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24 May 2019

Susan Fox
Department of Planning and Environment
GPO Box 39
Sydney NSW, 2001

Dear Susan

Regain Spent Potlining Treatment Facility - Response to Submissions MP 06_0050 Modification 2: NSW EPA Letter Dated 14 May 2019

I refer to the NSW Environment Protection Authority (EPA) letter dated 14 May 2019 with document reference number **DOC19/286906-3; EF 13/4408** seeking additional information following review of AECOM's 'Response to Submissions Report', dated 29 March 2019. The NSW EPA has requested additional information including:

- Speciated emission profiles for Polycyclic Aromatic Hydrocarbons (PAH's);
- The application of potency equivalency factors to PAH species for assessing against the impact assessment criteria which is applied as Benzo(a)pyrene equivalency; and
- The emission performance for PAH's (including test reports) as Benzo(a)pyrene equivalent.

The EPA have also recommended reduced emission limits for cadmium for both thermal treatment plants. AECOM have conducted a review of feedback from the EPA and provide our response in the sections below.

1.0 Assessment of Ground Level Concentrations (GLC) for Cadmium & PAH's

The NSW EPA has recommended that "*in the absence of further assessment accounting for cadmium emissions from other significant sources, a revised cadmium limit of 0.018 mg/m^3 is recommended for both processing kilns*".

The Regain facility operates under environment protection licence (EPL) 13269 which provides an air concentration limit of 0.035mg/m^3 for cadmium at emission point 1. Therefore, the proposed limit of 0.018 mg/m^3 would represent a substantial reduction in the emission limits currently applied to existing operations at the Regain facility.

The AQIA predicted ground level concentrations associated with both a conservative maximum cadmium emission rate (Scenario 1) as well as a 'typical' or average cadmium emission rate (Scenario 2), expected to occur during normal operating conditions. As described in the AQIA a reduced cadmium emission limit of 0.025 mg/m^3 is being proposed for both thermal treatment plants, based on conservative assumptions, to ensure compliance with relevant ground level concentration limits. Whilst it is considered that during typical operations, the Project's contribution to ground level concentrations would be lower, a limit of 0.025 mg/m^3 is proposed for the following reasons:

- Emission concentration limits should accommodate the known variability in feed material processed at the Regain facility. An emission concentration limit of 0.025 mg/m^3 for cadmium would allow for variability in the emission profile and continued compliance with EPL 13269 when compared with historic stack emissions monitoring results.
- Based on stack parameters (height, diameter, velocity) at both the Regain site and neighbouring operations and prevailing wind directions the potential for concentrated cumulative impacts to occur at the same location within the modelling domain would be minimised.
- A proposed emission concentration limit of 0.025 mg/m^3 for cadmium is considered appropriate as the conservative modelling approach demonstrated compliance with the relevant GLC criteria.

It is recognised that the Tomago Aluminium smelter may contribute to cumulative cadmium ground level concentrations within the modelling domain and that no other substantial sources of cadmium

emissions are considered likely to occur in proximity to the Project. Modelled cadmium emission point sources at the Regain facility are a maximum of 15m tall and wake-affected due to nearby buildings. As such, peak concentrations are predicted to occur in relative proximity to the Regain facility. Conversely, the main Tomago Aluminium smelter stacks are in excess of 50m tall and are less likely to be wake-affected by local buildings. Therefore, emissions from the Tomago Aluminium smelter stacks are likely to be substantially different, being dispersed further afield than emissions from the Regain facility.

Additionally, the isopleths presented in Section 7.0 of the AQIA demonstrate that the peak concentrations associated with the plume dispersion pattern are predicted to occur along a northwest-southeast axis. This is consistent with the long-term prevailing wind direction observed in the Newcastle Region. Under these conditions (considering the height and off axis location of the Tomago Aluminium smelter stacks in comparison with the Regain stacks) it is likely that mixing of pollutant plumes would be minimised, reducing the potential for concentrated cumulative impacts to occur at the same location within the modelling domain.

Scenario 1 demonstrates that under typical average operating conditions based on a cadmium emissions concentration rate of 0.004mg/m^3, the cadmium ground level concentration impact equates to 16% of the EPA criterion. Scenario 2 demonstrates that at 'worst-case' operational conditions of 0.025 mg/m^3 cadmium stack concentration, the emissions are also compliant with the criterion.

Historical stack testing data presented in Appendix D of the AECOM AQIA (Rev02) shows that for the 2014-2016 period maximum cadmium emissions measured at the Regain facility have been maintained below the proposed stack concentration limit of 0.025 mg/m^3. Therefore, a proposed stack concentration limit of 0.025 mg/m^3 for cadmium is considered appropriate as it demonstrates compliance with the relevant GLC criteria in the *Approved Methods* and is also achievable based on historical stack testing data.

In accordance with the statement of commitments a variation to EPL 13269 would be sought to provide for the revised site premises layout and additional emission points following approval of the Project. Regain will continue to engage with the EPA to establish appropriate air concentration limits which accommodate the known variability in feed material and enable the facility to continue to operate in an environmentally responsible manner; ensuring that the existing long-term trend of compliance with licence obligations continues.

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1.1 Polycyclic Aromatic Hydrocarbons (PAH's)

The NSW EPA have requested additional information to clarify the methodology adopted for the assessment of PAH's in the AQIA, specifically relating to the conversion of PAH's to benzo(a)pyrene equivalents for assessment against the EPA criterion.

AECOM confirm that for the purposes of the AQIA, a conservative approach was taken to assess the PAH ground level concentration. The AQIA assessed the total stack PAH concentrations as the summation of the individual species without converting to benzo(a)pyrene equivalents, giving substantially elevated result than had this conversion been applied.

A summary of stack emissions testing data showing the speciated breakdown of PAH's is provided in **Table 1**.

Table 1 Regain Tomago PAH Stack Emissions Testing Data (µg/m^3) – 2014-2016

PAH Species	Feb 2014		Sep 2014		April 2015		October 2015		Apr/May 2016	
	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL
Naphthalene	140	19	13	58	3.8	3	45	6.6	0.32	2.4
2 - Methylnapthalene	180	4.7	110	47	1.2	1.5	170	55	0.11	0.98
Acenaphthylene	15	1.8	32	6.3	0.065	0.076	0.34	0.41	0.0061	0.44
Acenaphthene	40	3.3	66	16	0.16	0.13	0.77	0.57	<0.0049	0.66
Fluorene	3.5	0.88	7.1	2.4	0.14	0.058	2.9	1	0.011	0.15
Phenanthrene	7.4	6.6	120	31	0.33	0.3	10	6	0.24	1.3
Anthracene	0.18	0.2	3.4	0.71	0.028	0.019	0.059	0.044	0.032	0.073
Fluoranthene	1.1	1.1	37	11	0.13	0.2	1.5	0.88	0.14	0.37
Pyrene	0.4	0.52	21	5.2	0.096	0.2	0.41	0.47	0.09	0.24
Benz(a)anthracene	0.035	0.0055	0.04	1.2	0.015	0.038	0.012	0.014	0.011	0.021
Chrysene	0.11	0.014	0.37	3.9	0.022	0.043	0.27	0.19	<0.0049	<0.0049
Benzo(b)fluoranthene	0.037	0.0055	0.04	1.2	0.02	0.043	0.043	0.038	0.015	<0.0049
Benzo(k)fluoranthene	0.019	0.0055	0.021	0.68	0.011	0.028	0.015	0.021	0.0056	<0.0049
Benzo(e)pyrene	0.024	0.0055	0.04	1.1	0.013	0.028	0.012	0.016	0.009	0.015
Benzo(a)pyrene	0.018	0.0055	0.0069	0.034	0.0098	0.024	0.01	0.011	0.0061	0.0085
Perylene	0.04	0.024	0.16	0.076	0.012	0.021	0.0045	0.0055	<0.0049	<0.0049
Indeno(123:cd)pyrene	0.018	0.0055	0.0082	0.045	0.0075	0.018	0.0091	0.015	<0.0049	<0.0049
Dibenzo(ah)anthracene	0.0074	0.0055	0.0053	0.018	0.005	0.0053	0.005	0.0055	<0.0049	<0.0049
Benzo(ghi)perylene	0.019	0.0083	0.025	0.06	0.0086	0.025	0.0073	0.012	<0.0049	<0.0049
Sum of reported PAH's	**390**	**38**	**410**	**190**	**6.1**	**5.8**	**230**	**71**	**1**	**6.7**

The PAH results were converted to benzo(a)pyrene equivalents utilising the Potency Equivalency Factors (PEF's) provided in the *Approved Methods - Table 7.2c: Potency equivalency factors for PAH's (OEHHA 1994)* and presented in **Table 2**.

Table 2 Regain Tomago PAH Stack Emissions Testing Data (µg/m^3) [as benzo(a)pyrene equivalents] – 2014-2016

PAH Species	PAH PEF's*	Feb 2014		Sep 2014		April 2015		October 2015		Apr/May 2016	
		First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL	First Cut SPL	Second Cut SPL
Naphthalene	N/A	0	0	0	0	0	0	0	0	0	0
2 - Methylnapthalene	N/A	0	0	0	0	0	0	0	0	0	0
Acenaphthylene	N/A	0	0	0	0	0	0	0	0	0	0
Acenaphthene	N/A	0	0	0	0	0	0	0	0	0	0
Fluorene	N/A	0	0	0	0	0	0	0	0	0	0
Phenanthrene	N/A	0	0	0	0	0	0	0	0	0	0
Anthracene	N/A	0	0	0	0	0	0	0	0	0	0
Fluoranthene	N/A	0	0	0	0	0	0	0	0	0	0
Pyrene	N/A	0	0	0	0	0	0	0	0	0	0
Benz(a)anthracene	0.1	0.0035	0.00055	0.004	0.12	0.0015	0.0038	0.0012	0.0014	0.0011	0.0021
Chrysene	0.01	0.0011	0.00014	0.0037	0.039	0.00022	0.00043	0.0027	0.0019	0.0000245	0.0000245
Benzo(b)fluoranthene	0.1	0.0037	0.00055	0.004	0.12	0.002	0.0043	0.0043	0.0038	0.0015	0.000245
Benzo(k)fluoranthene	0.1	0.0019	0.00055	0.0021	0.068	0.0011	0.0028	0.0015	0.0021	0.00056	0.000245
Benzo(e)pyrene	N/A	0	0	0	0	0	0	0	0	0	0
Benzo(a)pyrene	1	0.018	0.0055	0.0069	0.034	0.0098	0.024	0.01	0.011	0.0061	0.0085
Perylene	N/A	0	0	0	0	0	0	0	0	0	0
Indeno(123:cd)pyrene	0.1	0.0018	0.00055	0.00082	0.0045	0.00075	0.0018	0.00091	0.0015	0.000245	0.000245
Dibenzo(ah)anthracene	0.4	0.00296	0.0022	0.00212	0.0072	0.002	0.00212	0.002	0.0022	0.00098	0.00098
Benzo(ghi)perylene	N/A	0	0	0	0	0	0	0	0	0	0
Sum of reported PAH's [B(a)P Equiv.]		**0.0330**	**0.0100**	**0.0236**	**0.3927**	**0.0174**	**0.0393**	**0.0226**	**0.0239**	**0.0105**	**0.0123**

* Where no PEF was available in the approved methods a value of 0 was assumed as the species is considered to have no toxic equivalency with B(a)P.

Note – Where results were reported as non-detectable, half of the detection limit was used to calculate the B(a)P equivalent.

As demonstrated with the data provided in the preceding tables, converting the stack emissions testing results to B(a)P equivalents results in a PAH concentration around four orders of magnitude lower than what was modelled. The modelled ground level concentration results can be factored to the new stack concentrations to assess what the new predicted ground level concentrations for PAH's would be. A summary of the modelling inputs and associated ground level concentrations for each scenario presented in the revised AQIA are provided in **Table 3**, along with the results based on converting PAH's to benzo(a)pyrene equivalents.

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Table 3 Summary of Modelling Inputs & Results – PAH's (Actual) & PAH's as Benzo(a)pyrene Equivalents

Modelling Scenario	Stack Concentration (mg/m^3)		Stack Emission Rate (g/s)		Max 99.9th % GLC (µg/m^3)	% of GLC Criteria	GLC Criteria (µg/m^3)
	Kiln 1	Kiln 2	Kiln 1	Kiln 2			
PAH Results (Revised AQIA)							
1 - Typical Average	0.14	0.14	$1.16x10^{-3}$	$1.35 x10^{-3}$	0.1	25%	0.4
2 - Max EPL	0.5	0.5	$4.26x10^{-3}$	$4.94x10^{-3}$	0.36	90%	
Factored PAH Results [Corrected to B(a)P]							
1 - Typical Average	5.85E-05	5.85E-05	$4.98x10^{-7}$	$5.79x10^{-7}$	$4.29x10^{-5}$	0.01%	0.4
2 - Max EPL*	2.09E-04	2.09E-04	$1.78x10^{-6}$	$2.07x10^{-6}$	$1.51x10^{-4}$	0.04%	

* In the absence of speciated PAH concentrations linked to the approved EPL stack concentration, the B(a)P equivalent for this scenario was calculated based on the ratio of each PAH species to the respective total PAH result reported in the stack emissions testing data.

Table 3 shows that when converting the PAH stack emissions testing results to B(a)P equivalents for direct comparison with the ground level concentration criteria in the *Approved Methods*, the predicted results are expected to be <0.05% of the criteria. These results are substantially below the conservative predictions presented in the original AQIA (AECOM, 2018). Therefore, the proposal would not result in any significant impacts to air quality based on the modelled PAH ground level concentrations of B(a)P equivalents.

2.0 Conclusion

I trust that the above information adequately addresses the remaining stakeholder concerns to enable determination of the proposed modification of Project Approval MP 06_0050.

Yours sincerely

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