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24 February 2022
Stephen O'Donoghue
Director Resource Assessments
Department of Planning Industry and Environment
12 Darcy St, Locked Bag 5022
Parramatta NSW 2124

Dear Stephen,

We refer to your letter dated 18 February 2022 regarding the Bulli Seam Operations (MP08_0150) Modification 3 Application for the Appin Mine Ventilation and Access Project (the Project).

The letter outlines issues identified during an independent review of the Air Quality Impact Assessment (AQIA) for the project. In response, Illawarra Metallurgical Coal has prepared a memorandum which address all issues identified, including requested - revisions to dispersion modelling. The memorandum is attached as Annexure A.

If you have any queries or require additional information, please contact the undersigned.

Yours sincerely

Manager Approvals
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Annexure A

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23 February 2022

Acting Mining Approvals Manager
Simon McVeigh
South32 / Illawarra Metallurgical Coal
via email: simon.mcveigh@south32.net

Re: Appin Mine Ventilation and Access Project - Response to air quality peer review

Dear Simon,

The NSW Department of Planning, Industry and Environment (the Department) has engaged an independent expert to provide advice on the air quality impact assessment for the proposed Appin Mine Ventilation and Access Project. An independent peer review of the air quality impact assessment (AQIA) (EMM, 2021) was completed by Katestone Environmental Pty Ltd (Katestone, 2022) and the Department has requested a response to the issues raised in the peer review.

The Katestone review identified four key issues to address, which are responded to in Section 1 to Section 4 below.

1 Parameterisation of sources within the dispersion model

The Katestone Peer Review identified that the effective height (0.25) and initial sigma z (0.23) for the volume sources used to model material handling and hauling are much smaller than standard practice, and indicated that activities such as haulage and loading and unloading of trucks should have an effective height of between 4 and 10 m.

The Katestone Peer Review did not provide an opinion as to whether a smaller effective height and initial sigma z would likely result in lower or higher predicted offsite ground level concentrations for fugitive dust source, and noted that it was not possible to quantify this in their review.

1.1 Response

A model sensitivity analysis has been completed using a revised effective height of 4.25 m and revised initial sigma z of 3.95. These revised values are derived based on recommendations in the US EPA Haul Road Workgroup Final Report, as follows:

- assumed vehicle height of 5 m;
- assumed plume height of 8.5 m (1.7 times the vehicle height);
- assumed effective (release) height of 4.25 m (0.5 times the plume height); and
- assumed initial sigma z of 3.95 m (plume height divided by 2.15).

Modelling results using these revised heights were reviewed for 24-hour and annual average PM_{10} (as the key pollutant of concern) and compared to the modelling predictions presented in EMM (2021).

The percentage change in predicted ground level concentrations for 24-hour average PM_{10} ranged from -10% (concentrations decreased by 10%) to +23% (concentrations increased by 23%). It is noted that the 23% increase occurs from an already low number (ie represents an insignificant increase from 1.4 µg/m^3 to 1.7 µg/m^3). The percentage change in predicted ground level concentrations for annual average PM_{10} ranged from -18% (concentrations decreased by 18%) to +4% (concentrations increased by 4%). It is noted that the 4% increase occurs from an already low number (ie represents an insignificant increase from 0.19 µg/m^3 to 0.2 µg/m^3).

These findings are consistent with our experience in modelling fugitive dust sources; that is, while the values chosen for initial sigma z do influence the predicted ground level concentrations in close proximity to the source of emissions, the values chosen are generally inconsequential to the overall assessment of impact at distant receptors.

A summary of the model sensitivity analysis is presented in Appendix A.

2 Base elevations of sources within the dispersion model

The Katestone Peer Review identified that the base elevations for modelled sources in the construction scenario were set to zero. The Katestone Peer Review did not provide an opinion as to whether this would result in lower or higher predicted offsite ground level concentrations for fugitive dust sources, and noted that it was not possible to quantify this in their review.

2.1 Response

A model sensitivity analysis has been completed using the base elevations imported from the geo.dat file (terrain and land use file). The source base elevations are in the range of 100 m to 120 m and at an elevation similar to the surrounding residences. Modelling results using these revised base elevations were reviewed for 24-hour and annual average PM_{10} (as the key pollutant of concern) and compared to the modelling predictions presented in EMM (2021).

It is noted that this model sensitivity analysis also includes the revised effective height and initial sigma z described above (the change described below is for both changes to the model).

The percentage change in predicted ground level concentrations for 24-hour average PM_{10} ranged from -10% (concentrations decreased by 10%) to +19% (concentrations increased by 19%). It is noted that the 19% increase occurs from an already low number (ie represents an insignificant increase from 0.96 µg/m^3 to 1.14 µg/m^3). The percentage change in predicted ground level concentrations for annual average PM_{10} ranged from -18% (concentrations decreased by 18%) to +2% (concentrations increased by 2%). It is noted that the 2% increase occurs from an already low number (ie represents an insignificant increase from 0.28 µg/m^3 to 0.29 µg/m^3).

The change in base elevation means the modelled sources are emitted from a higher point, relative to the receptor assessment locations. The (general) decrease in predicted ground level concentrations for source released from these higher elevations is likely due to less of the plume impacting on the ground as terrain above source height is encountered.

3 Hours of operation of construction works

The Katestone Peer Review identified that the bulk earthworks phase of construction may not be indicative of the potential impact of the entire construction phase because operations occur for 12 hours per day, whereas construction of VS7 and VS8 will occur for 24 hours per day. The Katestone Peer Review notes that the hours of operation are important for the selection of dispersion modelling scenario because dispersion is poorer at night and, consequently, air pollutant concentrations may be greater than during the day.

3.1 Response

The emission rates for modelling the bulk earthworks phase (g/s) are derived from the total (annual) emissions based on a 12-hour day and modelled for every day of the year. If the modelling scenario occurred over a 24-hour day, the emission rates would be half those derived for the 12-hour a day bulk earthworks phase. Modelling of a 12-hour day with emission rates that are double what would be modelled for a 24-hour day is expected to result in similar predicted 24-hour average ground level concentrations. It is noted that the above applies to material handling only. Wind erosion is assumed to occur for all hours[1] and therefore emission rates for modelling of wind erosions are derived based on a 24-hour day.

EMM agrees with the reviewer that poorer dispersion conditions experienced overnight can result in higher concentrations (when sources are modelled on a 24-hour basis). However, the only construction activities that are proposed to occur over 24-hours are shaft sinking activities, with the shaft itself and the acoustic sheds providing dust emission mitigation through enclosure. Surface construction activities (with the highest propensity for dust) are limited to day-time hours.

Therefore, the modelled scenario for bulk earthworks remains a suitable conservative modelling scenario for construction activities.

4 Potential impacts of silica

The Katestone Peer Review concluded that silica levels should be acceptable, however identified that that the uncertainly around the modelling outcomes for the assessment based on issues with source parameterisation and hours of operation, makes it difficult to determine definitively.

In addressing issues regarding uncertainly around the modelling outcomes in the sections above, it is assumed that the issue relating to silica is also thereby addressed.

Yours sincerely

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References

EMM (2021), Air Quality and Greenhouse Gas Assessment Appin Mine Ventilation and Access Project, June 2021.

Katestone (2022), Mod 3 Appin Mine Ventilation and Access Project: Peer Review of Air Quality Assessment, prepared for NSW Department of Planning Industry and Environment, February 2022.

[1] For all hours above a threshold wind speed

Appendix A

Revised modelling predictions

Table A.1 Predicted ground level concentrations for PM_{10} (µg/m^3) during construction – AQIA predictions and changes for model sensitivity tests

	AQIA model predictions		Model predictions with revised sigma z				Model predictions with revised sigma z and revised base elevations			
	24-hour average	Annual average	24-hour average	% change	Annual average	% change	24-hour average	% change	Annual average	% change
R2	6.1	0.7	6.9	12%	-6%	-6%	6.4	5%	0.5	-18%
R3	2.7	0.3	2.5	-6%	-18%	-18%	2.6	-5%	0.2	-18%
R4	2.7	0.2	2.6	-1%	-17%	-17%	2.7	0%	0.2	-16%
R5	2.6	0.3	2.7	4%	-15%	-15%	2.7	5%	0.2	-14%
R6	3.1	0.3	2.9	-6%	-15%	-15%	3.0	-5%	0.3	-14%
R7	3.0	0.3	2.7	-10%	-15%	-15%	2.7	-10%	0.2	-14%
R8	2.4	0.2	2.2	-7%	-15%	-15%	2.2	-7%	0.2	-14%
R9	1.6	0.1	1.5	-1%	-15%	-15%	1.5	-1%	0.1	-14%
R10	1.9	0.1	1.9	2%	-15%	-15%	2.0	4%	0.1	-14%
R11	1.8	0.1	1.8	3%	-15%	-15%	1.8	5%	0.1	-14%
R12	1.3	0.1	1.3	0%	-15%	-15%	1.3	1%	0.1	-14%
R13	1.0	<0.1	1.1	18%	-7%	-7%	1.1	19%	0.0	-6%
R14	4.4	0.3	4.6	4%	2%	2%	4.5	3%	0.29	2%
R15	2.6	0.4	3.1	17%	2%	2%	2.8	6%	0.3	-21%
R16	3.8	0.3	4.4	18%	-5%	-5%	4.0	5%	0.3	-16%
R17	1.4	0.2	1.7	23%	4%	4%	1.6	15%	0.2	-8%
R18	0.9	<0.1	1.0	8%	-5%	-5%	1.0	7%	0.0	-4%
R19	1.1	<0.1	1.1	3%	-13%	-13%	1.1	1%	0.0	-12%
R20	0.4	<0.1	0.4	4%	-15%	-15%	0.4	4%	0.0	-14%
R21	0.7	<0.1	0.8	4%	-15%	-15%	0.8	5%	0.0	-14%
R22	0.8	<0.1	0.8	1%	-15%	-15%	0.8	2%	0.0	-14%
R23	1.7	0.1	1.8	2%	-15%	-15%	1.8	3%	0.1	-14%
R24	1.1	0.1	1.2	12%	-14%	-14%	1.2	13%	0.1	-13%
R25	1.7	0.1	1.9	7%	-10%	-10%	1.9	7%	0.1	-10%

Table A.1 Predicted ground level concentrations for PM_{10} (µg/m^3) during construction – AQIA predictions and changes for model sensitivity tests

	AQIA model predictions		Model predictions with revised sigma z				Model predictions with revised sigma z and revised base elevations			
	24-hour average	Annual average	24-hour average	% change	Annual average	% change	24-hour average	% change	Annual average	% change
R26	1.5	0.1	1.6	6%	-11%	-11%	1.6	7%	0.1	-10%
R27	1.4	0.1	1.4	-5%	-12%	-12%	1.4	-4%	0.1	-11%
R28	0.9	0.1	1.0	3%	-14%	-14%	1.0	4%	0.1	-13%
R29	1.0	0.1	1.1	2%	-14%	-14%	1.1	3%	0.1	-14%
R30	1.1	0.1	1.1	1%	-14%	-14%	1.1	2%	0.1	-13%
R31	1.1	0.1	1.1	-3%	-14%	-14%	1.1	-2%	0.1	-13%
R32	1.2	0.1	1.1	-2%	-14%	-14%	1.1	-1%	0.1	-13%
R33	0.9	0.1	0.9	2%	-14%	-14%	0.9	3%	0.0	-13%
R34	1.2	<0.1	1.1	-3%	-12%	-12%	1.1	-2%	0.0	-11%
R35	1.2	0.1	1.3	7%	-11%	-11%	1.3	8%	0.1	-10%