Cement Australia Glebe Island Capacity Uplift

Air Quality Assessment

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Cement Australia Glebe Island Capacity Uplift

Air Quality Assessment

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1. INTRODUCTION

ERM Australia Pacific Pty Ltd (ERM) has been commissioned by Cement Australia to prepare an Air Quality Assessment for a proposed increase in the capacity of the cement-shipping terminal and distribution facility at Glebe Island in Sydney.

Due to sustained increased demand for cementitious materials, the existing facility needs to increase its operational capacity to ensure ongoing sustainable supply through Glebe Island.

This Air Quality Assessment has been prepared to support a Development Application which seeks to alter the Cement Australia Glebe Island facility by way of increasing the throughput capacity of the facility in line with projected future demand.

1.1 Objectives and scope

The objective of this air quality assessment is to meet the requirements of the Secretary's Environmental Assessment Requirements (SEARs). These SEARS relating to air quality are outlined in Table 1-1.

Table 1-1: Response to SEARS

SEARS – Air Quality and Odour	Response
A quantitative assessment of the potential air quality, dust and odour impacts of the development in accordance with relevant Environment Protection Authority guidelines	Section 6 and 7
Cumulative impacts from existing onsite operations and from surrounding developments	Section 8 and 9
The details of buildings and air handling systems and strong justification for any material handling, processing or stockpiling external to buildings	Materials delivery is sealed, no external stockpiles
Details of proposed mitigation, management and monitoring measures	Section 9 – outlining future monitoring and assessment
Describe, characterise and quantify additional air emissions and cumulative impacts associated with intensified use, including increased shipping and truck movements on site, and consider the impacts from dispersal of these air pollutants on the ambient air quality.	Section 5, 7 and 9
Modelling, including dispersion modelling must be conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017) or a suitably justified and verified alternative method based on current scientific understanding of atmospheric dispersion. Particular attention must be given to the verification of the method of predicting local air quality or meteorological conditions based on non-local or modelled data.	Alternative method proposed, justified and approved by EPA Section 5

2. PROJECT DESCRIPTION

The site is located at the Glebe Island facility in Sydney, which is part of the Bays Precinct, and is located approximately 2.3 km west of the Sydney CBD (shown in Figure 2-1). The site features 16 of the total set of 30 silos which make up the complete Glebe Island Silos set (the remaining 14 silos are operated by Sugar Australia).

The facility currently holds a Development Approval (DA 350) which allows for an annual throughput of up to 500,000 tpa. In 2020, the site applied for and was granted a Development Approval (DA9967) which allows for a temporary increase to the annual throughput of up to a maximum of 600,000 tpa up to October 2021. Post this timeframe the original approved maximum throughput of 500,000 tpa will apply.

Cement Australia is seeking to extend the operating capacity of the facility by up to 1,200,000 tpa. No physical works are required to enable this increase in proposed operational throughput capacity.

As the physical infrastructure currently on site is capable of handling the proposed throughput, this application supports a more effective and efficient utilisation of the facility. Cement Australia does not propose any physical works, nor any changes to current operating practices, including hours of operation.

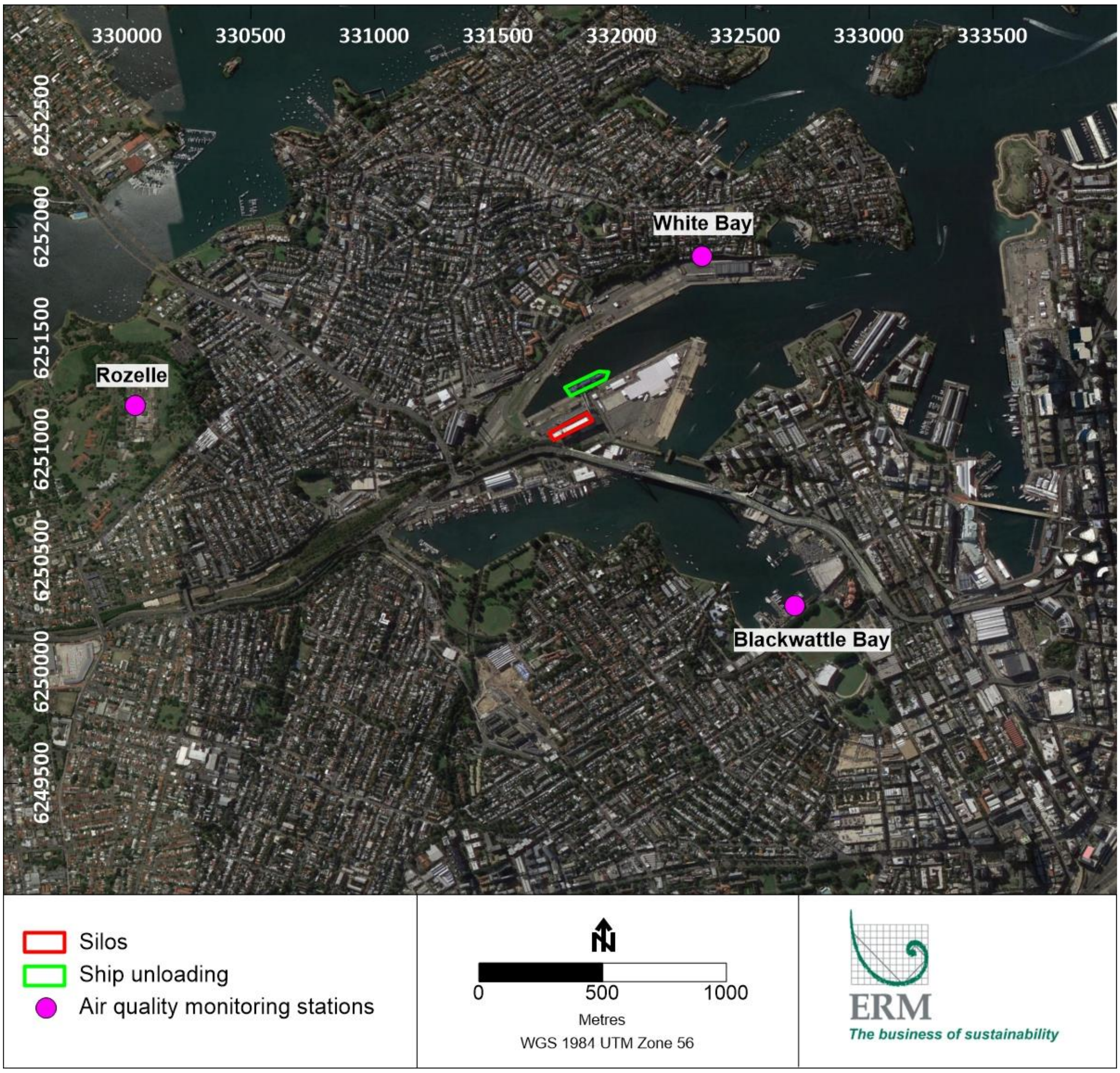

Figure 2-1 Site location and local area

3. AIR QUALITY ASSESSMENT CRITERIA

The NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutant in New South Wales* (the Approved Methods) (NSW EPA, 2016) specify air quality assessment criteria relevant for assessing impacts from air pollution. These criteria are health-based (i.e. they are set at levels to protect against health effects).

For the purposes of this assessment, it is anticipated that the primary air emissions from the Project will comprise those associated with particulate matter (PM_{10}, $PM_{2.5}$ and deposited dust), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). There will therefore not be any further discussion regarding or assessment of odour as it is not a significant issue in this case.

Table 3-1 summarises the air quality criteria for atmospheric emissions relevant to this assessment. It is important to note that these criteria are also applied to the cumulative impact assessment (i.e. due to the proposed activities in combination with other background sources).

Table 3-1: Assessment criteria for key air quality metrics

Pollutant	Averaging period	Assessment	Concentration
Nitrogen dioxide (NO_2)	1-hour	Cumulative	246 µg/m^3
	Annual	Cumulative	62 µg/m^3
Sulfur dioxide (SO_2)	10-minute	Cumulative	712 µg/m^3
	1-hour	Cumulative	570 µg/m^3
	24-hour	Cumulative	228 µg/m^3
	Annual	Cumulative	60 µg/m^3
PM_{10}	24-hour	Cumulative	50 µg/m^3
	Annual	Cumulative	25 µg/m^3
$PM_{2.5}$	24-hour	Cumulative	25 µg/m^3
	Annual	Cumulative	8 µg/m^3

4. LOCAL METEOROLOGY

Air quality impacts are influenced by meteorological conditions, primarily in the form of gradient wind flow regimes, and by local conditions generally driven by topographical features and interactions with coastal influences, such as the sea breeze. The local dispersion meteorology for the site, in relation to wind speed and direction, has been reviewed based on the data available at nearby meteorological stations.

As specified in the Approved Methods, five years of meteorological data are required to be reviewed so that a representative year of meteorological conditions can be selected. A modelling study was carried out in 2020 for a proposed nearby concrete batching plant on Glebe Island, to be operated by Hanson (ERM, 2020). Five years of meteorological data analysis are presented in that report, from 2015 – 2019. The review determined that wind patterns from year to year do not change significantly on an annual basis, and it was shown that 2017 was a representative year.

The meteorological conditions for the Hanson site (less than 500 m from the silos) were extracted from the CALMET model and are presented as seasonal and annual wind roses in Figure 4-1, for 2017.

The meteorological modelling indicated the strongest winds are from the west and west southwest, and occur in winter and spring. It is likely that any emissions from the site at this time would be blown away from the nearest sensitive residential receptors in Glebe, Rozelle and Balmain. Dispersion is also likely to be more efficient during these times under higher wind speed conditions. Contour plots in the ERM (2020) report indicate that dispersion patterns follow this ENE / WSW axis, as suggested by the annual wind rose in Figure 4-1.

Figure 4-1: Annual and seasonal wind roses for CALMET extraction at Glebe Island (2017)

5. ASSESSMENT METHODOLOGY

Cement Australia's facility at Glebe Island is currently operating, and so any changes to processes at that site need to be viewed in context of what is already occurring. In other words, this is not a 'greenfield' site, there are current shipping movements both for Cement Australia and other sites in White Bay, as well as other operations in the area.

A detailed analysis of background monitoring data for NO_2, SO_2, PM_{10} and $PM_{2.5}$ is provided in Section 6 of this report. These data have been collected at three locations as shown in Figure 2-1, to the west, northeast and southeast of the site. The data show very similar trends and concentrations where time periods align, indicating that the levels across the area of the Cement Australia site are relatively consistent and well represented in the DPIE Rozelle dataset.

The data also demonstrate that concentrations in the area generally remain below EPA assessment criteria and in some cases, such as for SO_2 and NO_2, well below criteria. There are some exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criteria, for reasons explained further in Section 6 which are not related to the industry in and around White Bay and Glebe Island.

In summary, the monitoring data have shown little change in air quality over many years, and the different sites are consistent with each other even though they are in different directions from the Cement Australia silos. Given this, it is likely that the existing operations have very little impact on local air quality, either in the short-term (1-hour or 24-hour) or long-term.

To have such a comprehensive dataset in a relatively small geographical area to be able to validate this finding is rare. Given the inherent conservatisms and limitations of dispersion modelling, it would be more useful in this case to use the quantitative analysis of these data, combined with a comparison of existing and future emissions to show that the increases are not likely to be significant enough to change the existing characteristics of the ambient air quality environment.

Section 6 presents this data analysis in detail for each pollutant, and Section 7 compares potential future emissions from the site to those currently estimated to occur under the existing operational scenario.

The aim of this methodology is therefore to demonstrate that:

- concentrations of each pollutant are currently at levels below the relevant criteria in the local area;
- these concentrations will already include contributions from the existing operations at Cement Australia's Glebe Island site as well as all other industries in the local area;
- there will be increased emissions from the site as a result of the proposal, mainly due to increased shipping and these will be intermittent throughout the year; and
- the estimated increases are not likely to be sufficient to cause measureable increases in ambient air quality.

6. LOCAL AIR QUALITY

There has not been any air quality monitoring undertaken at the site of the proposed development. A project of this scale typically does not warrant a specific monitoring program, but understanding the general levels in a similar environment is important.

In lieu of direct on-site monitoring, data collected by the NSW Department of Planning, Industry and Environment (DPIE) at Rozelle, located approximately 2 km north-west of the project site, is considered representative of ambient air quality in the study area. As shown in the following sections, these monitoring data are presented for both short-term averages (1-hour or 24-hour) as well as annual averages. With regard to particulate matter (PM_{10} and $PM_{2.5}$), these short-term averages are particularly sensitive to regional events such as bushfires, dust storms and hazard reduction burns. These result in very high maximum 24-hour averages which are not representative of general background conditions in the area. The following sections therefore include a calculation of the 98th percentile, which is often used as a background value for particulates for assessments when maximum values are not representative. It is still relatively conservative as ambient concentrations are, by definition, less than this value for 98% of the time. However, it removes the influence of the most elevated concentrations which are in most cases influenced by regional events.

In addition, the NSW Ports Authority installed an air quality monitoring station in September 2015 to measure local ambient air quality in the vicinity of the White Bay Cruise Terminal (WBCT) (Port Authority of NSW, 2016-2019). This station is maintained by ERM and is located approximately 1 km north-west of the proposed site. Due to the proximity of the station, the data recorded by this station may also be considered representative of air quality in the north of the study area. The relevant data measured at the WBCT, to this project are $PM_{2.5}$ and SO_2 concentrations.

Additional data has also been used to characterise the local air quality. These data have been collected by ERM (then Pacific Environment) and include continuous (campaign) NO_2 and PM_{10} monitoring data in the vicinity of B1-B2 Wharves at Bridge Road, Glebe (Pacific Environment, 2017), approximately 1 km from the proposed Project. The campaign took place from 14 March 2017 to 28 March 2017 and provides a two week snapshot of air quality at that time. As the monitoring was during a short term period, the collected data from the Pacific Environment 2017 assessment cannot be used for comparison against long-term air quality criteria. However, these data are useful for comparison with other data sets to show the geographical and temporal consistency in ambient air quality.

6.1 Particulate matter as PM_{10}

6.1.1 DPIE PM_{10} monitoring

A summary of the PM_{10} data measured between 2011 and 2019 at the NSW DPIE Rozelle monitoring station are presented in Table 6-1. This indicates that existing concentrations of PM_{10} are almost always below the 24-hour average EPA impact assessment criterion of 50 µg/m^3 for the majority of days, and below the annual average criterion of 25 µg/m^3. Short-term exceedances are rare and generally associated with regional events such as dust storms and bushfires or hazard reduction burns. It is clear from this data that 2019 was an anomaly, both in the number of and the magnitude of exceedances, due to the severe bushfires across NSW during the spring and summer.

As 2019 is clearly an anomaly due to unprecedented bushfire activity, Figure 6-1 presents the data from 2011 to 2018 only. There are still regional events which lead to the occasional elevated 24-hour PM_{10} concentrations, but generally, PM_{10} remains well below the criterion of 50 µg/m^3. These events included such things as bushfires in October 2013, hazard reduction burns in May 2016 and the dust storm in November 2018.

There is a clear seasonal variation with higher concentrations over the warmer summer months. The 98th percentiles presented in Table 6-1, also indicate 24-hour average PM_{10} concentrations are rarely above 38 µg/m³. The 98th percentile for the entire monitoring period from 2011 – 2018 is 35 µg/m³, meaning that on average there are only about 7 days per year (2% of the time) when this level is generally exceeded. This 98th percentile for the period would therefore be a conservative estimate of background 24-hour average PM_{10} most of the time, but more reasonable than a maximum measurement.

Annual averages are also well below the criterion of 25 µg/m³. The highest annual average for the period 2011 to 2018 is 18 µg/m³, a reasonably representative annual background.

For an urban environment such as this, these levels are generally good. This monitoring data is likely to include some contribution from existing sources such as the current ships in the Glebe Island area.

Table 6-1: Maximum 24-hour and annual average PM_{10} concentrations (µg/m³) at Rozelle

Year	PM_{10} 24-hour maximum	98th percentile	No. days per year >50 µg/m³	PM_{10} annual average
EPA Criterion	**50**	**n/a**	**n/a**	**25**
2011	39	32	0	17
2012	41	32	0	17
2013	59	38	3	18
2014	44	36	0	18
2015	60	33	1	17
2016	59	32	1	17
2017	54	35	1	18
2018	88	34	2	18
2019	*143*	*73*	*18*	*23*

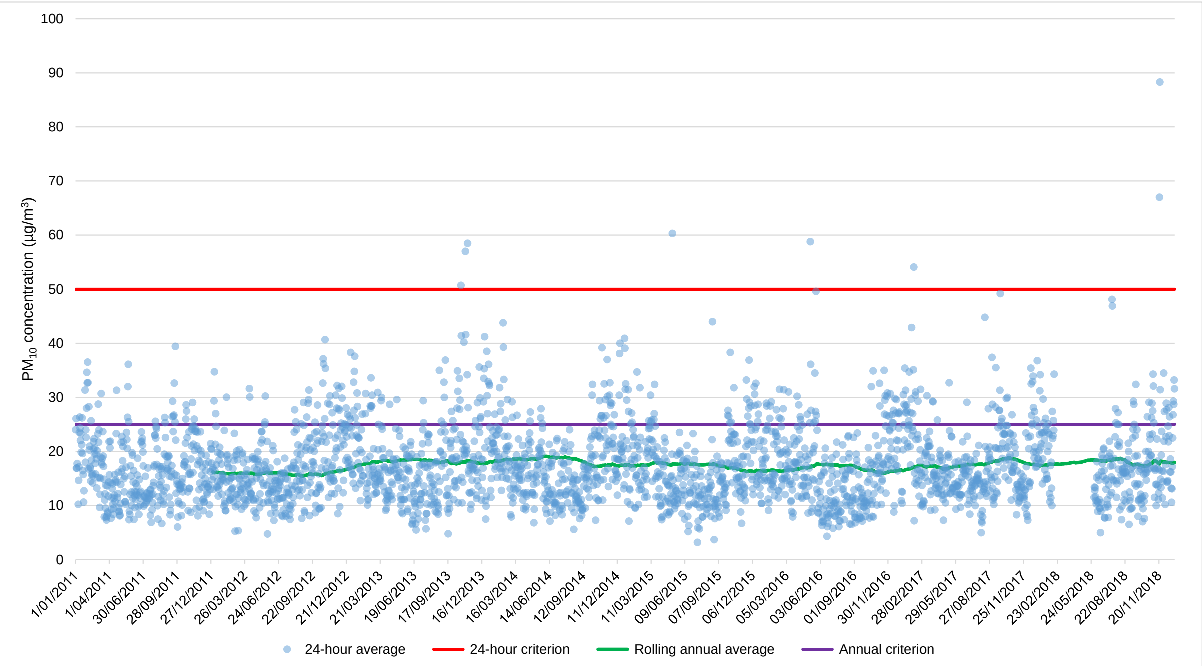

Figure 6-1 Measured PM_{10} concentrations at Rozelle (2011 – 2018)

6.1.2 Other PM_{10} monitoring

Figure 6-2 provides a time series of the 24-hour average PM_{10} concentrations measured in the vicinity of B1-B2 Wharves at Bridge Road, Glebe as part of Pacific Environment (2017). The maximum 24-hour average PM_{10} concentration measured during the two week monitoring period was 22.9 µg/m^3, well below the impact assessment criterion of 50 µg/m^3. Values are comparable with those observed at Rozelle, in both magnitude and trend.

This similarity demonstrates that values at Rozelle are likely to be representative of the site and the local area, including the emissions from local industry. While the Cement Australia will be one of these industrial sources, it is not likely to be a dominant source as these two monitors are in almost opposite directions from that site and the variation is consistent between the two, suggesting no significant contribution from Cement Australia.

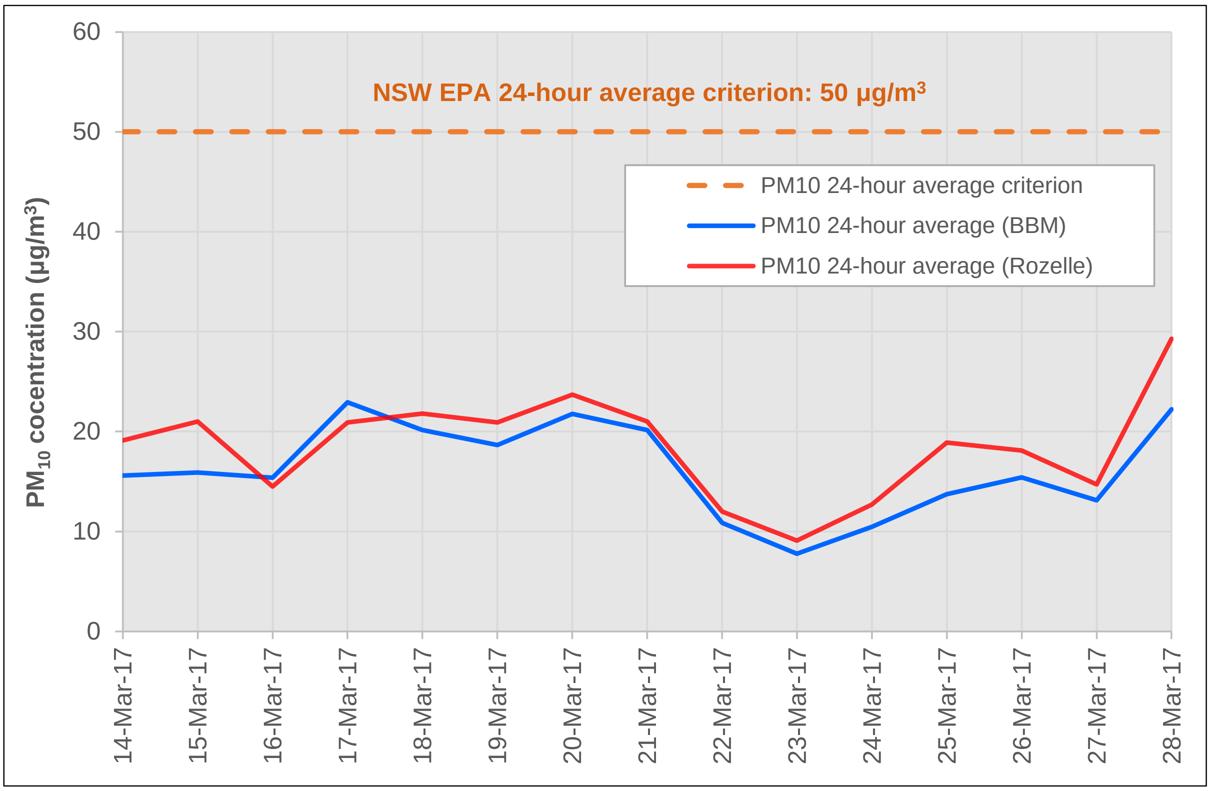

Figure 6-2: Time-series plot of 24-hour average PM_{10} concentrations measured at Blackwattle Bay Marina (BBM) and at DPIE Rozelle during the BBM monitoring period

6.2 Particulate matter as $PM_{2.5}$

6.2.1 DPIE $PM_{2.5}$ monitoring

A summary of the $PM_{2.5}$ data measured for 2015 and 2019 at the DPIE Rozelle monitoring station is presented in Table 6-2. This indicates that existing concentrations of $PM_{2.5}$ are mostly below the EPA impact assessment criterion of 25 µg/m³ for the 24-hour maximum and 8 µg/m³ for the 24-hour annual average. Again, 2019 is clearly an anomaly with high concentrations and a large number of exceedances due to the severe bushfire activity. There have been several occasions where the 24-hour average criterion of 25 µg/m³ has been exceeded. These days are associated with regional events such as bushfire / hazard reduction burning activity. There is a weak seasonal trend with higher concentrations in the cooler months, likely as a result of domestic wood burning in winter.

The 98th percentiles presented in Table 6-2, also indicate 24-hour average $PM_{2.5}$ concentrations are rarely above 22 µg/m³. The 98th percentile for the entire monitoring period from 2011 – 2018 is 17 µg/m³, meaning that on average there are only about 7 days per year (2% of the time) when this level is generally exceeded. This 98th percentile for the period would therefore be a conservative estimate of background 24-hour average $PM_{2.5}$ most of the time, but more reasonable than a maximum measurement.

Annual averages are below the criterion of 8 µg/m³, except for 2019. The highest annual average for the period 2011 to 2018 is 7 µg/m³, a reasonably representative annual background.

Table 6-2: Maximum 24-hour and annual average $PM_{2.5}$ concentrations (µg/m³) at Rozelle

Year	$PM_{2.5}$ 24-hour maximum	98th percentile	No. days per year > 25µg/m³	$PM_{2.5}$ annual average
EPA Criterion	**25**	**n/a**	**n/a**	**8**
2015	33	17	1	7
2016	49	22	5	7
2017	36	17	2	7
2018	19	16	0	7
2019	*102*	*51*	*21*	*10*

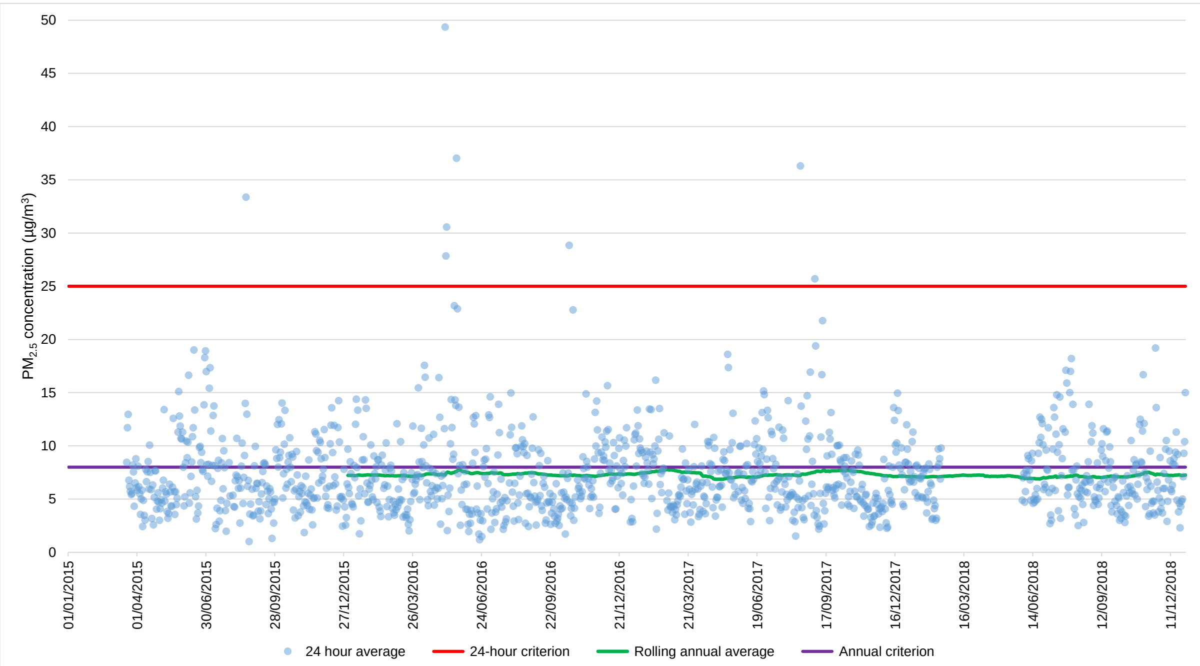

Figure 6-3 Measured $PM_{2.5}$ concentrations at Rozelle (2011 – 2018)

6.2.2 White Bay Cruise Terminal (WBCT) $PM_{2.5}$ monitoring

The summary of results $PM_{2.5}$ concentration recorded between 2016 and 2019 at the WBCT air quality station is shown in Table 6-3. This indicates that the 24-hour average $PM_{2.5}$ concentrations are generally lower than the EPA's maximum 24-hour average impact assessment criterion of 25 µg/m^3.

The cases when there have been exceedances are related to the occurrence of a regional event such as bushfire, hazard reduction and localised sources of particulate emissions (Port Authority of NSW, 2016-2019). Again, highly elevated concentrations in the latter part of 2019 were due to intense bushfire activity across the state. As with PM_{10}, 2019 data are not presented in Figure 6-4 due to the severe nature of the bushfires which is not representative of normal conditions. The plot shows the individual 24-hour average concentrations throughout the monitoring period (2016 – 2018), with large peaks due to a hazard reduction burns, particularly in May 2016. There is a seasonal trend with higher levels in winter, likely due to domestic wood heating.

Table 6-3: Summary of $PM_{2.5}$ concentration measurements at White Bay

Year	$PM_{2.5}$ 24-hour maximum	98th percentile	No. days per year >25µg/m^3	$PM_{2.5}$ annual average
EPA Criterion	**25**	**n/a**	**n/a**	**8**
2016	68	27	9	11
2017	48	23	5	10
2018	35	21	4	9
2019	*89*	*45*	*21*	*11*

The data presented in this table are a summary of the results presented in the monthly reports for the WBCT air quality station (Port Authority of NSW, 2016-2019).

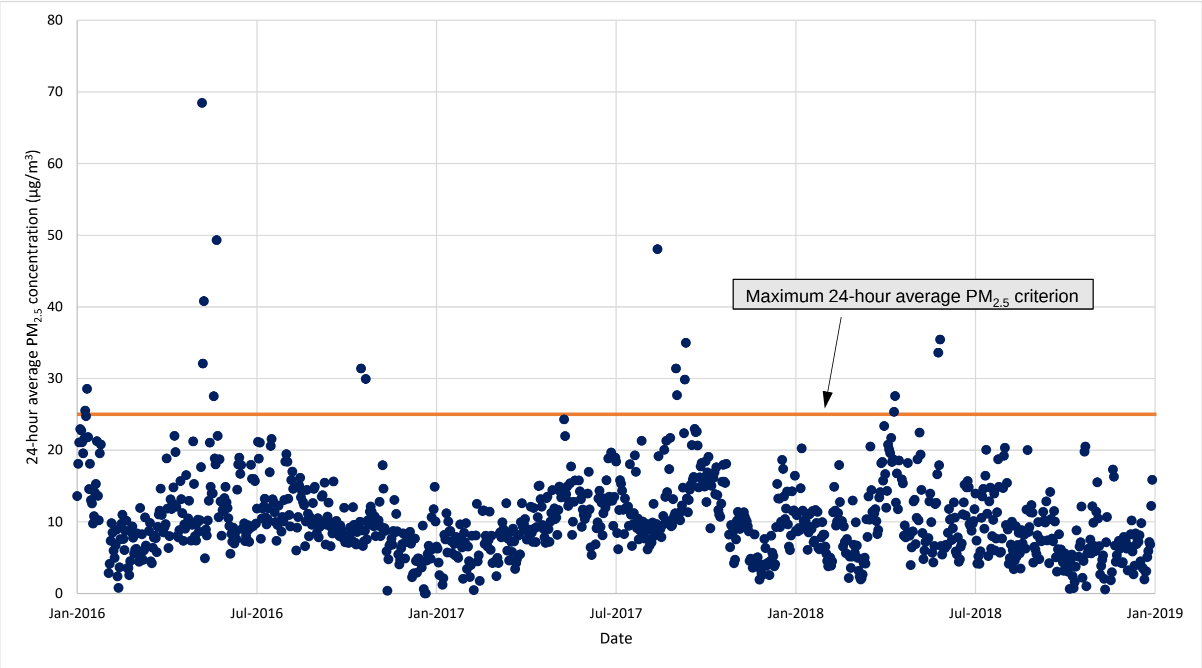

Figure 6-4: 24-hour average $PM_{2.5}$ concentrations measured at White Bay from 2016 – 2018

These White Bay Cruise Terminal data are shown with the $PM_{2.5}$ data from Rozelle, in Figure 6-5. The WBCT data are slightly higher. It is noted that the WBCT air quality station (located at Grafton Street, Balmain), has not been sited to be an urban background site like DPIE's air quality monitoring station at Rozelle. Rather, the WBCT collects data for a specific purpose and should not be evaluated as representative of an urban background site (i.e. they are likely to be impacted by a number of local sources including domestic wood burning, periodic vehicle emissions, etc.).

However, it is clear that the trends are similar at the two locations, and that there are seasonal variations, as well as the capture of regional events such as hazard reduction burns.

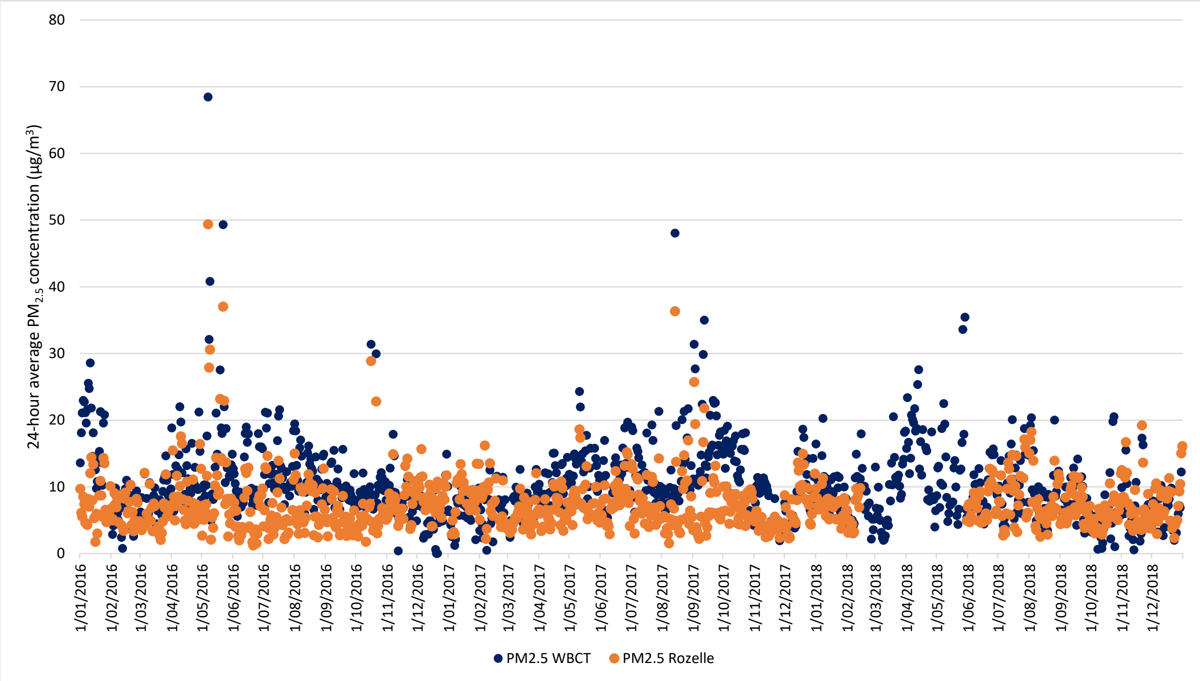

Figure 6-5: 24-hour average $PM_{2.5}$ concentrations measured at White Bay and Rozelle from 2016 – 2018

6.3 Nitrogen dioxide

6.3.1 *DPIE NO_2 monitoring*

The DPIE monitoring station at Rozelle provides continuous measurements of NO_2. A summary of the annual NO_2 data from 2011 to 2019 is presented in Table 6-4. All values are well below the EPA impact assessment criteria of 62 µg/m^3 for the annual average and 246 µg/m^3 for the 1-hour average. As for PM_{10} and $PM_{2.5}$, the 98th percentile is presented for 1-hour averages. Even though the 1-hour average criterion is not exceeded, the 98th percentile is a more representative background value for the short-term average.

Table 6-4: Summary of NO_2 monitoring data at Rozelle from 2011 to 2019 (µg/m^3)

Month	Maximum 1-hour average	98th percentile	Annual average
EPA Criteria	**246**	**n/a**	**62**
2011	103	62	21
2012	127	66	23
2013	144	64	21
2014	113	59	21
2015	123	59	21
2016	103	62	21
2017	125	66	23
2018	117	64	20
2019	185	62	19

6.3.2 *Other NO_2 monitoring*

Figure 6-6 provides a time series of the 1-hour average NO_2 concentrations measured in the vicinity of B1-B2 Wharves at Bridge Road, Glebe as part of Pacific Environment (2017). The maximum 1-hour average NO_2 concentration measured during the two week monitoring period was 53.4 µg/m^3, well below the impact assessment criterion of 246 µg/m^3 and comparable to the values observed at DPIE Rozelle.

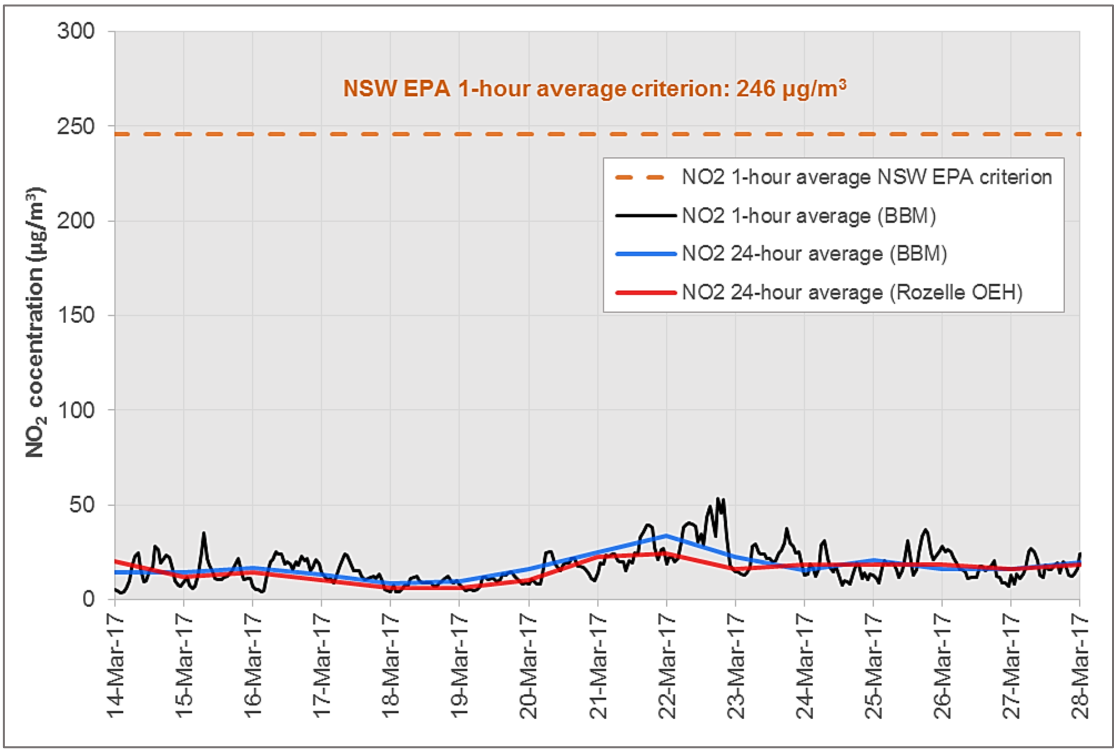

Figure 6-6: Time-series plot of 1-hour average NO_2 concentrations measured at Blackwattle Bay Marina (BBM) and at DPIE Rozelle during the BBM monitoring period

6.4 Sulfur dioxide

Sulfur dioxide (SO_2) data are available from the nearby White Bay Cruise Terminal (WBCT) monitoring station. Data from this site have been used to establish background SO_2 concentrations.

A summary of the SO_2 data measured between 2016 and 2019 at the WBCT (Ports Authority of NSW, 2016-2019) monitoring station are presented in Table 6-5. These data show that existing concentrations of SO_2 are below the EPA impact assessment criterion for all averaging periods.

Table 6-5: Summary of maximum SO_2 concentrations (µg/m³) at the WBCT station

Period	Maximum 10-minutes (µg/m³)	Maximum 1-hour (µg/m³)	Maximum 24-hour (µg/m³)	Annual average (µg/m³)
EPA Criterion	**712**	**570**	**228**	**60**
August – December 2016	86	51	18	-
January – December 2017	146	71	9	1
January – December 2018	198	117	44	2
January – December 2019	179	58	14	3

6.5 Summary of background data

The existing concentrations referred to in this assessment are based on the available representative monitoring data and are presented in Table 6-6. These are conservative, as they represent the maximum recorded values (except for 24-hour PM_{10} and $PM_{2.5}$), and are all below their relevant air quality criteria. With regard to particulate matter, 2019 was discounted as it was not representative of general existing concentrations, as discussed in Sections 6.1 and 6.2.

Table 6-6: Summary of background data

Pollutant	Averaging period	Criteria	Background concentrations
Nitrogen dioxide (NO_2)	1-hour	246 µg/m^3	185 µg/m^3
	Annual	62 µg/m^3	23 µg/m^3
Sulfur dioxide (SO_2)	10-minute	712 µg/m^3	198 µg/m^3
	1-hour	570 µg/m^3	117 µg/m^3
	24-hour	228 µg/m^3	44µg/m^3
	Annual	60 µg/m^3	3 µg/m^3
PM_{10}	24-hour	50 µg/m^3	* 35 µg/m^3
	Annual	25 µg/m^3	18 µg/m^3
$PM_{2.5}$	24-hour	25 µg/m^3	* 17 µg/m^3
	Annual	8 µg/m^3	7 µg/m^3

* These values represent the 98th percentile 24-hour average for the monitoring period 2015 – 2018.

7. EMISSIONS TO AIR

The following section provides detailed information on the calculation of the two key emission sources that would be released in local air environment as a result of the operations and include:

- Particulate emissions from operations at the site – these are considered fugitive dust source emissions from vehicle movements and minor emissions due to de-dusted air from the bag filters.
- Emissions from ships – these emissions would arise from the use of the auxiliary engine and auxiliary boiler while at berth delivering cement to the site.

7.1 Fugitive on-site emissions

Emissions from wheel generated dust on paved roads have been determined using emission factors developed in the United States (US EPA, 1995) that are accepted for use in air assessment completed in NSW.

PM_{10} and $PM_{2.5}$ emissions from vehicle movements on paved roads were estimated using the US EPA emission factor equation given in Equation 1 (US EPA, 1995).

Equation 1

$EPM_{10} = 0.62 \times (sL)^{0.91} \times [(W \times 1.1023)^{1.02}] / 1000$ kg/VKT

$EPM_{2.5} = 0.15 \times (sL)^{0.91} \times [(W \times 1.1023)^{1.02}] / 1000$ kg/VKT

where,

sL = silt loading of the surface (g/m^2)

W = mean vehicle weight (t)

For this project, a silt loading of 0.4 g/m^2 has been used for roads that have < 5,000 vehicles per day. No cleaning and sweeping controls on the road have been accounted for. A site inspection indicated that these were reasonable assumptions as the roads were not significantly dusty and there was no track-out to the main roads.

The average payload of trucks loaded at site is about 25 t, with an average gross vehicle mass (GVM) of 41 t fully loaded resulting in a mean vehicle weight of 29 t. At current production levels of 500,000 t/y this would equate to about 20,000 truck movements per year. The return travel distance of 1.6 km from entering the site, loading and then leaving the site.

Table 7-1 shows the potential emissions from wheel generated dust at the current levels. The table also shows estimated emissions if the production levels were increased to 600,000 t/y and 1,200,000 t/y. Clearly, the increase in total emissions due to wheel generated dust is linear with the increase in the tonnage of material moved, however, this does not necessarily mean that any resulting concentrations will also be, as discussed in Section 9.

Table 7-1: Estimated emissions from wheel generated dust on paved roads

Production rate (tonnes per annum)	PM_{10} emissions (kg/year)	$PM_{2.5}$ emissions (kg/year)
500,000	1,511	70
600,000	1,813	84
1,200,000	3,627	168

In addition to fugitive dust, there may be some residual dust from the baghouse filtration. These emissions are generally low as they are designed to remove the majority of the dust from the internal operations before the air is emitted to the atmosphere. When these are operated in a proper and efficient manner and well maintained they are very effective in removing particles and are not considered a significant source, even when assessing concrete batching plants.

7.2 Emissions from ships

For a throughput of 500,000 tpa there are approximately 30 ships per year delivering to the site, each with a payload of 15,000 – 17,000 tonnes. The expected time at berth for a single ship is approximately 48 hours, totalling about 1,440 hours per year for production levels of 500,000 t/y. This would equate to 1,728 h/y and 3,456 h/y for production levels of 600,000 t/y and 1,200,000 t/y, respectively.

Emissions from ships have been assumed to include emissions from the auxiliary engine and auxiliary boiler while the ship is at berth. Emissions from the main engine have not been included as this would only be engaged intermittently, and on approach / departure from the site.

For conservatism, emission estimation for the auxiliary engine and auxiliary boiler are assumed to be operating using residual oil (RO). As source specific information on these ship types was limited, it has been assumed that a bulk carrier ship (as defined by ICF (2009)) would be representative of these ships and therefore used as the basis for the emissions calculations.

Ships offload material to the silos via a pneumatically sealed delivery system, allowing fine dust to be captured by bag filters within the structure and reduce particulate emissions to the atmosphere to almost zero.

Table 7-2 and Table 7-3 show the estimated emissions of various pollutants for the current production rate, and increases to 600,000 t/y and 1,200,000 t/y.

Table 7-2: Estimated emissions from auxiliary engines

Pollutant	Emission rate (g/s)	Hours at berth (h/y)	Total emission (kg/y)
Scenario 1 – current delivery volume of 500,000 t/y, 30 ships per year			
PM_{10}	0.07	1,440	363
$PM_{2.5}$	0.07	1,440	363
NO_X	0.73	1,440	3,784
SO_2	0.59	1,440	3,059
Scenario 2 – increased delivery volume of 600,000 t/y, 36 ships per year			
PM_{10}	0.07	1,728	435
$PM_{2.5}$	0.07	1,728	435
NO_X	0.73	1,728	4,541
SO_2	0.59	1,728	3,670
Scenario 3 – increased delivery volume of 1,200,000 t/y, 72 ships per year			
PM_{10}	0.07	3,456	871
$PM_{2.5}$	0.07	3,456	871
NO_X	0.73	3,456	9,082
SO_2	0.59	3,456	7,341

Table 7-3: Estimated emissions from auxiliary boiler

Pollutant	Emission rate (g/s)	Hours at berth (h/y)	Total emission (kg/y)
Scenario 1 – current delivery volume of 500,000 t/y, 30 ships per year			
PM_{10}	0.003	1,440	16
$PM_{2.5}$	0.003	1,440	16
NO_X	0.033	1,440	171
SO_2	0.142	1,440	736
Scenario 2 – increased delivery volume of 600,000 t/y, 36 ships per year			
PM_{10}	0.003	1,728	19
$PM_{2.5}$	0.003	1,728	19
NO_X	0.033	1,728	205
SO_2	0.142	1,728	883
Scenario 3 – current delivery volumes of 1,200,000 t/y, 72 ships per year			
PM_{10}	0.003	3,456	37
$PM_{2.5}$	0.003	3,456	37
NO_X	0.033	3,456	411
SO_2	0.142	3,456	1,767

8. RESULTS

Combined, the emission estimates from wheel generated dust and shipping sources represent approximately 1,890 kg/y of PM_{10} and 448 kg/y of $PM_{2.5}$ for current operations. These increase to about 4,535 kg/y (PM_{10}) and 1,076 kg/y ($PM_{2.5}$) for deliveries of up to 1,200,000 t/y. These maximum increases of 2,645 kg/y (PM_{10}) and 628 kg/y ($PM_{2.5}$) are low values in comparison to other dust generating operations and are unlikely to cause any measureable difference to ground level concentrations at the nearest sensitive receptors.

The increases in NO_X emissions are also unlikely to cause any measureable difference to ground level concentrations at nearby sensitive receptors. The nearby road network and associated vehicle emissions will be a much larger and more constant source of NO_X than ships berthing at various times throughout the year. In addition, the NSW EPA has developed a *"Tiered Procedure for Estimating Ground Level Ozone Impacts from Stationary Sources"*. Whilst this does not relate specifically to shipping projects, it does given an emission threshold for NO_X of 90 t/y for new sources for proceeding to a detailed modelling assessment for ozone. The changes in emissions associated with this project are an order of magnitude below this threshold.

With regard to SO_2 emissions, it was noted in the available monitoring data that current levels measured at White Bay represent only a fraction of the air quality criteria, which would include some contribution from the current emissions from existing shipping in Glebe Island. As is the case for both PM and NOx, estimated increases are unlikely to make a measureable difference to ground level concentrations at nearby sensitive receptors.

9. DISCUSSION

Given this is not a new facility at the site, but rather an increase in existing operations, it is reasonable to conduct a semi-quantitative assessment to determine what the potential associated increase in emissions would be. In this case, the increases are minor and are unlikely to lead to any measureable impacts on local air quality or any additional exceedances to air quality criteria (in the case of 24-hour PM_{10} and $PM_{2.5}$). Current monitoring data from Rozelle have been summarised and show that concentrations of most pollutants are at acceptable levels. For pollutants (particulate matter) which are shown to exceed short-term criteria from time to time, these elevated concentrations are due to regional events and not caused by local sources.

The assessment has also demonstrated that a local monitoring campaign closer to the site, and in a different direction, correlates well with the Rozelle data for the same period indicating that Rozelle is likely to be representative of background levels in the area. These data will also include emissions to air from other existing industry in the area. The assessment has shown that the potential increases in emissions from the increased throughput are estimated to be minor and in the context of background concentrations unlikely to lead to air quality impacts.

10. REFERENCES

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