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Ashleigh Zarlenga
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21 October 2020,

Reference: 22201

Dear Ashleigh,

Subject: Hanson Glebe Island Concrete Batching Plant AQIA - Technical Addendum: Dispersion Modelling Sensitivity Analysis

Please find attached a technical addendum provide an updated dispersion modelling assessment for the Hanson Glebe Island Batching Plant ('the Project'), incorporating Project updates and additional sensitivity analysis as per the Department of Planning, Industry and Environment (DPIE) peer reviewer's comments (TAS, 2020), ('the reviewer's comments').

The following does not endorse the peer reviewer's view; rather, this exercise was seen as the most direct way to establish whether technical comments provided have any material implications on the conclusions of ERM's air quality assessment for the Project (PE, 2018). For broader context on the Project assessment, the technical addendum should be read in conjunction with PE (2018).

As consistent with PE (2018), the results of this updated analysis indicate compliance with relevant impact assessment criteria for all pollutants and averaging periods assessed. On this basis, with implementation of the proposed operational controls, it is concluded that the Project is unlikely to generate adverse air quality impacts at sensitive receptors in the vicinity of the Project.

Should you have any questions, please do not hesitate to contact the undersigned.

Kind regards,

Damon Roddis	James Grieve
Partner	Senior Consultant

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TECHNICAL ADDENDUM – DISPERSION MODELLING SENSITIVITY ANALYSIS

The content of this technical addendum provides documentation of the methodology and findings of the dispersion modelling sensitivity analysis.

1 Selection of Meteorological Year

A meteorological year has been selected from the most recent five years, based on consistency with average conditions observed within the period 2015-2019. This has been achieved through review of wind roses, as well as statistical assessment of meteorological data variability.

Attachment A provides annual and seasonal windroses for several Automatic Weather Stations (AWS) in the region of the Project:

- Bureau of Meteorology (BoM) Fort Denison Automatic Weather Station (AWS).
- BoM Sydney Olympic Park AWS.
- BoM Sydney Airport AWS
- BoM Canterbury AWS.

A statistical assessment of the representative meteorological year has been undertaken by calculating the five year mean frequency for each of 96 wind speed / wind direction combinations (wind data 'bins') with calculation of the standard deviation for each bin across the five individual years. Using these data, the representativeness of each individual year has then been assessed based on the average number of standard deviations of each individual wind bin from the five year mean, where lower variance (as the average standard deviations) are consistent with a more representative meteorological year.

Average variance has been calculated for all winds, as well as dominant winds (i.e. 10% most prevalent) winds, whereby the avoidance of outliers for both metrics is considered desirable for the selection of a representative meteorological year.

Table 1.1 presents a summary of the results of this analysis using the data from the BoM Sydney Olympic Park AWS, which has been selected from available monitoring locations based on its alignment within Sydney Harbour, and absence of specific localised land use / terrain influences. Whilst no AWS locations were identified as being specifically representative of the Project Site, the Sydney Olympic Park data is considered instructive in assessing inter-annual variability of winds in the region.

Table 1.1: Selection of Representative Meteorological Year: BoM Sydney Olympic Park

Year	Average standard deviations from 5 year mean	
	All Winds	Dominant (Top 10%) Winds
2015	0.80	0.73
2016	0.92 (Worst Performing)	0.83
2017	**0.68**	**0.58 (Best Performing)**
2018	0.64 (Best Performing)	0.93 (Worst Performing)
2019	0.77	0.69

Based on this analysis, the year 2017 has been selected for use in this assessment.

2 Meteorological Modelling

A meteorological dataset has been prepared for the selected year using the CSIRO's TAPM in conjunction with the CALPUFF meteorological pre-processor CALMET. TAPM Version 4.0.5 has been run configured and run as per the following model settings:

- Grid Centre: 33°52'00"S, 151°11'00"E (331 962 mE, 6251 143 mN).
- Four model grids: 30 km initial, with 10 km, 3 km and 1 km nested grids.
- Run period 29 December 2016 (incorporating model spin-up days) through to 1 January 2018.
- 31 x 31 horizontal grid points, and 35 vertical levels.

The CALTAPM utility was then used to convert the 1 km into a 3D.DAT, for use in CALMET with a 'No-Observations' approach. CALMET version 6.5.0 has been configured and run as per the following settings:

- Grid origin 327.950 km E, 6246.950 km N (Zone 56S, UTM).
- 81 x 81 grid points at 100 m horizontal resolution.
- Customised land prepared manually from aerial imagery.
- 10 cell faces with heights of 0, 20, 40, 60, 100, 160, 320, 640, 1200, 2400, 3000 metres above ground level (mAGL).
- Use of 3D.DAT as initial guess field.
- Application of diagnostic procedures including slope flows, Froude number adjustment / blocking effects (kinematic effects not included).
- Terrain adjustment radius (TERRAD) of 1 km.

Figure 2.1 provides an overview of the CALMET modelling domain extent, overlaid with land use and an example wind field.

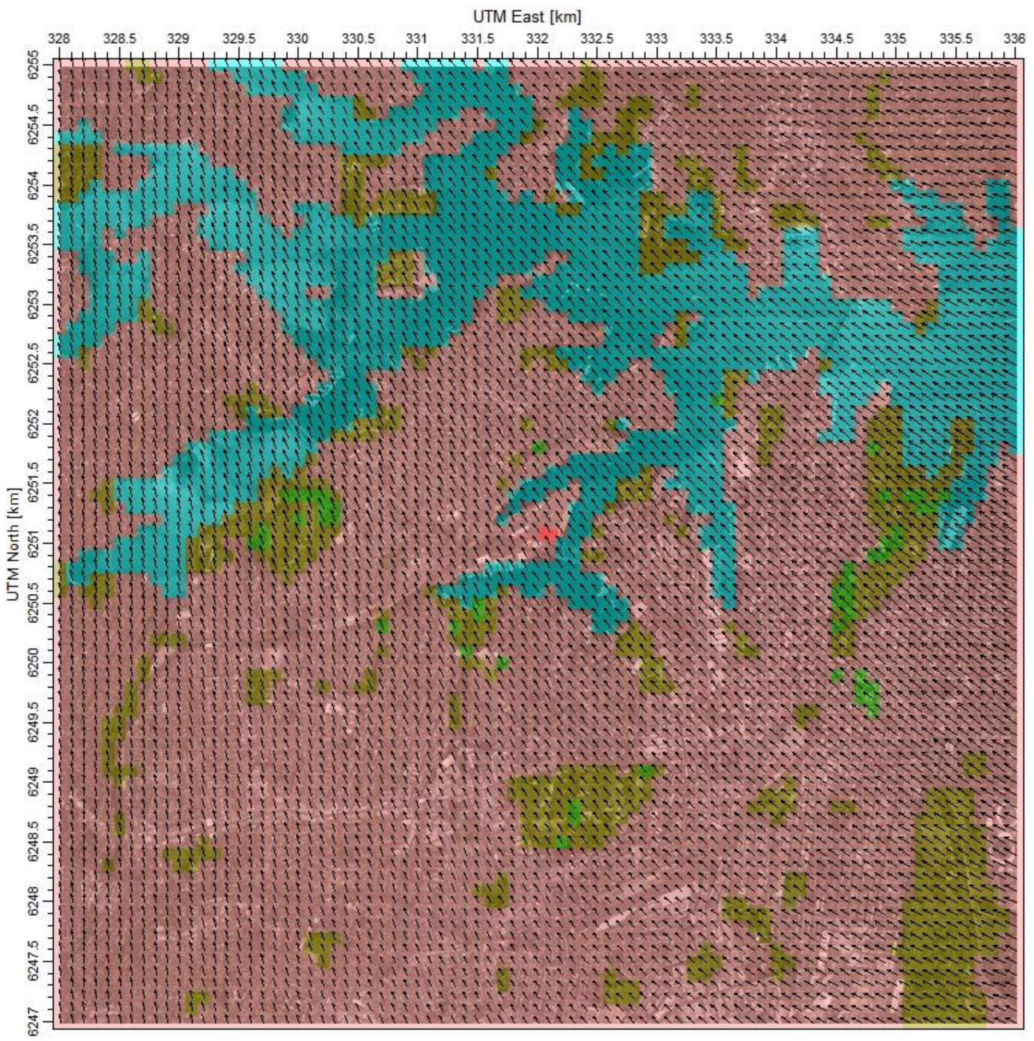


Figure 2.1: Aerial image of 81 x 81 CALMET domain overlaid with custom land use and example wind field.

Table 2.1 and Figure 2.2 provide a summary of wind predictions at the Project Site. As shown in Figure 2.2, the meteorological modelling has reproduced key wind patterns of the region exhibited within wind roses for the region (see **Attachment A** for comparisons).

Table 2.1: Summary of Wind Predictions at Project Site.

Period	Frequency of Calm Conditions	Average Wind Speed (m/s)
Summer	0.7 %	2.1
Autumn	1.9 %	2.2
Winter	0.9 %	2.5
Spring	0.9 %	2.4
Annual	1.1 %	2.3

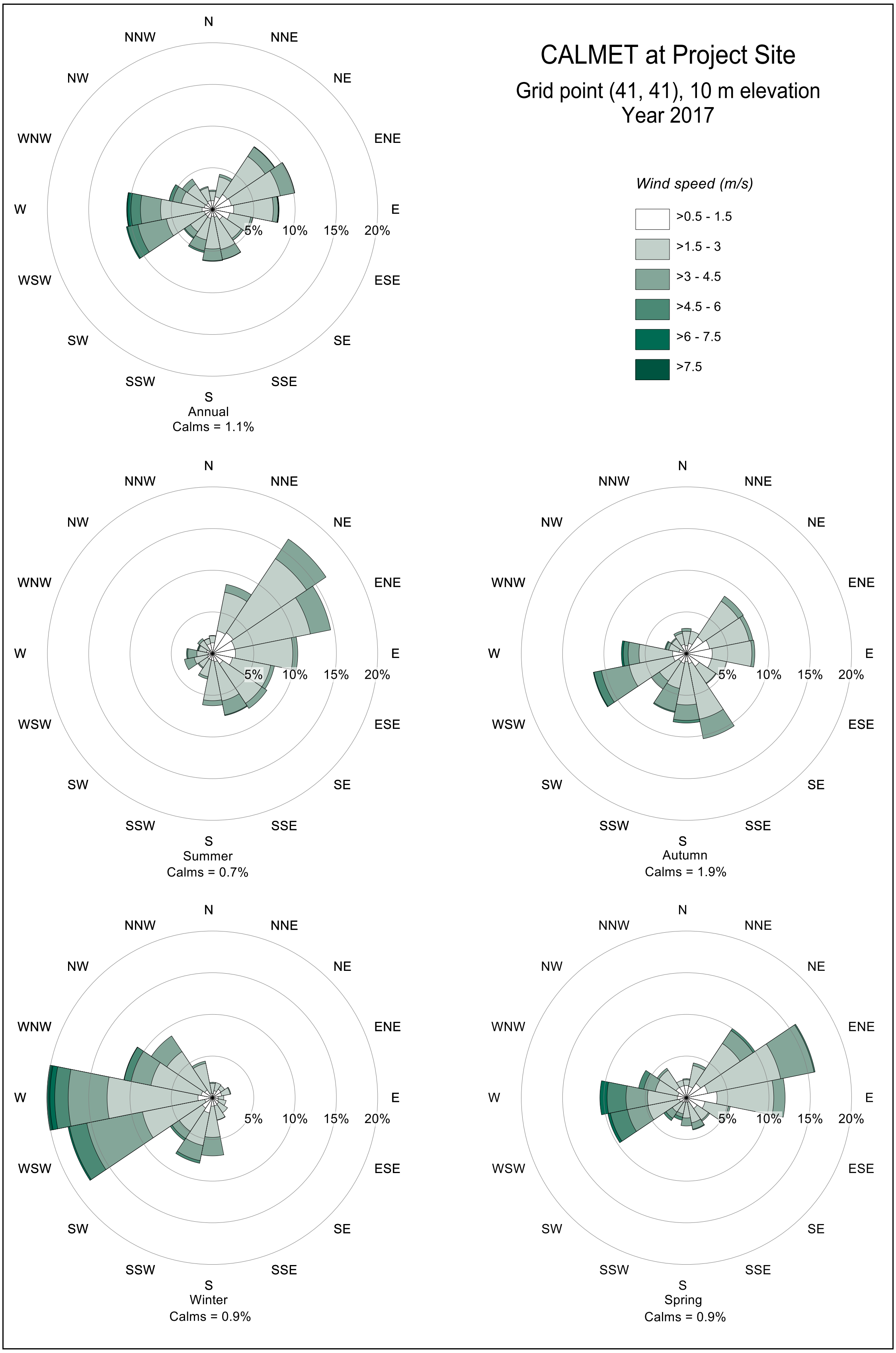


Figure 2.2: Annual and season wind roses showing predictions at Project Site

3 Emission Estimation

The emission inventory has been revised in light of the reviewer's comments and Project updates including the following:

- Average Day and Peak Day emission scenarios have been replicated from PE (2018). It is noted that the average scenario reflects intensive operation of the Project at its design capacity, whilst the peak day scenario also reflects this design capacity, with additional allowance for peak fluctuations in throughputs that may occur during the course of operation.
- Aggregate load-out has been located external to the main building at the south of the Site.
- Emission sources within the building have been itemised and incorporated into a bulk volume source that is reflective of the building dimensions. This approach has also been applied for road transit emissions that occur in the immediate perimeter of the building. A control factor of 70% has been included for non-combustion emission sources within the building to reflect enclosure. Combustion sources have been modelled without any attenuation from the building.
- No filtration of general air (from within the building) is proposed, hence a building ventilation source has not been included in the model. Where rooftop mounted (unfiltered) assisted building ventilation is used, emissions from this source would be contained within the building wake, hence the associated dispersion characteristics have been characterised as the bulk volume source.
- Filtration exhausts associated with concrete loading and cement silo filling have been modelled as discrete point sources on the roof of the building, inclusive of building downwash effects.
- Conveyor sources that are external to the building (e.g. silo top and aggregate conveyor merging) have been modelled as separate from the building volume source, based on their estimated location and bulk structure dimensions.
- Filtered point emission sources have been modelled based on an emission concentration of 20 mg/Nm³, dry at 1 atmosphere:
  - The pneumatic cement loading system would be operated throughout the day on an intermittent basis when cement trucks are unloading (approximately 60% of the time on average). Emissions from cement silo filling has been modelled to correspond with truck movements, which has been modelled on a 24 hour cycle as per the profiles detailed in PE (2018).
  - A concrete loading Local Exhaust Ventilation System would be operated throughout the day on an intermittent basis when concrete trucks are loaded.
- All truck movements and associated material handling activities have been modelled based on the diurnal profiles for concrete, cement and aggregate presented in PE (2018).
- Shipping emissions and associated material handling activities have been modelled on a 14 hour loading sequence, which has been repeated on a 23 hour cycle.
- The conveyor emission control factor has been revised from 99% down to 70% thus assuming enclosure of conveyors and transfer points in the absence of baghouse filtration.
- US EPA default moisture contents have been applied (Aggregate: 1.77%, Sand: 4:17%).
- Dispersion modelling of land based sources has been conducted on unity emission rate assumptions, with incorporation of relevant diurnal profiles for each emission source.
- Paved road particulate emissions have been estimated based on a surface silt loading of 4 g/m², as per the reviewer's opinion. This assumption has been applied for surfaces within the building and external to the building in the area post-aggregate loading (for trucks loaded. In addition, a truck carry-out source has been modelled, whereby it has been assumed that silt loadings progress from 4 g/m² to 0.4 g/m² over a 50 m path from the exit of the site.

3.1 Allowance for Aggregate that Passes through the Facility

The premise for the Project operating scenario has been the production of 2,300,000 tonnes of concrete per year, inclusive of 1,000,000 tonnes of sand, 1,000,000 tonnes of coarse aggregate, and 300,000 tonnes of cement / fly ash. To include an additional allowance for base materials that pass through the facility (assumed on top of the 2,300,000 tonne per annum concrete production flow), the 'average' scenario has been modified from PE (2018) to include an additional 10% (truck-based) delivery of sand and coarse aggregate, with corresponding truck-based export of sand and coarse aggregate from the facility (100,000 tonnes per year of each). This also captures emissions associated with the potential delivery of aggregate via truck.

The peak day scenario has not been modified, given that this is representative of intensive concrete production, and represents a worst case emissions scenario for plant operations. Under this operating condition, it is not anticipated that sand and aggregate would be simultaneously delivered and exported via the truck network.

3.2 Shipping Emissions

Subsequent to PE (2018), a more detailed shipping emission inventory has been prepared, incorporating estimates for the class of ship nominated for service of the Project within the EIS, namely self-unloading bulk carriers in the general vicinity of 120 m length, and 10,000 tonne capacity.

The emissions have been modelled on a repeating 23 hour cycle, inclusive of resolution of main engine, auxiliary engine and auxiliary boiler loads across a 14 hour berthing sequence that includes the following processes:

- Arrival/docking (Hour 1) – manoeuvring 30 minutes (main engine operational).
- Transfer setup (Hour 2)
- Unloading (Hours 3 – 12: 10 hours in total)
- Demobilisation of transfer equipment (Hour 13)
- Engine warm-up (30 minutes) / departure from berth (hour 14).

For the estimation of peak short-term impacts, this approach ensures that the proposed frequency of shipping operations is adequately and conservatively represented, i.e. 380 events / 3,800,000 tonnes imported per year, as compared to the proposed 120 events, 1,000,000 tonnes imported per year. This also ensures that the influence of diurnal and seasonal meteorological variability is adequately addressed. Annual average concentrations have been scaled by the number of ships modelled to that anticipated (i.e. a factor of 120 / 380).

Shipping emission factors have been based on US EPA (2020), assuming use of residual/heavy fuel oil with a reduced sulphur content of 0.5 wt%, as reflective of national obligations under MARPOL Annex XI, regulation 14, which came into effect in 2020.

Table 3.1 provides a summary of the adopted emission factors from US EPA (2020). It is noted that low load adjustment factors have been applied to the main engine to compensate for increased specific fuel consumption and changes in combustion dynamics present at low loads. A low load adjustment factor for CO_2 has been applied to SO_2 as a surrogate, (i.e. assuming that this factor is reflective of changes in specific fuel consumption).

Table 3.1: Adopted Emission Factors (EPA, 2020)

Plant	Emission Factor (g/kWh)			
	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Main Engine	14.0 (2.341)	2.0 (1.76)	0.32 (2.44)	0.31 (2.44)
Auxiliary Engine	14.7	2.1	0.33	0.32
Auxiliary Boiler	2.0	2.9	0.39	0.38

Note: Low load adjustment factors applied to main engine - factors shown in italicised brackets.

A main engine capacity of 3,384 kW has been adopted, as based on the CSL Elbe. A main engine load factor of 0.05 has been applied for manoeuvring, idling and warm-up. As context, based on a vessel service speed of 14 knots, this would also reflect the load associated with transit at a speed of 10 km/h (5.4 knots).

Auxiliary engine and auxiliary boiler default loads have been adopted from USEPA (2020), which supersede those previously documented within ICF (2009). A review of electrical demand on self-unloading bulk unloaders has indicated these auxiliary loads to be generally representative of the vessels proposed[1]. The proposed vessels use composite boilers that are located in-line with the main engine exhaust stream, and have thus been assumed non-operational when the main engine is in use. Table 3.2 presents a summary of adopted engine and boiler loads, whilst Table 3.3 presents the modelled emission rates for the ship source.

Table 3.2: Adopted average engine/boiler loads (US EPA, 2020)

Hour of Sequence	Operation	Estimated Engine Load (kW)		
		Main Engine	Auxiliary Engine	Auxiliary Boiler
1	Arrival	85	295	0
2	Setup	0	280	50
3	Transfer	0	280	50
4	Transfer	0	280	50
5	Transfer	0	280	50
6	Transfer	0	280	50
7	Transfer	0	280	50
8	Transfer	0	280	50
9	Transfer	0	280	50
10	Transfer	0	280	50
11	Transfer	0	280	50
12	Transfer	0	280	50
13	Disconnect/Warmup	85	280	25
14	Depart	170	295	0

[1] Based on Singer et al. (2020), auxiliary loads of approximately 230 kW were estimated for a self-unloading bulk carrier at a discharge rate of 1,000 tonnes/hr, thus indicating an auxiliary load of 280 kW is generally representative.

Table 3.3: Modelled ship emission rates (sum of main engine, auxiliary engine and auxiliary boiler)

Hour of Sequence	Operation	Modelled Emission Rate (g/s)			
		NO_x	SO_2	PM_{10}	$PM_{2.5}$
1	Arrival	1.823	0.275	0.109	0.106
2	Setup	1.171	0.204	0.069	0.067
3	Transfer	1.171	0.204	0.069	0.067
4	Transfer	1.171	0.204	0.069	0.067
5	Transfer	1.171	0.204	0.069	0.067
6	Transfer	1.171	0.204	0.069	0.067
7	Transfer	1.171	0.204	0.069	0.067
8	Transfer	1.171	0.204	0.069	0.067
9	Transfer	1.171	0.204	0.069	0.067
10	Transfer	1.171	0.204	0.069	0.067
11	Transfer	1.171	0.204	0.069	0.067
12	Transfer	1.171	0.204	0.069	0.067
13	Disconnect/Warmup	1.171	0.204	0.069	0.067
14	Depart	2.414	0.338	0.146	0.142

3.3 Emission Inventory Summary

Table 3.4 and Table 3.5 present annualised emission inventories for Peak Day and Average Day scenarios (respectively). Figure 3.1 presents annual emission estimates for the Project, as based on the Average Day scenario.

In the case of the Peak Day scenario, annualised emission quantities have been presented to allow comparison against the Average Day scenario, and simply represent peak daily estimates multiplied by 365. It is noted that the Average Day inventory provides relevant annual quantities for the Project operating at its design throughput.

Additional detail of Average Day and Peak Day emission inventories can be found in **Attachment B** and **Attachment C** (respectively).

Table 3.4: Emission inventory summary – Peak Day scenario

Activity	Flow	Source	Annualised Emission Estimate (kg)				
			NO_x	SO_2	TSP	PM_{10}	$PM_{2.5}$
Road Transit	Delivery	Sand - Truck	417	1	2,886	568	40
		Aggregate - Truck	0	0	0	0	0
		Flyash / Cement - Truck	53	0	420	82	6
	Dispatch	Concrete - Truck	1,037	2	5,431	1,077	85
		Sand - Truck	0	0	0	0	0
		Aggregate - Truck	0	0	0	0	0
	N/A	Carryout	216	0	5,241	1,013	54
Material Transfer	Delivery	Sand - Truck	0	0	1,915	906	65
		Aggregate - Truck	0	0	0	0	0
		Aggregate - Ship	0	0	1,827	864	62
		Flyash / Cement - Truck	0	0	309	102	17
	Process	Sand - Process	0	0	267	126	9
		Aggregate - Process	0	0	274	130	9
	Dispatch	Sand - Truck	0	0	0	0	0
		Aggregate - Truck	0	0	0	0	0
		Concrete - Truck	0	0	696	209	6
Shipping	Delivery	Engines / Boiler	25,088	4,193	1,492	1,492	1,447
TOTAL			**26,810**	**4,196**	**20,759**	**6,569**	**1,801**

Note: Annualised emission quantities represent peak day quantities multiplied by 365 and do not represent an estimate of emissions that occur over a year.

Table 3.5: Emission inventory summary – Average Day scenario

Activity	Flow	Source	Annual Emission Estimate (kg)				
			NO_x	SO_2	TSP	PM_{10}	$PM_{2.5}$
Road Transit	Delivery	Sand - Truck	143	0	988	194	14
		Aggregate - Truck	13	0	90	18	1
		Flyash / Cement - Truck	35	0	276	54	4
	Dispatch	Concrete - Truck	749	1	3,926	778	61
		Sand - Truck	12	0	177	34	2
		Aggregate - Truck	12	0	177	34	2
	N/A	Carryout	140	0	3,356	649	35
Material Transfer	Delivery	Sand - Truck	0	0	656	310	22
		Aggregate - Truck	0	0	198	94	7
		Aggregate - Ship	0	0	1,827	864	62
		Flyash / Cement - Truck	0	0	203	67	11
	Process	Sand - Process	0	0	83	39	3
		Aggregate - Process	0	0	274	130	9
	Dispatch	Sand - Truck	0	0	14	7	0
		Aggregate - Truck	0	0	46	22	2
		Concrete - Truck	0	0	503	151	5
Shipping	Delivery	Engines / Boiler	7,902	1,321	470	470	456
TOTAL			**9,005**	**1,322**	**13,263**	**3,915**	**695**

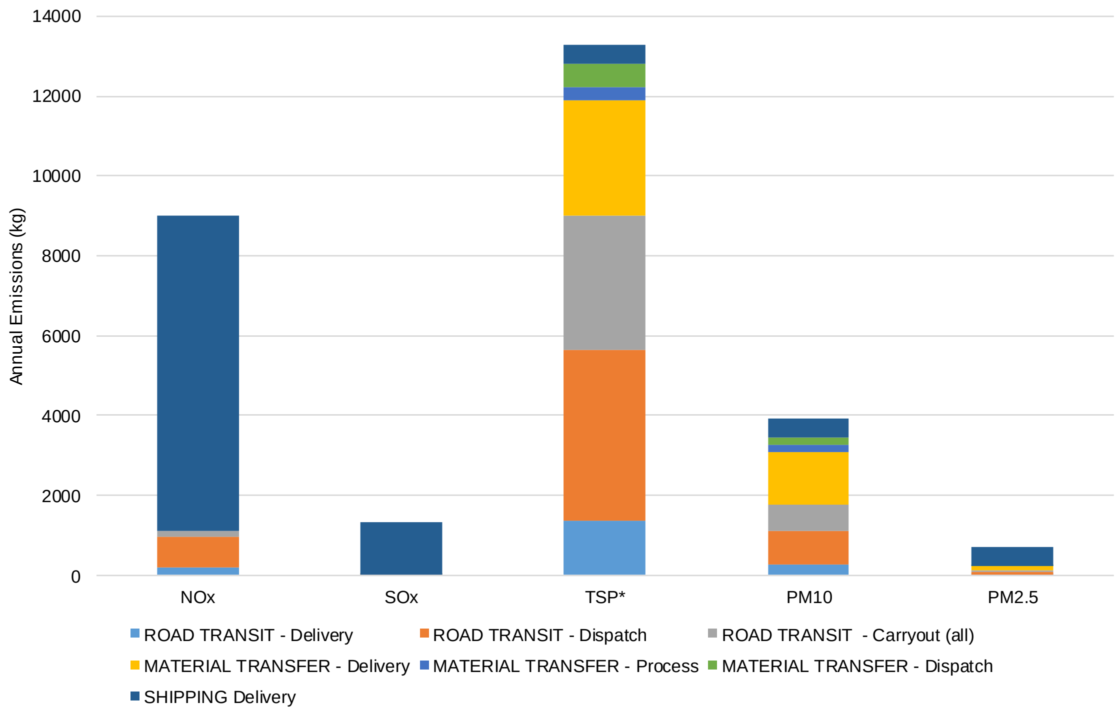


Figure 3.1: Annual emission inventory summary (Average Day scenario)

4 Model Receptors

PE (2018) considered a set of 35 discrete receptors. As per the reviewer's comments, the modelled receptor dataset has been modified as per the following:

- Receptors R04 and R07 (Harbour Utilities Area) as well as R08 (Anzac Bridge carriageway) have been removed on the basis that these are not sensitive receptors in the context of the Approved Methods. The numbering of remaining receptors has been retained as is for consistency with PE (2018).
- An elevated receptor dataset (R36 through R76) has been added to capture potential impacts on buildings along the Pyrmont waterfront. These receptors have been configured at 5 m intervals from ground level to the top of the structures, as consistent with AECOM (2019).

Gridded receptors have been applied at a resolution of 61 x 61 points at 100 m resolution, comprising a horizontal extent of 6 x 6 km. Table 4.1 presents a summary of ground level receptors, whilst Figure 4.1 shows these receptors along with the gridded receptor domain extent. Table 4.2 and Figure 4.2 present the elevated receptor dataset.

Table 4.1: Location of ground level receptors (R01 – R35)

Receptor ID	Easting (kmE)	Northing (kmN)	Height (mAGL)
R01	332.453	6251.070	0
R02	332.403	6250.960	0
R03	332.354	6250.879	0
R05	331.842	6250.888	0
R06	331.820	6251.092	0
R09	331.533	6250.833	0
R10	331.350	6251.126	0
R11	331.459	6251.298	0
R12	331.630	6251.424	0
R13	331.790	6251.579	0
R14	331.134	6250.419	0
R15	331.592	6250.541	0
R16	332.039	6250.613	0
R17	331.675	6250.097	0
R18	331.773	6250.602	0
R19	332.234	6250.438	0
R20	332.396	6250.221	0
R21	332.844	6250.499	0
R22	332.676	6251.452	0
R23	332.525	6251.212	0
R24	332.796	6251.026	0
R25	332.892	6250.886	0
R26	333.062	6251.962	0
R27	332.826	6251.979	0
R28	332.348	6251.875	0

Receptor ID	Easting (kmE)	Northing (kmN)	Height (mAGL)
R29	332.030	6251.804	0
R30	332.039	6252.180	0
R31	330.681	6251.794	0
R32	330.756	6251.519	0
R33	331.947	6251.965	0
R34	331.996	6252.010	0
R35	332.723	6250.244	0

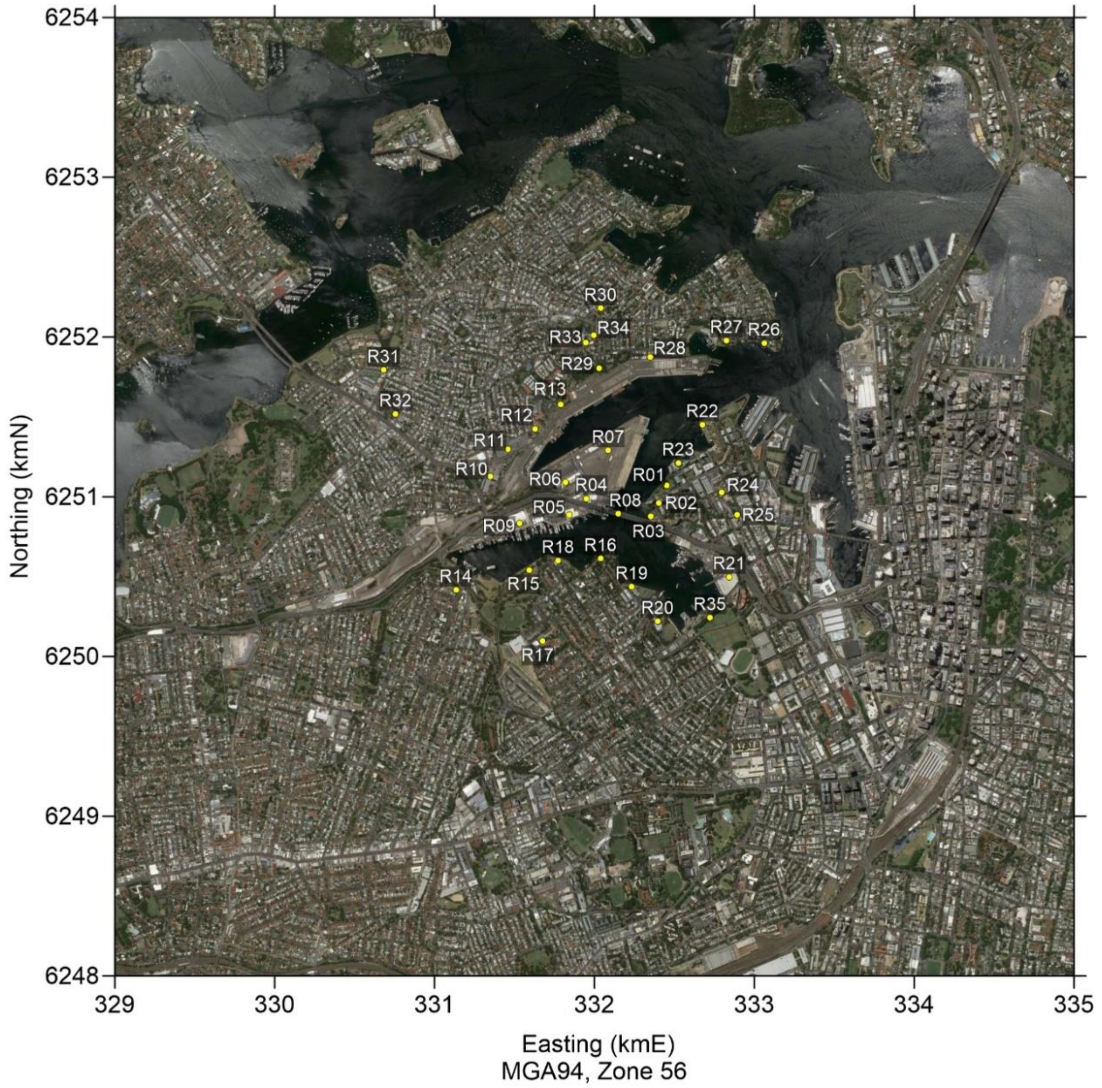
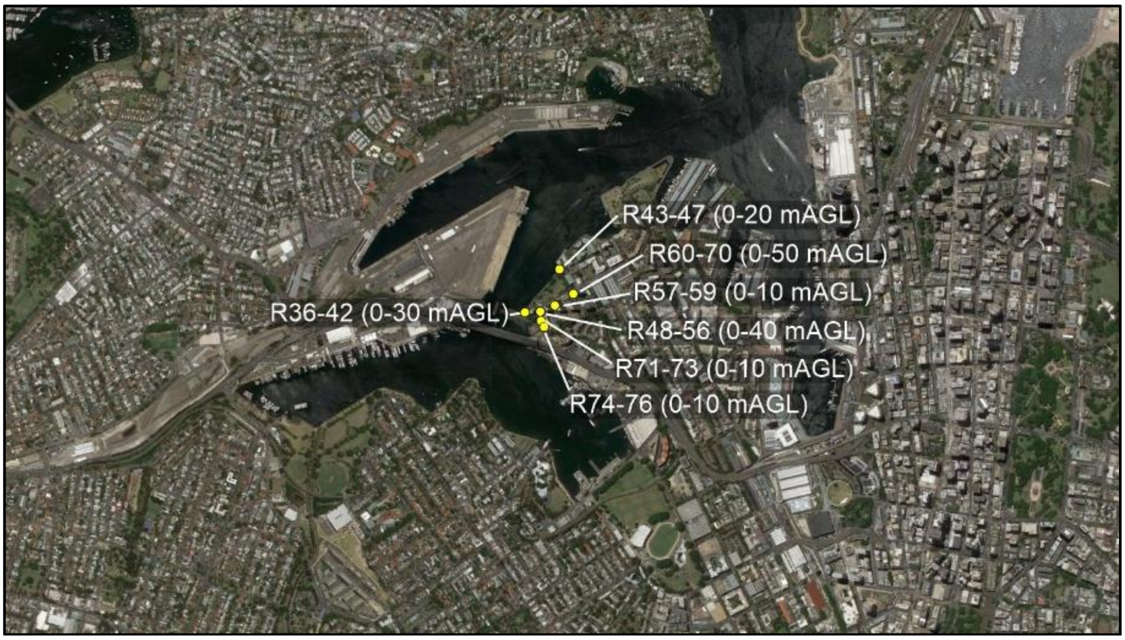


Figure 4.1: Aerial image showing location of ground level receptors (R01 – R35) and extent of gridded receptor domain.

Table 4.2: Location of elevated receptors (R36 – R76)

Receptor ID	Easting (kmE)	Northing (kmN)	Height (mAGL)
R36	332.327	6250.964	0
R37	332.327	6250.964	5
R38	332.327	6250.964	10
R39	332.327	6250.964	15
R40	332.327	6250.964	20
R41	332.327	6250.964	25
R42	332.327	6250.964	30
R43	332.477	6251.152	0
R44	332.477	6251.152	5
R45	332.477	6251.152	10
R46	332.477	6251.152	15
R47	332.477	6251.152	20
R48	332.394	6250.969	0
R49	332.394	6250.969	5
R50	332.394	6250.969	10
R51	332.394	6250.969	15
R52	332.394	6250.969	20
R53	332.394	6250.969	25
R54	332.394	6250.969	30
R55	332.394	6250.969	35
R56	332.394	6250.969	40
R57	332.457	6250.993	0
R58	332.457	6250.993	5
R59	332.457	6250.993	10
R60	332.537	6251.043	0
R61	332.537	6251.043	5
R62	332.537	6251.043	10
R63	332.537	6251.043	15
R64	332.537	6251.043	20
R65	332.537	6251.043	25
R66	332.537	6251.043	30
R67	332.537	6251.043	35
R68	332.537	6251.043	40
R69	332.537	6251.043	45
R70	332.537	6251.043	50
R71	332.395	6250.929	0
R72	332.395	6250.929	5
R73	332.395	6250.929	10
R74	332.409	6250.900	0
R75	332.409	6250.900	5
R76	332.409	6250.900	10

Note: mAGL (metres above ground level).



Base image sourced from google earth.

Figure 4.2: Location of elevated receptors (R36 – R76)

5 Model Configuration

CALPUFF Version 7.2.1 was configured to run as detailed in the following sections.

5.1 Emission Source Parameters

Table 5.1 and Table 5.2 provide a summary of modelled emission parameters for volume sources and point sources (respectively). Table 5.3 provides a summary of diurnal scaling factors applied to each source, as dependent on the material handled.

Table 5.1: Summary of modelled emission parameters – Volume sources

Source ID	Description	Base Elevation (mAHD)	Source Height (mAGL)	Initial Sig.y	Initial Sig.Z	Easting (mE)	Northing (mN)
BLD_SA	Main Building - Sand / Aggregate Profile	5	0	15.11	5.58	332064	6251100
BLD_CM	Main Building - Cement Profile	5	0	15.11	5.58	332064	6251100
BLD_CC	Main Building - Concrete Profile	5	0	15.11	5.58	332064	6251100
CMRGT	Aggregate Conveyor Belt Merger	5	9	0.93	0.93	332113	6251104
AGSL1	Aggregate Silo Structure 1	5	17	3.72	7.91	332025	6251053
AGSL2	Aggregate Silo Structure 2	5	17	3.72	7.91	332046	6251046
AGSL3	Aggregate Silo Structure 3	5	17	3.72	7.91	332067	6251040
AGSL4	Aggregate Silo Structure 4	5	17	3.72	7.91	332089	6251033
AGSL5	Aggregate Silo Structure 5	5	17	3.72	7.91	332110	6251027
CO1	Carryout 1	9.31	0	2.91	1.86	331997	6251090
CO2	Carryout 2	9.31	0	2.91	1.86	331988	6251082
CO3	Carryout 3	9.31	0	2.91	1.86	331980	6251072
CO4	Carryout 4	9.31	0	2.91	1.86	331971	6251064
SRB	Ship Receival Bin	5	6	1.65	2.79	332191	6251093

Table 5.2: Summary of modelled emission parameters – Point sources

Source ID	Description	Base Elevation (mAHD)	Source Height (mAGL)	Diameter (m)	Exit Velocity (m/s)	Exit Temp. (K)	Easting (mE)	Northing (mN)
CMSFF	Cement Silo Fabric Filter	5	25	0.25	11.5	293	332086	6251086
CCLEV	Concrete Truck Loading Local Exhaust Ventilation	5	13	0.5	12.7	293	332079	6251088
SHIP	Ship Exhaust	0	21	0.75	Time Varying (2.6 – 8.2)	605	332188	6251048

Table 5.3: Summary of non-shipping diurnal scaling profiles

Hour of Day	Diurnal Scaling Profiles			
	Cement	Sand / Aggregate	Concrete	Carryout
1	0.69	0.30	0.24	0.27
2	0.69	0.30	0.28	0.30
3	0.69	0.40	0.24	0.30
4	0.69	0.40	0.33	0.36
5	0.69	0.50	0.24	0.32
6	0.69	1.29	0.45	0.67
7	0.69	1.59	0.70	0.92
8	1.37	2.09	2.19	2.14
9	2.06	2.19	3.17	2.88
10	1.37	1.99	4.18	3.53
11	1.37	2.09	0.98	1.27
12	1.37	2.19	3.13	2.84
13	1.37	1.69	1.13	1.28
14	1.37	1.20	0.98	1.04
15	1.37	1.10	0.91	0.97
16	1.37	0.85	0.80	0.83
17	1.37	0.70	0.84	0.82
18	0.69	0.65	0.73	0.71
19	0.69	0.60	0.63	0.62
20	0.69	0.50	0.56	0.55
21	0.69	0.40	0.45	0.45
22	0.69	0.40	0.42	0.42
23	0.69	0.30	0.21	0.25
24	0.69	0.30	0.21	0.25
Average	**1.00**	**1.00**	**1.00**	**1.00**

Table 5.4: Summary of modelled emission streams with source allocation and diurnal profile

Activity	Process	Material	Carrier	Description	Model Source Allocation	Diurnal Scaling Profile
Vehicle Transit	Delivery	Sand	Truck	External	BLD_SA	Sand/Agg.
				Internal		
		Aggregate	Truck	External		
				Internal		
		Flyash/Cement	Truck	External	BLD_CM	Cement
				Internal		
	Dispatch	Concrete	Truck	External	BLD_CC	Concrete
				Internal		
		Sand	Truck	External	BLD_SA	Sand/Agg.
				Internal		
		Aggregate	Truck	External		
				Internal		
	Carryout	-	-	Truck carryout	CO 1-4	Carryout
Material Handling	Delivery	Sand	Truck	Drive over grizzly	BLD_SA	Sand/Agg.
				90° belt transfer		
				SRB belt merger	CMRGT	
				Conveyor Head	AGSL 1-5	
				Silo fill		
		Aggregate	Truck	Drive over grizzly	BLD_SA	
				90° belt transfer		
				TRF belt merger		
				Silo distributor		
				Silo fill		
			Ship	Ship Receival Bin	SRBS*	N/A – modelled on 23 hour cycle.
				SRB belt merger	CMRGS*	
				Conveyor Head	AGSLS 1-5*	
				Silo fill	AGSLS 1-5*	
		Flyash/Cement	Truck	-	CMSFF	Cement
	Process	Sand	N/A	Transfer Point 1	BLDSA	Cement
				Transfer Point 2	BLDSA	
		Aggregate		Transfer Point 1	BLDSA	
				Transfer Point 2	BLDSA	
	Dispatch	Sand	Truck	Loading	BLDSA	Sand/Agg.
		Aggregate	Truck	Loading	BLDSA	
		Concrete	Truck	-	CCLEV	Concrete

Notes: N/A – Not Applicable; * - 'S' suffix on source denotes 23 hour ship-cycle based version of model source.

5.2 Building Downwash

Aerodynamic wakes are produced as air travels over irregular objects such as building structures. Within these wakes, there is a high level of turbulence and vertical mixing. In instances where exhaust plumes interact with these wakes, pollutants can be mixed downward to ground level, producing locally elevated concentrations, and otherwise reducing the scale of plume rise at distances downwind of the source. Within dispersion modelling, this effect is referred to as building downwash.

For this study, emission sources were screened for potential interaction with building wakes, where wakes extend:

- by a distance of 5 x L from the leeward edge of a wake producing structure, where L is the lesser of the structure height or the projected structure width.
- to a height of 2.5 times the height of the structure.

Based on this review, buildings were incorporated on the basis of proximity to the following sources:

- Ship at berth
- Main building structure
- Aggregate silos.

Figure 5.1 provides a visual representation of these structures relevant to point sources (shown in red).

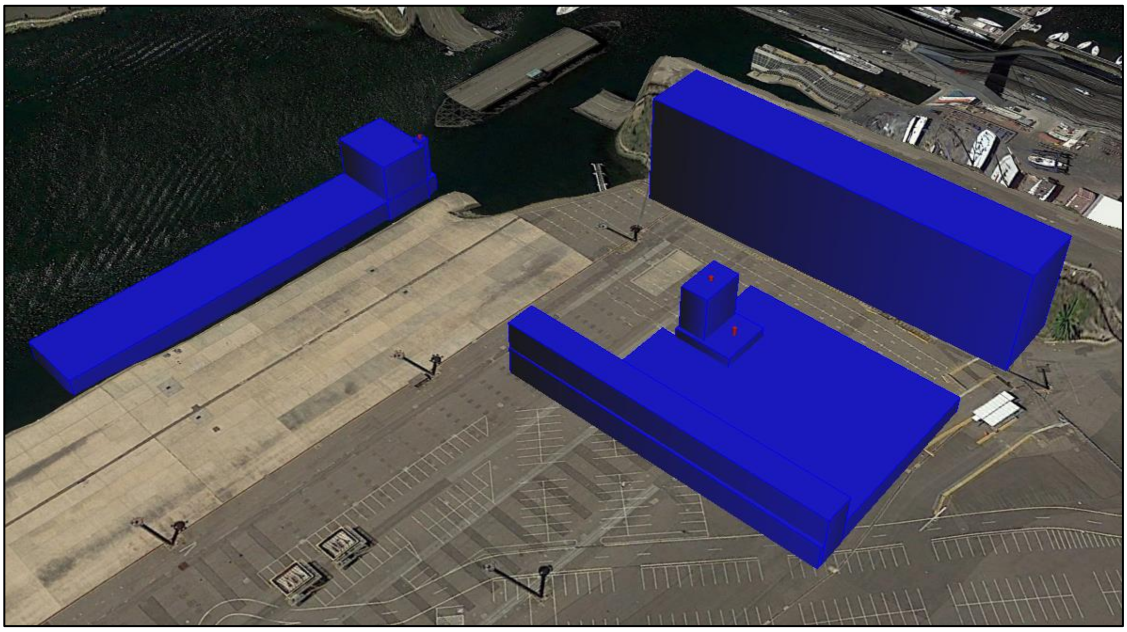


Figure 5.1: Visual representation of building downwash structures (blue) relative to modelled point sources (red).

6 NO_X to NO_2 Conversion

NO_2 concentrations have been estimated using the ozone limiting method in conjunction with time varying background NO_2 and ozone datasets, sourced from the Department of Planning, Industry and Environment (DPIE) Rozelle monitoring station. In order to provide a complete dataset, missing records of up to 3 hours have been linearly interpolated, whilst missing records for longer periods have been substituted from the DPIE Earlwood monitoring station located approximately 7 km to the south of the site.

7 Backgound Air Quality Data

Background data has been sourced from the nearby DPIE Rozelle Monitoring Station, located approximate 1,800 m to the West of the Project Site.

Particulate matter records have been reviewed to exclude measurements during extraneous events such as bushfires, hazard reduction burns and dust storms (31/01, 06/02, 11-12/05, 14/08, 27/08, 03/09, 12/09) as identified in satellite imagery, Rural Fire Service (RFS) bulletins and/or news reporting.

Table 7.1 presents a summary of adopted background concentrations applied in this assessment.

Table 7.1: Summary of adopted background concentrations

Pollutant	Averaging period	Adopted background concentration	EPA criterion
NO_2	1 hour	Time Varying (0 – 124.4)	246
	Annual	22.6	62
Sulfur dioxide (SO_2)	10-minute	98	712
	1-hour	69	570
	24-hour	8.6	228
	Annual	1.5	60
$PM_{2.5}$	24 hour	16.7	25
	Annual	7.2	8
PM_{10}	24 hour	Time Varying (5 – 36.8)	50
	Annual	7.2	25

White Bay Cruise Terminal (WBCT) Monitoring Data

Based on the reviewer's comments, an annual $PM_{2.5}$ dataset was also compiled for the Port Authority of NSW-operated White Bay Cruise Terminal (WBCT) monitoring station. An annual average $PM_{2.5}$ concentration of 10.1 µg/m³ was estimated based on the reported data[2].

Within the reporting it is noted that upward background drift was observed to occur on multiple occasions during the 2017, with apparent offset biases evident from April through August, and a

[2] It is noted that the author of this technical addendum is also the reviewer of the WBCT monitoring reporting.

concentration of 6 µg/m³ measured during a zero test conducted in mid-October[3]. PE (2017) states:

> *"Review of the raw September $PM_{2.5}$ monitoring data indicated that the data was carrying an offset bias. This was evidenced by a consistent elevation of reported concentrations above the nearby OEH Rozelle monitoring station (i.e. WBCT = 1.05 x OEH Rozelle + 9.4, Correlation Coefficient: R = 0.92), as well as a minimum reported hourly $PM_{2.5}$ concentration of 6 µg/m³ for the month. On this basis, a 3-day background zero test was commissioned in mid-October as a repeat of the background test conducted during the June maintenance event. The results of this test indicated a downward shift in the background offset of 5.9 µg/m³. On this basis, the September $PM_{2.5}$ results have been adjusted correspondingly. The $PM_{2.5}$ data presented within this report is inclusive of this correction. The influence of this bias on other months has not been investigated within this monthly report."*

Noting that the influence of this error has not been reconciled in prior months, and the significance of the offset bias measured in October (i.e. 75% of the annual standard), the objective adaptation of these data is not considered feasible, and use of these data within this analysis has not been pursued further.

8 Assessment Results

This section provides a summary of the dispersion modelling results, with comparison against adopted impact assessment criteria.

- Annual average results have been based on the average day scenario.
- All other results have been based on the Peak Day scenario. As context, for $PM_{2.5}$ and PM_{10}, peak 24 hour Average day results range from 30%-40% and 40%-60% of corresponding peak day results (respectively).
- Time varying backgrounds have been used in a contemporaneous analysis of 1 hour NO_2 and 24 hour PM_{10}, whilst peak predictions have been added to peak background concentrations for assessment of other criteria.

Table 8.1 presents a summary of assessment results for all pollutants.

Table 8.1: Summary of assessment results (all sensitive receptors)

Pollutant	Averaging Period	Maximum Increment	Background	Maximum Cumulative	Criterion
NO_2	1 hour	138	(Time Varying)	185*	246
	Annual	0.9	22.6	23.5	62
SO_2	10 minute	180	98	278	712
	1 hour	126	69	195	570
	24 hour	20	9	29	228
	Annual	0.3	1.5	1.8	60
$PM_{2.5}$	1 hour	7.3	16.7	24	25
	Annual	0.1	7.2	7.3	8
PM_{10}	24 hour	15	(Time Varying)	40.7*	50
	Annual	1.0	18.2	19.2	25

[3] A zero test involves attaching a filter to the instrument inlet such that the response of the instrument to particulate free air can be established. See: https://www.portauthoritynsw.com.au/media/2701/20132-pansw-wbct-aq-september-2017-r2-final.pdf (accessed October 2020)

Table 8.2 presents assessment results for NO_2 and SO_2 at individual sensitive receptors.

Table 8.2: Summary of assessment results by sensitive receptor – NO_2 and SO_2

Receptor	NO_2		SO_2			
	1 hour	Annual	10 minute	1 hour	24 hour	Annual
R01	81	0.9	79.1	55	11	0.3
R02	106	0.7	80.5	56	11	0.2
R03	98	0.6	86.1	60	16	0.2
R05	68	0.7	28.2	20	4	0.1
R06	66	0.7	54.3	38	5	0.1
R09	47	0.3	18.8	13	2	0.0
R10	55	0.2	21.9	15	2	0.0
R11	62	0.2	19.9	14	2	0.0
R12	59	0.2	26.1	18	2	0.0
R13	56	0.2	31.1	22	3	0.0
R14	37	0.2	14.3	10	1	0.0
R15	64	0.4	29.9	21	4	0.1
R16	81	0.3	45.2	32	5	0.1
R17	45	0.1	13.5	9	1	0.0
R18	60	0.5	40.6	28	4	0.1
R19	68	0.1	29.4	21	2	0.0
R20	55	0.1	17.1	12	1	0.0
R21	43	0.1	18.8	13	2	0.0
R22	63	0.3	27.6	19	3	0.1
R23	73	0.5	33.3	23	4	0.1
R24	55	0.2	26.6	19	3	0.1
R25	49	0.2	23.9	17	3	0.0
R26	40	0.1	18.3	13	1	0.0
R27	48	0.1	18.2	13	1	0.0
R28	54	0.2	19.9	14	3	0.0
R29	62	0.2	25.1	18	2	0.0
R30	36	0.1	14.3	10	1	0.0
R31	30	0.0	10.1	7	1	0.0
R32	38	0.1	9.4	7	1	0.0
R33	54	0.1	19.9	14	1	0.0
R34	56	0.1	18.9	13	1	0.0
R35	52	0.1	21.5	15	2	0.0

Receptor	NO_2		SO_2			
	1 hour	Annual	10 minute	1 hour	24 hour	Annual
R36_00m	108	0.8	108.3	76	19	0.2
R37_05m	109	0.8	110.9	78	19	0.2
R38_10m	114	0.8	117.5	82	19	0.2
R39_15m	123	0.8	134.8	94	20	0.2
R40_20m	132	0.8	157.4	110	20	0.2
R41_25m	138	0.8	171.4	120	19	0.2
R42_30m	138	0.7	180.2	126	17	0.2
R43_00m	119	0.8	52.5	37	5	0.2
R44_05m	119	0.8	52.4	37	5	0.2
R45_10m	118	0.8	52.2	37	5	0.2
R46_15m	118	0.8	52.0	36	5	0.2
R47_20m	115	0.7	51.7	36	5	0.2
R48_00m	117	0.7	78.8	55	11	0.2
R49_05m	117	0.7	80.0	56	11	0.2
R50_10m	117	0.7	83.1	58	11	0.2
R51_15m	117	0.7	86.3	60	11	0.2
R52_20m	113	0.7	91.1	64	12	0.2
R53_25m	110	0.7	105.3	74	12	0.2
R54_30m	110	0.6	112.9	79	12	0.2
R55_35m	110	0.6	134.9	94	12	0.2
R56_40m	114	0.5	151.3	106	12	0.1
R57_00m	122	0.8	93.3	65	18	0.2
R58_05m	122	0.8	92.8	65	18	0.2
R59_10m	122	0.8	91.6	64	17	0.2
R60_00m	62	0.5	58.8	41	8	0.2
R61_05m	62	0.5	58.8	41	8	0.2
R62_10m	62	0.5	58.9	41	8	0.1
R63_15m	62	0.5	59.1	41	8	0.1
R64_20m	61	0.5	59.3	41	7	0.1
R65_25m	60	0.5	59.5	42	7	0.1
R66_30m	60	0.5	59.7	42	7	0.1
R67_35m	60	0.4	59.9	42	6	0.1
R68_40m	61	0.4	60.1	42	6	0.1
R69_45m	61	0.4	60.2	42	5	0.1

Receptor	NO_2		SO_2			
	1 hour	Annual	10 minute	1 hour	24 hour	Annual
R70_50m	61	0.4	69.1	48	5	0.1
R71_00m	104	0.7	117.7	82	14	0.2
R72_05m	104	0.7	116.7	82	14	0.2
R73_10m	105	0.7	113.6	79	14	0.2
R74_00m	95	0.7	123.5	86	16	0.2
R75_05m	95	0.6	122.8	86	15	0.2
R76_10m	95	0.6	120.1	84	15	0.2
Maximum Increment	138	0.9	180	126	20	0.3
Background	(Time Varying)	22.6	98	69	9	1.5
Maximum Cumulative	185*	23.5	278	195	29	1.8
Criterion	**246**	**62**	**712**	**570**	**228**	**60**

Note: *Based on a contemporaneous analysis.

Table 8.3 presents a summary of assessment results for $PM_{2.5}$ and PM_{10} at individual sensitive receptors.

Table 8.3: Summary of assessment results by sensitive receptor – $PM_{2.5}$ and PM_{10}

Receptor	$PM_{2.5}$		PM_{10}	
	24 hour	Annual	24 hour	Annual
R01	4.5	0.13	13.5	0.6
R02	4.2	0.08	12.8	0.5
R03	5.9	0.09	12.4	0.5
R05	1.4	0.08	9.3	0.6
R06	2.2	0.09	12.4	1.0
R09	0.8	0.03	3.2	0.2
R10	0.7	0.02	2.2	0.1
R11	0.8	0.02	3.5	0.1
R12	0.7	0.02	2.9	0.1
R13	1.2	0.02	3.7	0.2
R14	0.5	0.01	1.6	0.1
R15	1.5	0.03	3.3	0.2
R16	1.7	0.03	4.0	0.2
R17	0.4	0.01	1.5	0.0
R18	1.4	0.04	3.8	0.2
R19	0.9	0.02	2.6	0.1

Receptor	$PM_{2.5}$		PM_{10}	
	24 hour	Annual	24 hour	Annual
R20	0.5	0.01	1.4	0.0
R21	0.6	0.01	1.8	0.1
R22	1.3	0.03	4.2	0.2
R23	1.8	0.06	6.4	0.4
R24	1.2	0.03	3.6	0.2
R25	1.1	0.02	3.3	0.1
R26	0.5	0.01	1.2	0.1
R27	0.4	0.01	0.9	0.0
R28	1.0	0.01	2.9	0.1
R29	0.6	0.02	2.6	0.1
R30	0.4	0.01	1.2	0.0
R31	0.3	0.00	1.0	0.0
R32	0.4	0.01	1.3	0.0
R33	0.4	0.01	1.7	0.1
R34	0.4	0.01	1.6	0.1
R35	0.8	0.01	2.8	0.1
R36_00m	6.9	0.11	14.2	0.6
R37_05m	7.0	0.11	14.2	0.6
R38_10m	7.2	0.11	13.9	0.6
R39_15m	7.3	0.11	13.4	0.5
R40_20m	7.3	0.11	12.6	0.5
R41_25m	6.9	0.11	11.3	0.4
R42_30m	6.1	0.10	9.8	0.4
R43_00m	1.9	0.10	7.9	0.6
R44_05m	1.9	0.10	7.7	0.6
R45_10m	1.9	0.10	7.3	0.5
R46_15m	1.8	0.09	6.7	0.5
R47_20m	1.7	0.09	6.1	0.5
R48_00m	4.2	0.09	13.1	0.5
R49_05m	4.2	0.09	13.1	0.5
R50_10m	4.3	0.09	12.8	0.5
R51_15m	4.4	0.08	12.3	0.4
R52_20m	4.4	0.08	11.7	0.4
R53_25m	4.4	0.08	10.9	0.3
R54_30m	4.5	0.07	9.9	0.3
R55_35m	4.5	0.07	8.7	0.3

Receptor	$PM_{2.5}$		PM_{10}	
	24 hour	Annual	24 hour	Annual
R56_40m	4.3	0.06	8.1	0.2
R57_00m	6.8	0.10	15.2	0.4
R58_05m	6.8	0.10	15.0	0.4
R59_10m	6.6	0.10	14.4	0.4
R60_00m	3.2	0.08	9.0	0.4
R61_05m	3.1	0.08	8.9	0.4
R62_10m	3.1	0.08	8.5	0.4
R63_15m	3.0	0.07	7.9	0.3
R64_20m	2.8	0.07	7.2	0.3
R65_25m	2.7	0.06	6.4	0.3
R66_30m	2.5	0.06	5.7	0.3
R67_35m	2.3	0.06	5.1	0.2
R68_40m	2.1	0.05	4.5	0.2
R69_45m	1.9	0.05	4.0	0.2
R70_50m	1.8	0.05	3.5	0.2
R71_00m	5.4	0.09	12.0	0.5
R72_05m	5.4	0.09	11.8	0.5
R73_10m	5.2	0.09	11.2	0.4
R74_00m	5.7	0.09	12.3	0.4
R75_05m	5.6	0.09	12.0	0.4
R76_10m	5.4	0.08	11.4	0.4
Maximum Increment	7.3	0.13	15	1.0
Background	16.7	7.20	(Time Varying)	18.2
Maximum Cumulative	24.0	7.33	40.7*	19.16
Criterion	**25**	**8**	**50**	**25**

Note: *Based on a contemporaneous analysis.

Table 8.3 through Table 8.5 present a summary of the contemporaneous analysis of PM_{10}, detailing the cumulative assessment of top ten cumulative predictions, Project contributions and background concentrations (respectively).

Table 8.4: Contemporaneous PM_{10} analysis – Top ten cumulative predictions

Rank	Date	24 hour Average PM_{10} Concentration (µg/m³)			Peak Receptor
		Background	Project	Total	
1	11/02/2017	31.0	9.7	40.7	R48
2	31/12/2017	36.8	2.0	38.8	R06
3	25/01/2017	34.7	4.0	38.7	R06
4	23/08/2017	27.9	10.6	38.5	R01
5	19/12/2017	32.9	5.0	37.9	R05
6	13/01/2017	35.4	2.5	37.9	R05
7	14/12/2017	35.4	2.4	37.8	R05
8	15/12/2017	32.5	5.2	37.7	R06
9	11/09/2017	28.2	8.8	37.0	R57
10	5/02/2017	35.1	1.5	36.6	R05

Table 8.5: Contemporaneous PM_{10} analysis – Top ten Project contributions

Rank	Date	24 hour Average PM_{10} Concentration (µg/m³)			Peak Receptor
		Background	Project	Total	
1	7/07/2017	18.4	15.2	33.6	R57
2	18/07/2017	13.6	14.2	27.8	R36
3	24/09/2017	17.6	14.1	31.7	R36
4	14/08/2017	17.6	13.9	31.5	R36
5	23/06/2017	16.4	13.8	30.2	R36
6	25/06/2017	16.5	13.5	30.0	R01
7	12/09/2017	17.6	12.4	30.0	R03
8	14/05/2017	13.3	12.4	25.7	R06
9	28/11/2017	12.8	12.2	25.0	R06
10	17/04/2017	20.2	12.1	32.3	R06

Table 8.6: Contemporaneous PM_{10} analysis – Top ten background concentrations

Rank	Date	24 hour Average PM_{10} Concentration (µg/m³)			Peak Receptor
		Background	Project	Total	
1	31/12/2017	36.8	2.0	38.8	R06
2	13/01/2017	35.4	2.5	37.9	R05
3	14/12/2017	35.4	2.4	37.8	R05
4	5/02/2017	35.1	1.5	36.6	R05
5	25/01/2017	34.7	4.0	38.7	R06
6	20/12/2017	33.9	1.3	35.2	R16
7	19/12/2017	32.9	5.0	37.9	R05
8	11/05/2017	32.7	1.9	34.6	R23
9	15/12/2017	32.5	5.2	37.7	R06
10	24/02/2017	31.5	2.9	34.4	R06

Note: *Based on a contemporaneous analysis.

9 Contour Isopleths

Figure 10.1 through Figure 10.11 present the following contour isopleths of modelling prediction results across all gridded receptors:

- Maximum 1 hour average incremental NO_2;
- Maximum 1 hour average cumulative NO_2;
- Annual average incremental NO_2;
- Maximum 10 minute average incremental SO_2;
- Maximum 1 hour average incremental SO_2;
- Maximum 24 hour average incremental SO_2;
- Maximum 10 minute average incremental SO_2;
- Maximum 24 hour average incremental $PM_{2.5}$;
- Annual average incremental $PM_{2.5}$;
- Maximum 24 hour average incremental PM_{10};
- Annual average incremental PM_{10}.

Contours have been presented at geometric intervals (i.e. 1, 2, 5, 10, 20, 50 etc.) unless indicated otherwise.

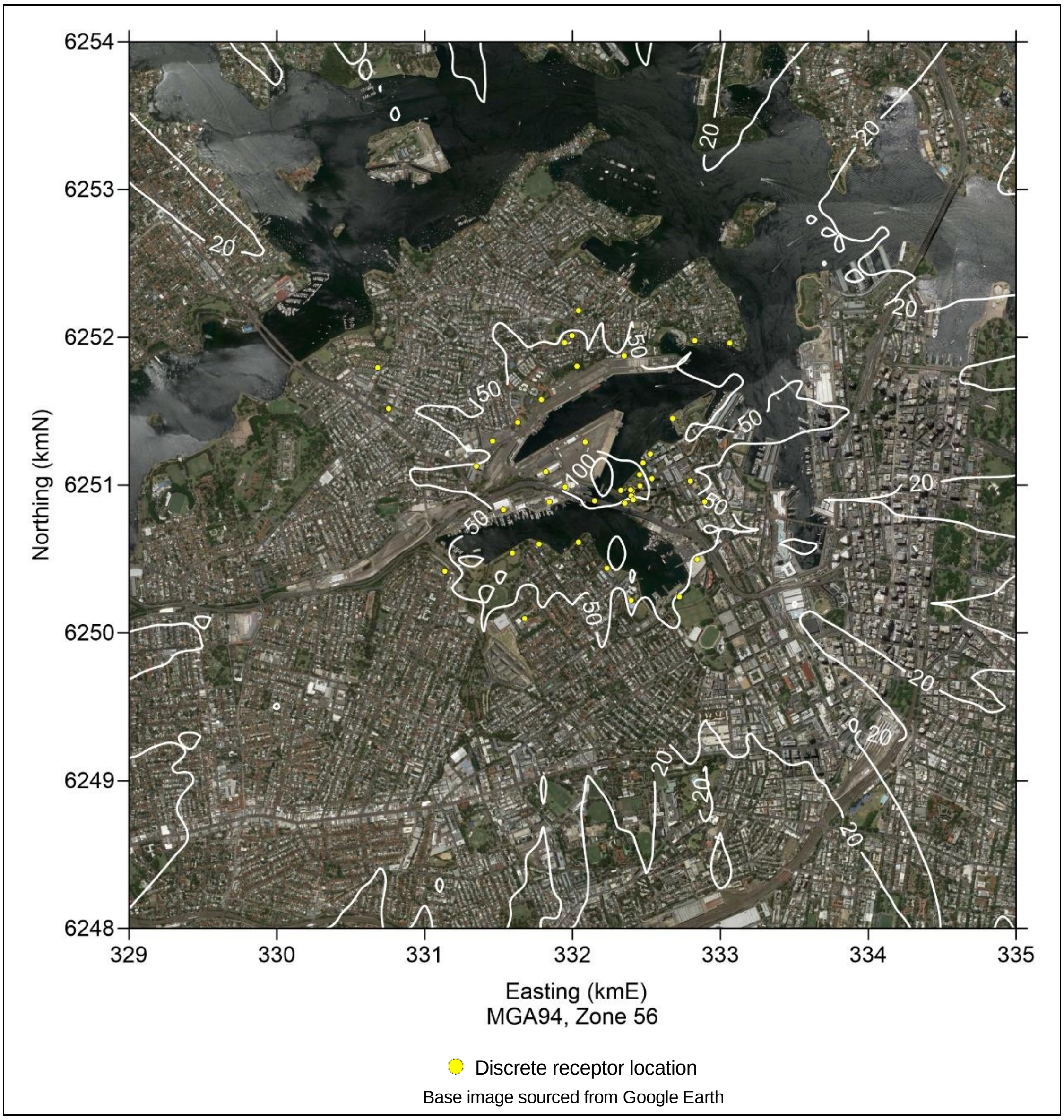


Figure 9.1: Maximum 1 hour average incremental NO_2 predictions (µg/m³)

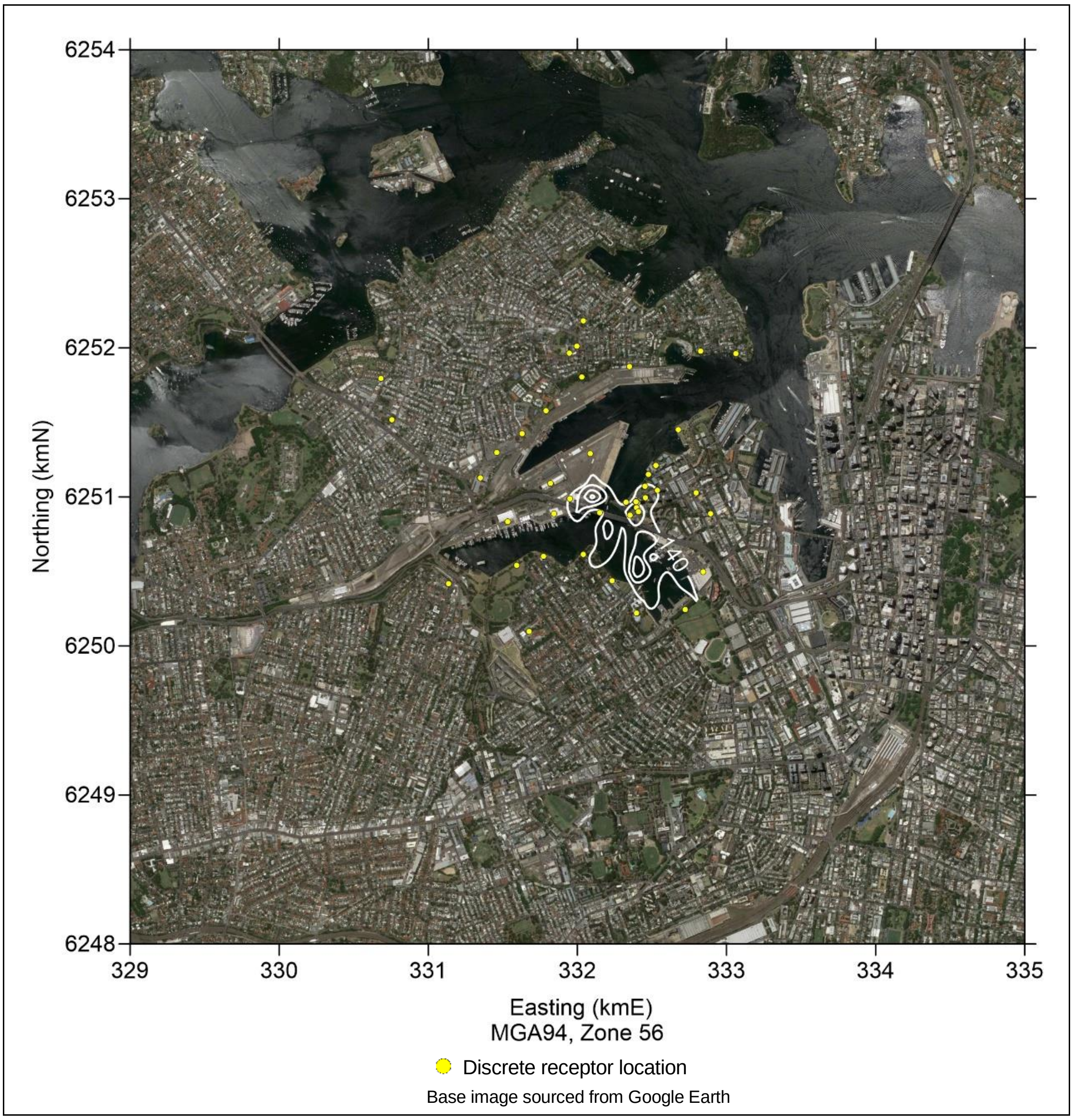


Figure 9.2: Maximum 1 hour average cumulative NO_2 predictions (µg/m³)

Contour levels: 140, 160, 180, 200 µg/m³.

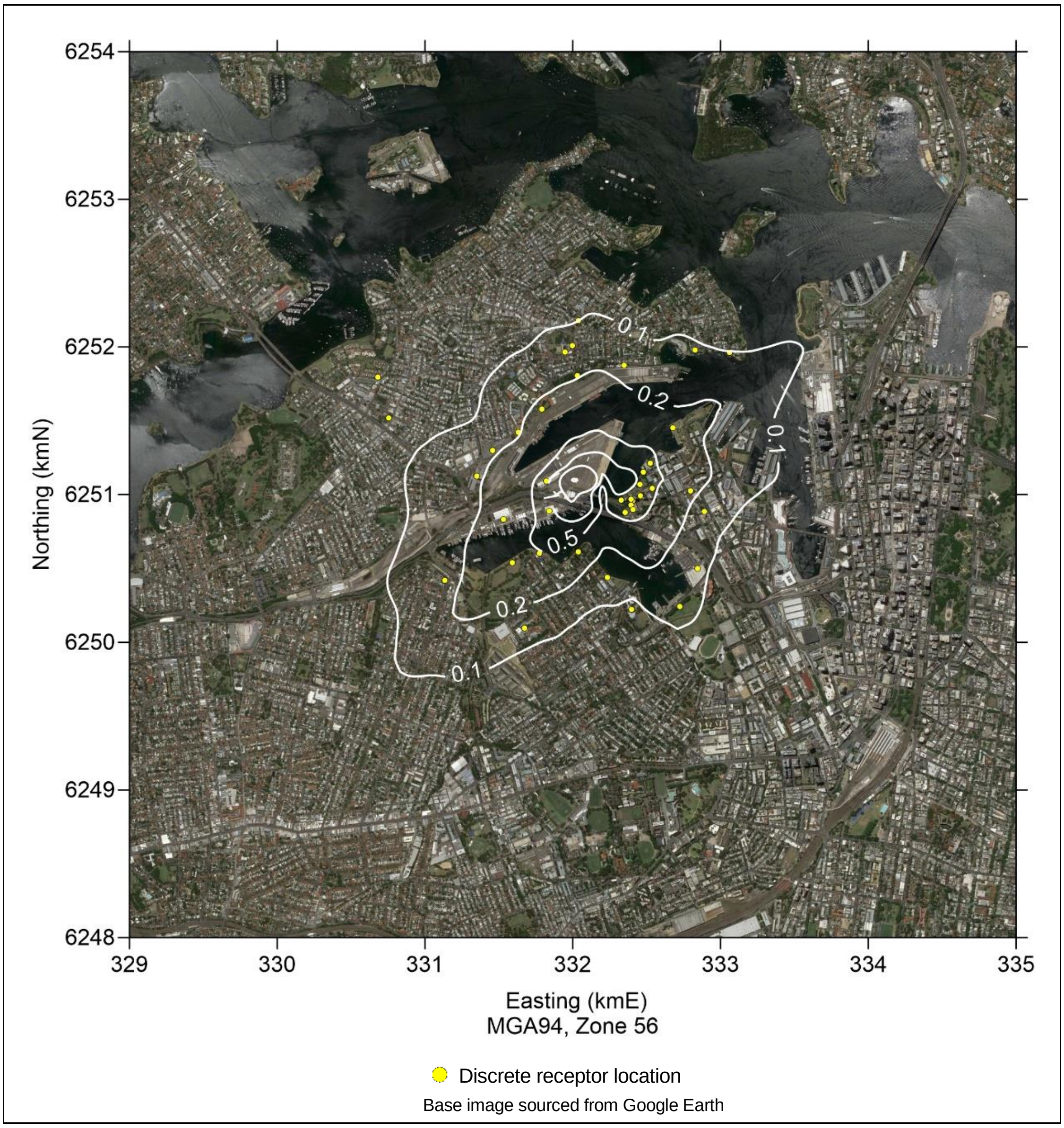


Figure 9.3: Annual average incremental NO2 predictions (µg/m³)

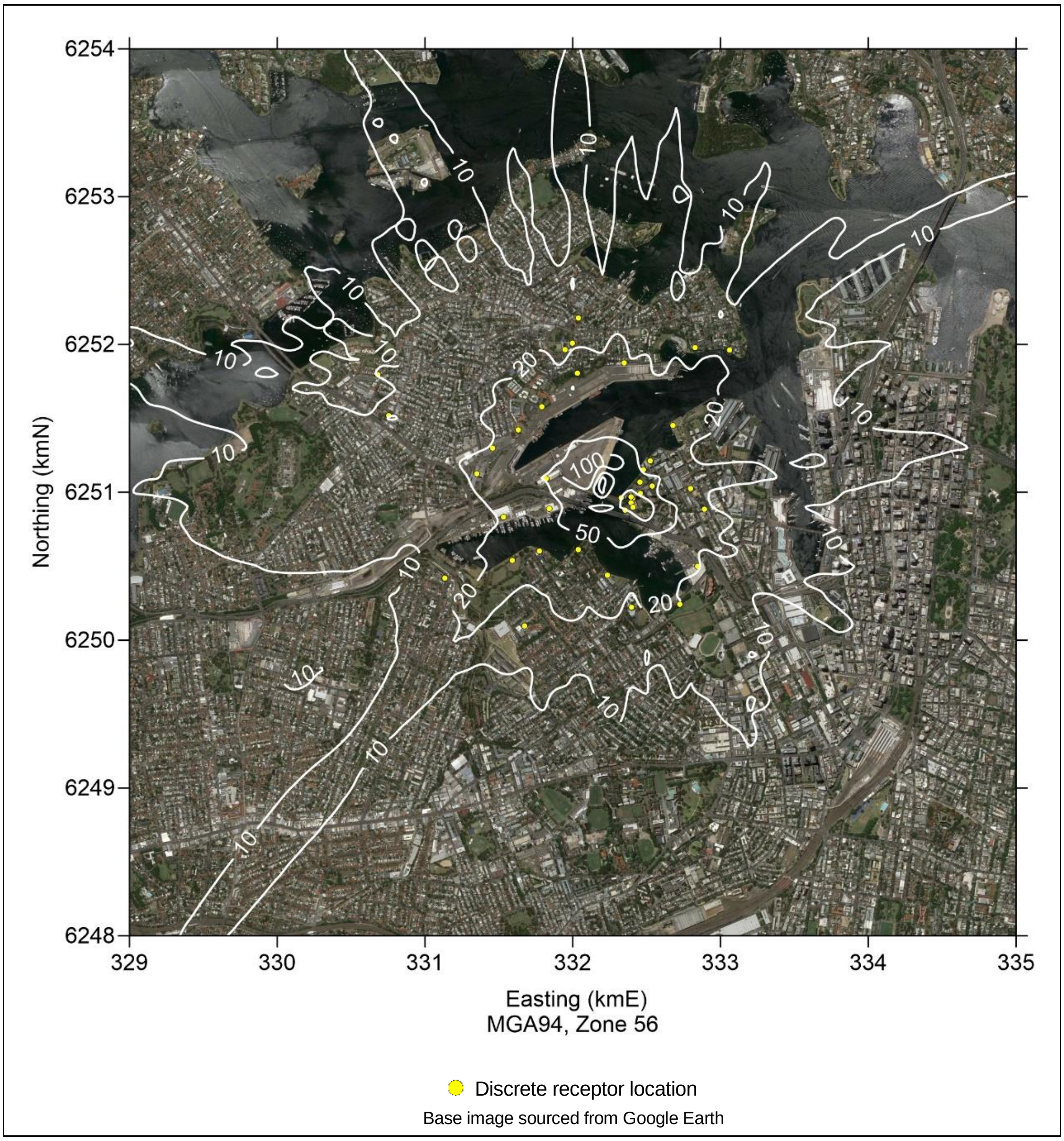


Figure 9.4: Maximum 10 minute average incremental SO2 predictions (µg/m³)

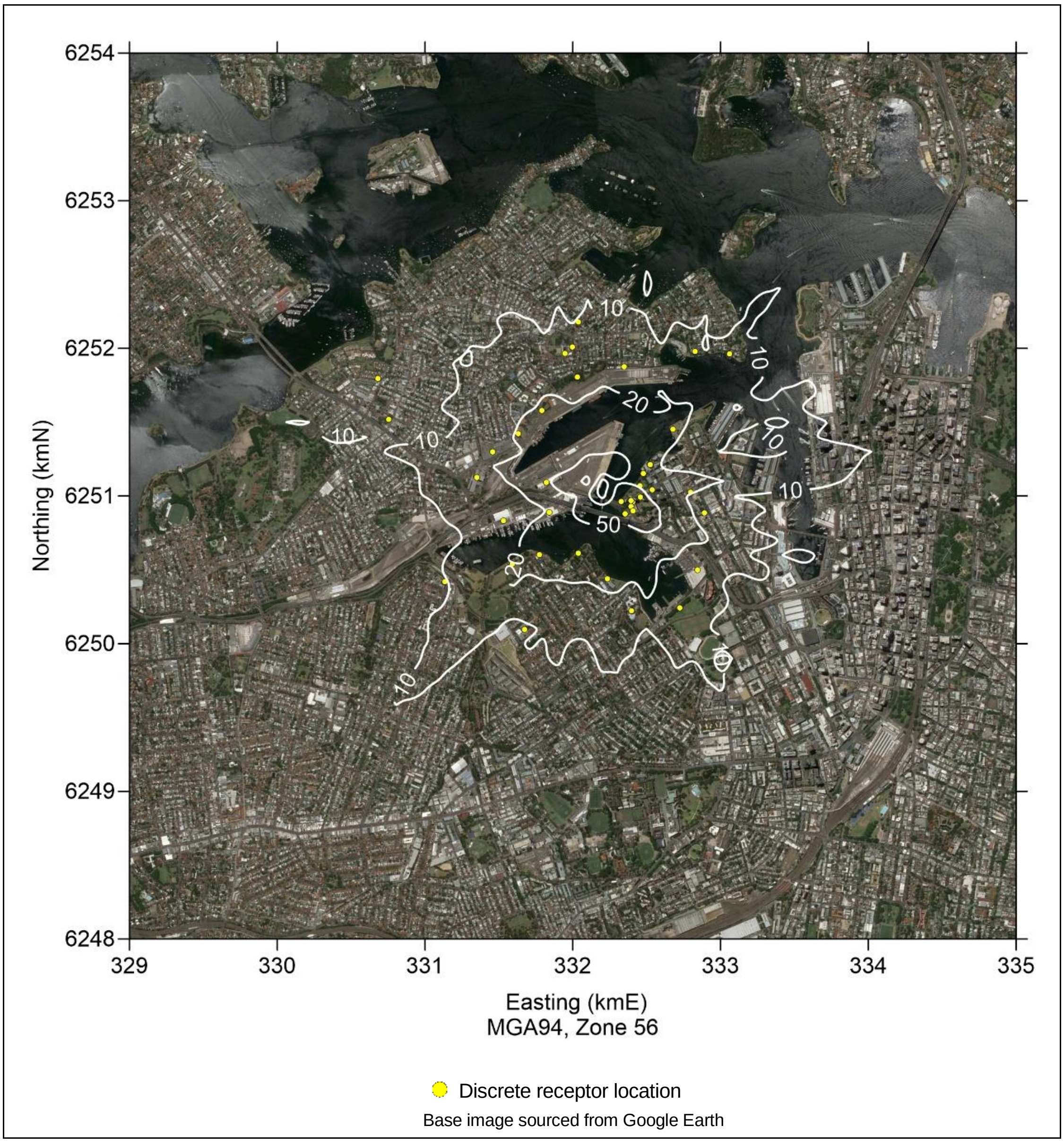


Figure 9.5: Maximum 1 hour average incremental SO2 predictions (µg/m³)

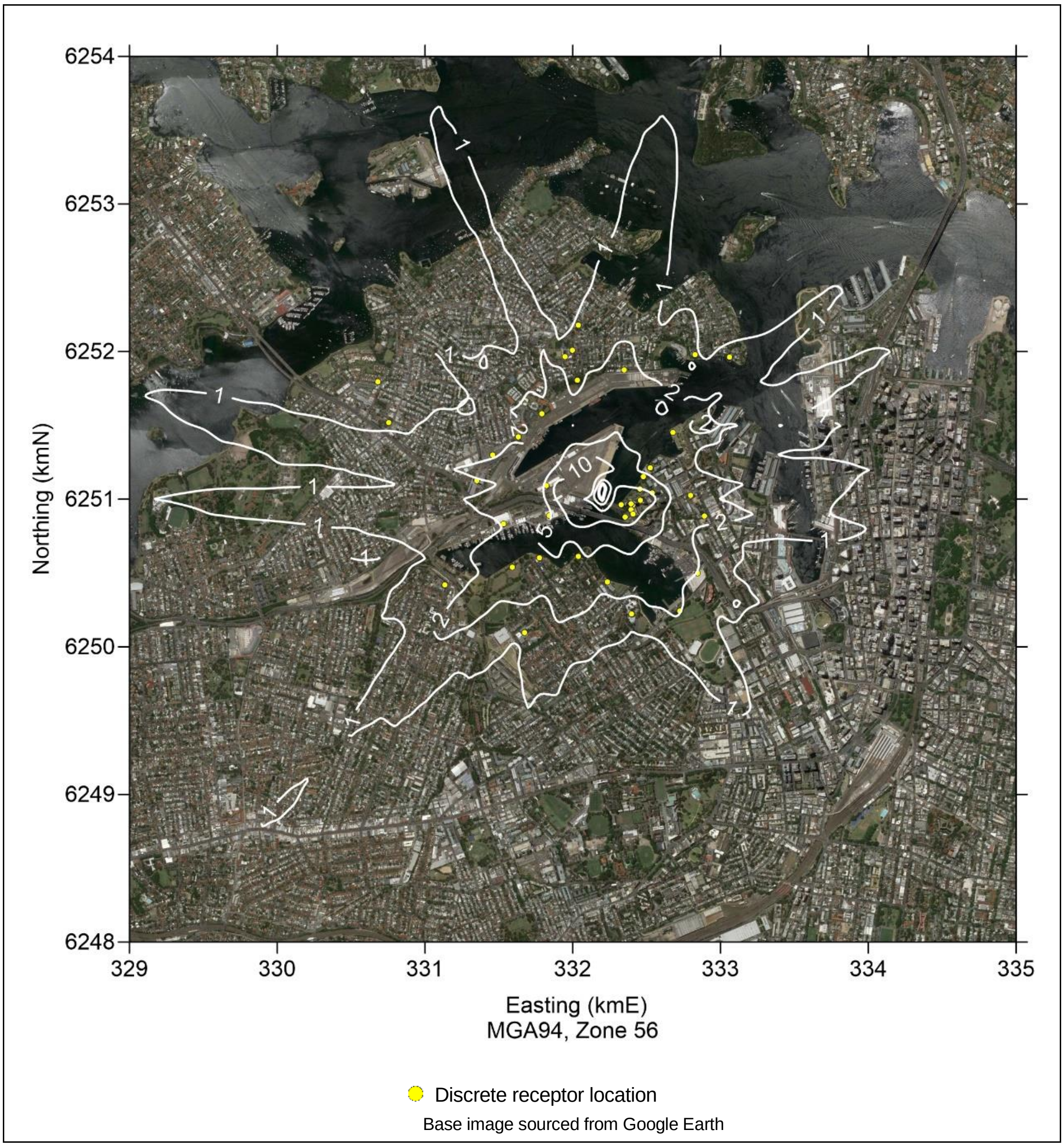


Figure 9.6: Maximum 24 hour average incremental SO_2 predictions (µg/m³)

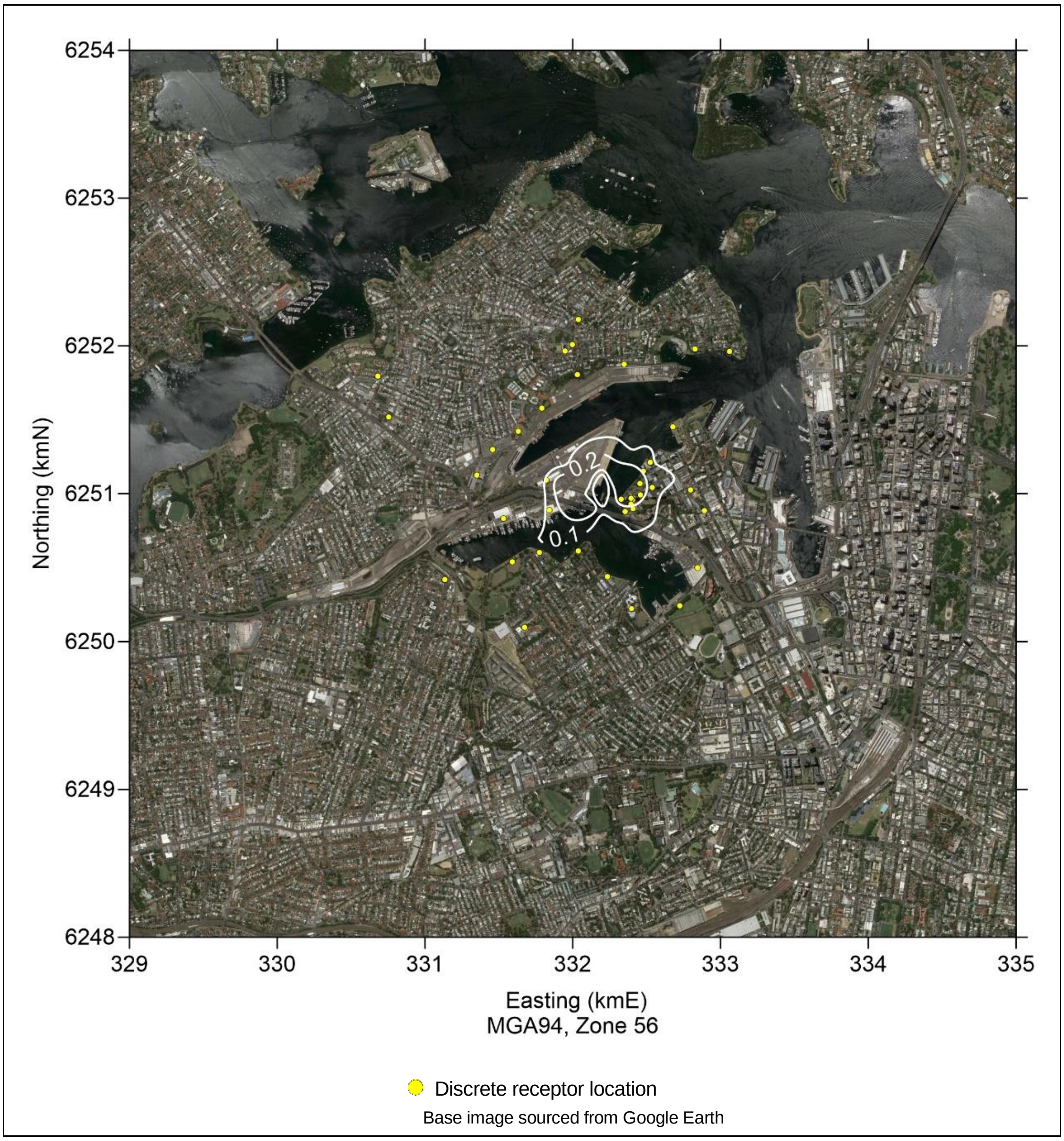


Figure 9.7: Maximum 10 minute average incremental SO_2 predictions (μg/m³)

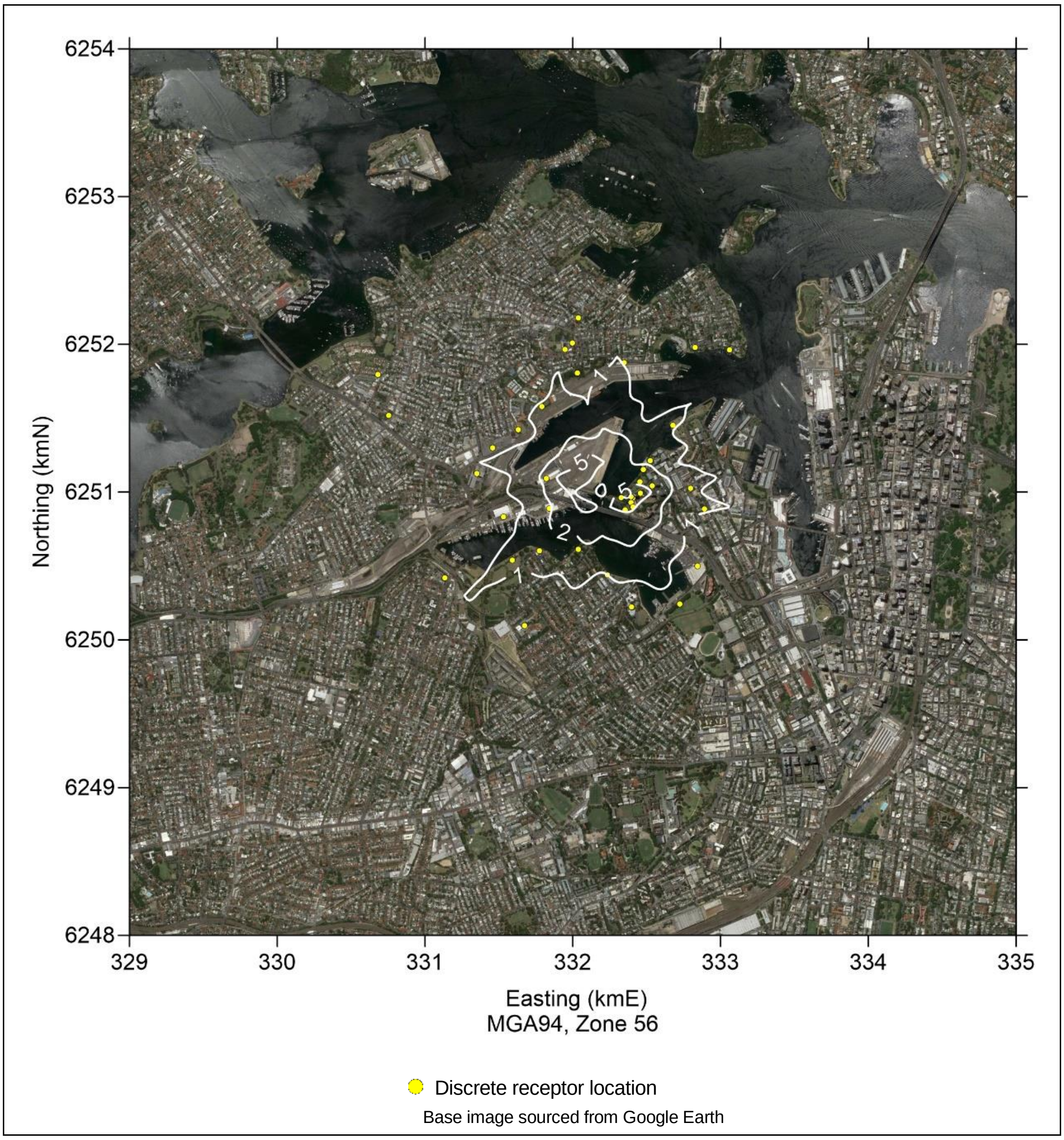


Figure 9.8: Maximum 24 hour average incremental $PM_{2.5}$ predictions (µg/m³)

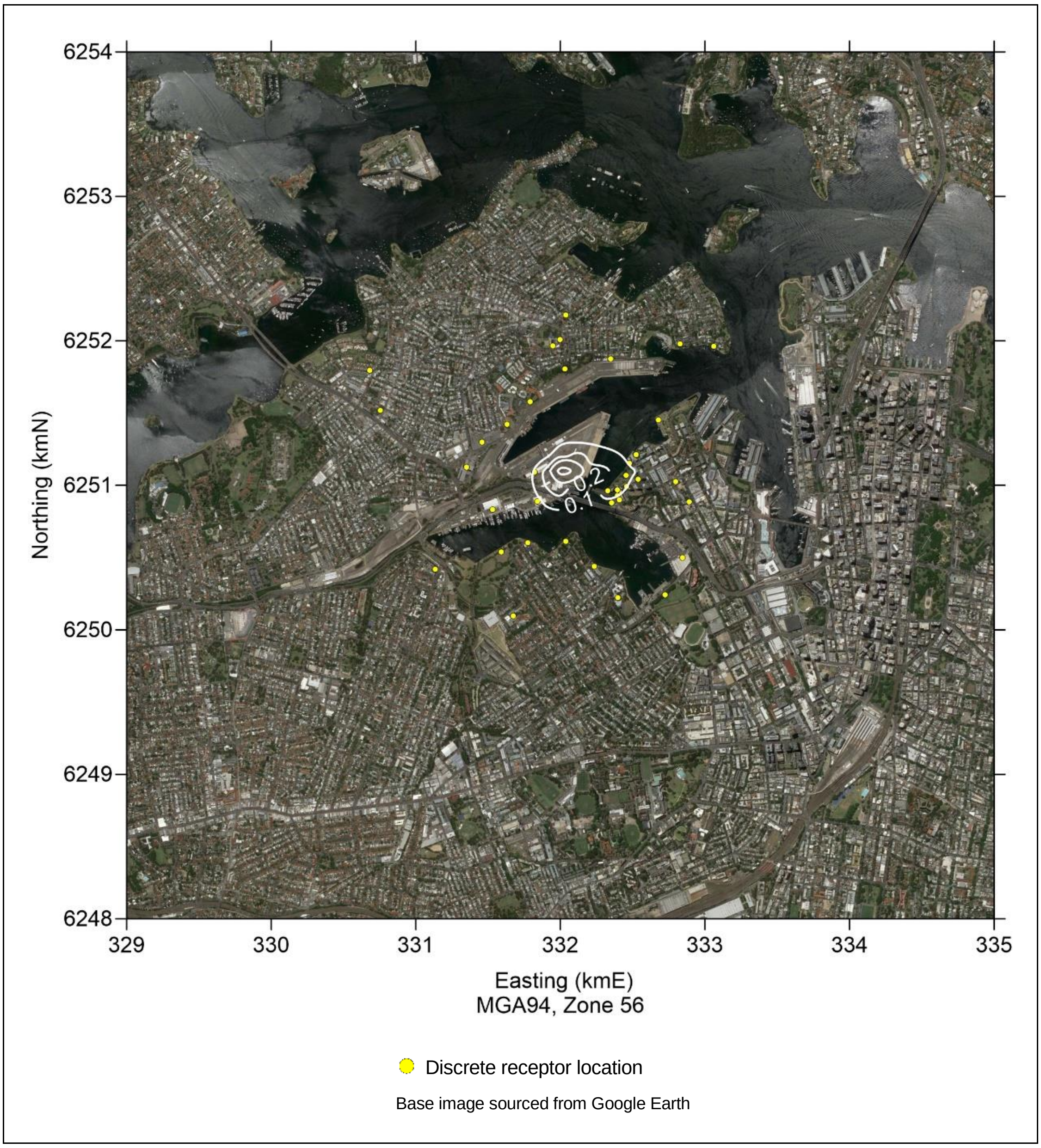


Figure 9.9: Annual average incremental $PM_{2.5}$ predictions (µg/m³)

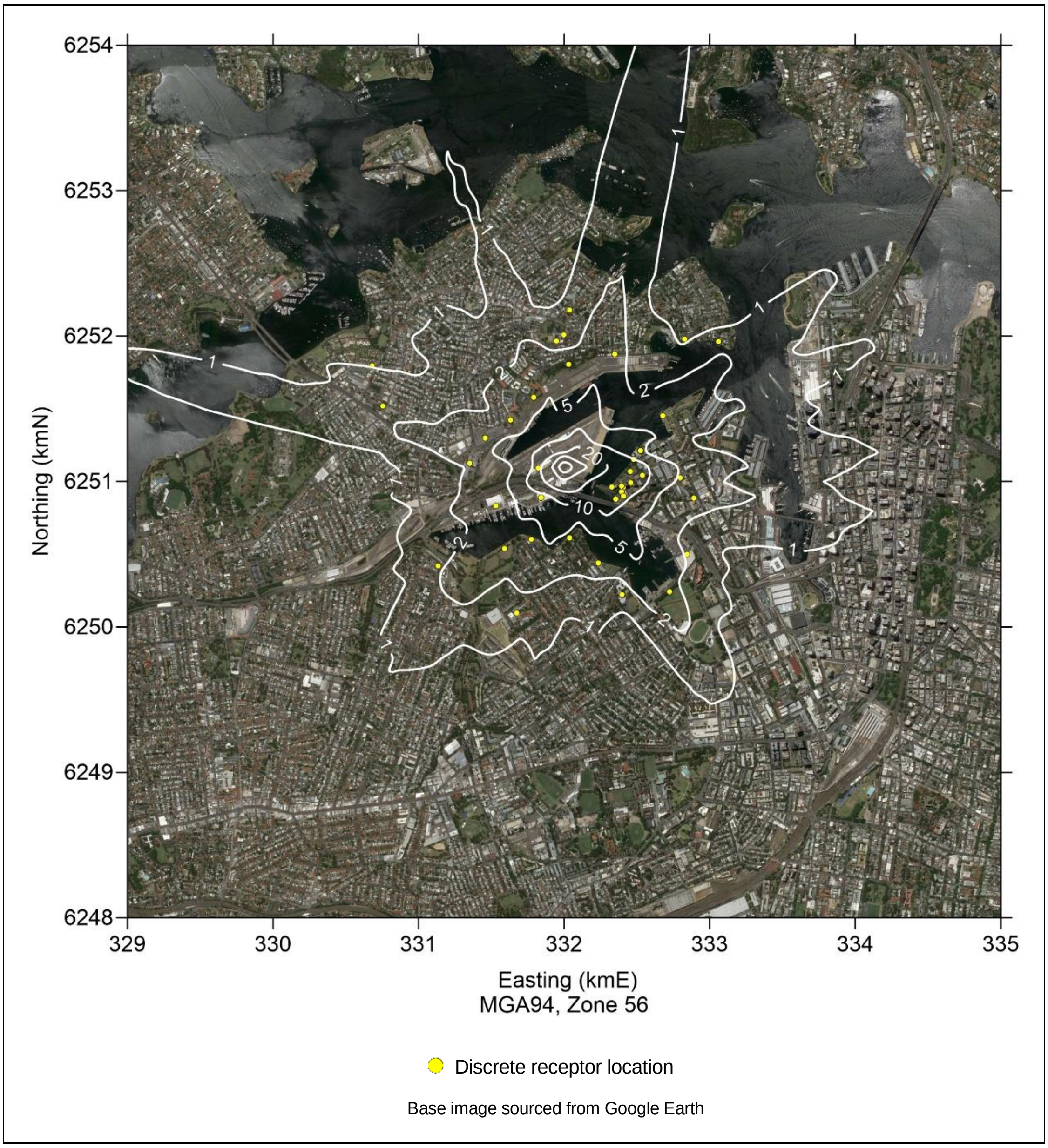


Figure 9.10: Maximum 24 hour average incremental PM_{10} predictions (μg/m³)

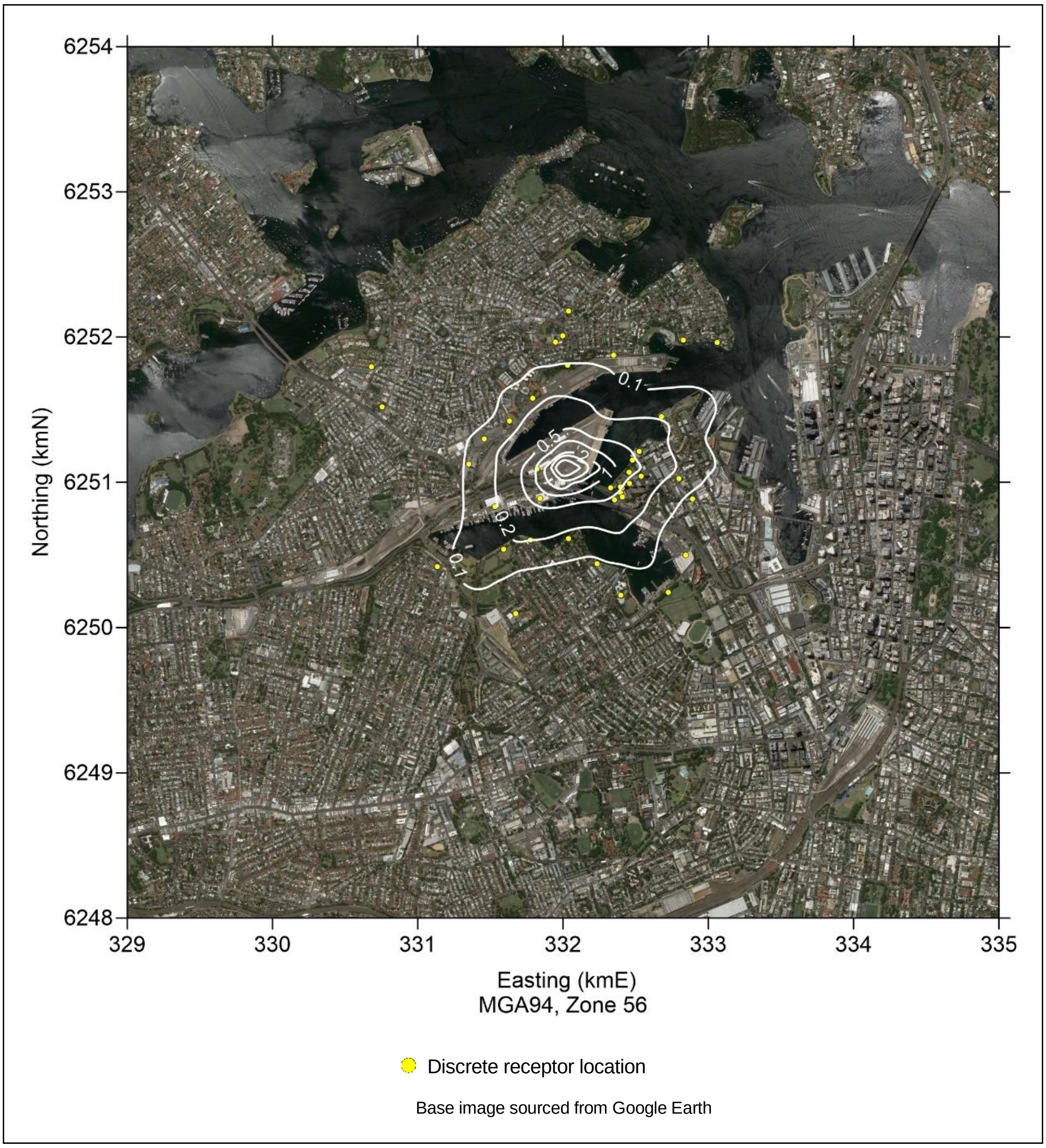


Figure 9.11: Annual average incremental PM_{10} predictions (µg/m³).

10 Cumulative Impacts with the Adjacent Multi-User Facility

AECOM (2019) presents an analysis of cumulative impacts between the Project and the adjacent multi-user facility. All (Hanson) Project-related emissions have been assessed within AECOM (2019) at higher emission rates than estimated within the Average Day scenario detailed in this report, with only PM_{10} emissions being lower (i.e. approximately 80% of) the Peak Day emission estimates.

As relevant to potential cumulative impacts between the two facilities, AECOM (2019) concludes:

> *"Based on the results of the modelling, no significant air quality impacts are anticipated as a result of the operation of the multi-user facility and shipping, in isolation, and while accounting for the proposed operation of the adjoining Hanson concrete batching plant and associated shipping operations."*

Full detail of the analysis is provided within AECOM (2019). Noting the small scale of predicted impacts detailed within this report, and the shared nature of the shipping berths in conjunction with conclusions of the multi-user facility cumulative assessment, the risk of potential adverse cumulative air quality impacts between the two projects is considered minor.

11 Performance Against Future Air Quality Standards

The reviewer's comments raise the potential future tightening of air quality standards as relevant to the assessment of potential impacts associated with the Project:

"…it is also noted that in the Draft Varied National Environment Protection (Ambient Air Quality) measures for O_3, NO_2 and SO_2 the SO_2 criteria is significantly lowered from the current standards. The draft proposal is for the 1-hr SO_2 standard be halved and the 24-hr SO_2 limit reduced to one quarter of the current standard. Whilst it is noted that this standard is only in draft form and is not currently applicable, the proposed large tightening of the standards indicate that the current standards are not considered adequate, and highlights that these emissions should at least be considered carefully and fully."

Noting this commentary, assessment predictions have been considered in the context of potential future air quality standards, under the potential that future air quality standards are carried through directly under the assessment methodologies provided within the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016).

Table 11.1 provides a comparison of current and potential future EPA criteria for SO_2, with current peak cumulative assessment predictions.

Table 11.1: Comparison of current and potential future EPA SO_2 criteria with current peak cumulative SO_2 predictions

Averaging Period	SO_2 Concentration (µg/m³)		
	Current EPA Criterion	Potential Future EPA Criterion	Peak Cumulative Prediction
1-hour	570	215	195
24-hour	228	57	29

As shown in Table 11.1, whilst not applicable to this assessment, the current peak cumulative 1 hour and 24 hour SO_2 predictions are within the *potential future* EPA criteria, under the assumption that the proposed NEPM standards were carried directly through as impact assessment criteria in NSW.

12 Conclusions

The updated modelling analysis has incorporated a range of Project revisions as well as addressing a number of technical comments provided by the peer reviewer (TAS, 2020).

As consistent with PE (2018), the results of this updated analysis indicate compliance with relevant impact assessment criteria for all pollutants and averaging periods assessed. On this basis, with implementation of the proposed operational controls, it is concluded that the Project is unlikely to generate adverse air quality impacts at sensitive receptors in the vicinity of the Project.

References

AECOM 2019, *Glebe Island Multi-User Facility, Response to Submissions*, AECOM Australia Pty Ltd, 30 January 2019, https://www.portauthoritynsw.com.au/media/3835/rts-report-final.pdf (accessed August 2020).

EPA 2016, *The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, NSW Environment Protection Authority, 2016.

ICF 2009, *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories*, https://www.epa.gov/sites/production/files/2016-06/documents/2009-portinventory- guidance.pdf (accessed April 2020).

PE 2017, *White Bay Cruise Terminal: Air Quality And Meteorological Monitoring Report – September 2017*, Pacific Environment, 9 November 2017, https://www.portauthoritynsw.com.au/media/2701/20132-pansw-wbct-aq-september-2017-r2-final.pdf (accessed October 2020).

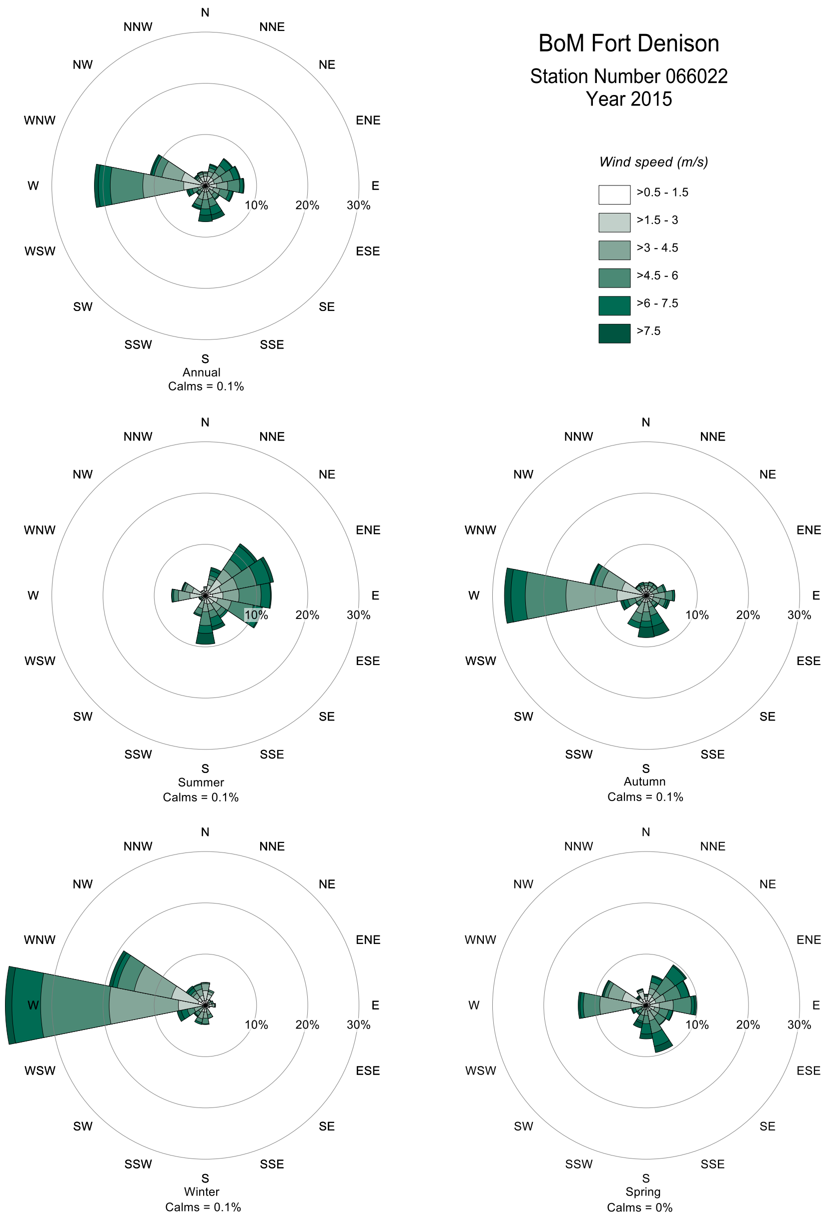
PE 2018, *Hanson Glebe Island Concrete Batching Plant Air Quality Assessment*, Pacific Environment, 15 March 2018.

Singer et al. 2020, *Integrated Electric Plants in Future Great Lakes Self-Unloaders*, Great Lakes Maritime Research Institute, March 28 2011.

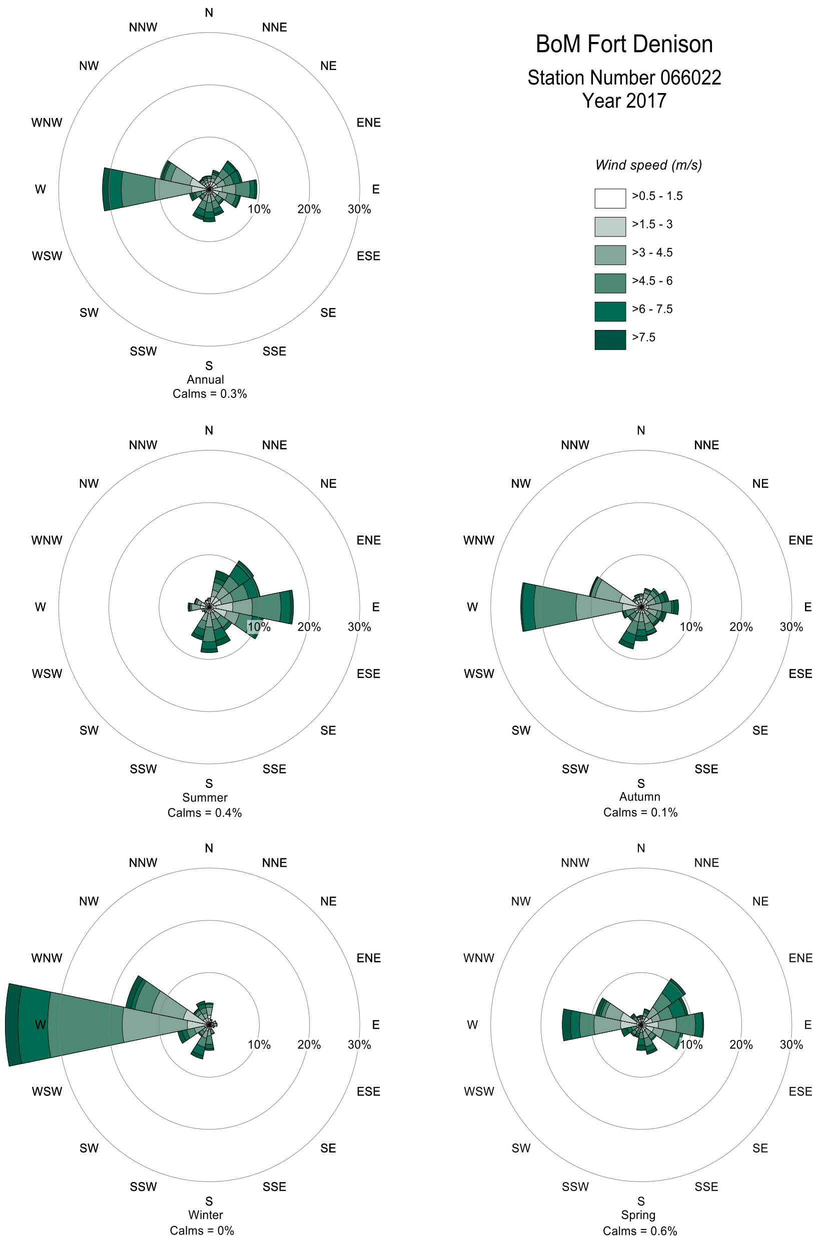
TAS 2020, *Glebe CBP – Review of Response to Submissions*, Todoroski Air Sciences, 9 July 2020.

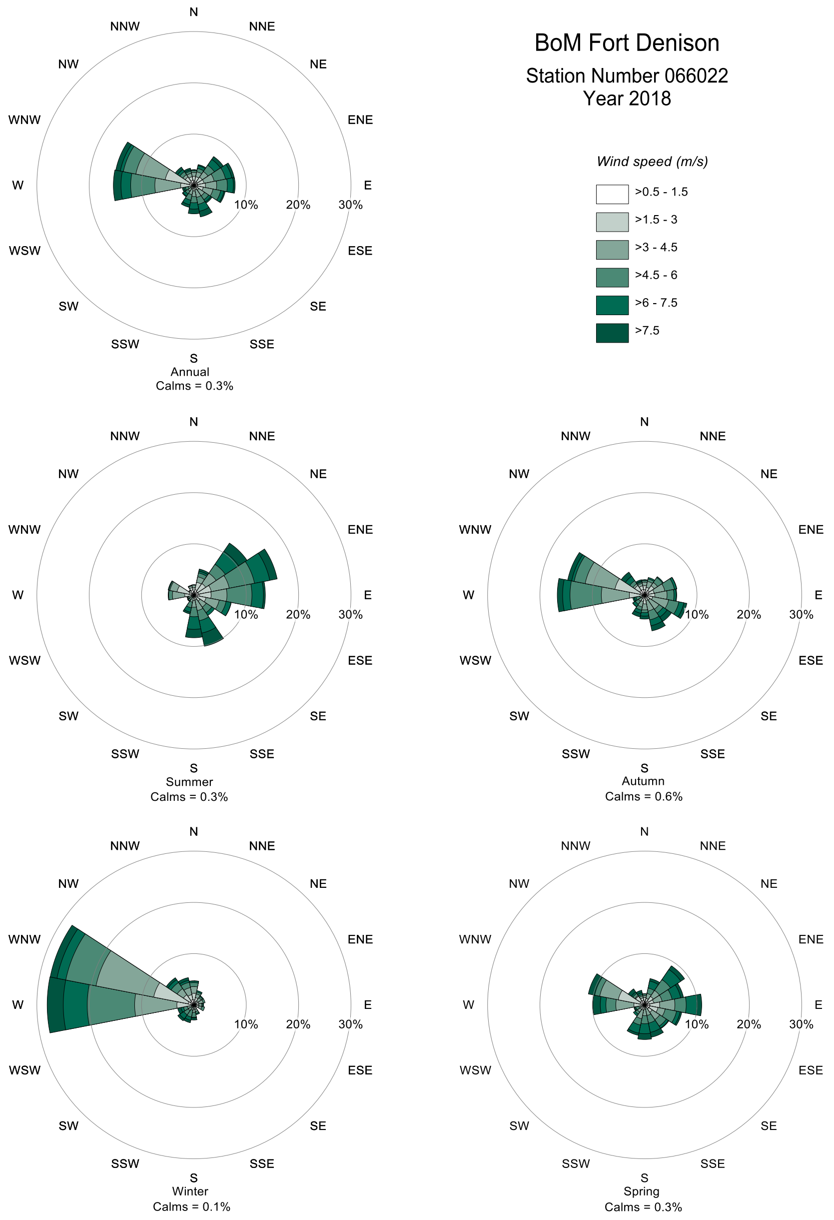
US EPA 2020, *Ports Emissions Inventory Guidance – Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions*, Ref: EPA-420-B-20-046, Transportation and Climate Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, September 2020.

Attachment A – Bureau of Meteorology Wind Roses


BoM Fort Denison
Station Number 066022
Year 2015
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
10%
20%
30%
Annual
Calms = 0.1%
Summer
Calms = 0.1%
Autumn
Calms = 0.1%
Winter
Calms = 0.1%
Spring
Calms = 0%


BoM Fort Denison
Station Number 066022
Year 2016
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
10%
20%
30%
Annual
Calms = 0.1%
Summer
Calms = 0.1%
Autumn
Calms = 0.2%
Winter
Calms = 0%
Spring
Calms = 0.1%


BoM Fort Denison
Station Number 066022
Year 2017
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
10%
20%
30%
Annual
Calms = 0.3%
Summer
Calms = 0.4%
Autumn
Calms = 0.1%
Winter
Calms = 0%
Spring
Calms = 0.6%


BoM Fort Denison
Station Number 066022
Year 2018
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
10%
20%
30%
Annual
Calms = 0.3%
Summer
Calms = 0.3%
Autumn
Calms = 0.6%
Winter
Calms = 0.1%
Spring
Calms = 0.3%

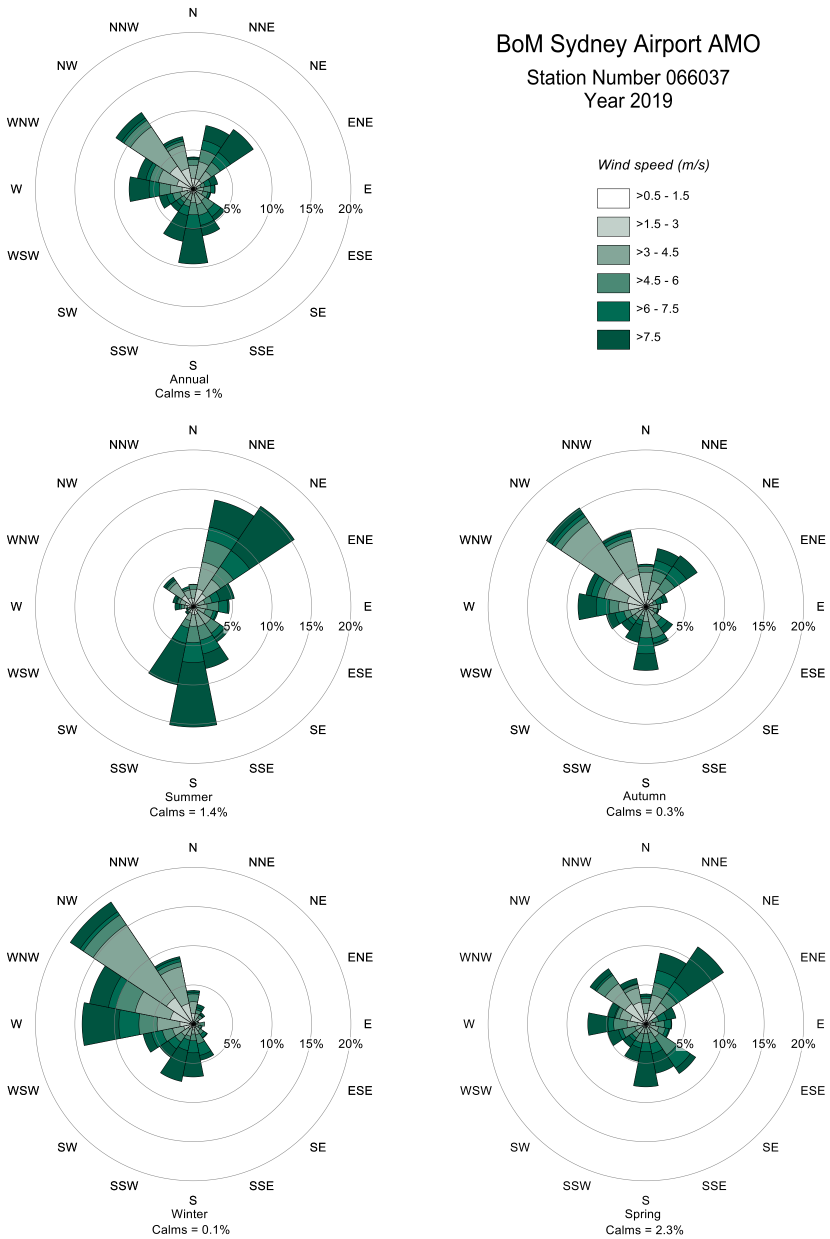

BoM Fort Denison
Station Number 066022
Year 2019
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
10%
20%
30%
Annual
Calms = 1.6%
Summer
Calms = 0.5%
Autumn
Calms = 0.4%
Winter
Calms = 0.1%
Spring
Calms = 5.2%


BoM Sydney Airport AMO
Station Number 066037
Year 2015
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 0.2%
Summer
Calms = 0.2%
Autumn
Calms = 0.3%
Winter
Calms = 0.1%
Spring
Calms = 0.1%


BoM Sydney Airport AMO
Station Number 066037
Year 2016
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 0.2%
Summer
Calms = 0.3%
Autumn
Calms = 0.2%
Winter
Calms = 0%
Spring
Calms = 0.4%


BoM Sydney Airport AMO
Station Number 066037
Year 2017
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 0.2%
Summer
Calms = 0.3%
Autumn
Calms = 0.1%
Winter
Calms = 0.1%
Spring
Calms = 0.3%


BoM Sydney Airport AMO
Station Number 066037
Year 2018
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 0.3%
Summer
Calms = 0.2%
Autumn
Calms = 0.2%
Winter
Calms = 0.1%
Spring
Calms = 0.7%

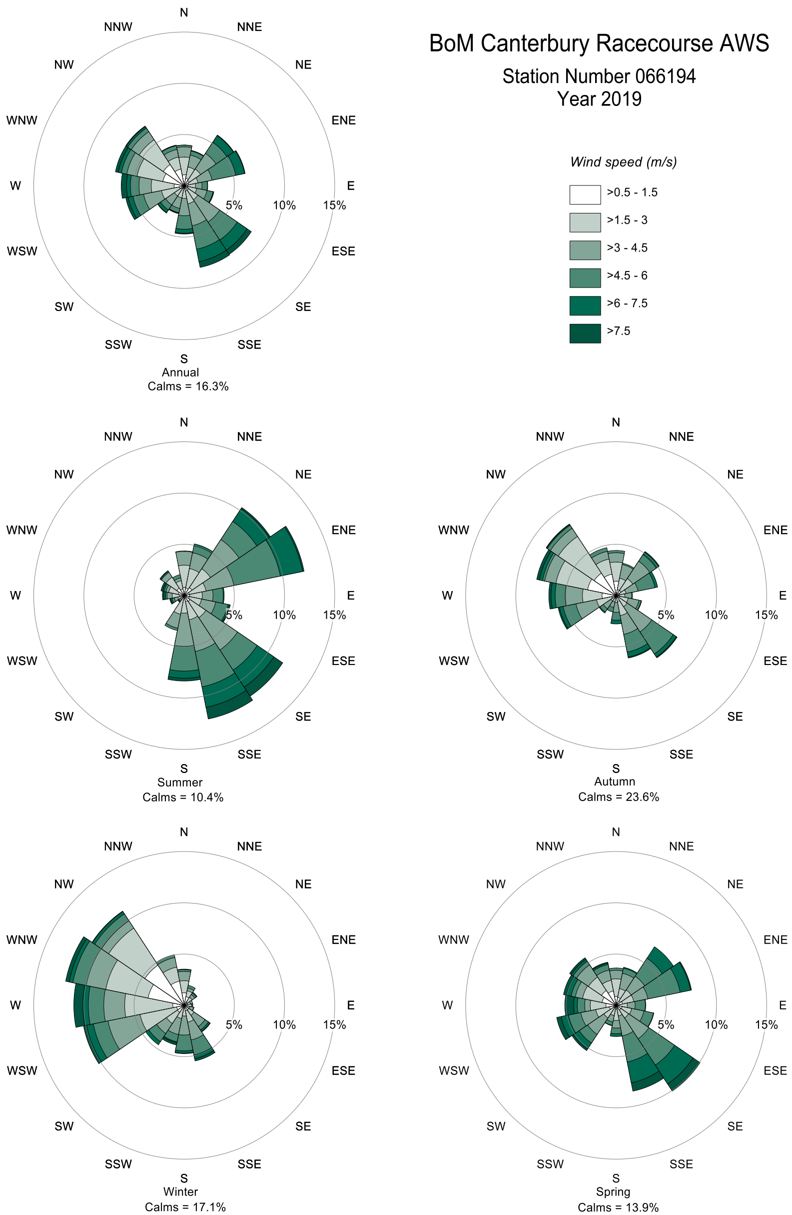

BoM Sydney Airport AMO
Station Number 066037
Year 2019
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 1%
Summer
Calms = 1.4%
Autumn
Calms = 0.3%
Winter
Calms = 0.1%
Spring
Calms = 2.3%


BoM Canterbury Racecourse AWS
Station Number 066194
Year 2015
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
Annual
Calms = 15.6%
Summer
Calms = 13%
Autumn
Calms = 16%
Winter
Calms = 19.7%
Spring
Calms = 13.6%


BoM Canterbury Racecourse AWS
Station Number 066194
Year 2016
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
Annual
Calms = 14.8%
Summer
Calms = 11.9%
Autumn
Calms = 21.7%
Winter
Calms = 13.8%
Spring
Calms = 11.6%

BoM Canterbury Racecourse AWS
Station Number 066194
Year 2017

BoM Canterbury Racecourse AWS
Station Number 066194
Year 2018


BoM Canterbury Racecourse AWS
Station Number 066194
Year 2019
Wind speed (m/s)
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>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
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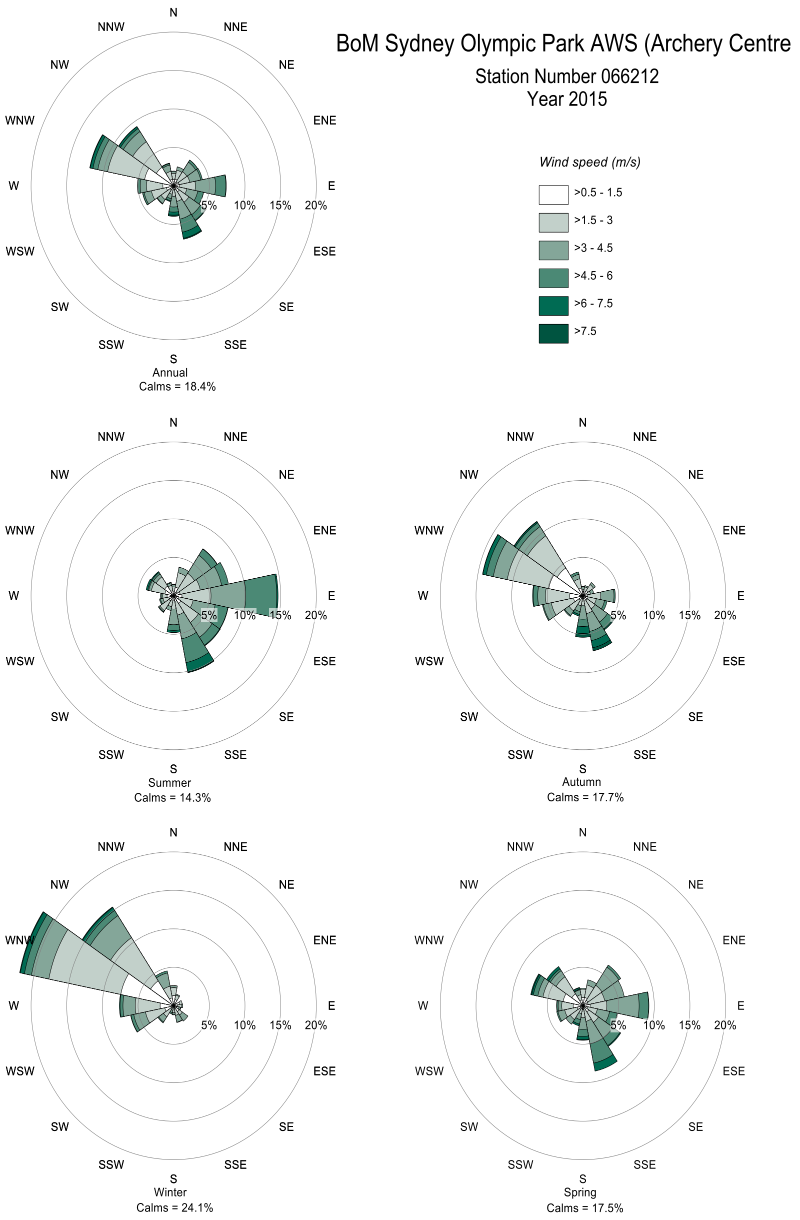
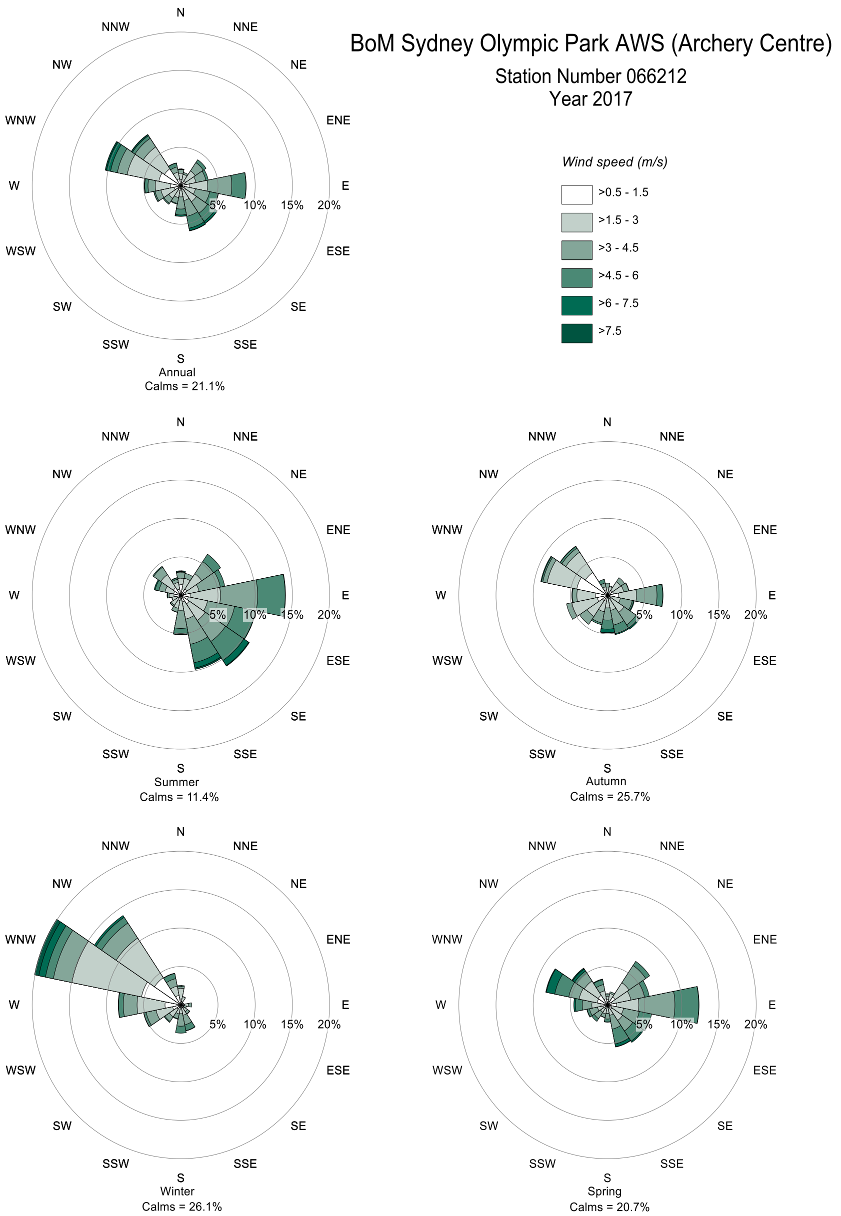
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
Annual
Calms = 16.3%
Summer
Calms = 10.4%
Autumn
Calms = 23.6%
Winter
Calms = 17.1%
Spring
Calms = 13.9%


BoM Sydney Olympic Park AWS (Archery Centre
Station Number 066212
Year 2015
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
Annual
Calms = 18.4%
Summer
Calms = 14.3%
Autumn
Calms = 17.7%
Winter
Calms = 24.1%
Spring
Calms = 17.5%


BoM Sydney Olympic Park AWS (Archery Centre)
Station Number 066212
Year 2016
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
Annual
Calms = 18.6%
Summer
Calms = 16%
Autumn
Calms = 25.1%
Winter
Calms = 18.3%
Spring
Calms = 14.9%


BoM Sydney Olympic Park AWS (Archery Centre)
Station Number 066212
Year 2017
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
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ENE
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ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 21.1%
Summer
Calms = 11.4%
Autumn
Calms = 25.7%
Winter
Calms = 26.1%
Spring
Calms = 20.7%


BoM Sydney Olympic Park AWS (Archery Centre)
Station Number 066212
Year 2018
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 20.2%
Summer
Calms = 14.7%
Autumn
Calms = 23.9%
Winter
Calms = 22%
Spring
Calms = 20%


BoM Sydney Olympic Park AWS (Archery Centre)
Station Number 066212
Year 2019
Wind speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 4.5
>4.5 - 6
>6 - 7.5
>7.5
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5%
10%
15%
20%
Annual
Calms = 20.7%
Summer
Calms = 13.2%
Autumn
Calms = 27.1%
Winter
Calms = 23%
Spring
Calms = 19.4%

Attachment B –Emissions Inventory – Average Day Scenario

ACTIVITY | TRUCK INPUTS | INTENSITY (as daily quantities) | CONTROLS

AVERAGE DAY

Activity	Process	Material	Carrier	Source	Desc	Trucks/day	Payload (t)	Onsite Path Length (std) - (m)	Onsite Path Length (soiled) - (m)	Onsite Path Length (wet) - (m)	VKT (std)	VKT (soiled)	VKT (wet)	m³ Exhausted	Material Quantity (t)	CF1	CF2	CF3	CFtot
Vehicle Transit	Delivery	Sand	Truck	External	-	83	36.8	270		18	22.3	0.0	1.5			0%			0%
				Internal	-	83	36.8		80	18	0.0	6.6	1.5			70%			70%
		Aggregate	Truck	External	-	8	36.8	270		18	2.0	0.0	0.1			0%			0%
				Internal	-	8	36.8		80	18	0.0	0.6	0.1			70%			70%
		Flyash / Cement	Truck	External	-	23	35.6	260		18	6.0	0.0	0.4			0%			0%
				Internal	-	23	35.6		40	18	0.0	0.9	0.4			70%			70%
	Dispatch	Concrete	Truck	External	-	498	12.7	260		18	129.5	0.0	9.0			0%			0%
				Internal	-	498	12.7		40	18	0.0	19.9	9.0			70%			70%
		Sand	Truck	External	-	8	36.8	270	80		2.0	0.6	0.0			0%			0%
				Internal	-	8	36.8				0.0	0.0	0.0			70%			70%
		Aggregate	Truck	External	-	8	36.8	270	80		2.0	0.6	0.0			0%			0%
				Internal	-	8	36.8				0.0	0.0	0.0			70%			70%
	Carryout	-	-	Truck carryout		626	-	0	50		0.0	31.3	0.0			0%			0%
Material Handling	Delivery	Sand	Truck	TRF Bin	Drive over grizzly										3036	70%			70%
				Transfer Point 1	90° belt transfer										3036	70%	70%		91%
				Transfer Point 2	SRB belt merger										3036	70%			70%
				Transfer Point 3	Conveyor Head										3036	70%			70%
				Transfer Point 4	Silo fill										3036	70%			70%
		Aggregate	Truck	Tipping Bin	Drive over grizzly										276	70%			70%
				Transfer Point 1	90° belt transfer										276	70%	70%		91%
				Transfer Point 2	TRF belt merger										276	70%			70%
				Transfer Point 3	Silo distributor										276	70%			70%
				Transfer Point 4	Silo fill										276	70%			70%
			Ship	SRB	Ship Receival Bin										2740	70%			70%
				Transfer Point 1	SRB belt merger										2740	70%			70%
				Transfer Point 2	Conveyor Head										2740	70%			70%
				Transfer Point 3	Silo fill										2740	70%			70%
		Flyash / Cement	Truck	Silo baghouse	-									27839	819				0%
	Process	Sand	N/A	Transfer Point 1	-										2760	70%	70%		91%
				Transfer Point 2	-										2760	70%	70%		91%
		Aggregate	N/A	Transfer Point 1	-										2740	70%	70%		91%
				Transfer Point 2	-										2740	70%	70%		91%
	Dispatch	Sand	Truck	Loading	-										276	70%			70%
		Aggregate	Truck	Loading	-										276	70%			70%
		Concrete	Truck	LEV Baghouse	-									68908					0%

ACTIVITY | EMISSION FACTOR INPUT VARIABLES | EMISSION FACTORS (Uncontrolled) | NON-COMBUSTION PSD Multipliers

AVERAGE DAY

Activity	Process	Material	Carrier	Source	Profile	Desc	SL (std)	SL (soiled)	GVM (std)	GVM (soiled)	U	M	g/VKT (std)	g/VKT (soiled)	g/m²	g/t	TSP	PM10	PM2.5	REF
Vehicle Transit	Delivery	Sand	Truck	External	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Aggregate	Truck	External	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Flyash / Cement	Truck	External	CFT	-	0.4	4.0	55	55			91	744			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	CFT	-	0.4	4.0	55	55			91	744			3.23	0.62	0.15	AP-42 13.2.1.3
	Dispatch	Concrete	Truck	External	CT	-	0.4	4.0	36	36			60	487			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	CT	-	0.4	4.0	36	36			60	487			3.23	0.62	0.15	AP-42 13.2.1.3
		Sand	Truck	External	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Aggregate	Truck	External	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	ST	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
	Carryout	-	-	Truck carryout	COUT		0.4	2.18	38	38			63	293			3.23	0.62	0.15	AP-42 13.2.1.3
Material Handling	Delivery	Sand	Truck	TRF Bin	ST	Drive over grizzly					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	ST	90° belt transfer					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	ST	SRB belt merger					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	ST	Conveyor Head					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 4	ST	Silo fill					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	Truck	Tipping Bin	ST	Drive over grizzly					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	ST	90° belt transfer					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	ST	TRF belt merger					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	ST	Silo distributor					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 4	ST	Silo fill					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
			Ship	SRB	SHP	Ship Receival Bin					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	SHP	SRB belt merger					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	SHP	Conveyor Head					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	SHP	Silo fill					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
		Flyash / Cement	Truck	Silo baghouse	CFT	-									0.020		1.00	0.33	0.165	AP42 11.12/Assumption*
	Process	Sand	N/A	Transfer Point 1	CT	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	CT	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	N/A	Transfer Point 1	CT	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	CT	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
	Dispatch	Sand	Truck	Loading	ST	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	Truck	Loading	ST	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
		Concrete	Truck	LEV Baghouse	CT	-									0.020		1.0	0.30	0.03	AP-42 11.12 BG Doc

*Assumed $PM_{2.5}$ = 50% of PM_{10}.

ACTIVITY | COMBUSTION EMISSIONS (KG/DAY | EMISSIONS (kg/annum)

AVERAGE DAY

ACTIVITY						COMBUSTION EMISSIONS (KG/DAY					MECHANICAL			ROAD ~= COMBUSTION					TOTAL				
Activity	Process	Material	Carrier	Source	Desc	VKT	NO_x 12.27	SO_x 0.0203	PM10 0.503	PM2.5 0.4356	TSP	PM10	PM2.5	NOx	SOx	TSP*	PM10	PM2.5	NOx	SOx	TSP*	PM10	PM2.5
Vehicle Transit	Delivery	Sand	Truck	External	-	24	0.3	0.000	0.012	0.010	570	109	5	106	0	4	4	4	106	0	575	114	9
				Internal	-	8	0.1	0.000	0.004	0.004	412	79	4	36	0	1	1	1	36	0	413	81	5
		Aggregate	Truck	External	-	2	0.0	0.000	0.001	0.001	52	10	0	10	0	0	0	0	10	0	52	10	1
				Internal	-	1	0.0	0.000	0.000	0.000	37	7	0	3	0	0	0	0	3	0	38	7	0
		Flyash / Cement	Truck	External	-	6	0.1	0.000	0.003	0.003	200	38	2	29	0	1	1	1	29	0	201	40	3
				Internal	-	1	0.0	0.000	0.001	0.001	75	14	1	6	0	0	0	0	6	0	75	15	1
	Dispatch	Concrete	Truck	External	-	138	1.7	0.003	0.070	0.060	2832	544	25	620	1	25	25	22	620	1	2858	569	47
				Internal	-	29	0.4	0.001	0.015	0.013	1063	204	9	129	0	5	5	5	129	0	1068	209	14
		Sand	Truck	External	-	3	0.0	0.000	0.001	0.001	177	34	2	12	0	0	0	0	12	0	177	34	2
				Internal	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
		Aggregate	Truck	External	-	3	0.0	0.000	0.001	0.001	177	34	2	12	0	0	0	0	12	0	177	34	2
				Internal	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carryout	-	-	Truck carryout	-	31	0.4	0.001	0.016	0.014	3351	643	30	140	0	6	6	5	140	0	3356	649	35
Material Handling	Delivery	Sand	Truck	TRF Bin	Drive over grizzly						152	72	5								152	72	5
				Transfer Point 1	90° belt transfer						46	22	2								46	22	2
				Transfer Point 2	SRB belt merger						152	72	5								152	72	5
				Transfer Point 3	Conveyor Head						152	72	5								152	72	5
				Transfer Point 4	Silo fill						152	72	5								152	72	5
		Aggregate	Truck	Tipping Bin	Drive over grizzly						46	22	2								46	22	2
				Transfer Point 1	90° belt transfer						14	7	0								14	7	0
				Transfer Point 2	TRF belt merger						46	22	2								46	22	2
				Transfer Point 3	Silo distributor						46	22	2								46	22	2
				Transfer Point 4	Silo fill						46	22	2								46	22	2
			Ship	SRB	Ship Receival Bin						457	216	15								457	216	15
				Transfer Point 1	SRB belt merger						457	216	15								457	216	15
				Transfer Point 2	Conveyor Head						457	216	15								457	216	15
				Transfer Point 3	Silo fill						457	216	15								457	216	15
		Flyash / Cement	Truck	Silo baghouse	-						203	67	11								203	67	11
	Process	Sand	N/A	Transfer Point 1	-						42	20	1								42	20	1
				Transfer Point 2	-						42	20	1								42	20	1
		Aggregate	N/A	Transfer Point 1	-						137	65	5								137	65	5
				Transfer Point 2	-						137	65	5								137	65	5
	Dispatch	Sand	Truck	Loading	-						14	7	0								14	7	0
		Aggregate	Truck	Loading	-						46	22	2								46	22	2
		Concrete	Truck	LEV Baghouse	-						503	151	5								503	151	5
											12748	**3400**	**200**	**1103**	**2**	**45**	**45**	**39**	**1103**	**2**	**12793**	**3445**	**239**

*Assumed road component of TSP = Road PM_{10}.

Attachment C –Emissions Inventory – Peak Day Scenario

ACTIVITY | TRUCK INPUTS | INTENSITY (as daily quantities) | CONTROLS

PEAK DAY

Activity	Process	Material	Carrier	Source	Desc	Trucks/day	Payload (t)	Onsite Path Length (std) - (m)	Onsite Path Length (soiled) - (m)	Onsite Path Length (wet) - (m)	VKT (std)	VKT (soiled)	VKT (wet)	m³ Exhausted	Material Quantity (t)	CF1	CF2	CF3	CFtot
Vehicle Transit	Delivery	Sand	Truck	External	-	241	36.8	270		18	65.1	0.0	4.3			0%			0%
				Internal	-	241	36.8		80	18	0.0	19.3	4.3			70%			70%
		Aggregate	Truck	External	-	0	36.8	270		18	0.0	0.0	0.0			0%			0%
				Internal	-	0	36.8		80	18	0.0	0.0	0.0			70%			70%
		Flyash / Cement	Truck	External	-	35	35.6	260		18	9.1	0.0	0.6			0%			0%
				Internal	-	35	35.6		40	18	0.0	1.4	0.6			70%			70%
	Dispatch	Concrete	Truck	External	-	689	12.7	260		18	179.1	0.0	12.4			0%			0%
				Internal	-	689	12.7		40	18	0.0	27.6	12.4			70%			70%
		Sand	Truck	External	-	0	36.8	270	80		0.0	0.0	0.0			0%			0%
				Internal	-	0	36.8				0.0	0.0	0.0			70%			70%
		Aggregate	Truck	External	-	0	36.8	270	80		0.0	0.0	0.0			0%			0%
				Internal	-	0	36.8				0.0	0.0	0.0			70%			70%
	Carryout	-	-	Truck carryout		965	-	0	50		0.0	48.3	0.0			0%			0%
Material Handling	Delivery	Sand	Truck	TRF Bin	Drive over grizzly										8869	70%			70%
				Transfer Point 1	90° belt transfer										8869	70%	70%		91%
				Transfer Point 2	SRB belt merger										8869	70%			70%
				Transfer Point 3	Conveyor Head										8869	70%			70%
				Transfer Point 4	Silo fill										8869	70%			70%
		Aggregate	Truck	Tipping Bin	Drive over grizzly										0	70%			70%
				Transfer Point 1	90° belt transfer										0	70%	70%		91%
				Transfer Point 2	TRF belt merger										0	70%			70%
				Transfer Point 3	Silo distributor										0	70%			70%
				Transfer Point 4	Silo fill										0	70%			70%
			Ship	SRB	Ship Receival Bin										2740	70%			70%
				Transfer Point 1	SRB belt merger										2740	70%			70%
				Transfer Point 2	Conveyor Head										2740	70%			70%
				Transfer Point 3	Silo fill										2740	70%			70%
		Flyash / Cement	Truck	Silo baghouse	-									42364	1246				0%
	Process	Sand	N/A	Transfer Point 1	-										8869	70%	70%		91%
				Transfer Point 2	-										8869	70%	70%		91%
		Aggregate	N/A	Transfer Point 1	-										2740	70%	70%		91%
				Transfer Point 2	-										2740	70%	70%		91%
	Dispatch	Sand	Truck	Loading	-										0	70%			70%
		Aggregate	Truck	Loading	-										0	70%			70%
		Concrete	Truck	LEV Baghouse	-									95336					0%

PEAK DAY

ACTIVITY						EMISSION FACTOR INPUT VARIABLES						EMISSION FACTORS (Uncontrolled)				NON-COMBUSTION PSD Multipliers			
Activity	Process	Material	Carrier	Source	Desc	SL (std)	SL (soiled)	GVM (std)	GVM (soiled)	U	M	g/VKT (std)	g/VKT (soiled)	g/m³	g/t	TSP	PM10	PM2.5	REF
Vehicle Transit	Delivery	Sand	Truck	External	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Aggregate	Truck	External	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Flyash / Cement	Truck	External	-	0.4	4.0	55	55			91	744			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	55	55			91	744			3.23	0.62	0.15	AP-42 13.2.1.3
	Dispatch	Concrete	Truck	External	-	0.4	4.0	36	36			60	487			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	36	36			60	487			3.23	0.62	0.15	AP-42 13.2.1.3
		Sand	Truck	External	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
		Aggregate	Truck	External	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
				Internal	-	0.4	4.0	42	42			70	570			3.23	0.62	0.15	AP-42 13.2.1.3
	Carryout	-	-	Truck carryout		0.4	2.18	38	38			64	297			3.23	0.62	0.15	AP-42 13.2.1.3
Material Handling	Delivery	Sand	Truck	TRF Bin	Drive over grizzly					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	90° belt transfer					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	SRB belt merger					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	Conveyor Head					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 4	Silo fill					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	Truck	Tipping Bin	Drive over grizzly					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	90° belt transfer					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	TRF belt merger					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	Silo distributor					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 4	Silo fill					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
			Ship	SRB	Ship Receival Bin					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 1	SRB belt merger					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	Conveyor Head					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 3	Silo fill					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
		Flyash / Cement	Truck	Silo baghouse	-									0.020		1.00	0.33	0.165	AP42 11.12/Assumption*
	Process	Sand	N/A	Transfer Point 1	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	N/A	Transfer Point 1	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
				Transfer Point 2	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
	Dispatch	Sand	Truck	Loading	-					2.34	4.17				0.46	0.74	0.35	0.053	AP-42 13.2.4.3
		Aggregate	Truck	Loading	-					2.34	1.77				1.52	0.74	0.35	0.053	AP-42 13.2.4.3
		Concrete	Truck	LEV Baghouse	-									0.020		1.0	0.30	0.03	AP-42 11.12 BG Doc

ACTIVITY | COMBUSTION EMISSIONS (KG/DAY | EMISSIONS (kg/annum)

PEAK DAY

Activity	Process	Material	Carrier	Source	Desc	VKT	NO_x	SO_x	PM10	PM2.5	MECHANICAL TSP	MECHANICAL PM10	MECHANICAL PM2.5	ROAD ~= COMBUSTION NOx	ROAD ~= COMBUSTION SOx	ROAD ~= COMBUSTION TSP*	ROAD ~= COMBUSTION PM10	ROAD ~= COMBUSTION PM2.5	TOTAL NOx	TOTAL SOx	TOTAL TSP*	TOTAL PM10	TOTAL PM2.5
							12.27	0.0203	0.503	0.4356													
Vehicle Transit	Delivery	Sand	Truck	External	-	69	0.9	0.001	0.035	0.030	1666	320	15	311	1	13	13	11	311	1	1678	332	26
				Internal	-	24	0.3	0.000	0.012	0.010	1204	231	11	106	0	4	4	4	106	0	1208	235	14
		Aggregate	Truck	External	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
				Internal	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
		Flyash / Cement	Truck	External	-	10	0.1	0.000	0.005	0.004	304	58	3	44	0	2	2	2	44	0	306	60	4
				Internal	-	2	0.0	0.000	0.001	0.001	114	22	1	9	0	0	0	0	9	0	114	22	1
	Dispatch	Concrete	Truck	External	-	192	2.4	0.004	0.096	0.083	3919	752	35	858	1	35	35	30	858	1	3954	787	65
				Internal	-	40	0.5	0.001	0.020	0.017	1470	282	13	179	0	7	7	6	179	0	1477	290	19
		Sand	Truck	External	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
				Internal	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
		Aggregate	Truck	External	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
				Internal	-	0	0.0	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carryout	-	-	Truck carryout		48	0.6	0.001	0.024	0.021	5233	1004	47	216	0	9	9	8	216	0	5241	1013	54
Material Handling	Delivery	Sand	Truck	TRF Bin	Drive over grizzly						445	211	15								445	211	15
				Transfer Point 1	90° belt transfer						134	63	5								134	63	5
				Transfer Point 2	SRB belt merger						445	211	15								445	211	15
				Transfer Point 3	Conveyor Head						445	211	15								445	211	15
				Transfer Point 4	Silo fill						445	211	15								445	211	15
		Aggregate	Truck	Tipping Bin	Drive over grizzly						0	0	0								0	0	0
				Transfer Point 1	90° belt transfer						0	0	0								0	0	0
				Transfer Point 2	TRF belt merger						0	0	0								0	0	0
				Transfer Point 3	Silo distributor						0	0	0								0	0	0
				Transfer Point 4	Silo fill						0	0	0								0	0	0
			Ship	SRB	Ship Receival Bin						457	216	15								457	216	15
				Transfer Point 1	SRB belt merger						457	216	15								457	216	15
				Transfer Point 2	Conveyor Head						457	216	15								457	216	15
				Transfer Point 3	Silo fill						457	216	15								457	216	15
		Flyash / Cement	Truck	Silo baghouse	-						309	102	17								309	102	17
	Process	Sand	N/A	Transfer Point 1	-						134	63	5								134	63	5
				Transfer Point 2	-						134	63	5								134	63	5
		Aggregate	N/A	Transfer Point 1	-						137	65	5								137	65	5
				Transfer Point 2	-						137	65	5								137	65	5
	Dispatch	Sand	Truck	Loading	-						0	0	0								0	0	0
		Aggregate	Truck	Loading	-						0	0	0								0	0	0
		Concrete	Truck	LEV Baghouse	-						696	209	6								696	209	6
											19196	5006	292	1722	3	71	71	61	1722	3	19267	5077	353