blast	8291	Area of blast in square metres									0	% control
OB - Dozers on Dragline OB in-pit - Whynot	599	2,541	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dragline removal of OB - Whynot	196,545	10,287,862	bcm/y	0.0191	kg/m3 (loose)	7	drop distance in m	10.9	moisture content in %							0	% control
OB - Dozers on Excavator OB in-pit - Whynot	1,136	4,816	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Whynot	3,629	20,694,435	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling excavator OB to emplacement area (east) - Whynot	258,071	10,347,218	t/y	0.12471	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling excavator OB to emplacement area (west) - Whynot	171,109	10,347,218	t/y	0.08268	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.5	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Dozers on OB haul roads (east) - Whynot	258	1,092	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers on OB haul roads (west) - Whynot	258	1,092	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB- Emplacing excavator OB at emplacement area - Whynot	3,629	20,694,435	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Whynot	1,735	7,358	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Whynot	1,398	5,925	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Whynot	459	1,948	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Loading partings to haul trucks - Whynot	227	1,296,741	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area (east) - Whynot	16,171	648,370	t/y	0.12471	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.3	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling partings to emplacement area (west) - Whynot	10,722	648,370	t/y	0.08268	kg/t	222	t/load	275.0	Vehicle gross mass (t)	3.5	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Emplacing Partings at emplacement area - Whynot	227	1,296,741	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Drilling coal and partings - Whynot	2,517	14,220	holes/y	0.5900	kg/hole											70	% control
CL - Blasting coal and partings - Whynot	2,038	64	blasts/y	31.8922	kg/blast	2760	Area of blast in square metres									-	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Whynot	21,444	6,246	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Whynot	142,760	2,369,365	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads (east) - Whynot	43,076	1,184,683	t/y	0.18180	kg/t	70	t/load	65.0	Vehicle gross mass (t)	5	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad (east) - Whynot	30,877	1,184,683	t/y	0.17376	kg/t	70	t/load	65.0	Vehicle gross mass (t)	23	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Hauling open coal in-pit roads (middle) - Whynot	25,445	1,184,683	t/y	0.10739	kg/t	70	t/load	65.0	Vehicle gross mass (t)	3	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad (middle) - Whynot	41,156	1,184,683	t/y	0.23160	kg/t	70	t/load	65.0	Vehicle gross mass (t)	30	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Whynot	7,108	2,369,365	t/y	0.010	kg/t											70	% control
CL- Handle coal at CHPP - Whynot	767	2,369,365	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Whynot	2,369	236,937	t/y	0.01	kg/t											0	% control
BLAKEFIELD																	
Site preparation - Dozers on Blakefield	2,654	317	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Blakefield	10	10,946	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area - Blakefield	117	10,946	t/y	0.05342	kg/t	222	t/load	275.0	Vehicle gross mass (t)	2.3	km/return trip	5.198	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Emplacing topsoil at emplacement area - Blakefield	21	10,946	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Blakefield	415	2,345	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Blakefield	2,160	13	blasts/y	166.0857	kg/blast	8291	Area of blast in square metres									0	% control
OB - Dozers on Dragline OB in-pit - Blakefield	78	332	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dragline removal of OB - Blakefield	41,566	2,175,707	bcm/y	0.0191	kg/m3 (loose)	7	drop distance in m	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Blakefield	78	332	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Blakefield	58	245	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Blakefield	10	44	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - loading partings to trucks - Blakefield	12	68,579	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area - Blakefield	733	68,579	t/y	0.05342	kg/t	222	t/load	275.0	Vehicle gross mass (t)	2.3	km/return trip	5.198	kg/VKT	4.1	% silt content	80	% control
OB - Emplacing partings to emplacement area - Blakefield	12	68,579	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Drilling coal - Blakefield	104	589	holes/y	0.5900	kg/hole											70	% control
CL - Blasting coal - Blakefield	84	3	blasts/y	31.8922	kg/blast	2760	Area of blast in square metres									-	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Blakefield	596	174	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Blakefield	5,914	98,156	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads - Blakefield	1,315	98,156	t/y	0.06696	kg/t	70	t/load	65.0	Vehicle gross mass (t)	1.7	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad - Blakefield	4,075	98,156	t/y	0.27679	kg/t	70	t/load	65.0	Vehicle gross mass (t)	36.4	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Blakefield	294	98,156	t/y	0.010	kg/t											70	% control
CL - Handle coal at CHPP - Blakefield	32	98,156	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Blakefield	98	9,816	t/y	0.01	kg/t											0	% control

ACTIVITY	TSP emissions (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
REDBANK																	
Site preparation - Dozers on Redbank	13,220	1,580	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Redbank	76	81,047	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area (north) - Redbank	1,093	60,785	t/y	0.11990	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.1	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
Topsoil removal - Hauling topsoil to emplacement area (south)- Redbank	449	20,262	t/y	0.14774	kg/t	222	t/load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
Topsoil removal - Emplacing topsoil at emplacement area -Redbank	153	81,047	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Redbank	1,814	10,247	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Redbank	9,442	57	blasts/y	166.0857	kg/blast	8291	Area of blast in square metres									0	% control
OB - Dozers on Excavator OB in-pit -Redbank	1,367	5,795	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Redbank	4,366	24,896,975	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling to emplacement area (north) - Redbank	335,824	18,672,731	t/y	0.11990	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.1	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Hauling to emplacement area (south) - Redbank	137,932	6,224,244	t/y	0.14774	kg/t	222	t/load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Dozers on OB haul roads (north) - Redbank	292	1,239	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers on OB haul roads (south) - Redbank	292	1,239	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB- Emplacing excavator OB at emplacement area - Redbank	4,366	24,896,975	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Redbank	1,367	5,795	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Redbank	819	3,473	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings -Redbank	174	736	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - loading partings to trucks - Redbank	142	808,942	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area (north) - Redbank	10,911	606,707	t/y	0.11990	kg/t	222	t/load	275.0	Vehicle gross mass (t)	5.1	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Hauling partings to emplacement area (south)- Redbank	4,482	202,236	t/y	0.14774	kg/t	222	t/load	275.0	Vehicle gross mass (t)	6.3	km/return trip	5.20	kg/VKT	4.1	% silt content	85	% control
OB - Emplacing partings to emplacement area - Redbank	142	808,942	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Drilling coal - Redbank	1,475	8,335	holes/y	0.5900	kg/hole											70	% control
CL - Blasting coal - Redbank	1,194	37	blasts/y	31.8922	kg/blast	2760	Area of blast in square metres									-	% control
CL - Dozers ripping/pushing/clean-up ROM in-pit - Redbank	10,075	2,935	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Redbank	83,674	1,388,715	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads - Redbank	83,290	1,388,715	t/y	0.39984	kg/t	70	t/load	65.0	Vehicle gross mass (t)	10.3	km/return trip	2.72	kg/VKT	4.1	% silt content	85	% control
CL - Hauling open coal to ROM pad - Redbank	50,700	1,388,715	t/y	0.24339	kg/t	70	t/load	65.0	Vehicle gross mass (t)	32.0	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper -Redbank	4,166	1,388,715	t/y	0.010	kg/t											70	% control
CL - Handle coal at CHPP - Redbank	450	1,388,715	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Redbank	1,389	138,872	t/y	0.01	kg/t											0	% control
HOUSTON																	
Topsoil removal - Dozers/Excavators stripping topsoil - Houston	6,181	739	h/y	16.7	kg/h	10	silt content in %	2	moisture content in %							50	% control
Topsoil removal - Sh/Ex/FELs loading topsoil - Houston	29	31,129	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							50	% control
Topsoil removal - Hauling topsoil to emplacement area (east) - Houston	127	15,565	t/y	0.04085	kg/t	222	t/truck load	275.0	Vehicle gross mass (t)	1.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Hauling topsoil to emplacement area (west) - Houston	154	15,565	t/y	0.04939	kg/t	222	t/truck load	275.0	Vehicle gross mass (t)	2.1	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
Topsoil removal - Emplacing topsoil at emplacement area - Houston	59	31,129	t/y	0.00188	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	2	moisture content in %							0	% control
OB - Drilling - Houston	836	4,724	holes/y	0.59	kg/hole											70	% control
OB - Blasting - Houston	4,353	26	blasts/y	166.0857	kg/blast	8291	Area of blast in square metres									0	% control
OB - Dozers on Dragline OB in-pit - Houston	156	662	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dragline removal of OB - Houston	52,854	2,766,556	bcm/y	0.0191	kg/m3 (loose)	7	drop distance in m	10.9	moisture content in %							0	% control
OB - Dozers on Excavator OB in-pit - Houston	217	918	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Excavator loading OB to haul truck - Houston	692	3,945,131	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling to emplacement area (east) - Houston	16,116	1,972,565	t/y	0.04085	kg/t	222	t/load	275.0	Vehicle gross mass (t)	1.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling to emplacement area (west) - Houston	19,483	1,972,565	t/y	0.04939	kg/t	222	t/load	275.0	Vehicle gross mass (t)	2.1	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Dozers on OB haul roads (east) - Houston	49	208	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers on OB haul roads (west) - Houston	49	208	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB- Emplacing at emplacement area - Houston	692	3,945,131	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Dozers on OB emplacement area - Houston	373	1,581	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers in-pit ancillary tasks - Houston	445	1,885	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Dozers ripping/pushing/clean-up Partings - Houston	78	331	h/y	0.24	kg/h	1.8	silt content in %	10.9	moisture content in %							0	% control
OB - Loading partings to trucks - Houston	31	175,692	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
OB - Hauling partings to emplacement area (east) - Houston	718	87,846	t/y	0.04085	kg/t	222	t/load	275.0	Vehicle gross mass (t)	1.7	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
OB - Hauling partings to emplacement area (west) - Houston	868	87,846	t/y	0.04939	kg/t	222	t/load	275.0	Vehicle gross mass (t)	2.1	km/return trip	5.20	kg/VKT	4.1	% silt content	80	% control
CL - Emplacing partings at emplacement area - Houston	31	175,692	t/y	0.00018	kg/t	1.59	average of (wind speed/2.2)^1.3 in m/s	10.9	moisture content in %							0	% control
CL - Dozers ripping/pushing/clean-up ROM (in-pit) - Houston	7,813	2,276	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Sh/Ex/FELs loading open coal to trucks - Houston	45,423	753,885	t/y	0.06025	kg/t	6.6	moisture content in %									0	% control
CL - Hauling open coal in-pit roads (east) - Houston	7,634	376,942	t/y	0.10126	kg/t	70	t/load	65.0	Vehicle gross mass (t)	2.6	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal in-pit roads (west) - Houston	4,434	376,942	t/y	0.05882	kg/t	70	t/load	65.0	Vehicle gross mass (t)	1.5	km/return trip	2.72	kg/VKT	4.1	% silt content	80	% control
CL - Hauling open coal to ROM pad (east) - Houston	11,181	376,942	t/y	0.19776	kg/t	70	t/load	65.0	Vehicle gross mass (t)	26.0	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Hauling open coal to ROM pad (west) - Houston	12,202	376,942	t/y	0.21580	kg/t	70	t/load	65.0	Vehicle gross mass (t)	28.4	km/return trip	0.53	kg/VKT	0.4	% silt content	85	% control
CL - Unloading ROM to ROM stockpiles/hopper - Houston	2,262	753,885	t/y	0.010	kg/t											70	% control
CL - Handle coal at CHPP - Houston	244	753,885	t/y	0.0003	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	6.6	moisture content in %							0	% control
CL - Rehandle ROM coal at stockpiles/hopper - Houston	754	75,388	t/y	0.01	kg/t											0	% control
ROM/REJECTS HANDLING																0	% control
CL - Dozers ROM Coal Handling & Rejects - ROM stockpile	19,792	5,765	h/y	3.4333	kg/h	1.1	silt content in %	6.6	moisture content in %							0	% control
CL - Loading rejects	-	1,152,530	t/y	Rejects very wet therefore no dust												0	% control
CL - Transporting rejects	56,257	1,152,530	t/y	0.2441	kg/t	91	t/load	117.9	Vehicle gross mass (t)	6.2	km/return trip	3.55	kg/VKT	4.1	% silt content	80	% control
CL - Unloading rejects	-	1,152,530	t/y	Rejects very wet therefore no dust												0	% control
PRODUCT COAL																	
CL - Loading product stockpile	1,106	3,437,913	t/y	0.0004	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	5.4	moisture content in %							25	% control
CL - Loading product coal to trains	1,475	3,437,913	t/y	0.0004	kg/t	1.46	average of (wind speed/2.2)^1.3 in m/s	5.4	moisture content in %							0	% control
WIND EROSION																	
WE - OB dump & disturbed area - Uncontrolled	1,306,674	373	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - OB dump & disturbed area - Controlled	72,593	41	ha	0.4	kg/ha/h	8760	h/y									50	% control
WE - Open mining area - Whynot	397,444	113	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Blakefield	34,361	10	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Redbank	254,412	73	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - Open mining area - Houston	97,717	28	ha	0.4	kg/ha/h	8760	h/y									0	% control
WE - ROM stockpiles	7,358	6	ha	0.4	kg/ha/h	8760	h/y									65	% control
WE - Product stockpiles	52,560	15	ha	0.4	kg/ha/h	8760	h/y									0	% control
TOTAL	**4,360,917**																

Appendix C. $PM_{2.5}$ ASSESSMENT

A.1 PROJECT ONLY ANNUAL AVERAGE $PM_{2.5}$ PREDICTIONS

A summary of the Project-only predicted $PM_{2.5}$ concentrations at each of the individual residences for the original and revised modelling are provided in **Table D.5-3**.

There are no privately owned residences that are predicted to experience annual average $PM_{2.5}$ concentrations due to emissions from the Project-only above the NEPM standard (8 µg/m³).

Table D.5-3: Annual $PM_{2.5}$ concentrations (µg/m³) at nearby residences for each modelling year – Project Only

ID	Project Only			
	Maximum 24-hour Average $PM_{2.5}$ (µg/m³)			
	Advisory Reporting Standard = 25 µg/m³			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	0.2	1.2	0.2	1.1
3	0.2	1.3	0.2	1.2
24A	0.2	1.6	0.2	1.3
24B	0.2	1.6	0.2	1.3
25	0.2	1.6	0.2	1.4
172	0.3	1.4	0.3	1.3
207	0.3	1.3	0.3	1.2
209	0.4	1.7	0.4	1.5
211	0.4	1.6	0.4	1.4
217A	0.6	2.1	0.6	1.9
217B	0.4	1.7	0.4	1.3
219A	0.5	1.9	0.5	2.0
219B	0.6	2.2	0.6	2.1
219C	0.6	2.0	0.5	2.0
219D	0.5	1.8	0.5	2.0
226A	1.8	7.5	1.6	6.4
226B	2.2	8.4	2.0	7.3
226C	2.0	7.9	1.8	6.9
226D	1.1	5.7	1.0	5.1
227A	0.4	3.3	0.4	2.8
227B	0.3	3.2	0.3	2.7
227C	0.3	3.2	0.3	2.8
227D	0.4	3.2	0.3	2.8
227E	0.4	3.2	0.4	2.9
227F	1.2	4.1	1.2	4.0
228A	0.2	2.5	0.2	2.0
228B	0.2	2.5	0.2	2.0
228C	0.2	2.5	0.2	2.1
228D	0.2	2.6	0.2	2.1
228E	0.2	2.6	0.2	2.1
228F	0.2	2.6	0.2	2.1
228G	0.2	2.6	0.2	2.2
228H	0.2	2.6	0.2	2.2
228I	0.1	2.0	0.1	1.6
228J	0.2	2.6	0.2	2.1
228K	0.3	3.3	0.3	2.7
228L	0.3	3.6	0.3	2.9
228M	0.4	4.2	0.4	3.4
230	0.1	1.6	0.1	1.4
238A	0.1	1.3	0.1	1.1
238B	0.1	1.3	0.1	1.0
238C	0.1	1.3	0.1	1.0
238D	0.1	1.3	0.1	1.0
238E	0.1	1.3	0.1	1.0
238F	0.1	1.3	0.1	1.0
239A	0.1	1.2	0.1	1.0

ID	Project Only Maximum 24-hour Average $PM_{2.5}$ (µg/m³) *Advisory Reporting Standard = 25 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
239B	0.1	1.3	0.1	1.0
239C	0.1	1.3	0.1	1.0
239D	0.1	1.3	0.1	1.0
239E	0.1	1.3	0.1	1.0
239F	0.1	1.2	0.1	1.0
239G	0.1	1.2	0.1	1.0
239H	0.1	1.3	0.1	1.0
239I	0.1	1.3	0.1	1.1
240A	0.1	1.9	0.1	1.5
240B	0.2	2.1	0.1	1.7
240C	0.2	2.2	0.1	1.7
240D	0.2	2.2	0.2	1.8
240E	0.2	2.1	0.1	1.7
250A	0.2	2.3	0.2	1.8
250B	0.2	2.3	0.2	1.9
253	0.1	1.6	0.1	1.3
254A	0.1	1.6	0.1	1.3
254B	0.1	1.6	0.1	1.3
254C	0.1	1.6	0.1	1.3
255	0.1	1.5	0.1	1.2
279	0.1	1.2	0.1	1.0
284	0.1	1.4	0.1	1.1
285	0.1	1.3	0.1	1.0
287	0.1	1.3	0.1	1.0
288	0.1	1.1	0.1	0.9
298A	0.2	1.9	0.1	1.5
298B	0.1	1.8	0.1	1.5
299	0.1	1.6	0.1	1.3
306	0.1	1.5	0.1	1.2
Drayton Mine				
384	0.0	0.4	0.0	0.3
385	0.0	0.4	0.0	0.3
386	0.1	0.5	0.1	0.4
387	0.1	0.6	0.1	0.5
390	0.1	0.8	0.1	0.7
398	0.1	0.7	0.1	0.6
399	0.1	0.6	0.1	0.5
400	0.1	0.5	0.1	0.4
401	0.1	0.6	0.1	0.5
402	0.1	0.6	0.1	0.5
403	0.1	0.7	0.1	0.7
411	0.1	1.2	0.1	0.9
418	0.1	1.1	0.1	0.9
419	0.1	1.0	0.1	0.8
420	0.1	1.0	0.1	0.7
421	0.1	0.8	0.1	0.6
423	0.1	0.7	0.1	0.5
424	0.1	0.6	0.1	0.5
425	0.1	0.7	0.1	0.5
427	0.1	0.6	0.0	0.4
429	0.0	0.4	0.0	0.3
432	0.0	0.4	0.0	0.3
433A	0.0	0.3	0.0	0.3
433B	0.0	0.3	0.0	0.3
435	0.0	0.3	0.0	0.3
438	0.0	0.5	0.0	0.3
440	0.0	0.6	0.0	0.4
441	0.0	0.4	0.0	0.3
443	0.0	0.6	0.0	0.4
444	0.1	0.7	0.0	0.5

ID	Project Only			
	Maximum 24-hour Average $PM_{2.5}$ (µg/m³)			
	Advisory Reporting Standard = 25 µg/m³			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
446A	0.1	0.7	0.1	0.5
446B	0.0	0.4	0.0	0.3
451	0.0	0.3	0.0	0.2
455	0.0	0.3	0.0	0.3
456	0.0	0.4	0.0	0.3
460	0.0	0.5	0.0	0.4
Mine owned residences				
57	0.8	5.3	0.8	4.5
58A	2.0	6.3	2.1	7.5
58B	1.6	5.5	1.6	6.1
60	1.7	4.6	1.4	4.1
145A	0.8	2.6	0.8	2.4
145B	0.8	2.5	0.9	2.5
145C	0.9	2.8	0.9	2.7
145D	0.9	2.7	0.9	2.5
388	0.1	0.7	0.1	0.6
389	0.1	0.7	0.1	0.6
404	0.1	0.6	0.1	0.5
410	0.1	1.2	0.1	0.9

A.2 CUMULATIVE ANNUAL AVERAGE $PM_{2.5}$ PREDICTIONS

To assess the cumulative impact of $PM_{2.5}$, monitoring data were sourced taken from the nearest EPA monitoring sites at Muswellbrook, Singleton and Camberwell. The annual average for 2011 for each of the site is presented in **Table D.5-4**. These values are already close to or above the current annual NEPM standard for $PM_{2.5}$.

Table D.5-4: Annual average $PM_{2.5}$ concentrations (µg/m³) at nearby EPA monitoring sites

Monitor location	Annual average - 2011
Muswellbrook	9.11
Singleton	7.60
Camberwell	8.24

The 24-hour average values for these three sites are plotted in **Figure D-1**. These monitoring data show a clear seasonal signal, with and increase across all three sites through winter. This increase in $PM_{2.5}$ is possibly the result of domestic wood burning and would explain why the annual average is close or exceeding to the NEPM standard.

The Project alone predicted ground-level concentrations are less than 1 µg/m³ at most residences for all operational years, so they are unlikely contribute significantly to the background $PM_{2.5}$ levels.

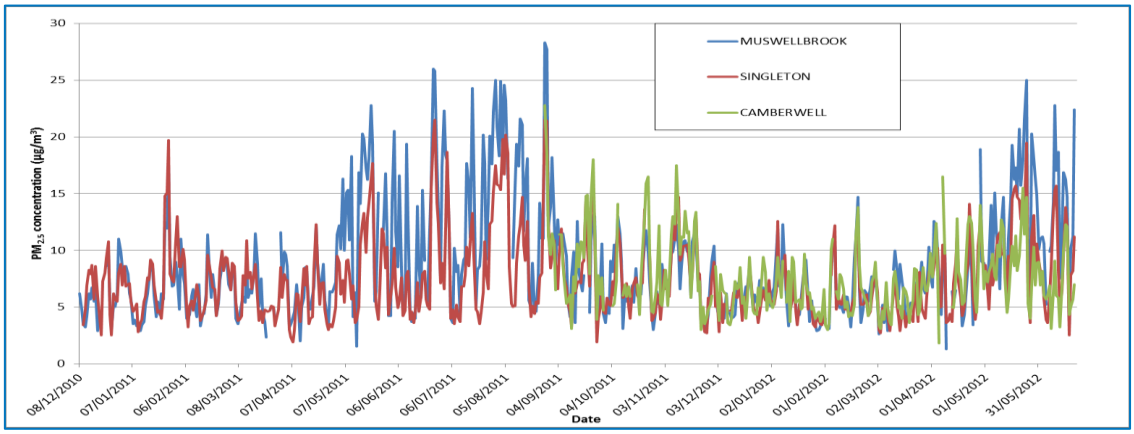

Figure D-1: Measured 24-hour average $PM_{2.5}$ at 3 EPA Upper Hunter monitoring sites

A.3 PROJECT ONLY 24-HOUR AVERAGE $PM_{2.5}$ PREDICTIONS

A summary of the predicted maximum 24-hour average $PM_{2.5}$ concentrations at each of the individual residences are provided in **Table D.5-5**. No residences are predicted to experience 24-hour average $PM_{2.5}$ levels above the NEPM standard of 25 µg/m³.

Note that the 24-hour $PM_{2.5}$ values do not represent a single worst case day, but rather represent the potential worst case 24-hour $PM_{2.5}$ concentration that could be reached at that particular location across the entire modelling year.

Table D.5-5: Maximum 24-hour $PM_{2.5}$ concentrations (µg/m³) at nearby residences for each modelling year – Project Only

ID	Project Only			
	Annual Average $PM_{2.5}$ (µg/m³)			
	Advisory Reporting Standard = 8 µg/m³			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
Privately owned residences				
Drayton South				
2	2.0	0.1	1.9	0.1
3	2.0	0.1	2.0	0.1
24A	2.7	0.1	2.2	0.1
24B	2.6	0.1	2.2	0.1
25	2.7	0.1	2.3	0.1
172	2.1	0.2	2.2	0.2
207	2.0	0.2	2.2	0.2
209	2.6	0.3	2.8	0.3
211	2.4	0.3	2.6	0.3
217A	3.2	0.4	3.8	0.4
217B	2.5	0.3	3.6	0.3
219A	2.9	0.4	3.8	0.3
219B	3.3	0.4	4.7	0.4
219C	3.0	0.4	4.0	0.4
219D	2.7	0.4	3.5	0.3
226A	11.3	1.2	4.4	1.0
226B	12.7	1.5	4.6	1.2
226C	12.0	1.4	4.5	1.1
226D	8.6	0.7	3.8	0.6
227A	5.2	0.2	3.2	0.2
227B	5.0	0.2	3.1	0.2
227C	5.0	0.2	3.1	0.2
227D	5.0	0.2	3.0	0.2
227E	5.0	0.2	2.9	0.2
227F	6.3	0.9	4.3	0.7
228A	3.9	0.1	2.7	0.1
228B	3.9	0.1	2.7	0.1
228C	3.9	0.1	2.7	0.1
228D	4.0	0.1	2.8	0.1
228E	4.1	0.1	2.8	0.1
228F	4.1	0.1	2.8	0.1
228G	4.1	0.1	2.8	0.1
228H	4.1	0.1	2.8	0.1
228I	3.2	0.1	2.2	0.1
228J	4.0	0.1	2.8	0.1
228K	5.2	0.2	3.5	0.2
228L	5.6	0.2	3.7	0.2
228M	6.5	0.2	4.0	0.2
230	2.6	0.1	1.9	0.1
238A	2.2	0.1	1.6	0.0
238B	2.1	0.0	1.5	0.0
238C	2.1	0.0	1.5	0.0
238D	2.1	0.0	1.6	0.0

ID	Project Only Annual Average $PM_{2.5}$ (µg/m³) *Advisory Reporting Standard = 8 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
238E	2.1	0.0	1.6	0.0
238F	2.1	0.0	1.6	0.0
239A	2.0	0.0	1.7	0.0
239B	2.1	0.1	1.8	0.0
239C	2.1	0.1	1.8	0.0
239D	2.1	0.1	1.8	0.0
239E	2.1	0.1	1.8	0.0
239F	2.0	0.0	1.7	0.0
239G	2.1	0.1	1.7	0.0
239H	2.1	0.1	1.8	0.0
239I	2.2	0.1	1.9	0.0
240A	3.1	0.1	2.5	0.1
240B	3.5	0.1	2.8	0.1
240C	3.6	0.1	2.9	0.1
240D	3.6	0.1	2.9	0.1
240E	3.5	0.1	2.8	0.1
250A	3.7	0.1	2.9	0.1
250B	3.7	0.1	2.9	0.1
253	2.6	0.1	2.2	0.1
254A	2.6	0.1	2.2	0.1
254B	2.6	0.1	2.2	0.1
254C	2.6	0.1	2.2	0.1
255	2.4	0.1	2.0	0.1
279	2.1	0.1	1.8	0.0
284	2.3	0.1	2.0	0.1
285	2.2	0.1	1.8	0.0
287	2.2	0.1	1.8	0.0
288	1.9	0.0	1.6	0.0
298A	3.1	0.1	2.5	0.1
298B	3.0	0.1	2.4	0.1
299	2.7	0.1	2.2	0.1
306	2.4	0.1	2.0	0.1
Drayton Mine				
384	0.8	0.0	0.9	0.0
385	0.9	0.0	1.1	0.0
386	1.0	0.0	1.1	0.0
387	1.3	0.0	1.6	0.0
390	1.7	0.1	2.1	0.0
398	1.6	0.0	1.9	0.0
399	1.4	0.0	1.6	0.0
400	1.2	0.0	1.4	0.0
401	1.2	0.0	1.4	0.0
402	1.4	0.0	1.6	0.0
403	1.4	0.0	1.7	0.0
411	2.8	0.0	2.4	0.0
418	2.6	0.0	2.3	0.0
419	2.3	0.0	2.0	0.0
420	2.2	0.0	1.9	0.0
421	1.8	0.0	1.5	0.0
423	1.4	0.0	1.1	0.0
424	1.1	0.0	1.0	0.0
425	1.4	0.0	1.1	0.0
427	1.0	0.0	0.9	0.0
429	0.9	0.0	0.8	0.0
432	0.7	0.0	0.7	0.0
433A	0.7	0.0	0.6	0.0
433B	0.6	0.0	0.6	0.0
435	0.6	0.0	0.6	0.0
438	0.9	0.0	0.7	0.0
440	1.1	0.0	0.9	0.0

ID	Project Only Annual Average $PM_{2.5}$ (µg/m³) *Advisory Reporting Standard = 8 µg/m³*			
	Year 10		Year 15	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling
441	0.8	0.0	0.6	0.0
443	1.2	0.0	1.0	0.0
444	1.5	0.0	1.3	0.0
446A	1.6	0.0	1.3	0.0
446B	0.8	0.0	0.7	0.0
451	0.6	0.0	0.5	0.0
455	0.6	0.0	0.5	0.0
456	0.8	0.0	0.6	0.0
460	0.9	0.0	0.7	0.0
Mine owned residences				
57	8.3	0.6	7.6	0.5
58A	9.5	1.4	12.1	1.3
58B	8.3	1.1	10.0	1.0
60	7.3	1.2	6.2	1.0
145A	3.8	0.6	3.8	0.6
145B	3.7	0.6	4.1	0.6
145C	4.1	0.6	4.2	0.6
145D	3.9	0.6	4.1	0.6
388	1.5	0.0	1.3	0.0
389	1.7	0.1	1.6	0.1
404	1.2	0.0	1.1	0.0
410	2.7	0.1	2.4	0.0

A.4 CUMULATIVE 24 HOUR AVERAGE $PM_{2.5}$ PREDICTIONS

The Monte Carlo method was used for the cumulative analysis of the 24-hour average $PM_{2.5}$. The three nearest EPA Upper Hunter Air Quality network sites of Muswellbrook, Singleton and Camberwell $PM_{2.5}$ data were used as the background data to add to the predicted Project alone concentrations, as in the $PM_{2.5}$ cumulative analysis. The same 13 residences were assessed for the average 24-hour $PM_{2.5}$ impacts.

The results of the Monte Carlo simulations are present in **Figure D-2**, **Figure D-3** and **Figure D-4**. As in the PM2.5 analysis the residences closer to the Project are more likely to experience days over the NEPM standard, however for all sites the predicted number of days varying between 1 to 2 days per year (see **Table D.5-6**). There is a reduction in the predicted number of days to exceed the advisory reporting standard compared to the original EA modelling.

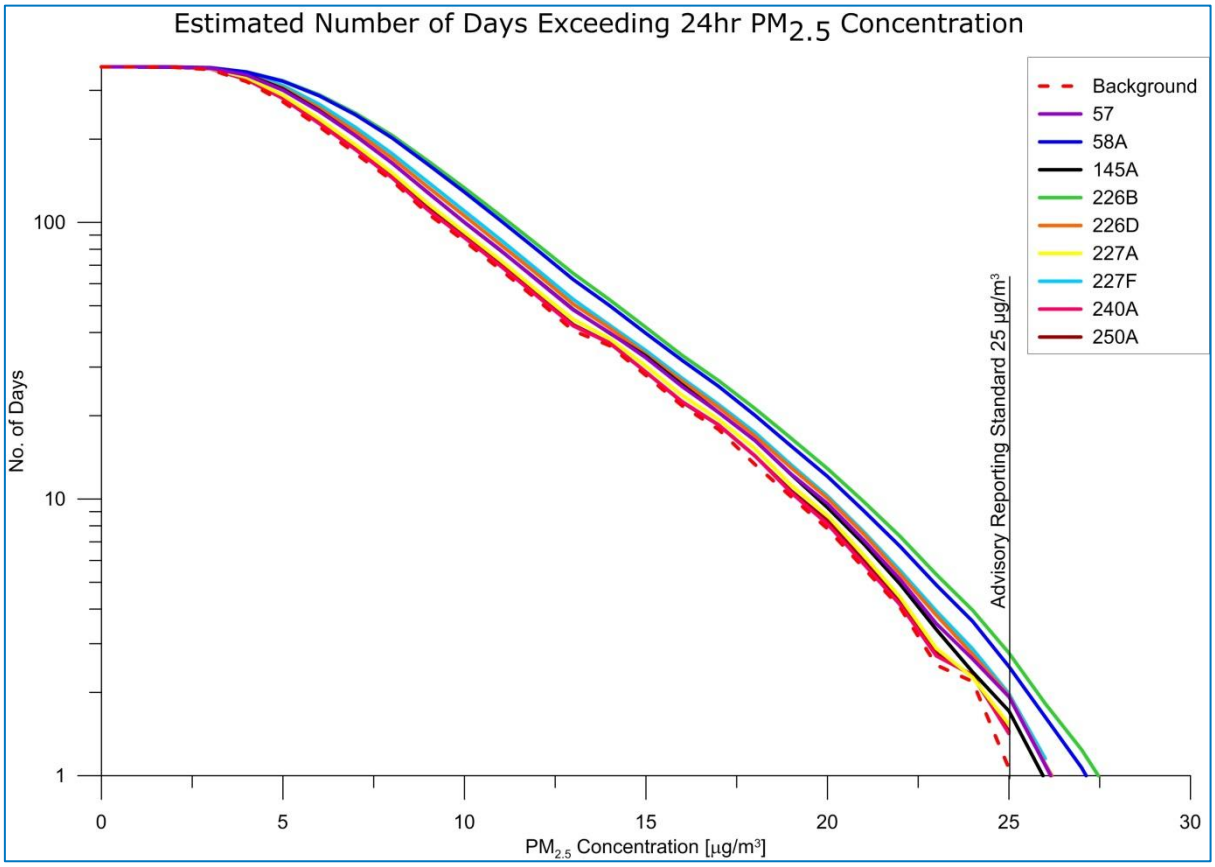

Figure D-2: Year 10 – Number of days likely to exceed cumulative maximum 24-h average $PM_{2.5}$ concentration (25 µg/m³) for south/south-west residences

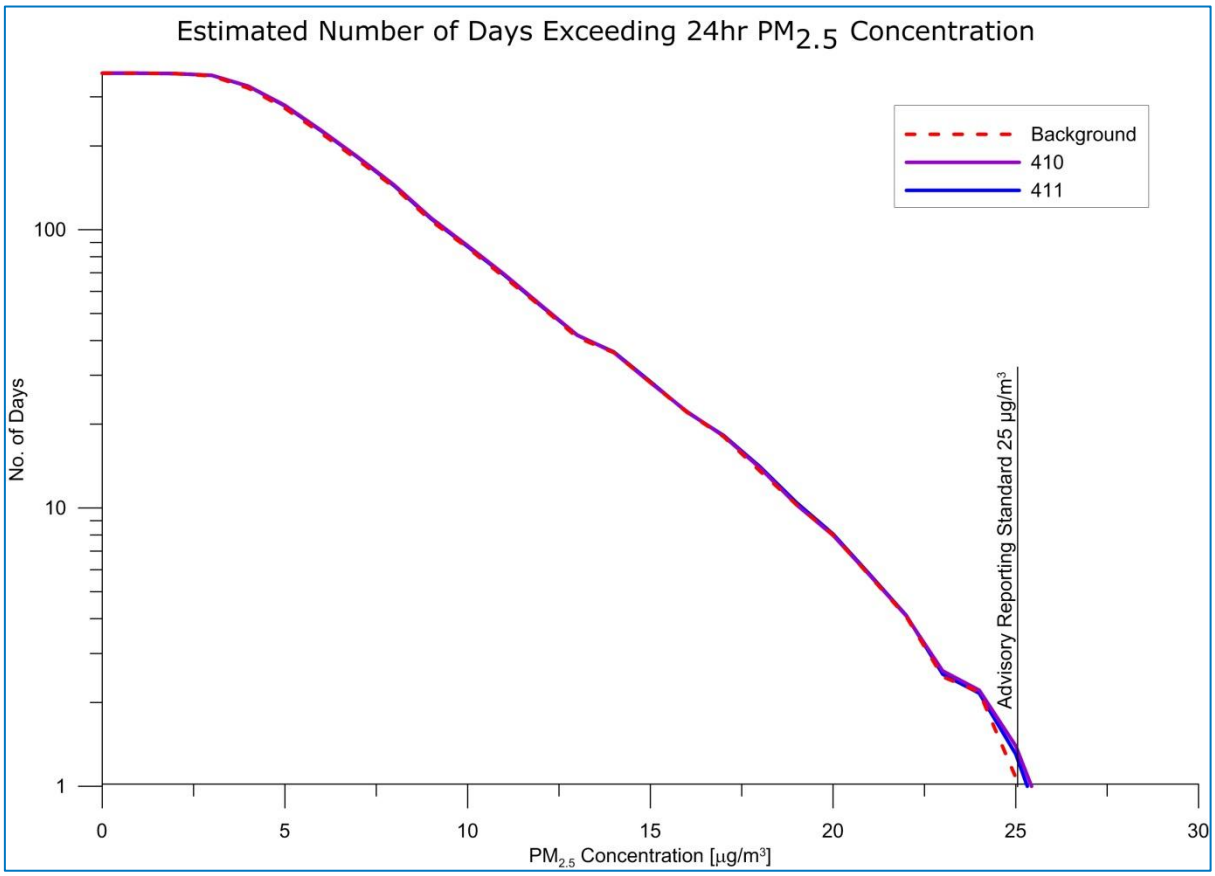

Figure D-3: Year 10 – Number of days likely to exceed cumulative maximum 24-hr average $PM_{2.5}$ concentration (25 µg/m³) for residences north east of Drayton Mine

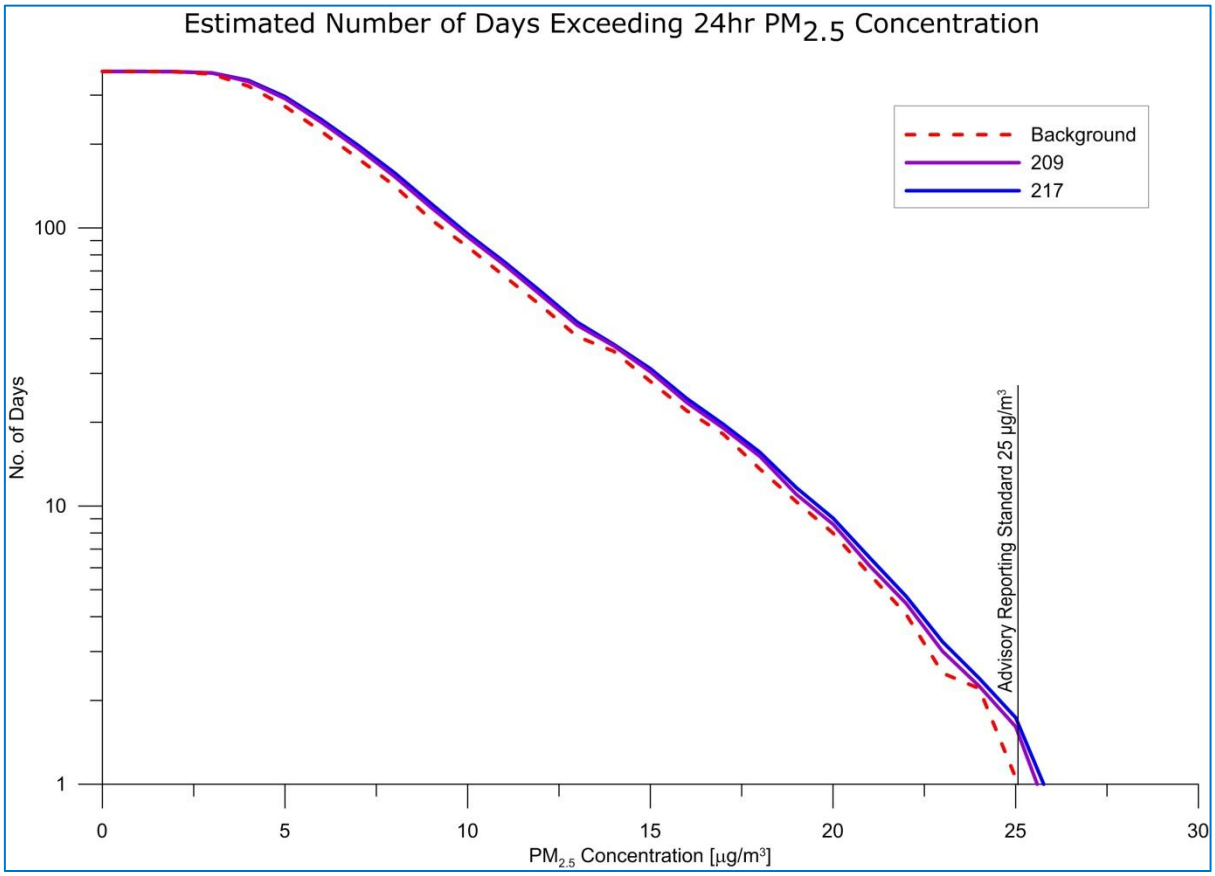

Figure D-4: Year 10 – Number of days likely to exceed cumulative maximum 24-hr average $PM_{2.5}$ concentration (25 µg/m³) for south east residences

Table D.5-6: Summary of days exceeding 25 µg/m³ for 24 hour $PM_{2.5}$– Year10 project alone and cumulative

Receptor ID	Maximum predicted $PM_{2.5}$ 24-hour concentrations		Predicted number of days exceeding 25 µg/m3 cumulative criteria						
	Project Alone		Project Alone		Cumulative		Background	days more than background	
	Original – EA Modelling	Revised – RTS Modelling	Original – EA Modelling	Revised – RTS Modelling	Original– EA Modelling	Revised – RTS Modelling		Original– EA Modelling	Revised – RTS Modelling
Units	µg/m³		Number of days						
Privately owned residences									
226B	13	8	0	0	4	2	1	3	<1
226D	9	6	0	0	2	2	1	1	<1
227A	5	3	0	0	2	2	1	<1	<1
227F	6	4	0	0	2	1	1	1	<1
240A	3	2	0	0	1	1	1	<1	<1
250A	4	2	0	0	2	1	1	<1	<1
209	3	2	0	0	1	2	1	<1	<1
217A	3	2	0	0	2	2	1	<1	<1
411	3	1	0	0	1	1	1	<1	<1
Mine owned residences									
57	8	5	0	0	2	1	1	1	<1
58A	9	6	0	0	4	2	1	2	<1
145A	4	3	0	0	2	2	1	<1	<1
410	3	1	0	0	1	1	1	<1	<1

Note: Totals may differ to the sum of the columns due to rounding and significant figures.