

MODIFICATION OF SPRING FARM QUARRY CONSENT (DA 75/256)

Lot 22 (No. 186) DP 833317 and Part
Lot 32 (No. 172) (DP 635271)

Macarthur Road, Spring Farm

ENVIRONMENTAL ASSESSMENT



Prepared For:



M. Collins and Sons Holdings Pty Ltd

APPENDIX H



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February 2018

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M COLLINS AND SONS

1 SPRING FARM QUARRY

AIR QUALITY IMPACT ASSESSMENT

JANUARY 2018



Air Quality Impact Assessment

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2 ABBREVIATIONS

AQIA	Air quality impact assessment
AWS	Automatic weather station
BOM	Bureau of Meteorology
C	Celsius
DPE	Department of Planning and Environment (NSW)
EPA	Environment Protection Authority
g/m ² /mth	grams per metre squared per month
g/s	grams per second
kg	kilogram
kg/ha/hr	kilograms per hectare per hour
kg/t	kilogram/tonne
km	kilometre
mm	millimetres
NEPM	National Environment Protection Measure
OEHS	Office of Environment and Heritage
PM _{2.5}	particulate matter less than or equal to 1.5 microns in diameter
PM ₁₀	particulate matter less than or equal to 10 microns in diameter
TAPM	The Air Pollution Model
t	tonnes
tpa	tonnes per annum
TSP	total suspended particulates less than or equal to 30 microns in aerodynamic diameter
μ	micron
VKT	vehicle kilometres travelled

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3 EXECUTIVE SUMMARY

M Collins and Sons (the client) are seeking a Consent Modification with the Department of Planning and Environment (DPE) to extend their permit for extraction and rehabilitation operations at the Spring Farm Quarry for a further two years.

To support their Consent Modification application, the client has engaged WSP to conduct air quality modelling and assessment for the proposed time extension.

The objective of this air quality impact assessment (AQIA) was to assess the impact of the operation of the quarry for a further two years on the air quality at nearby sensitive receptors.

Current operations produce around 200,000 tonnes of sand and soil products annually. An additional 100,000 tonnes per annum (tpa) of soil is imported into the site to undergo screening each year.

Air dispersion modelling was conducted to predict the particulate concentrations at six sensitive receptors. Particulates investigated were total suspended particulates smaller than or equal to 30 microns in aerodynamic diameter (TSP), particulate matter smaller than or equal to 10 microns in diameter (PM₁₀) and particulate matter less than or equal to 2.5 microns in diameter (PM_{2.5}), and nuisance dust deposition. The modelling scenario was based on the environmental licence conditions for operations at the site.

The results for all TSP, PM_{2.5} and dust deposition all complied with the respective air quality criteria. Predicted PM₁₀ concentrations also met the annual average criteria objective.

The following findings were made based on the modelling:

- TSP are predicted to be below the relevant air quality criteria at all receptors.
- PM₁₀ concentrations for maximum 24 hour average and annual average concentrations are predicted to be below the air quality criteria at all sensitive receptors.

- PM_{2.5} concentrations for maximum 24 hour average and annual average concentrations are predicted to be below the air quality criteria at all sensitive receptors.
 - Dust deposition levels are predicted to be below the current air quality goal at all sensitive receptors.
- Based on the results, the site is considered suitable to operate for an additional 2 years.

M Collins and Sons (the client) are seeking a Consent Modification with the Department of Planning and Environment (DPE) to extend their permit for extraction and rehabilitation operations at the Spring Farm Quarry for a further two years.

To support their Consent Modification application, the client has engaged WSP to conduct air quality modelling and assessment for the proposed time extension.

1.1.**1.1 REPORT OBJECTIVES**

The objective of this air quality impact assessment (AQIA) was to assess the impact of the operation of the quarry for a further two years on the air quality at nearby sensitive receptors.

1.2.**1.2 SCOPE OF WORKS**

- Identification of nearby sensitive receptors.
- Description of existing air quality and meteorological conditions at the site.
- Dispersion modelling for a worst-case scenario.
- Assessment of impacts on nearby sensitive receptors, including the proposed development (DA/2015/147/1), based on the results of the modelling.

1.3. 2.1 SITE DESCRIPTION

Spring Farm Quarry (the site) is located at Elderslie, approximately 65 km southwest of Sydney. Current operations produce around 200,000 tonnes of sand and soil products annually. An additional 100,000 tonnes per annum (tpa) of soil is imported into the site to undergo screening each year.

The location of Spring Farm Quarry is shown in Figure 1 (Appendix A).

1.4. 2.2 SENSITIVE RECEPTORS

Sensitive receptors are defined as people or places that may be impacted by air emissions. Examples of sensitive receptors include residential dwellings, schools, hospitals, offices or public recreational areas (NSW EPA 2016).

Six sensitive receptors were identified as the receptors which would represent maximum impacts from quarry activities. Table 2.1 shows the direction, distance and location of the sensitive receptors selected for this assessment. Sensitive receptors are marked on Figure 2 (Appendix A).

Table 2.1 Nearby sensitive receptors

SENSITIVE RECEPTOR	DIRECTION FROM QUARRY BOUNDARY	DISTANCE FROM QUARRY BOUNDARY	EASTING	NORTHING	ELEVATION
SR1	North	400 m	288695	6227886	73
SR2	North	110 m	288809	6227636	74
SR3	East	80 m	289148	6227255	77
SR4	East	70 m	289236	6227467	77
SR5	West	230 m	289187	6227589	71
SR6	West	220 m	287838	6227099	70

6 3 AIR QUALITY ASSESSMENT CRITERIA

The Project must demonstrate compliance with the impact assessment criteria outlined in the Approved Methods for Modelling and Assessment of Air Pollutants in NSW (EPA, 2016 – hereafter the Approved Methods for Modelling). The impact assessment criteria are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being.

The pollutants of interest during operation of the sand quarry is primarily airborne particulate matter. Due to the relatively small scale of the operation and distance to the nearest sensitive receivers, emissions of gaseous pollutants from site plant and equipment has not been considered within this assessment.

1.5. 3.1 AIRBORNE PARTICULATE MATTER

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP).

Emissions of particulate matter less than 10 and 2.5 microns (µm) in diameter (referred to as PM₁₀ and PM_{2.5}

respectively) are considered important pollutants due to their ability to penetrate into the respiratory system. In the case of the PM_{2.5} category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM₁₀ and PM_{2.5} include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

Air quality criteria for PM in Australia are given for particle size metrics including TSP, PM₁₀ and PM_{2.5}. The 2016 update to the Approved Methods for Modelling, gazetted on 20 January 2017, includes particle assessment criteria that are consistent with revised National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) national reporting standards (National Environment Protection Council [NEPC], 1998; NEPC, 2015).

For the purpose of this report, predicted ground level concentrations (GLCs) are assessed against the NSW EPA's impact assessment criteria presented in Table 3.1.

Table 3.1 Impact assessment criteria for PM

PM METRIC	AVERAGING PERIOD	CONCENTRATION (µG/M ³)
TSP	Annual	90
PM ₁₀	24 hour	50
	Annual	30
PM _{2.5}	24 hour	25
	Annual	8

nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition rates exceed 4 g/m²/month.

The NSW EPA impact assessment criteria for dust deposition are given in Table 3.2 illustrating the allowable increment in dust deposition rates above ambient (background) dust deposition rates which would be acceptable so that dust nuisance could be avoided.

Table 3.2 Impact assessment criteria for dust deposition

AVERAGING PERIOD	MAXIMUM INCREASE IN DEPOSITED DUST LEVEL	MAXIMUM TOTAL DEPOSITED DUST LEVEL
Annual	2 g/m ² /month	4 g/m ² /month

¹.2 DUST DEPOSITION CRITERIA

The preceding sections are concerned in large part with the health impacts of airborne particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. In NSW, accepted practice regarding the

METEOROLOGY

Meteorological mechanisms affect the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere.

The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the boundary layer (the general term for the layer of the atmosphere adjacent to the earth's surface) and other factors such as wind speed and direction.

Thermal turbulence is driven by incoming solar radiation during daylight hours. Mechanical turbulence is associated with wind speed, in combination with the surface roughness of the surrounding area. The stability of the atmosphere increases with a decrease in thermal and mechanical turbulence.

Air pollutant dispersion consists of vertical and horizontal components of motion. Vertical motion is defined by the stability of the atmosphere (e.g. a stable atmosphere has low vertical dispersion potential) and the depth of the surfacemixing layer, typically the vertical distance between the earth's surface and a temperature inversion during the day.

The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field (i.e. wind speed and direction). The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume 'stretching'. The wind direction, and the variability in wind direction, determines the general path that the pollutants will follow.

Airborne particulate concentration levels therefore fluctuate in response to changes in atmospheric stability, mixing depth and winds (Oke, 2003; Sturman and Tapper, 2006; Seinfeld and Pandis, 2006).

In order to characterise the dispersion meteorology of the region surrounding the Project, long-term climate records, time-resolved meteorological monitoring data and meteorological modelling for the region were drawn upon, as documented in the following sections.

1.6.

4.1

REGIONAL METEOROLOGY

Data from the Camden Airport AWS was used to review regional meteorological conditions.

1.6.1.

4.1.1

WIND SPEED AND WIND DIRECTION

Based on the climate observations from Camden Airport AWS, afternoon summer winds (15:00) are the strongest, with an average wind speed of 30 km/hr. The predominant wind direction is from the northeast and east at 15:00, and is consistent with the seasonal wind pattern. As the predominate winds during summer shift to easterly due to seasonal circulation changes in the upper atmosphere, the calmest winds are the northeasterly morning winds, with an average of 10 km/hr. This typically changes during spring when the subtropical ridge shifts north, and winds transition from a southerly to westerly direction.

Seasonal 9:00 and 15:00 wind roses are displayed in Figure 4.1.

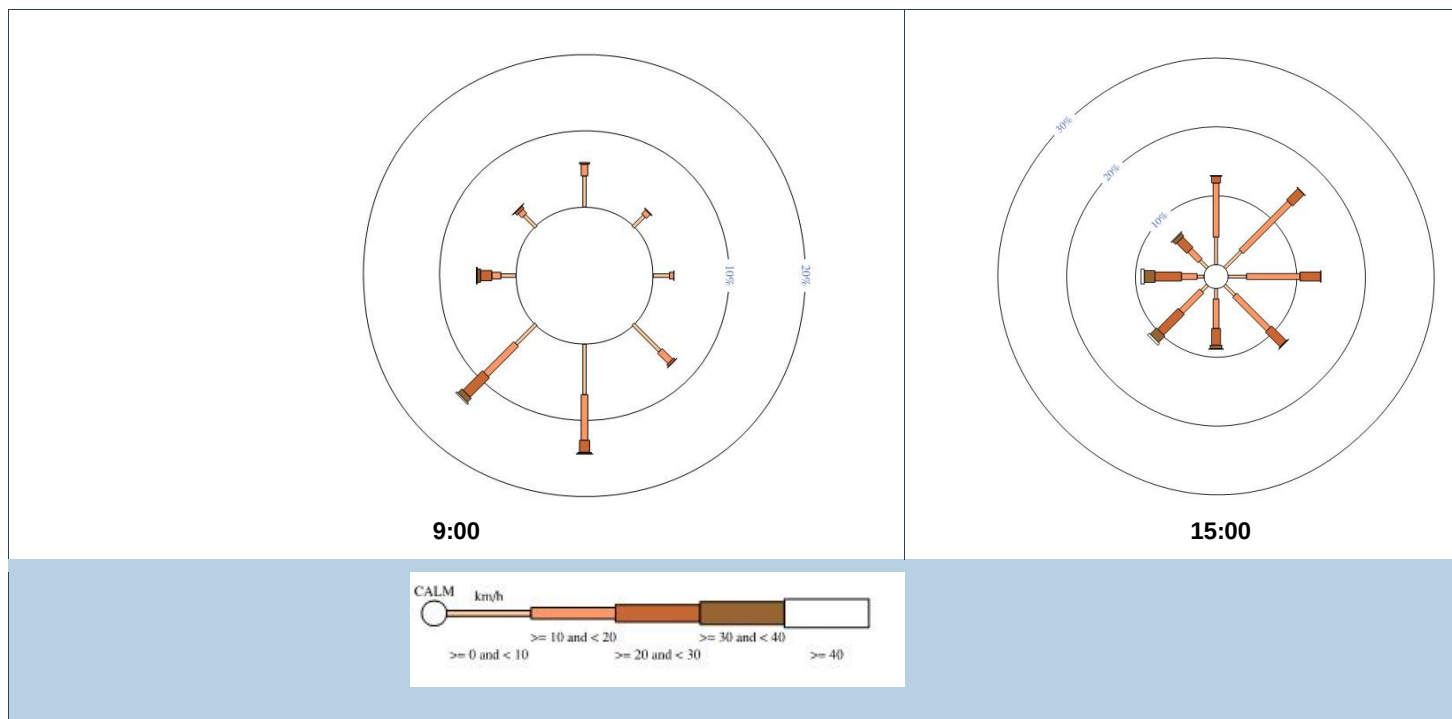


Figure 4.1 Annual 9:00 and 15:00 wind roses, Camden Airport AWS

1.6.2.

4.1.2 RAINFALL AND TEMPERATURE

Camden Airport AWS observes an average temperature of 24°Celsius (C) yearly. The lowest temperature on average recorded is 17°C in July, and the maximum temperature on average recorded is 31 C in January. Total average cumulative rainfall captured is 789 mm, with the minimum average of 38 m recorded in July and maximum rainfall of 96 mm recorded in February. The average temperature and cumulative rainfall for Camden Airport is shown in Figure 4.2.

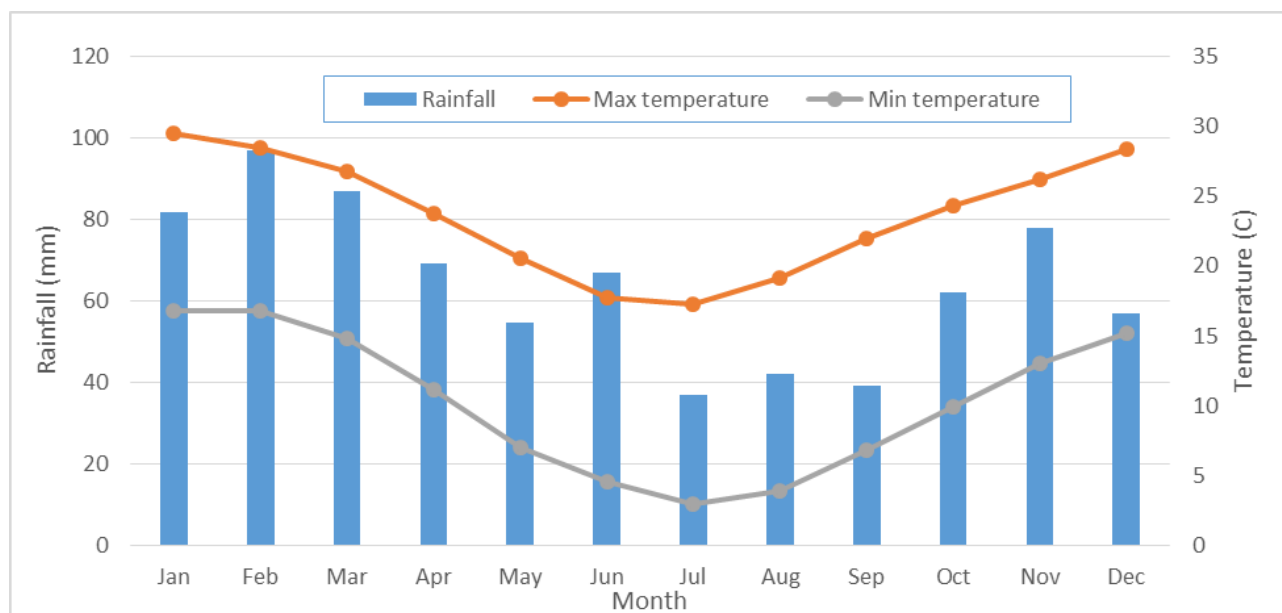


Figure 4.2 Monthly cumulative rainfall and average temperatures for Camden Airport AWS (BOM, 2016)

8 5 EXISITING AIR QUALITY ENVIRONMENT

The existing air quality environment has been assessed using data collected for the year 2015. This year provides one year of continuous data and was not significantly impacted by bush fires or other external factors. The data is also contemporaneous with the meteorological data used for the assessment.

1.7. 5.1 AMBIENT AIR QUALITY DATA

Ambient air quality data was assessed based on data collected at the Camden NSW EPA air quality monitoring station. The monitoring station is located approximately 4.5km north of the site.

The data for PM₁₀ and PM_{2.5} concentrations in 2015 is summarised in Table 5.1.

Table 5.1 Existing air quality for 2015 (µg/m³)

POLLUTANT	AVERAGING PERIOD	MAXIMUM CONCENTRATIONS (µg/m ³)	DATE	ANNUAL AVERAGE CONCENTRATION (µg/m ³)
PM ₁₀	24 hour	62	6/05/2015	14
		33	26/11/2015	
PM _{2.5}	24 hour	25	21/08/2015	6
		21	22/08/2015	
		18	10/10/2015	

Table 5.1 indicates a maximum PM₁₀ 24-hour concentration of 62 µg/m³ on 6 May 2015, which exceeds the air quality daily average criteria of 50 µg/m³. This occurred due to a dust storm (NSW OEH, 2015). A more representative measurement for daily PM₁₀ concentrations is 33 µg/m³, which is the second highest daily average for 2015. The average annual concentration for PM₁₀ was 14 µg/m³.

Table 5.1 shows the highest PM_{2.5} daily average concentration concentrations of 25 µg/m³ for 21 August 2015, which meets the air quality criteria of 25 µg/m³. The second highest daily average concentration for PM_{2.5} was 21 µg/m³ on 22 August 2015. For both dates the majority of monitoring sites within the Sydney region recorded elevated PM_{2.5} daily averages. This was due to a smoke haze from a number of large hazard reduction burns (NSW OEH, 2015). Therefore, both of these measurements are not considered representative of the existing environment. A more representative measure is third highest PM_{2.5} daily of 18 µg/m³. The average annual concentration for PM_{2.5} was 6 µg/m³.

It is noted that the PM₁₀ sub-set is typically 50% of TSP mass in regions where road traffic is not the dominant particulate source (USEPA, 2001) and for the purposes of this study, TSP concentrations have therefore been assumed to be twice those of the measured PM₁₀ concentrations at Camden (66 µg/m³).

No background deposited dust data is available for the project site. Data is collected at the Site, but is impacted by site activities, and is not considered background. The assessment criterion used is based on the incremental impact, so no background was required.

9 6 AIR QUALITY MODELLING METHODOLOGY

This section of the report details the emission scenarios and emission parameters that were used in the atmospheric dispersion modelling in this assessment of the operation of the sand quarry.

1.8. 6.1 MODEL SELECTION

The AUSPLUME (v6.0) dispersion model is a Gaussian plume dispersion model. It was designed to predict ground level concentrations or the deposition of pollutants emitted from one or more sources. The mathematical basis of AUSPLUME is available in the Victorian EPA Plume Calculation Project (VIC EPA, 1986).

To configure AUSPLUME a range of information is required, including source location, pollutant emission rates, emission source characteristics (location, height, hours required) and the terrain of the site. The meteorological data produced by The Air Pollution Model (TAPM - Section 6.2) was used within AUSPLUME to predict the dispersion of particulates using the current operation scenarios described in Section 7.1.

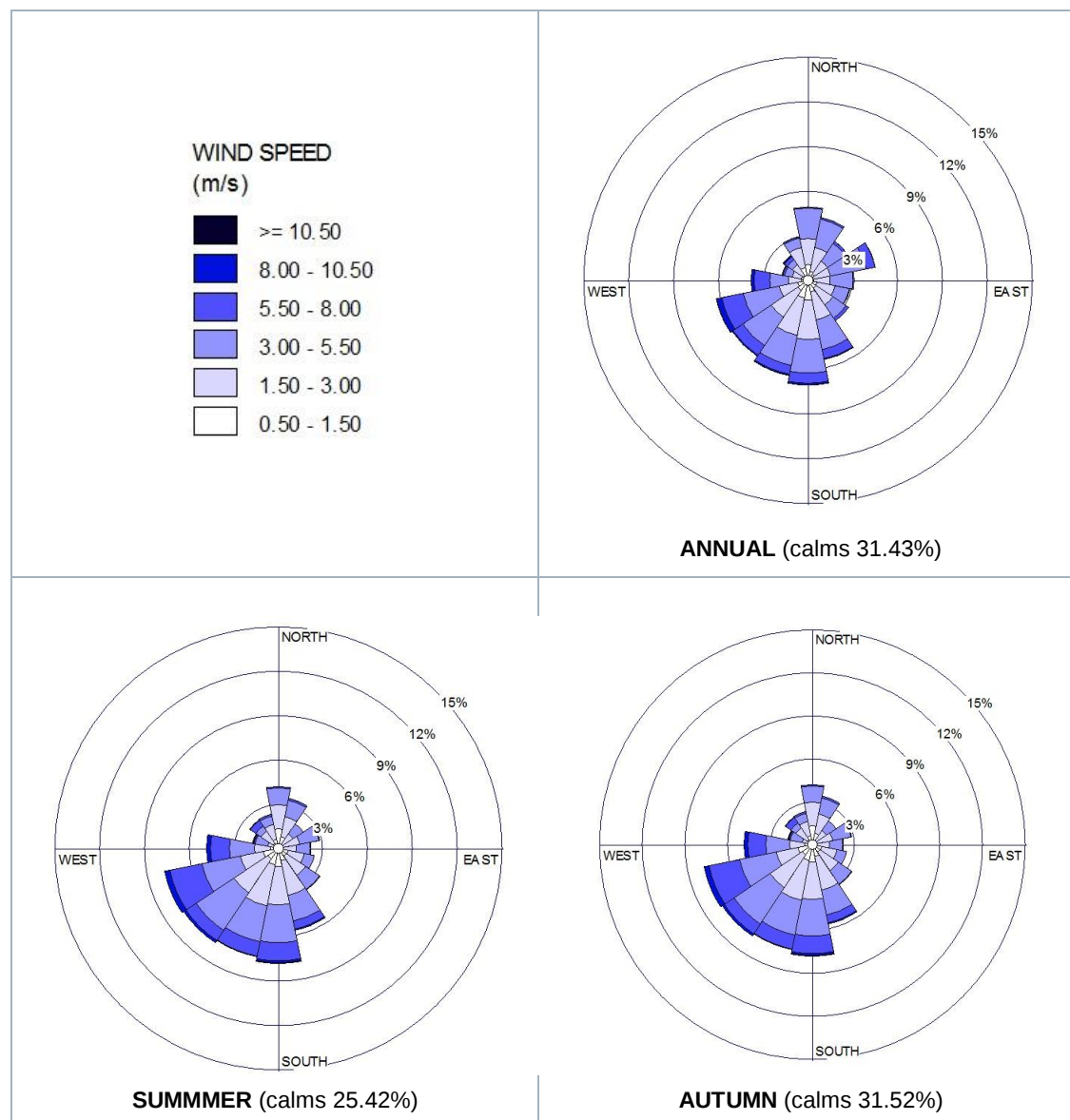
1.9. 6.2 METEOROLOGICAL MODEL

The Air Pollution Model (TAPM) (version 4.0.4) is a three dimension prognostic model that uses observational datasets

to predict meteorological conditions. TAPM was configured and run in accordance with the *Approved Methods* to produce site representative meteorological data for 2015, and parameterisation for cloud, rain, turbulence, urbanisation, vegetation, soil and radiative fluxes.

Hourly observations from Camden Airport were used to assimilate synoptic data for the surrounding area. Synoptic simulations projected by TAPM were verified against historical observations from Camden Airport AWS and considered to be representative of the site.

The TAPM seasonal and annual windroses are provided in Figure 6.1.



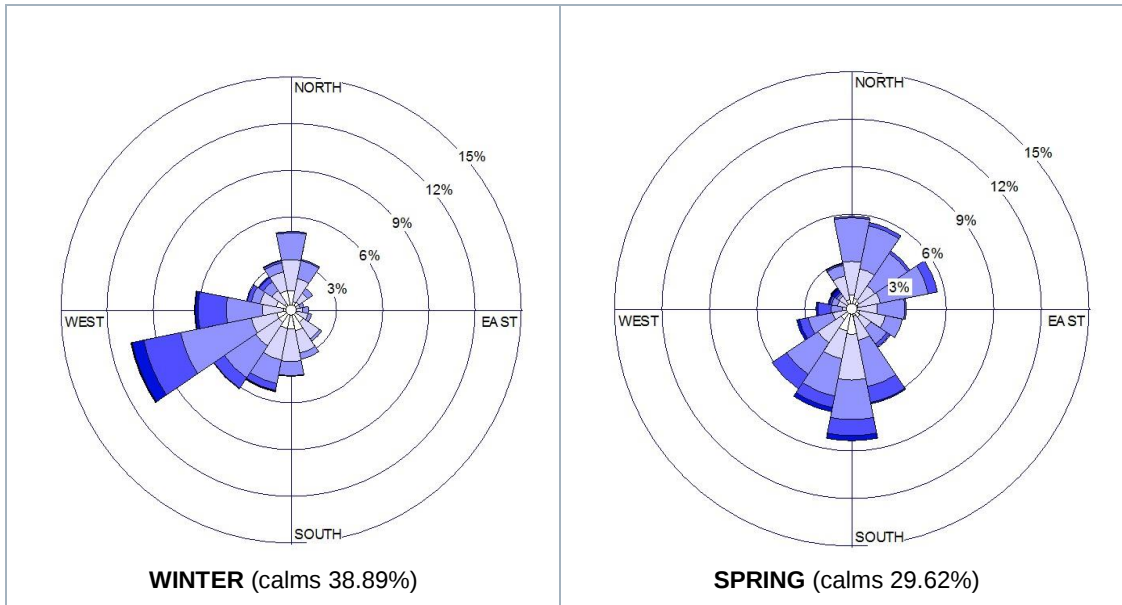


Figure 6.1 Annual and seasonal wind roses for 2015 simulated by TAPM at the Project site for 2015.

1.9.1.

6.2.1 ATMOSPHERIC STABILITY

TAPM synoptic simulations can be used to assess the stability of the atmosphere. The stability classes presented in Figure 6.2 provide a diagram of the stability of the surface layer. The stability classes range from A, above the ground in which vertical variation of heat and momentum flux is negligible; to F which experiences high mixing, and is very unstable. Class A is the stability class shown the least, and Class D is the most prevalent stability class seen at the site (Figure 6.2).

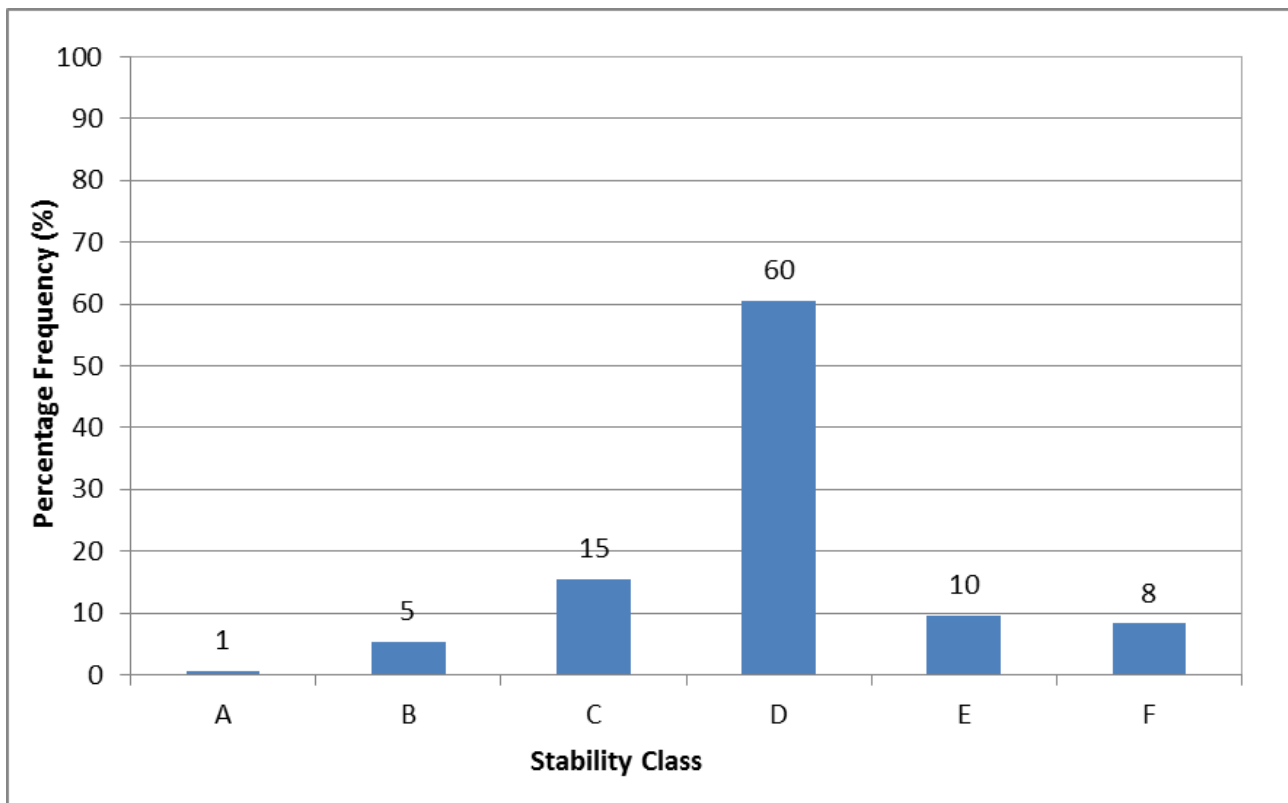


Figure 6.2 Stability Class Frequencies simulated by TAPM at the Project site for 2015

Figure 6.3 illustrates the diurnal variation of atmospheric stability generated by TAPM for the Site during 2015. The diurnal profile presented illustrates that atmospheric instability increases during daylight hours as convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for atmospheric dispersion of emissions would be greatest during day time hours and lowest during evening through to early morning hours.

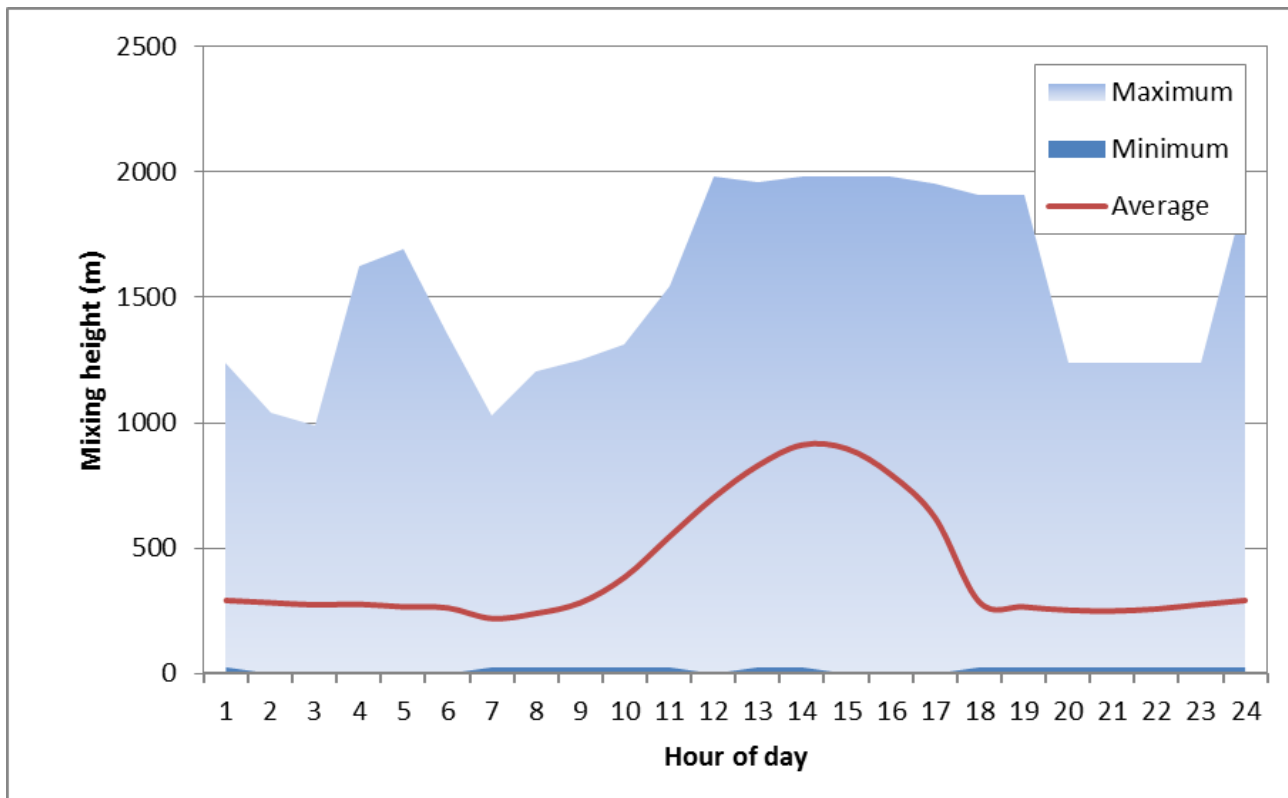


Figure 6.3 Diurnal variations simulated by TAPM at the Project site for 2015

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7 EMISSIONS ESTIMATION

The section below describes the model scenario used to assess the air quality impacts of the site.

1.10. 7.1 MODELLING SCENARIO

One scenario has been modelled to reflect the extraction and processing areas of the site. This scenario reflects worst case emissions from site and impacts for licensed emission limits.

The scenario includes the following:

- Site operates 6 days per week (excluding public holidays). Hours of operation are 7:00 to 17:00 Monday to Friday, and 8:00 to 13:00 Saturday

- Worst case annual throughput extracted from the pit – 100,000 tonnes per year —

Worst case throughput at processing plant – 50,000 tonnes per year.

- Worst case throughput (tonnes per day) extracted from the pit – 2000 tonnes per day.

- Worst case throughput at processing plant (tonnes per day) – 800 tonnes per day.

- A throughput of 200 tonnes per hour has been assumed for modelling purposes for the pit and processing.

- 1 excavator operating in the pit.

- 2 front end loaders operating in the processing area.

- The active pit area is assumed to be 6 hectares.

- The rehabilitation area (which includes Mixture of trees on the riparian & anabranch areas & grass on flats) is assumed to be 3 hectares.
- The raw processing and stockpiling area is assumed to be 4 hectares.
- Washed sand stockpiling is assumed to be 0.44 hectares.
- 4 haul roads
 - Pit to raw stockpiling area (1.95 km).
 - Pit to directly off site (1.86 km).
 - Raw stockpile to processing hopper (0.13 km).
 - Washed stockpiles to offsite (0.34 km)

The operational scenario assessed is illustrated in Figure 3, Appendix A.

1.11. 7.2 EMISSIONS INVENTORY

Emission equations and assumptions are presented in Appendix B.

Table 7.1 presents emission factors sourced from these equations and assumptions for the adopted operational scenario.

Table 7.1 Emission factors

ACTIVITY/SOURCE	UNITS	TSP	PM ₁₀	PM _{2.5}
EXTRACTION AREA				
Excavator removal or in-situ resource, stockpiling of sand, truck loading	kg/t	0.00020	0.00009	0.00001
Hauling – transport of material within site on unpaved roads	kg/VKT	3.77136	1.03354	0.10335
Stockpile – wind erosion	kg/ha/hr	0.4	0.2	0.03
Open pit – wind erosion	kg/ha/hr	0.4	0.2	0.03
REHABILITATION AREA				
Open pit – wind erosion	kg/ha/hr	0.4	0.2	0.03
SAND PROCESSING PLANT AND PROCESSING AREA				
Truck unloading product	kg/t	0.00020	0.00009	0.00001
2 x front end loaders		0.00020	0.00009	0.00001
Stockpile – wind erosion	kg/ha/hr	0.4	0.2	0.03
PRODUCT TRANSPORT				

Hauling – receiving offsite imported material and transporting product off site	kg/VKT	3.77136	1.03354	0.10335
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The emissions inventory for the operations scenario is provided in Appendix B.

The screening of the raw sand is a wet process. Dust emissions from this source are assumed to be negligible and have not been included within the emissions inventory.

11 8 RESULTS

Section ² describes the results predicted from the dispersion modelling of the site. An example model output is provided in Appendix C.

1.12. 8.1 TOTAL SUSPENDED PARTICULATES

The predicted TSP incremental and cumulative concentrations from dispersion modelling of operations at the site for each sensitive receptor are presented in Table 8.1.

Table 8.1 Predicted annual average TSP concentrations (µg/m³)

SENSITIVE RECEPTOR	INCREMENTAL	CUMULATIVE
SR1	0.5	66.5
SR2	0.7	66.7
SR3	0.5	66.5
SR4	1.2	67.2
SR5	1.2	67.2
SR6	0.4	66.4
Objective	90	

For the scenario assessed, the modelling results for TSP do not exceed the Project assessment criterion.

1.13. 8.2 PM₁₀

Table 8.2 presents the maximum 24 hour and annual average PM₁₀ concentrations for each sensitive receptor.

Table 8.2 Predicted 24 hour and annual average PM₁₀ concentrations (µg/m³)

SENSITIVE RECEPTOR	24 HOUR		ANNUAL	
	INCREMENTAL	CUMULATIVE	INCREMENTAL	CUMULATIVE
SR1	1.0	34.0	0.2	14.2
SR2	1.2	34.2	0.3	14.3
SR3	2.5	35.5	0.3	14.3

².3 PM_{2.5}

Table 8.3 presents the maximum 24 hour and annual average PM_{2.5} concentrations for each sensitive receptor.

SR4	2.9	35.9	0.6	14.6
SR5	3.0	36.0	0.7	14.7
SR6	1.3	34.3	0.2	14.2
Objective	50		30	

For the scenario assessed, the modelling results for PM₁₀ did not exceed the Project assessment criteria.

Table 8.3 Predicted 24 hour and annual average PM_{2.5} concentrations (µg/m³)

SENSITIVE RECEPTOR	24 HOUR		ANNUAL	
	INCREMENTAL	CUMULATIVE	INCREMENTAL	CUMULATIVE
SR1	0.3	18.3	<0.1	6.0
SR2	0.2	18.2	<0.1	6.0
SR3	0.1	18.1	<0.1	6.0
SR4	0.1	18.1	<0.1	6.0
SR5	0.1	18.1	<0.1	6.0
SR6	0.3	18.3	<0.1	6.0
Objective	25		8	

For the scenario assessed, the modelling results for PM_{2.5} did not exceed the Project assessment criteria.

1.14. 8.4 DUST DEPOSITION

Table 8.4 presents the results of dispersion modelling for dust deposition from the site at each sensitive receptor.

Table 8.4 Predicted annual average dust deposition concentrations (g/m²/mth)

SENSITIVE RECEPTOR	INCREMENT
SR1	<0.1
SR2	<0.1
SR3	<0.1
SR4	<0.1
Objective	2

For the scenario assessed, the modelling results for deposited dust did not exceed the Project assessment criterion,

12 CONCLUSION

9 DISCUSSION AND

The objective of this AQIA was to assess the impact of the operation of the quarry for a further two years on the air quality at nearby sensitive receptors.

Current operations produce around 200,000 tonnes of sand and soil products annually. An additional 100,000 tonnes per annum (tpa) of soil is imported into the site to undergo screening each year.

The following findings were made based on the modelling:

- TSP are predicted to be below the relevant air quality criteria at all receptors.
- PM₁₀ concentrations for maximum 24 hour average and annual average concentrations are predicted to be below the air quality criteria at all sensitive receptors.
- PM_{2.5} concentrations for maximum 24 hour average and annual average concentrations are predicted to be below the air quality criteria at all sensitive receptors.
- Dust deposition levels are predicted to be below the current air quality goal at all sensitive receptors.

Based on the results, the site is considered suitable to operate for an additional 2 years.

- BOM (2015). Hourly observations at Camden Airport. Retrieved from www.bom.gov.au/climate/data/.
- NPI Emission Estimation Technique Manual for Mining and Processing of non-Metallic Minerals (NPI 2014).
- NPI Emission Estimation Technique Manual for Mining (NPI 2012).
- NSW EPA (2016) Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.
- NSW OEH (2017) NSW Annual Compliance Report 2015.
- US EPA (2001) AP42 Compilation of Air Pollutant Emission Factors, Fifth Edition —
USEPA AP-42 Chapter 13.2.2 Unpaved Roads (US EPA 2006a).
- USEPA AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles (US EPA 2006b).
- USEPA AP-42 Chapter 13.2.5 Industrial Wind Erosion (US EPA 2006b).

SCOPE OF SERVICES

This environmental site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data and has not conducted any environmental field monitoring or testing in the preparation of the report. The conclusions are based upon the data and visual observations and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Within the limitations imposed by the scope of services, the assessment of the site and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client and no other party. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party in relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

WSP will not be liable to update or revise the report to take into account any events, emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to nor ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

APPENDIX A

FIGURES



ENGESIA

1.15.



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Figure 1



Map: PS105863_GIS_F002_A

Author: PottsR

Date: 9/01/2018

Approved by: JW

Source: © Land and Property Information 2015



1:12,500

M. Collins and Sons

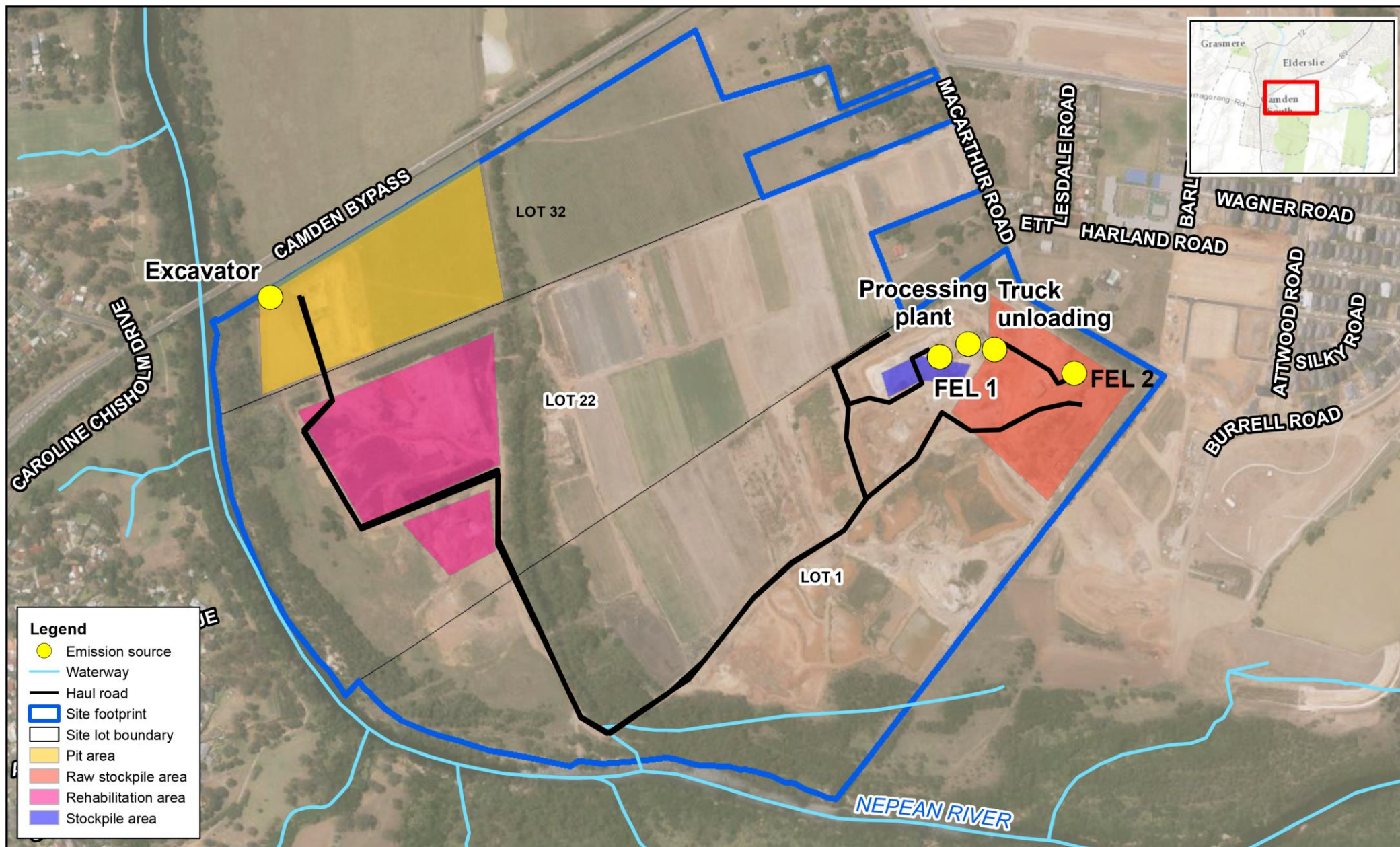
Coordinate system: GDA 1984 MGA Zone 56
Scale ratio correct when printed at A4

Spring Farm Quarry 2017

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Figure 2

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APPENDIX B

EMISSION INVENTORY



15 B1 EMISSION CALCULATIONS

Particulate emissions were estimated using the following sources:

- NPI Emission Estimation Technique Manual for Mining and Processing of non-Metallic Minerals (NPI 2014).
- NPI Emission Estimation Technique Manual for Mining (NPI 2012).
- USEPA AP-42 Chapter 13.2.2 Unpaved Roads (US EPA 2006a).
- USEPA AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles (US EPA 2006b).
- USEPA AP-42 Chapter 13.2.5 Industrial Wind Erosion (US EPA 2006b).

Material properties, emission estimation equations and emission source activity rates for the selected operational scenario for the Spring Hill Quarry.

Emission source model locations are presented in Figure 3, Appendix A.

Table B.1 Material properties

PROPERTIES	UNITS	VALUE	SOURCE OF INFORMATION
Silt content of excavated material	%	8.5	US-EPA (2006a) mean value for “construction sites”
Silt content of unpaved roads	%	6.9	US-EPA AP42 (1998) mean value for “overburden”
Moisture content of excavated material	%	7.9	US-EPA AP42 (1998) mean value for “overburden”

Table B.2 Emission equations

INVENTORY ACTIVITY	UNITS	TSP EMISSION FACTOR / EQUATION	PM ₁₀ EMISSION FACTOR / EQUATION	PM _{2.5} EMISSION FACTOR / EQUATION	VARIABLES	EF SOURCE
Material handling (material extraction, loading trucks, unloading trucks)	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}} \right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}} \right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}} \right)$	U = mean wind speed (m/s) M = material moisture content (%)	AP42 13.2.4
Hauling on unsealed roads	kg/VKT	$\left(\frac{0.4536}{1.6093} \right) \times 4.9 * \left(\frac{s}{12} \right)^{0.7} \times \left(\frac{W \times 1.1023}{3} \right)^{0.45}$	$\left(\frac{0.4536}{1.6093} \right) \times 1.5 * \left(\frac{s}{12} \right)^{0.9} \times \left(\frac{W \times 1.1023}{3} \right)^{0.45}$	$\left(\frac{0.4536}{1.6093} \right) \times 0.15 * \left(\frac{s}{12} \right)^{0.9} \times \left(\frac{W \times 1.1023}{3} \right)^{0.45}$	s = surface material silt content (%) W = mean vehicle weight (tonnes)	AP42 13.2.2
Wind erosion – exposed areas and stockpiles	kg/ha/hr	0.40	0.20	0.03	Default	NPI (2012)

Mitigation measures applied to the emissions inventory are detailed below in Table B.3.

Table B.3 Mitigation Measures

INVENTORY ACTIVITY	UNITS	MITIGATION	CONTROL EFFICENCY (%)	SOURCE
Hauling on unsealed roads	kg/VKT	Designated water cart on the site - (>2L/m2/Hr)	75%	NPI (2012)
Excavator in pit	Kg/t	Pit retention	50% TSP, 5% PM10	NPI (2012)
Wind erosion – Pit	Kg/Ha	Pit retention	50% TSP, 5% PM10	NPI (2012)

Wind Erosion – Rehabilitation area	Kg/Ha	Primary Rehabilitation	30%	NPI (2012)
Washed stockpiles	Kg/Ha	Water sprays	50%	NPI (2012)

Table B.4 Emissions Inventory

Emissions Inventory													
EMISSION SOURCE	SOURCE ID	ACTIVITY	EMISSION FACTOR			UNITS	ACTIVITY RATE	UNITS	MITIGATION	REDUCTION APPLIED	EMISSION RATE (G/S)		
			TSP	PM ₁₀	PM _{2.5}							TSP	PM ₁₀
Extraction Area													
Excavator	S1	Removal of insitu resource, stockpiling of sand, truck loading	0.00020	0.000094	0.0000095	kg/t	200	tonnes/hr	Pit retention	50% TSP, 5% PM10	5.52E-06 4.96E-06 5.26E-07		
Hauling		Transport of material within site	3.77136	1.03354	0.10335	kg/VKT	15.5	VKT/hr	Water Cart (>2L/m2/Hr)	75%	1.76E-07 4.84E-08 4.84E-09		

Hauling		Transport of material directly offsite from pit	3.77136	1.03354	0.10335	kg/VKT	7.4	VKT/hr	Water cart (>2L/m2/Hr)	75%	8.81E-08	2.41E-08	2.41E-09
Open pit / stockpiles		Wind erosion	0.4	0.2	0.03	kg/ha/hr	6	ha	Pit retention	50% TSP, 5% PM10	3.33E-07	3.17E-07	5.00E-08
Rehabilitation Area													

EMISSION SOURCE	SOURCE ID	ACTIVITY	EMISSION FACTOR			UNITS	ACTIVITY RATE	UNITS	MITIGATION	REDUCTION APPLIED	EMISSION RATE (G/S)		
			TSP	PM ₁₀	PM _{2.5}						TSP	PM ₁₀	PM _{2.5}
Open Pit		Wind erosion	0.4	0.2	0.03	kg/ha/hr	3	ha	Primary rehabilitation	30%	2.33E-07	1.17E-07	1.75E-08

Processing Area													
Truck unloading		Unloading product into hopper	0.00020	0.000094	0.0000095	kg/t	200	tonnes/hr	NIL	NIL	1.10E-08	5.22E-09	5.26E-10
Front end loader		Stockpiling washed product and truck loading	0.00020	0.000094	0.0000095	kg/t	200	tones/hr	NIL	NIL	1.10E-08	5.22E-09	5.26E-10

Front end loader		Managing raw product stockpiles and transfer product to processing hopper	0.00020	0.000094	0.0000095	kg/t	200	tones/hr	NIL	NIL	1.10E-08	5.22E-09	5.26E-10
Hauling		Transport from raw stockpile to processing hopper	3.77136	1.03354	0.10335	kg/VKT	3.9	VKT/hr	Water Cart (>2L/m2/Hr)	75%	1.94E-06	5.31E-07	5.31E-08
Raw stockpiling area		Wind erosion	0.4	0.2	0.03	kg/ha/hr	4	ha	NIL	NIL	4.44E-07	2.22E-07	3.33E-08
EMISSION SOURCE	SOURCE ID	ACTIVITY	EMISSION FACTOR			UNITS	ACTIVITY RATE	UNITS	MITIGATION	REDUCTION APPLIED	EMISSION RATE (G/S)		
			TSP	PM ₁₀	PM _{2.5}						TSP	PM ₁₀	PM _{2.5}
washed stockpiles		Wind erosion	0.4	0.2	0.03	kg/ha/hr	0.44	ha	Water spraying	50%	2.44E-08	1.22E-08	1.83E-09
Haul roads		Transporting product off site	3.77136	1.03354	0.10335	kg/VKT	3.4	VKT/hr	Water Cart (>2L/m2/Hr)	75%	8.90E-07	6.10E-08	2.44E-08

APPENDIX C

EXAMPLE AUSPLUME MODEL OUTPUT



PM10_24hr_yearly

Concentration or deposition	Concentration
Emission rate units	grams/second
Concentration units	microgram/m3
Units conversion factor	1.00E+06
Constant background concentration	0.00E+00
Terrain effects	Egan method
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	Yes
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Use the convective PDF algorithm?	No

Averaging time for sigma-theta values
60 min.

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Sigma-theta
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.100m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes

Building downwash algorithm:
PRIME method.

Entrainment coeff. for neutral & stable lapse rates 0.60,0.60

Partial penetration of elevated inversions? No

Disregard temp. gradients in the hourly met. file? No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

	Wind Speed		Stability Class				
	Category	A	B	C	D	E	F
1		0.000	0.000	0.000	0.000	0.020	0.035
2		0.000	0.000	0.000	0.000	0.020	0.035
3		0.000	0.000	0.000	0.000	0.020	0.035
4		0.000	0.000	0.000	0.000	0.020	0.035
5		0.000	0.000	0.000	0.000	0.020	0.035

[illegible]

PM10_24hr_yearly

SOURCE CHARACTERISTICS

INTEGRATED POLYGON AREA SOURCE: S4

X0(m)	Y0(m)	Ground El	No. Vertices	Ver. spread	Height
287882	6227420	66m	4	1m	1m

Integrated Polygon Area Source Vertice Locations (in metres)

No.	X	Y	No.	X	Y
1	287882	6227420	2	287873	6227577
3	288202	6227765	4	288237	6227563

(Constant) emission rate = 1.17E-07 grams/second per square metre scavenging.

No gravitational settling or

INTEGRATED POLYGON AREA SOURCE: S5

X0(m)	Y0(m)	Ground El	No. Vertices	Ver. spread	Height
288157	6227157	66m	4	1m	1m

Integrated Polygon Area Source Vertice Locations (in metres)

No.	X	Y	No.	X	Y
1	288157	6227157	2	287933	6227400
3	288224	6227515	4	288223	6227193

(Constant) emission rate = 1.17E-07 grams/second per square metre scavenging.

No gravitational settling or

INTEGRATED POLYGON AREA SOURCE: S10

X0(m)	Y0(m)	Ground El	No. Vertices	Ver. spread	Height
289034	6227271	73m	5	1m	1m

Integrated Polygon Area Source Vertice Locations (in metres)

No.	X	Y	No.	X	Y
1	289034	6227271	2	288894	6227399
3	288953	6227482	4	288955	6227570
5	289162	6227435			

(Constant) emission rate = 2.22E-07 grams/second per square metre scavenging.

No gravitational settling or

INTEGRATED POLYGON AREA SOURCE: S11

X0(m)	Y0(m)	Ground El	No. Vertices	Ver. spread	Height
-------	-------	-----------	--------------	-------------	--------

288806 6227419 73m 6 1m 1m

Integrated Polygon Area Source Vertice Locations (in metres)

No.	X	Y	No.	X	Y
1	288806	6227419	2	288793	6227455
3	288846	6227482	4	288924	6227468
5	288913	6227441	6	288854	6227443

(Constant) emission rate = 1.20E-08 grams/second per square metre
scavenging.

No gravitational settling or

VOLUME SOURCE: S1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287895	6227567	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.96E-06	8	4.96E-06
9	4.96E-06	10	4.96E-06	11	4.96E-06	12	4.96E-06
13	4.96E-06	14	4.96E-06	15	4.96E-06	16	4.96E-06
17	4.96E-06	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287947	6227555	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational settling or scavenging.

VOLUME SOURCE: S2-2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287984	6227430	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00

21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287965	6227389	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-4

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287970	6227326	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-5

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287989	6227291	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-6

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288015	6227246	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-7

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288046	6227234	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-8

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288046	6227247	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-9

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288124	6227263	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-10

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread	
288175	6227289	68m	1m	1m	1m	Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-11

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288230	6227255	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-12

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288240	6227183	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-13

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288278	6227100	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-14

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288317	6227010	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-15

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288384	6226931	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-16

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
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288489 6226993 68m 1m 1m 1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-17

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288566	6227076	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-18

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288626	6227147	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08
17 4.80E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

VOLUME SOURCE: S2-19

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288756	6227247	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 4.80E-08	8 4.80E-08
9 4.80E-08	10 4.80E-08	11 4.80E-08	12 4.80E-08
13 4.80E-08	14 4.80E-08	15 4.80E-08	16 4.80E-08

17 4.80E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-20

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288842	6227324	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 4.80E-08 8 4.80E-08
9 4.80E-08 10 4.80E-08 11 4.80E-08 12 4.80E-08
13 4.80E-08 14 4.80E-08 15 4.80E-08 16 4.80E-08
17 4.80E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-21

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288879	6227392	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 4.80E-08 8 4.80E-08
9 4.80E-08 10 4.80E-08 11 4.80E-08 12 4.80E-08
13 4.80E-08 14 4.80E-08 15 4.80E-08 16 4.80E-08
17 4.80E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-22

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288967	6227368	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 4.80E-08 8 4.80E-08
9 4.80E-08 10 4.80E-08 11 4.80E-08 12 4.80E-08
13 4.80E-08 14 4.80E-08 15 4.80E-08 16 4.80E-08
17 4.80E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S2-23

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
289070	6227410	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	4.80E-08	8	4.80E-08
9	4.80E-08	10	4.80E-08	11	4.80E-08	12	4.80E-08
13	4.80E-08	14	4.80E-08	15	4.80E-08	16	4.80E-08
17	4.80E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287947	6227555	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287984	6227430	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287965	6227389	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-4

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread	Emission rates by hour of day in grams/second:
287970	6227326	68m	1m	1m	1m	

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-5

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
287989	6227291	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-6

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288015	6227246	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-7

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288046	6227234	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-8

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288046	6227247	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-9

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288124	6227263	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-10

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
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288175 6227289 68m 1m 1m 1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 2.40E-08	8 2.40E-08
9 2.40E-08	10 2.40E-08	11 2.40E-08	12 2.40E-08
13 2.40E-08	14 2.40E-08	15 2.40E-08	16 2.40E-08
17 2.40E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-11

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288230	6227255	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 2.40E-08	8 2.40E-08
9 2.40E-08	10 2.40E-08	11 2.40E-08	12 2.40E-08
13 2.40E-08	14 2.40E-08	15 2.40E-08	16 2.40E-08
17 2.40E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-12

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288240	6227183	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 2.40E-08	8 2.40E-08
9 2.40E-08	10 2.40E-08	11 2.40E-08	12 2.40E-08
13 2.40E-08	14 2.40E-08	15 2.40E-08	16 2.40E-08
17 2.40E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

VOLUME SOURCE: S3-13

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288278	6227100	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 2.40E-08	8 2.40E-08
9 2.40E-08	10 2.40E-08	11 2.40E-08	12 2.40E-08
13 2.40E-08	14 2.40E-08	15 2.40E-08	16 2.40E-08

17 2.40E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-14

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288317	6227010	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 2.40E-08 8 2.40E-08
9 2.40E-08 10 2.40E-08 11 2.40E-08 12 2.40E-08
13 2.40E-08 14 2.40E-08 15 2.40E-08 16 2.40E-08
17 2.40E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-15

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288384	6226931	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 2.40E-08 8 2.40E-08
9 2.40E-08 10 2.40E-08 11 2.40E-08 12 2.40E-08
13 2.40E-08 14 2.40E-08 15 2.40E-08 16 2.40E-08
17 2.40E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-16

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288489	6226993	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00 2 0.00E+00 3 0.00E+00 4 0.00E+00
5 0.00E+00 6 0.00E+00 7 2.40E-08 8 2.40E-08
9 2.40E-08 10 2.40E-08 11 2.40E-08 12 2.40E-08
13 2.40E-08 14 2.40E-08 15 2.40E-08 16 2.40E-08
17 2.40E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-17

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288566	6227076	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-18

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288626	6227147	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-19

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288756	6227247	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-20

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288756	6227316	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-21

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread	Emission rates by hour of day in grams/second:
288741	6227407	68m	1m	1m	1m	

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S3-22

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288774	6227492	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	2.40E-08	8	2.40E-08
9	2.40E-08	10	2.40E-08	11	2.40E-08	12	2.40E-08
13	2.40E-08	14	2.40E-08	15	2.40E-08	16	2.40E-08
17	2.40E-08	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S6

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288962	6227490	68m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	5.00E-09	8	5.00E-09
9	5.00E-09	10	5.00E-09	11	5.00E-09	12	5.00E-09
13	5.00E-09	14	5.00E-09	15	5.00E-09	16	5.00E-09
17	5.00E-09	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S7

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288881	6227479	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	5.00E-09	8	5.00E-09
9	5.00E-09	10	5.00E-09	11	5.00E-09	12	5.00E-09
13	5.00E-09	14	5.00E-09	15	5.00E-09	16	5.00E-09
17	5.00E-09	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S8

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
289079	6227455	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	5.00E-09	8	5.00E-09
9	5.00E-09	10	5.00E-09	11	5.00E-09	12	5.00E-09
13	5.00E-09	14	5.00E-09	15	5.00E-09	16	5.00E-09
17	5.00E-09	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S9

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
289004	6227480	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1	0.00E+00	2	0.00E+00	3	0.00E+00	4	0.00E+00
5	0.00E+00	6	0.00E+00	7	1.94E-06	8	1.94E-06
9	1.94E-06	10	1.94E-06	11	1.94E-06	12	1.94E-06
13	1.94E-06	14	1.94E-06	15	1.94E-06	16	1.94E-06
17	1.94E-06	18	0.00E+00	19	0.00E+00	20	0.00E+00
21	0.00E+00	22	0.00E+00	23	0.00E+00	24	0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S12-1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
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288857 6227484 73m 1m 1m 1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 6.10E-08	8 6.10E-08
9 6.10E-08	10 6.10E-08	11 6.10E-08	12 6.10E-08
13 6.10E-08	14 6.10E-08	15 6.10E-08	16 6.10E-08
17 6.10E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S12-2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288828	6227424	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 6.10E-08	8 6.10E-08
9 6.10E-08	10 6.10E-08	11 6.10E-08	12 6.10E-08
13 6.10E-08	14 6.10E-08	15 6.10E-08	16 6.10E-08
17 6.10E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational

settling or scavenging.

VOLUME SOURCE: S12-3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288755	6227411	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 6.10E-08	8 6.10E-08
9 6.10E-08	10 6.10E-08	11 6.10E-08	12 6.10E-08
13 6.10E-08	14 6.10E-08	15 6.10E-08	16 6.10E-08
17 6.10E-08	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

VOLUME SOURCE: S12-4

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
288759	6227483	73m	1m	1m	1m

Emission rates by hour of day in grams/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 0.00E+00
5 0.00E+00	6 0.00E+00	7 6.10E-08	8 6.10E-08
9 6.10E-08	10 6.10E-08	11 6.10E-08	12 6.10E-08
13 6.10E-08	14 6.10E-08	15 6.10E-08	16 6.10E-08

17 6.10E-08 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 0.00E+00

No gravitational settling or

scavenging.

1

PM10_24hr_yearly

RECEPTOR LOCATIONS

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEV	HEIGHT	No.	X	Y	ELEV	HEIGHT
1	288695	6227886	73.0	1.2	4	289236	6227467	77.0	1.2
2	288809	6227636	74.0	1.2	5	289187	6227589	71.0	1.2
3	289148	6227255	77.0	1.2	6	287838	6227099	70.0	1.2

METEOROLOGICAL DATA : Spring Farm

AVERAGE OVER ALL HOURS FOR SOURCE GROUP No. 1
in microgram/m3

Concentrations at the discrete receptors (No. : Value):

1:2.25E-01 2:3.13E-01 3:2.55E-01 4:5.83E-01 5:6.85E-01
6:2.04E-01

AVERAGE OVER ALL HOURS FOR SOURCE GROUP No. 2
in microgram/m3

Concentrations at the discrete receptors (No. : Value):

1:2.25E-01 2:3.12E-01 3:2.55E-01 4:5.83E-01 5:6.85E-01
6:2.04E-01

AVERAGE OVER ALL HOURS FOR SOURCE GROUP No. 3
in microgram/m3

Concentrations at the discrete receptors (No. : Value):

1:1.07E-05 2:7.14E-06 3:2.76E-06 4:3.29E-06 5:4.00E-06

6:1.94E-05

AVERAGE OVER ALL HOURS FOR SOURCE GROUP No. 4
in microgram/m3

Concentrations at the discrete receptors (No. : Value):

1:1.21E-06 2:2.78E-06 3:1.10E-06 4:1.07E-06 5:1.21E-06
6:2.68E-06

AVERAGE OVER ALL HOURS FOR SOURCE GROUP No. 5
in microgram/m3

Concentrations at the discrete receptors (No. : Value):

1:1.21E-06 2:2.78E-06 3:1.10E-06 4:1.07E-06 5:1.21E-06 6:2.68E-06

1 HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 1

At the discrete receptors:

1: 1.01E+00 @Hr24,04/07/15 4: 2.93E+00 @Hr24,14/08/15
2: 1.21E+00 @Hr24,12/06/15 5: 2.95E+00 @Hr24,05/07/15
3: 2.50E+00 @Hr24,08/06/15 6: 1.30E+00 @Hr24,19/05/15

1 HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 2

At the discrete receptors:

1: 1.01E+00 @Hr24,04/07/15 4: 2.93E+00 @Hr24,14/08/15
2: 1.21E+00 @Hr24,12/06/15 5: 2.95E+00 @Hr24,05/07/15
3: 2.50E+00 @Hr24,08/06/15 6: 1.30E+00 @Hr24,19/05/15

1 HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 3

At the discrete receptors:

1: 9.29E-05 @Hr24,03/06/15 4: 2.93E-05 @Hr24,06/07/15
2: 5.06E-05 @Hr24,06/07/15 5: 3.47E-05 @Hr24,07/05/15
3: 2.36E-05 @Hr24,20/05/15 6: 1.51E-04 @Hr24,16/06/15

1 HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 4

At the discrete receptors:

1: 5.24E-06 @Hr24,19/07/15 4: 7.25E-06 @Hr24,03/06/15
2: 1.48E-05 @Hr24,10/06/15 5: 8.22E-06 @Hr24,21/06/15
3: 6.79E-06 @Hr24,06/07/15 6: 2.26E-05 @Hr24,17/06/15

1 HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 5

At the discrete receptors:

1: 5.24E-06 @Hr24,19/07/15 4: 7.25E-06 @Hr24,03/06/15
2: 1.48E-05 @Hr24,10/06/15 5: 8.22E-06 @Hr24,21/06/15
3: 6.79E-06 @Hr24,06/07/15 6: 2.26E-05 @Hr24,17/06/15

1 SECOND-HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 1

At the discrete receptors:

1: 9.60E-01 @Hr24,19/07/15 4: 2.89E+00 @Hr24,05/06/15
2: 1.13E+00 @Hr24,10/02/15 5: 2.88E+00 @Hr24,04/07/15
3: 1.76E+00 @Hr24,20/05/15 6: 1.15E+00 @Hr24,23/03/15

1 SECOND-HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 2

At the discrete receptors:

1: 9.60E-01 @Hr24,19/07/15 4: 2.89E+00 @Hr24,05/06/15
2: 1.13E+00 @Hr24,10/02/15 5: 2.88E+00 @Hr24,04/07/15
3: 1.76E+00 @Hr24,20/05/15 6: 1.15E+00 @Hr24,23/03/15

1 SECOND-HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 3

At the discrete receptors:

1: 8.73E-05 @Hr24,24/05/15 4: 2.90E-05 @Hr24,01/09/15
2: 4.99E-05 @Hr24,07/05/15 5: 3.35E-05 @Hr24,02/07/15

3: 2.25E-05 @Hr24,06/07/15 6: 1.25E-04 @Hr24,25/05/15

1 SECOND-HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
= 24 HOURS; SOURCE GROUP No. 4

AVERAGING TIME

At the discrete receptors:

1: 5.21E-06 @Hr24,28/06/15 4: 6.54E-06 @Hr24,23/04/15
2: 1.23E-05 @Hr24,25/05/15 5: 8.19E-06 @Hr24,03/06/15
3: 6.37E-06 @Hr24,05/06/15 6: 1.75E-05 @Hr24,16/06/15

1 SECOND-HIGHEST RECORDINGS FOR EACH RECEPTOR (in microgram/m3)
AVERAGING TIME = 24 HOURS; SOURCE GROUP No. 5

At the discrete receptors:

1: 5.21E-06 @Hr24,28/06/15 4: 6.54E-06 @Hr24,23/04/15
2: 1.23E-05 @Hr24,25/05/15 5: 8.19E-06 @Hr24,03/06/15
3: 6.37E-06 @Hr24,05/06/15 6: 1.75E-05 @Hr24,16/06/15

