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Project Atlas Data Centre

Air Quality Impact Assessment

Revision A – SSDA Submission

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Final Authority

This report must be regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below. A draft report is a working document, is issued without prejudice and is subject to change.



Varun Marwaha, CAQP

25 March 2026

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NON-TECHNICAL SUMMARY

This air quality impact assessment (AQIA) has been prepared by Northstar Air Quality Pty Ltd for Goodman Property Services (Aust) Pty Ltd, to accompany a State Significant Development Application for the construction and ongoing operation of a data centre facility and associated Offsite Enabling Infrastructure at 10 Roberts Road, Eastern Creek within the Blacktown Local Government Area. The Proposal site is legally described as Lot 553 in Deposited Plan 71110447.

This report has been prepared to address the Secretary's Environmental Assessment Requirements and accompanying cover letter issued for the Project Atlas Data Centre (SSD-101067971) dated 16 January 2026.

The Proposal comprises of the construction and operation of a data centre development which includes the following key components:

- Site preparation works including demolition, bulk excavation and removal of existing structures on the site, tree and vegetation clearing and bulk earthworks.
- Construction, fit-out and 24/7 operation of a data centre.
- Offsite enabling infrastructure.
- 2 data centre buildings:
 - Building 1 – 2 Level + rooftop plant
 - Building 2 – 3 Level + rooftop plant
- Ancillary office, EOT and amenity.
- Provision of required utilities including:
 - diesel storage tanks
 - water tanks
 - substations on site
- Vehicle access for 20 metre articulated vehicles (semi-trailers).
- Associated landscaping and site servicing.
- Installation of site services and drainage infrastructure.

During the construction phase, potential dust soiling and human health risks are considered manageable through the implementation of recommended mitigation measures. With these controls in place as part of a Construction Environment Management Plan, the residual construction-phase air quality impacts associated with the Proposal are considered acceptable.

During the operational phase, air emissions from emergency standby generators have been assessed as: (1) justified worst-case scenario (i.e. emergency power outage event with all generators operating); and (2) realistic scenario (i.e. maintenance testing). Based upon the assumptions presented in this report, the

Proposal is not predicted to cause any exceedance of the relevant air quality criteria at any identified receptor during either operating scenario.

Under realistic operating conditions, where standby generators are operated under an appropriate testing regime, predicted pollutant concentrations remain below the applicable air quality criteria.

In accordance with the NSW Department of Planning and Environment's 'Cumulative Impact Assessment Guidelines', this Air Quality Impact Assessment has proportionately addressed relevant cumulative air quality impacts. The cumulative impact assessment has been based on publicly available information, the regulatory context, and the likely scale and influence of surrounding future developments.

Potential cumulative impacts during overlapping construction phases, primarily related to dust emissions and human health risks have been evaluated. These impacts are expected to be effectively mitigated through site-specific Construction Environment Management Plans and appropriate controls implemented across each project.

During the operational phase, a potential cumulative scenario was identified in the event of a wide-scale electricity grid outage where multiple data centres, including the Proposal, may be required to operate backup generators simultaneously. This unlikely scenario would result in a temporary increase in emissions from each data centre. Such emergency events are recognised by the NSW Environment Protection Authority and are subject to regulatory allowances and controls. Routine maintenance testing presents limited potential for cumulative impacts, due to the short duration, staggered timing, and physical separation of facilities, alongside regulatory limits such as the 200-hour annual operating limit imposed under the *Protection of the Environment Operations Act 1997*.

CONTENTS

NON-TECHNICAL SUMMARY.....	III
1. INTRODUCTION	10
1.1. Purpose of the AQIA.....	10
1.2. NSW Planning Secretary Environmental Assessment Requirements.....	10
1.3. Other Regulatory Requirements.....	12
2. THE PROPOSAL	14
2.1. Environmental Setting.....	14
2.2. Proposal Overview.....	16
2.3. Identification of Emissions to Atmosphere.....	19
2.4. Alternative Options for Power Generation.....	22
3. LEGISLATION, REGULATION AND GUIDANCE	23
3.1. Protection of the Environment Operations Act 1997.....	23
3.2. Protection of the Environment Operations (Clean Air) Regulation.....	25
3.3. NSW Approved Methods	27
3.4. Blacktown Local Environmental Plan 2015.....	28
3.5. NSW Government Air Quality Planning	29
4. EXISTING CONDITIONS.....	31
4.1. Surrounding Land Sensitivity	31
4.2. Sensitive Receptor Locations	31
4.3. Meteorology	39
4.4. Background Air Quality	39
4.5. Topography	41
4.6. Potential for Cumulative Impacts	42
5. APPROACH TO ASSESSMENT.....	46
5.1. Construction Phase.....	46
5.2. Operational Phase	46
5.3. Assessment of Cumulative Impacts	60
6. CONSTRUCTION PHASE RISK ASSESSMENT	62

6.1.	Risk (Pre-Mitigation)	62
6.2.	Risk (Post-Mitigation)	62
7.	OPERATIONAL PHASE IMPACT ASSESSMENT	63
7.1.	Scenario 1 – Justified Worst-Case.....	63
7.2.	Scenario 2 – Maintenance Testing	74
7.3.	Assessment of Criteria Exceedances	84
7.4.	Comparison with POEO CAR Standards of Concentrations	85
7.5.	Cumulative Impact Assessment	86
8.	DISCUSSION AND CONCLUSION	96
8.1.	Construction Phase Risk Assessment	96
8.2.	Operational Phase Impact Assessment	96
8.3.	Cumulative Impacts	100
8.4.	Conclusion.....	101
9.	REFERENCES	103
APPENDIX A.....		104
APPENDIX B		109
APPENDIX C		124
APPENDIX D.....		131
APPENDIX E		137
APPENDIX F		147

FIGURES

Figure 1	Proposal site location.....	15
Figure 2	Proposal site layout	17
Figure 3	Proposal site layout – building - sections	18
Figure 4	Sensitive receptors and population density surrounding the Proposal site	38
Figure 5	Local topography	42
Figure 6	Locations of proximate neighbouring air emission sources.....	45
Figure 7	Buildings and discharge points considered in dispersion modelling (Scenario 1)	50
Figure 8	Buildings and discharge points considered in dispersion modelling (Scenario 2)	51
Figure 9	Predicted incremental 24-hour PM ₁₀ impacts – Scenario 1	67
Figure 10	Predicted incremental 1-hour NO ₂ impacts – Scenario 1.....	70
Figure 11	Predicted incremental 24-hour PM ₁₀ impacts – Scenario 2.....	78
Figure 12	Predicted incremental 1-hour NO ₂ impacts – Scenario 2	80
Figure 13	Endeavour Energy SAIDI performance information	98

TABLES

Table 1	NSW Planning SEARs (SSD-101067971).....	11
Table 2	NSW EPA Approved Methods – impact assessment reporting requirements	12
Table 3	Summary of key features	14
Table 4	Proposed emergency standby generator maintenance testing regime	21
Table 5	POEO CAR standards of concentrations for applicable air impurities	26
Table 6	NSW EPA impact assessment criteria.....	28
Table 7	NSW EPA impact assessment criteria for principal and individual toxic pollutants.....	28
Table 8	Discrete sensitive receptor locations	33
Table 9	NSW DCCEE AQMS within 10 km of the Proposal site	40
Table 10	Summary of background air quality data used in the AQIA	41
Table 11	Potential sources of air emissions proximate to the Proposal site	44
Table 12	General model parameters for CALPUFF dispersion modelling	47
Table 13	Emergency standby generator emissions and stack parameters	55
Table 14	Comparison of emissions concentrations against Schedule 2 Part 2 of POEO CAR	57
Table 15	Speciated VOC fractions	58
Table 16	Risk of air quality impacts from construction activities	62
Table 17	Predicted incremental 24-hour PM ₁₀ and PM _{2.5} concentrations – Scenario 1.....	64
Table 18	Summary of contemporaneous 24-hour PM ₁₀ concentrations – Scenario 1.....	66
Table 19	Summary of contemporaneous 24-hour PM _{2.5} concentrations – Scenario 1.....	66
Table 20	Predicted 1-hour NO ₂ concentrations – Scenario 1	68
Table 21	Predicted 15-minutes, 1-hour and 8-hour average CO concentrations – Scenario 1.....	71
Table 22	Predicted 1-hour and 24-hour SO ₂ concentrations – Scenario 1.....	72
Table 23	Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations – Scenario 1	73
Table 24	Predicted annual average TSP, PM ₁₀ and PM _{2.5} concentrations – Scenario 2.....	74
Table 25	Predicted incremental 24-hour PM ₁₀ and PM _{2.5} concentrations – Scenario 2	75
Table 26	Summary of contemporaneous 24-hour PM ₁₀ concentrations – Scenario 2	77
Table 27	Summary of contemporaneous 24-hour PM _{2.5} concentrations – Scenario 2	77

Table 28	Predicted 1-hour and annual average NO ₂ concentrations – Scenario 2	79
Table 29	Predicted 15-minute, 1-hour and 8-hour average CO concentrations – Scenario 2	81
Table 30	Predicted 1-hour and 24-hour SO ₂ concentrations – Scenario 2	82
Table 31	Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations - Scenario 2	83
Table 32	Assessment of the number of additional exceedances – Scenario 1, PM ₁₀ and PM _{2.5}	84
Table 33	Assessment of the number of additional exceedances – Scenario 1, NO ₂	85
Table 34	POEO CAR – Standards of concentrations comparison	86
Table 35	Local air pollutant sources with potential for cumulative impacts	87
Table 36	Probability of an exceedance during a power outage	98

1. INTRODUCTION

This air quality impact assessment (AQIA) has been prepared by Northstar Air Quality Pty Ltd (Northstar) for Goodman Property Services (Aust) Pty Ltd (Goodman), to accompany a State Significant Development Application (SSDA) for the construction and ongoing operation of a data centre facility and associated Offsite Enabling Infrastructure (OEI) (the Proposal) at 10 Roberts Road, Eastern Creek (the Proposal site) within the Blacktown Local Government Area (LGA). The Proposal site is legally described as Lot 553 in Deposited Plan (DP) 71110447.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and accompanying cover letter issued for the Project Atlas Data Centre (SSD-101067971) dated 16 January 2026.

The AQIA is to be submitted to NSW Department of Planning, Housing, and Infrastructure (NSW DPHI) and has been performed in accordance with the NSW Environment Protection Authority (NSW EPA) 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (the Approved Methods) (NSW EPA, 2022).

1.1. Purpose of the AQIA

The purpose of this AQIA is to examine and identify whether the impacts of the construction and operation of the Proposal may adversely impact on air quality in the surrounding area.

To allow assessment of the level of risk associated with the Proposal in relation to air quality, the AQIA has been performed in accordance with and due reference to (in no order):

- *Protection of the Environment Operations Act 1997* (POEO Act);
- Protection of the Environment Operations (Clean Air) Regulation 2022 (POEO CAR);
- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024); and
- Approved Methods for Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2022).

Appendix A presents a list of abbreviations, nomenclature and units used in this AQIA.

1.2. NSW Planning Secretary Environmental Assessment Requirements

This report has been prepared to address the specific requirements outlined in the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) which were issued for the SSDA (SSD-101067971) on 16 January 2026.

Table 1 details the SEARs coverage and indicates where each requirement has been addressed within this AQIA.

Table 1 NSW Planning SEARs (SSD-101067971)

Description of requirements		Addressed
Air Quality		
A quantitative assessment of the potential air quality, dust and odour impacts of the development (construction and operation) on surrounding sensitive receptors, in accordance with relevant Environment Protection Authority (EPA) guidelines, which includes:		This AQIA
modelling of emissions and air pollutants from predicted operations, including consideration of power unit testing, routine maintenance works that require use of power units and emergency scenario/s		Section 5.2 Section 7.1 Section 7.2
a cumulative assessment that considers all proposed and approved developments in proximity to the site for both construction and operation (including, but not limited to, other data centre developments in the vicinity of the site)		Section 4.6 Section 5.3 Section 7.5 Section 8.3
if operation of the development is staged, an assessment of each stage in isolation to accurately represent the predicted air quality impacts of each stage		Section 5.2.2 Section 7.2
a description of best practice air quality impact mitigation, management and monitoring measures that would be implemented.		Section 8.2.5 Appendix B
Attachment A – 4. Air Issues		
4.1 The EIS must demonstrate the proposal's ability to comply with the relevant regulatory framework, specifically the POEO Act and the Protection of the Environment Operations (Clean Air) Regulation 2022. This consideration should include section 129 of the POEO Act concerning control of "offensive odour".	Compliance with the relevant provisions of the POEO Act and the Protection of the Environment Operations (Clean Air) Regulation 2022 is addressed in Section 3.2. The Proposal is expected to constitute a scheduled activity under Clause 9, Schedule 1, Part 1 of the POEO Act (chemical storage), noting that annual generator testing hours are not anticipated to exceed 200 hours. Assessment of predicted in-stack concentrations against the applicable standards of concentration in the POEO (Clean Air) Regulation is provided in Section 7.4. Consideration of Section 129 of the POEO Act ("offensive odour") is incorporated, with potential odour impacts described in Section 2.3.3. Potential odorants associated with generator operation, including VOCs such as toluene (C₇H₈) and xylene (C₈H₁₀), have been evaluated. These compounds have been assessed against the 99.9th percentile 1-hour odour impact assessment criteria to address the potential for odour-related impacts.	
4.2 The EIS must include an air quality impact assessment (AQIA). The AQIA must be carried out in accordance with the document, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2022).	This AQIA has been prepared for the Proposal in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW. It quantitatively evaluates potential impacts from operational phases, including routine operations and worst-case emergency scenarios.	

Description of requirements	Addressed
4.3 The EIS must detail emission control techniques / practices that will be employed at the site and identify how the proposed control techniques/practices will meet the requirements of the POEO Act, POEO (Clean Air) Regulation (2022) and criteria within Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2022).	Relevant emissions control techniques and practices are detailed in Section 8.2.5 (Operations), and Appendix B (Construction).

1.3. Other Regulatory Requirements

Section 9 of the Approved Methods outlines the NSW EPA's requirements for the information to be included in an AQIA. Table 2 summarises each requirement relevant to this type of development proposal and outlines where this information can be located in the AQIA.

Table 2 NSW EPA Approved Methods – impact assessment reporting requirements

Assessment component	Addressed
9.1 Site Plan	
Layout of the site clearly showing all unit operations	Figure 2
All emissions sources clearly identified	Figure 7 Figure 8
Plant boundary	Figure 2
Sensitive receptors (e.g. nearest residences)	Figure 4
Topography	Figure 5
9.2 Description of the activities carried out on the site	
A detailed discussion of all unit operations carried out on the site, including all possible operational variability	Section 2.2
A detailed list of all process inputs and outputs	Section 2.2 Section 2.3
Plans, process flow diagrams and descriptions that clearly identify and explain all pollution control equipment and techniques for all processes on the premises	Figure 2 - Figure 3 Section 2.2
A description of all aspects of the air emission control system, with particular regard to any fugitive emission capture systems (e.g. hooding, ducting), treatment systems (e.g. scrubbers, bag filters) and discharge systems (e.g. stacks)	Section 2.2 Section 2.3
The operational parameters of all emission sources, including all operational variability, i.e. location, release type (stack, volume or area) and release parameters (e.g. stack height, stack diameter, exhaust velocity, temperature, emission concentration and rate)	Table 13 Section 5.2.3

Assessment component	Addressed
9.3 Emissions Inventory	
A detailed discussion of the methodology used to calculate the expected pollutant emission rates for each source	Section 5.2.3
Detailed calculation of pollutant emission rates for each source	Table 13, Table 15
Tables showing all release parameters of stack and fugitive sources (e.g. temperature, exit velocity, stack dimensions, and emission concentrations and rates)...	Table 13, Table 15
...and all pollutant emission concentrations with a comparison of the emission concentrations against the relevant requirements of the Regulation	Table 5, Table 14 Table 34
9.4 Meteorological data	
A detailed discussion of the prevailing dispersion meteorology at the proposed site. The report should typically include wind rose diagrams, an analysis of wind speed, wind direction, stability class, ambient temperature and mixing height; and joint frequency distributions of wind speed and wind direction as a function of stability class	Section 4.3 Appendix C
Demonstration that the site-representative data adequately describes the expected meteorological patterns at the site under investigation (e.g. wind speed, wind direction, ambient temperature, atmospheric stability class, inversion conditions and katabatic drift)	Appendix C
A description of the techniques used to prepare the meteorological data into a format for use in the dispersion modelling	Section 4.3 Section 5.2.1.2 Appendix C
A quality assurance and quality control analysis of the meteorological data used in the dispersion modelling. Provide and discuss any relevant results of this analysis	Appendix C
9.5 Background air quality data	
A detailed discussion of the methodology used to calculate the background concentrations for each pollutant	Section 4.4 Appendix D
Tables summarising the ambient monitoring data	Table 10 Appendix D
9.6 Dispersion modelling	
A detailed discussion and justification of all parameters used in the dispersion modelling and the manner in which topography, building wake effects and other site-specific peculiarities that may affect plume dispersion have been treated	Section 5.2.1
A detailed discussion of the methodology used to account for any atmospheric pollutant formation and chemistry	Section 5.2.7
A detailed discussion of air quality impacts for all relevant pollutants, based on predicted ground-level concentrations at the plant boundary and beyond, and at all sensitive receptors	Section 7.1 - Section 7.3 Section 8.2
Ground-level concentrations, hazard index and risk isopleths (contours) and tables summarising the predicted concentrations of all relevant pollutants at sensitive receptors	Section 7.1 – 7.3 Figure 9

2. THE PROPOSAL

The following provides a description of the context, location and scale of the Proposal, and a description of the processes and development activities on site. It also identifies the potential for emissions to air associated with the Proposal.

2.1. Environmental Setting

The Proposal site is located at 10 Roberts Road, Eastern Creek, legally referred to as Lot 553 Deposited Plan (DP) 1110447 with Offsite Enabling Infrastructure (OEI) proposed across Lot 21 DP 1246626, Lot 20 DP 1157491, and Lot 22 DP 1246626 to connect to TransGrid's Sydney West Substation & Switchyard (refer to Figure 1 below). The Proposal site is located on Country of the Dharug people within the local government area of Blacktown. The Proposal site has a land area of approximately 168 574 m².

The Proposal site is identified as part of the Eastern Creek Precinct Stage 3 within the Western Sydney Employment Area. It is located approximately 35 km from the Sydney Central Business District (CBD) and 5.1 kilometres (km) from Rooty Hill Train Station.

The Proposal site has a site area of approximately 17 hectares (ha) and is bounded by industrial development and has a primary frontage of 400 metres (m) to Roberts Road. The existing site contains an industrial warehouse and surrounding hardstand areas.

Surrounding land uses in the vicinity include:

- Northeast: A range of mixed-use industry & commercial buildings.
- Southeast: Data Centre and substation.
- South, southwest and west: land primarily owned and operated by TransGrid Sydney.
- Northwest: Commercial industry and the Industrial Harvest café.

The Proposal site is zoned IN1 General Industrial within Chapter 2 Western Sydney Employment Area of State Environmental Planning Policy (Industry and Employment) 2021 (IESEPP). The Proposal is permissible with development consent in the IN1 zone as per the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP). A summary of key features for the site and surrounding context is summarised in Table 3.

Table 3 Summary of key features

Item	Description
Site Area	Data Centre – 168 574 m ²
Ownership	Goodman
Legal Description	Data Centre – Lot 553 DP 1110447 OEI – Lot 21 DP 1246626, Lot 20 DP 1157491, and Lot 22 DP 1246626

Figure 1 Proposal site location



Source: Northstar

2.2. Proposal Overview

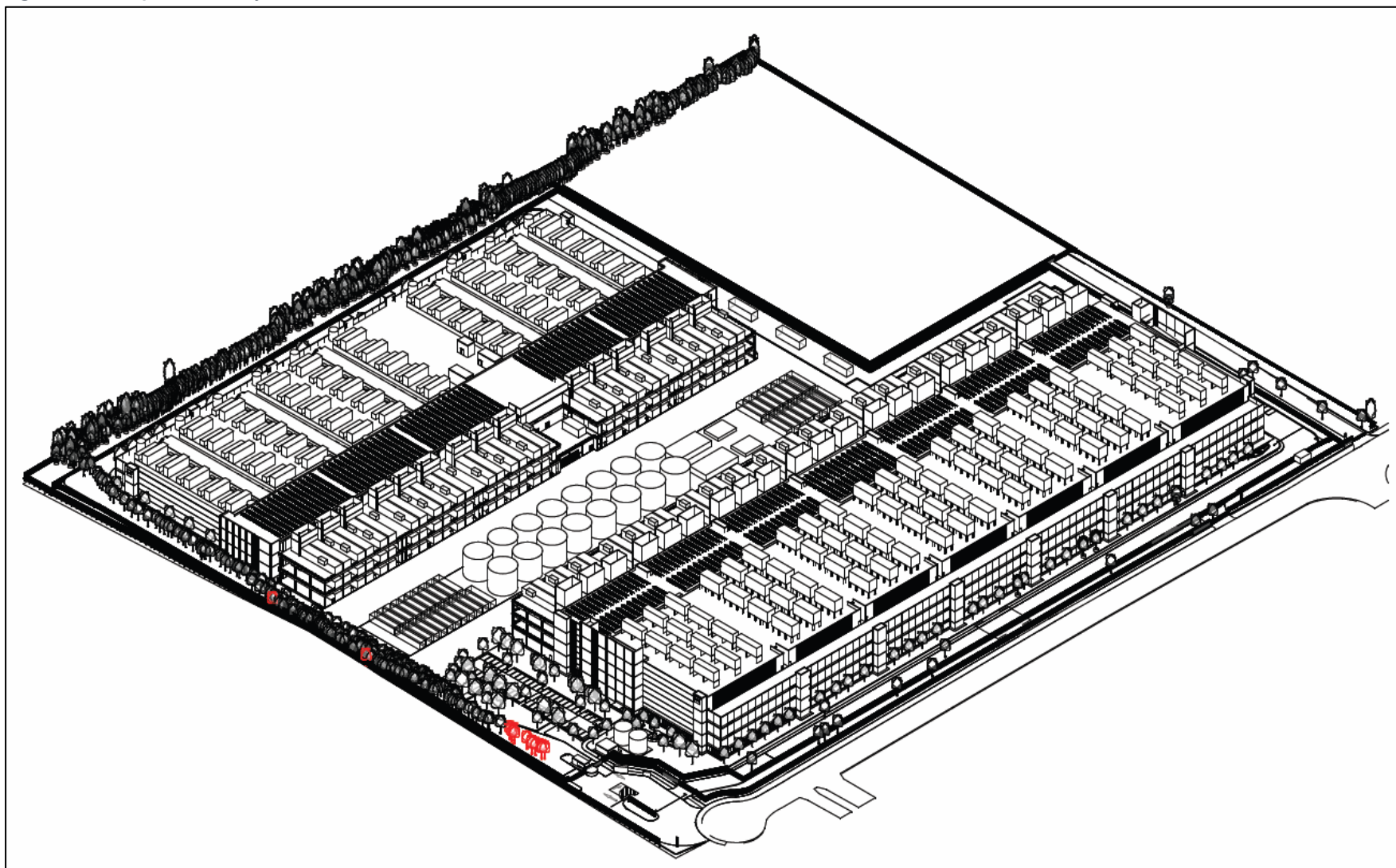
The Proposal comprises of the construction and operation of a data centre development which includes the following key components:

- Site preparation works including demolition, bulk excavation and removal of existing structures on the site, tree and vegetation clearing and bulk earthworks.
- Construction, fit-out and 24/7 operation of a data centre.
- Offsite enabling infrastructure.
- 2 data centre buildings:
 - Building 1 – 2 Level + rooftop plant
 - Building 2 – 3 Level + rooftop plant
- Ancillary office, EOT and amenity.
- Provision of required utilities including:
 - diesel storage tanks
 - water tanks
 - substations on site
- Vehicle access for 20 m articulated vehicles (semi-trailers).
- Associated landscaping and site servicing.
- Installation of site services and drainage infrastructure.

It is estimated that the diesel storage required for the proposal will be approximately 4 097 kilolitres (kL) or approximately 3 482 tonnes (t).

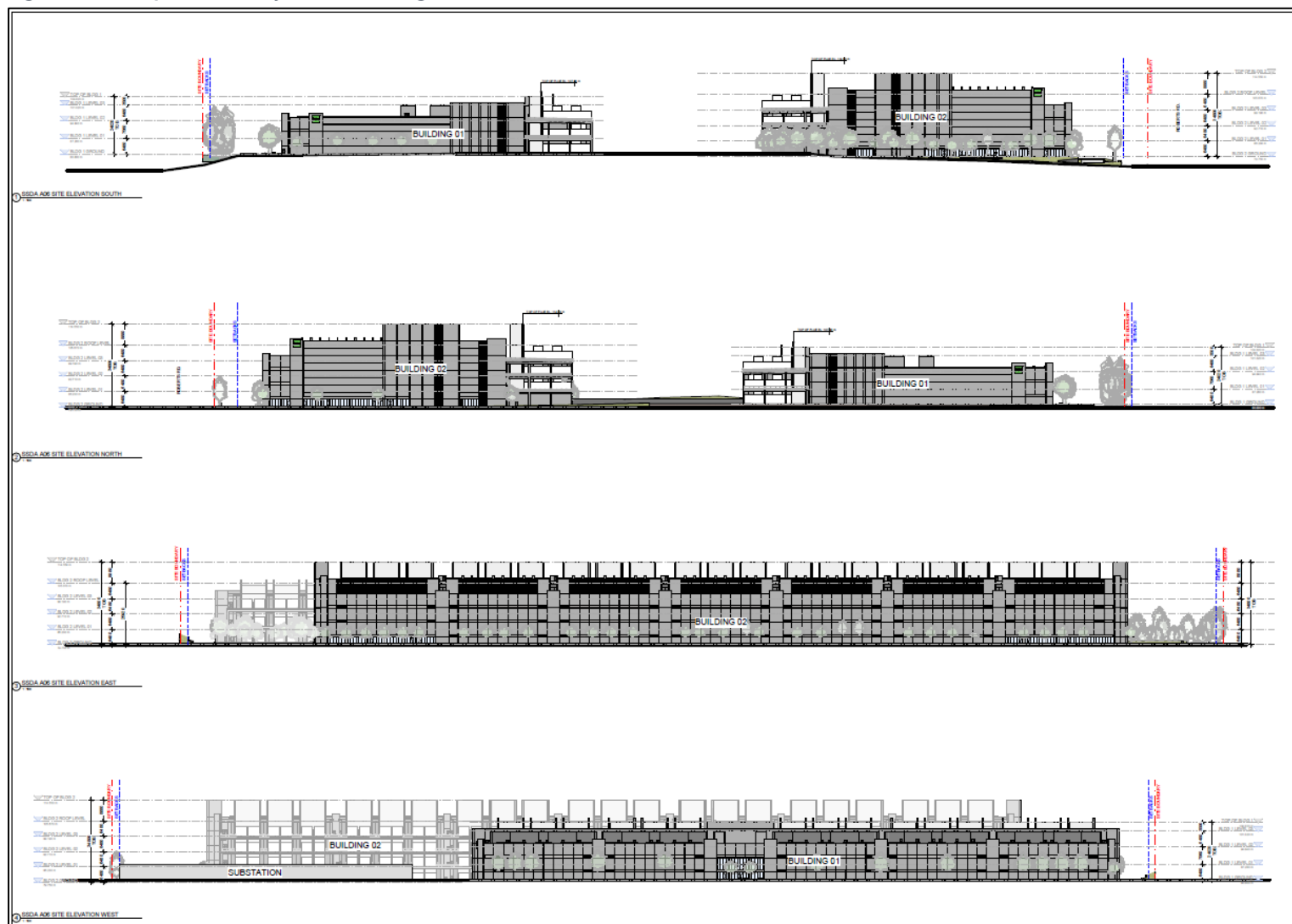
Figure 2 to Figure 3 illustrate the Proposal site layout, indicating the size, massing, and height of the buildings, along with the locations of standby diesel generators.

Figure 2 Proposal site layout



Source: Grimshaw Architects, Project No. 25124 – SSDA Submission – Rev A

Figure 3 Proposal site layout – building - sections



Source: Grimshaw Architects, Project No. 25124 – SSDA Submission – Rev A

2.3. Identification of Emissions to Atmosphere

Given the nature of the Proposal, emission to air would be likely to be generated as described in the following sections.

2.3.1. Construction Phase

The construction of the Proposal includes constructing 2 no. data centre buildings for the installation of data halls and associated infrastructure such as offices, staff amenities, plant and storage rooms, switch and battery rooms, and generator gantry platforms. It also involves construction of a new on-site substation as well as site preparation, earthworks, parking, infrastructure, access points, and landscaping.

An indicative list of plant and equipment that may be used during the construction of the Proposal includes:

- Excavators, front-end loaders (FEL), graders and rollers (smooth drum and vibratory);
- Light and heavy-duty vehicles;
- Drills and pneumatic hand, or power tools; and
- Mobile cranes and elevated working platforms.

The assessment of the potential local air quality risks from construction phase activities is presented in Section 6, while the risk assessment methodology is presented in Appendix B.

2.3.2. Operational Phase

Operational emissions from the Proposal site on a day-to-day basis would be anticipated to be negligible, with the exception of potential emissions from diesel-fuelled emergency standby generators during periodic maintenance testing or during a power outage event. Additionally, there is the potential for minor fugitive emissions from the storage of diesel at the Proposal site.

2.3.2.1. Emissions from Generator Use

The Proposal includes the installation of 246 IT generators and 3 admin generators to support operations, providing a total power capacity of 348 megawatts (MW).

The emergency standby generator models to be installed at the Proposal site is not currently finalised, however four potential candidate generator sets have been specified and are listed below:

- Candidate 1: MTU 20V4000G94F diesel-fuelled generators each with a capacity of:
 - 3 090 kW and a fuel consumption rate of 756 L·hr⁻¹ at 100 % load; or

- Candidate 2: CAT model 3516E diesel-fuelled generators each with a capacity of:
 - 3 085 kW and a fuel consumption rate of 751 litres per hour (L·hr⁻¹) at 100 % load; or
- Candidate 3: Baudouin 16M55G37505_5 diesel-fuelled generators each with a capacity of:
 - 3 300 kW and a fuel consumption rate of 755 L·hr⁻¹ at 100 % load; or
- Candidate 4: Cummins QSK95-G4 diesel-fuelled generators each with a capacity of:
 - 2 716 kW and a fuel consumption rate of 608 L·hr⁻¹ at 100 % load.

In addition, the only candidate for the admin generator to be installed at the Proposal Site is:

- Candidate 1: MTU 16V2000G76F diesel-fuelled generators each with a capacity of:
 - 979 kW and a fuel consumption rate of 237 L·hr⁻¹ at 100 % load.

Note: Other generators may be selected for installation as part of the Proposal, however the emissions from the potential candidate generators nominated above have been assessed in this AQIA.

During periods when the emergency standby generators may be required to provide power during mains power outage events, short-term emissions of combustion related pollutants would be generated. Emissions from diesel-fuelled emergency standby generators may include various air pollutants, as listed in the National Pollutant Inventory (NPI) Emission Estimation Technique Manual (NPI EETM) for combustion engines (NPI, 2008).

The pollutants of concern from the operation of the emergency standby generators includes (in no order):

- Particulate matter (PM);
- Oxides of nitrogen (NO_x);
- Carbon monoxide (CO);
- Sulphur dioxide (SO₂);
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile organic compounds (VOCs), as benzene (C₆H₆), toluene (C₇H₈) and xylene (C₈H₁₀); and
- Formaldehyde (CH₂O).

In addition to the potential operation as a back-up energy source during a power outage event, the generators would be required to be run during short-term routine maintenance testing.

The Applicant has provided a maintenance testing schedule for the emergency standby generators that support the power consumption load. This schedule, presented in Table 4, indicates that up to five emergency standby generators would be operated simultaneously during periodic maintenance testing. Additional information provided by the Applicant indicates that testing would take place during daylight hours which are assumed to be between 7:00 am and 6:00 pm. Standard monthly load tests are to be conducted at various loads (up to 100 % load).

For the purposes of the dispersion modelling assessment, it has been assumed that five emergency standby generators would undergo maintenance testing simultaneously on any given day for a period of up to one hour. Although actual testing is expected to occur intermittently and for shorter durations totalling no more than 200 hours per year, this assumption provides a conservative representation of potential emissions during operational daytime hours and ensures worst-case conditions are captured in the modelling exercise.

The generator testing schedule is anticipated to have a cumulative total of not more than the 200-hour exemption limit outlined in Schedule 1 Clause 17 of the NSW *Protection of the Environment Operations Act* 1997 (refer Section 3.1), in addition to Part 5, Division 6, Clause 73 of the POEO (Clean Air) Regulation 2022 (refer Section 3.2). It is noted that should SSDA approval be granted, a condition is likely to require periodic emissions testing of the emergency standby generators (refer Section 8.2.5).

Table 4 Proposed emergency standby generator maintenance testing regime

Test type	Qty. site generators	Generators run per test	Run time per year (mins)	Run time per year (hours)
Annual	249	5	4 354	73
6-monthly	249	5	2 344	39
3-monthly	249	5	4 687	78
Total site (hours)				190

2.3.2.2. Emissions from Fuel Storage

The Proposal includes on-site fuel storage, which may generate fugitive air emissions of VOCs during filling and dispensing of fuel, as well as from potential accidental spillages and leaks that may occur.

The total diesel storage capacity at the Proposal site is proposed to be 4 097 kL.

The storage tank configuration at the Proposal site will include adequate containment (such as double-walled tanks and tertiary bunding containment) and automated leak detection measures, in compliance with relevant Australian and New Zealand Standards (AS/NZS), including AS/NZS 1940:2017 (Storage and Handling of Flammable and Combustible Liquids) and AS/NZS 1692:2006 (Steel Tanks for Flammable and Combustible Liquids).

The emergency standby generators are anticipated to use low-sulphur diesel fuel during operations. The diesel fuel sourced and used will be in accordance with *Fuel Quality Standards Act* 2000 and the Fuel Quality Standards (Automotive Diesel) Determination 2019, specifically with regards to the sulphur content which will be tested to ASTM D5453 by the diesel fuel supplier.

Spill containment measures are also expected around tank fill connections, pumps, and filters where necessary. Given the low potential for fugitive emissions from fuel storage and the minimal risk of off-site impacts, no further quantification of these emissions has been included in this AQIA.

2.3.3. Odour

Construction phase activities may include the operation of plant and machinery, that may pose an insignificant risk of odour in the event of accidental fuel spillage, which can be effectively managed through the provision of spill kits to promptly manage any spillages.

Operational phase activities will not result in any air emissions, except for the periodic operation of the diesel-fuelled generators for testing and back-up power generation purposes only, as outlined above.

Air emissions of VOCs have been assessed as benzene (C_6H_6) as a principal toxic air pollutant, with anticipated emissions of toluene (C_7H_8) and xylene (C_8H_{10}) assessed and compared against the relevant odour impact assessment criteria.

2.4. Alternative Options for Power Generation

Currently, alternatives to diesel generators are not feasible for large-scale data centres, which depend on diesel for reliability, quick startup, and robust power delivery. While emerging technologies¹ like Hydrogenated Vegetable Oil (HVO) renewable diesel, hydrogen fuel cells, microgrids, and battery storage show promise, they are not yet technologically or financially viable for widespread use.

Due to the high load density and steady load profile, solar panels covering the entire roof would only meet a small portion of the Proposal site's power needs, and mechanical equipment further limits available space for solar installations.

While batteries could provide short-term backup, the fuel needed for 24-hour autonomy to maintain critical services during extended outages is significant. Using batteries for the same duration would be prohibitively expensive and space-intensive, also posing similar risks to diesel, such as chemical spills and fire hazards.

As a consequence, diesel-fuelled emergency standby generators will continue to be essential for the data centre industry until feasible alternatives are commercially available.

¹ <https://www.datacenterdynamics.com/en/opinions/is-it-time-to-replace-diesel-backup-generators/>

3. LEGISLATION, REGULATION AND GUIDANCE

The following provides an overview of the legislation and air quality criteria which are applicable to the activities being performed at the Proposal site.

3.1. Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) sets the statutory framework for managing air quality in NSW, including establishing the licensing scheme for major industrial premises (scheduled activities) and a range of air pollution offences and penalties.

Schedule 1, Part 1 of the POEO Act provides definitions for scheduled activities, and the associated threshold activity rates. For the Proposal, the thresholds associated with electricity generation (clause 17), and chemical storage (clause 9) are most relevant, given the use of standby diesel-fuelled generators as part of the Proposal.

3.1.1. Electricity Generation

Clause 17 of Schedule 1, Part 1 of the POEO Act states:

17 Electricity generation

(1) This clause applies to the following activities:

...

metropolitan electricity works (internal combustion engines), meaning the generation of electricity by means of electricity plant:

(a) that is based on, or uses, an internal combustion engine, and

(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly, or Kiama.

(1A) However, this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year.

(2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

During times of stable external supply of electricity, the emergency standby generators would only operate during scheduled maintenance events (refer Section 2.3.2). On this basis, the Proposal is not anticipated to exceed the 200-hour limit, on the generation of electricity by means of electricity plant that is emergency stand-by plant and is not deemed to be a scheduled activity under Schedule 1, Part 1, Clause 17 of the POEO Act.

3.1.2. Chemical Storage

Clause 9 of Schedule 1, Part 1 of the POEO Act states:

9 Chemical storage

(1) This clause applies to the following activities--

"general chemicals storage", meaning the storage or packaging in containers, bulk storage facilities or stockpiles of any chemical substance classified as a dangerous good in the Transport of Dangerous Goods Code , other than the following--...

"petroleum products storage", meaning the storage or packaging of petroleum or petroleum products in containers, bulk storage facilities or stockpiles.

(2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

Table

<i>Column 1</i>	<i>Column 2</i>
<i>Activity</i>	<i>Criteria</i>
<i>...</i>	
<i>petroleum products storage</i>	<i>capacity to store more than 200 tonnes (liquified gases) or 2,000 tonnes (chemicals in any other form)</i>

As outlined in Section 2.2, the Proposal includes the capacity to store up to 4 097 kL or 3 486 t of diesel fuel. Given the chemical storage threshold specified in Schedule 1 of the POEO Act, the Proposal would therefore be considered to be a scheduled activity under that provision, and correspondingly an Environment Protection Licence (EPL) would be required, on this basis.

3.1.3. Equipment Maintenance

Part 5.4 of the POEO Act outlines a number of requirements associated with air pollution. These requirements generally relate to the appropriate maintenance of plant and equipment in an efficient condition and dealing with materials in a manner as to not cause air pollution.

3.2. Protection of the Environment Operations (Clean Air) Regulation

The Protection of the Environment Operations (POEO) (Clean Air) Regulation 2022 (POEO CAR) establishes requirements and concentration standards for air emissions from industrial activities in NSW. It regulates air quality issues related to various sources, including burning activities, motor vehicle fuels, fuel usage and transfer, air impurities from activities and plants, and the storage of volatile organic liquids.

Part 5 of the POEO CAR sets concentration standards for air impurities from activities and plant, with Schedule 2 specifying maximum permissible in-stack emissions limits for both scheduled and non-scheduled premises.

Clause 73, Part 5, Division 6 of the POEO CAR provides an exemption for emergency electricity generation as follows:

73 Exemption relating to emergency electricity generation

Emergency standby plant is exempt from the air impurities standard for nitrogen dioxide and nitric oxide specified in Schedule 2, Part 2, Division 3 for the plant if –

(a) the plant comprises a stationary reciprocating internal combustion engine for generating electricity, and

(b) it is used for a total of not more than 200 hours per year.

As outlined in Section 2.3.2, the generator plant would be operated cumulatively for less than 200 hours per year, and the exemption above would therefore apply to the Proposal.

Clause 54 of the POEO CAR also clarifies that standards of concentrations do not apply during start-up and shutdown periods, except where specifically prescribed under Division 4 of the POEO CAR or by EPL condition. Importantly, even where in-stack concentration standards are exempt, operators remain subject to the general duty under section 128(2) of the POEO Act to prevent and minimise air pollution.

Accordingly, while the standby generators may be exempt from relevant NO_x standards of concentration limits (i.e. in-stack emission concentrations), the Proponent is not exempt from meeting ambient air quality criteria for NO₂, which is addressed in Section 3.3.

The standards of concentration, and whether they are applicable to the Proposal, are summarised in Table 5.

Table 5 POEO CAR standards of concentrations for applicable air impurities

Air impurity	Activity or plant	Concentration	Applicable
Schedule 2, Part 2, Division 2 – Electricity generation (Group 6)			
Solid particles (Total)	An activity or plant using a liquid or solid standard fuel or a non-standard fuel	50 mg·Nm ⁻³ (A)	Yes. This is a scheduled activity.
Nitrogen dioxide (NO ₂) or nitric oxide (NO) or both, as NO ₂ equivalent	A turbine operating on a fuel other than gas, being a turbine used in connection with an electricity generating system with a capacity of 30 MW or more	90 mg·Nm ⁻³ (A)	No. The Proposal is a scheduled activity and would not operate turbines. The Proposal would also operate for less than 200 hours per year
Schedule 2, Part 2, Division 3 - Scheduled premises (Group 6)			
Solid particles (Total)	An activity or plant	50 mg·Nm ⁻³ (A)	Yes. This is a scheduled activity.
Nitrogen dioxide (NO ₂) or nitric oxide (NO) or both, as NO ₂ equivalent	Stationary reciprocating internal combustion engines	450 mg·Nm ⁻³ (A)	No. The Proposal is a scheduled activity however would operate for less than 200 hours per year
Volatile organic compounds (VOCs), as n-propane	A stationary reciprocating internal combustion engine using a liquid fuel	1 140 mg·Nm ⁻³ (A) VOCs <i>or</i> 5 880 mg·Nm ⁻³ (A) CO	Yes. Proposal is a scheduled activity.
Smoke	An activity or plant in connection with which liquid or gaseous fuel is burnt	20 % opacity	Yes. Proposal is a scheduled activity
Schedule 2, Part 3 – Non-scheduled premises (Group C)			
Solid particles (Total)	An activity or plant	100 mg·Nm ⁻³ (B)	Not applicable - Proposal is a scheduled activity
Smoke	An activity or plant in connection with which liquid or gaseous fuel is burnt	20 % opacity	Not applicable – Proposal is a scheduled activity

Notes (A) POEO CAR Sch2, Pt 3, Div 1: dry, 273 K, 101.3 kPa, 7 % O₂

(B) POEO CAR Sch2, Pt 3, Div 2: dry, 273 K, 101.3 kPa, 7 % O₂

Part 4 Clause 20 of the POEO CAR requires that motor vehicles do not emit excessive air impurities which may be visible for a continuous period of more than 10-seconds when determined in accordance with the relevant standard.

All vehicles, plant, and equipment to be used either at the Proposal site or to transport materials to and from the Proposal site would be maintained regularly and in accordance with manufacturers' requirements, where these vehicles are under the operational control of the Proponent.

3.3. NSW Approved Methods

State air quality guidelines are prescribed by NSW EPA in the Approved Methods, which has been consulted during the preparation of this AQIA (refer Section 1.2, Table 2).

The Approved Methods lists the statutory methods that are to be used to assess emissions of criteria air pollutants in NSW. Section 7.1 and Section 7.2 of the Approved Methods clearly outlines the impact assessment criteria for those key pollutants of interest and both individual and principal toxic air pollutants. Principal toxic air pollutants are defined in the Approved Methods on the basis that they are carcinogenic, mutagenic, highly persistent, and/or highly toxic in the environment.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council [NHMRC], National Environment Protection Council [NEPC], and World Health Organisation [WHO]).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW for relevant individual air pollutants are presented in Table 6.

To assess the potential impact of emissions of total VOCs (TVOC, which is a complex mixture of hydrocarbons), the 1-hour impact assessment criterion for benzene (C_6H_6) of $0.029 \text{ mg}\cdot\text{m}^{-3}$ ($29 \text{ }\mu\text{g}\cdot\text{m}^{-3}$) as outlined in table 12 of the Approved Methods has been adopted.

Benzene (C_6H_6) is one of the primary components of TVOC emissions resulting from diesel combustion engines and compliance with the benzene (C_6H_6) criterion (refer Table 6) would generally result in compliance with all VOC components from a health-perspective. Additionally, formaldehyde (CH_2O) is assessed as a discrete VOC.

VOC emissions have additionally been assessed against the 1-hour odour impact assessment criteria for toluene (C_7H_8) of $0.36 \text{ mg}\cdot\text{m}^{-3}$ ($360 \text{ }\mu\text{g}\cdot\text{m}^{-3}$) and xylene (C_8H_{10}) of $0.19 \text{ mg}\cdot\text{m}^{-3}$ ($190 \text{ }\mu\text{g}\cdot\text{m}^{-3}$) to address the potential for odour impacts. Table 7 provides a summary of impact assessment criteria for principal toxic, and both individual odorous and toxic pollutants that are referenced within this AQIA, as outlined in Section 7.2 of the Approved Methods.

Table 6 NSW EPA impact assessment criteria

Pollutant	Averaging period	Criterion ($\mu\text{g}\cdot\text{m}^{-3}$) ^(a)	Notes
Sulphur dioxide (SO_2)	1 hour	215	Numerically equivalent to the AAQ NEPM ^(b) standards and goals
	24 hours	57	
Nitrogen dioxide (NO_2)	1 hour	164	
	Annual	31	
Particulates (as PM_{10})	24 hours	50	
	1 year	25	
Particulates (as $\text{PM}_{2.5}$)	24 hours	25	
	1 year	8	
Particulates (as TSP)	1 year	90	
Pollutant	Averaging period	Criterion ($\text{mg}\cdot\text{m}^{-3}$) ^(c)	Notes
Carbon monoxide (CO)	15 minutes	100	Numerically equivalent to the AAQ NEPM ^(b) standards and goals
	1 hour	30	
	8 hours	10	

Notes: (a): micrograms per cubic metre of air
 (b): National Environment Protection (Ambient Air Quality) Measure
 (c): milligrams per cubic metre of air

Table 7 NSW EPA impact assessment criteria for principal and individual toxic pollutants

Pollutant	Averaging period	Criterion ^(d)			Notes
		ppm ^(a)	$\text{mg}\cdot\text{m}^{-3}$ ^(b)	$\mu\text{g}\cdot\text{m}^{-3}$ ^(c)	
Polycyclic Aromatic Hydrocarbon (PAH) as benzo(a)pyrene	1 hour	n/a	0.0004	0.4	
Benzene (C_6H_6)	1 hour	0.009	0.029	29	
Toluene (C_7H_8)	1 hour	0.06	0.36	360	Odour
Xylene (C_8H_{10})	1 hour	0.04	0.19	190	Odour
Formaldehyde (CH_2O)	1 hour	0.018	0.02	20	

Notes: (a): parts per million (10^6)
 (b): milligrams per cubic metre of air
 (c): micrograms per cubic metre of air
 (d): assessed as the 99.9th percentile of 1-hour incremental concentration as per the Approved Methods

As required under section 7.2.2 of the Approved Methods, the criteria identified in Table 7 are assessed at any location at or beyond the Proposal site boundary.

3.4. Blacktown Local Environmental Plan 2015

The Blacktown Local Environmental Plan 2015 (BLEP2015) is the principle environmental planning instrument applying to the Proposal site and provides the legislative framework for developments and land use within the Blacktown LGA. Specifically, the aims of the BLEP2015 are as follows:

- (aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,
- (a) to recognise the role of the urban renewal precincts as the major locations for higher density residential and employment development for the city,
- (b) to ensure that appropriate housing opportunities are provided for all current and future residents through diversity of housing choice,
- (c) to provide land for community facilities, public purposes and recreational pursuits,
- (d) to encourage development opportunities for business and industry so as to deliver local and regional employment growth,
- (e) to minimise risk to the community by restricting development in sensitive areas that are subject to flooding and other hazards,
- (f) to provide for infrastructure to maintain and meet demands arising from housing and employment growth,
- (g) to conserve and enhance Blacktown's built, natural and cultural heritage,
- (h) to conserve, restore and enhance biological diversity and ecosystem health, particularly threatened species, populations and communities.

It is noted that the BLEP2015 does not outline any specific requirements for the development of data centres with regard to air quality and correspondingly, potential air quality impacts would be managed under the requirements of the POEO Act, POEO CAR and the Approved Methods.

3.5. NSW Government Air Quality Planning

NSW EPA has formed a comprehensive strategy with the objective of driving improvements in air quality across the State. This comprises several drivers, including:

- **Legislation:** formed principally through the implementation of the POEO Act and POEO CAR. The overall objective of the legislative instruments is to achieve the requirements of the National Environment Protection (Ambient Air Quality) Measure;
- **Clean Air for NSW:** The 10-year plan for the improvement in air quality;
- **Inter-agency Taskforce on Air Quality in NSW:** a vehicle to co-ordinate cross-government incentives and action on air quality;
- **Managing Particles and Improving Air Quality in NSW;** and
- **Diesel and Marine Emission Management Strategy.**

In regard to the relevance of the NSW Government's drive to maintain and improve air quality across the State and this AQIA, it is imperative that the Proposal would lead to the development of the NSW economy (in terms of activity and employment) and concomitantly not cause a detriment in air quality in achieving its objectives.

4. EXISTING CONDITIONS

The following information provides context around the location of sensitive receptor locations surrounding the Proposal site, the prevailing meteorology and air quality of the surrounding area and identifies other sources of air pollutants which have the potential to impact cumulatively with the Proposal.

4.1. Surrounding Land Sensitivity

The Proposal site and its immediate surroundings are zoned E3 - Productivity Support under the provisions of BLEP2015. The proposed data centre is classified as a high technology industry (a form of light industry), which is permissible with consent in this zone.

Within 500 m to the east, land is zoned R2 - Low Density Residential and RE1 - Public Recreation, while RE1 - Public Recreation and C2 - Environmental Conservation zones occur to the west of the Proposal site.

4.2. Sensitive Receptor Locations

Air quality assessments typically use a desk-top mapping study to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors, refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed.

The Approved Methods defines a sensitive receptor location to be:

'A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area'.

It is noted that the assessment criteria applied to particulates and sulphur dioxide (SO₂) (refer Table 6) are for a 24-hour averaging period, and as such the predicted impacts need to be interpreted at commercial and industrial receptor locations with care. It is considered to be atypical for a person to be at those locations for a complete 24-hour period and as such, the exposure risks associated with those pollutants at those locations would be over-estimated by adoption of those locations in the modelling assessment. However, these locations have been included within the assessment, as required by NSW EPA.

It is important to note that the selection of discrete receptor locations does not aim to cover all sensitive receptors within the study area. Rather, the selected locations are intended to be representative of their broader surroundings and can reasonably be assumed to reflect conditions in the immediate vicinity. In cases where multiple sensitive receptors exist in close proximity (such as a school adjacent to a medical centre) the receptor closest to the emission source is typically chosen to assess potential risks to other sensitive land uses in the area.

Beyond the identified discrete receptors, the entire modelling area has been overlaid with a grid of uniform receptor points to allow presentation of contour plots of predicted impacts in a comprehensive manner. As such, the accidental omission of a particular sensitive location does not invalidate the AQIA or render it incapable of assessing potential risks.

In accordance with the requirements of the Approved Methods, several receptors have been identified and the receptors adopted for use within this AQIA are presented in Table 8 and illustrated in Figure 4. Table 8 is not intended to represent a definitive list of sensitive land uses, but a cross section of available locations, that are used to characterise larger areas, or selected as they represent more sensitive locations, which may represent people who are more susceptible to changes in air pollution.

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the premises reside, population density data has been examined. Population density data based on the 2021 census have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km²) grid, covering mainland Australia (ABS, 2022).

Using a Geographical Information System (GIS), the locations of sensitive receptor locations have been confirmed with reference to their population densities (refer Figure 4).

For clarity, the ABS use the following categories to analyse population density (persons·km⁻²):

- No population Zero (0).
- Very low Up to 500.
- Low Between 500 and 2 000.
- Medium Between 2 000 and 5 000.
- High Between 5 000 and 8 000.
- Very high More than 8 000.

Using ABS data in a GIS, the population density around the Proposal site has been characterised. The immediate area surrounding the Proposal site is classified as having no population density (i.e. zero (0) persons·km⁻²), which is typical of the industrial environment in which the Proposal site is located.

Further to the north and east, population density increases to a low to medium range (i.e. between 500 and 5 000 persons·km⁻²), reflecting the transition into the Minchinbury suburb, where residential uses are more prevalent.

To the immediate south of the Proposal site, no population is observed due to the Transgrid power line corridor.

Table 8 Discrete sensitive receptor locations

Receptor ID	Location	Land use	Coordinates (UTM 56S)	
			mE	mS
R1	17 Roberts Rd, Eastern Creek	Industrial	299 865	6 255 920
R2	2 Telopea Pl, Eastern Creek	Industrial	299 465	6 256 533
R3	716 Old Wallgrove Rd, Eastern Creek	Industrial	300 055	6 256 190
R4	1 Telopea Pl, Eastern Creek	Industrial	299 291	6 256 571
R5	25-51 Eastern Creek Dr, Eastern Creek	Industrial	299 696	6 256 651
R6	200 Old Wallgrove Rd, Eastern Creek	Industrial	298 967	6 255 966
R7	Little Graces Childcare Centre, Unit 2 Southridge St, Eastern Creek	Childcare Centre	300 307	6 256 335
R8	50 Old Wallgrove Rd, Eastern Creek	Industrial	300 093	6 256 692
R9	25-51 Eastern Creek Dr, Eastern Creek	Industrial	299 919	6 256 829
R10	1 Southridge St, Eastern Creek	Industrial	300 468	6 256 476
R11	2 Millner Ave, Horsley Park	Industrial	298 721	6 255 473
R12	9 Roussell Rd, Eastern Creek	Industrial	300 630	6 255 895
R13	7 Grevillea St, Eastern Creek	Industrial	299 612	6 257 283
R14	4 Latitude Rd, Horsley Park	Industrial	299 060	6 255 044
R15	146 Burley Rd, Horsley Park	Residential	300 353	6 255 023
R16	Burley Rd, Horsley Park	Residential	299 930	6 254 729
R17	263 Burley Rd, Horsley Park	Residential	299 308	6 254 671
R18	10 Clay Pl, Eastern Creek	Industrial	301 028	6 256 237
R19	4 Alspec Pl, Eastern Creek	Industrial	300 670	6 257 036
R20	22B Hanson Pl, Eastern Creek	Industrial	299 031	6 257 471
R21	124 Burley Rd, Horsley Park	Residential	300 480	6 254 833
R22	Lenore Dr, Eastern Creek	Industrial	298 139	6 256 678
R23	1 Eucalyptus Pl, Eastern Creek	Industrial	299 566	6 257 707
R24	22-24 Wonderland Dr, Eastern Creek	Industrial	300 218	6 257 519
R25	3B Oakdale Cl, Horsley Park	Industrial	298 045	6 255 393
R26	4 Barwar Cl, Horsley Park	Residential	300 056	6 254 448
R27	2 Johnston Cres, Horsley Park	Industrial	298 483	6 254 834
R28	231 Walworth Rd, Horsley Park	Residential	300 698	6 254 734
R29	339 Wallgrove Rd, Eastern Creek	Industrial	301 470	6 255 728
R30	187 Walworth Rd, Horsley Park	Residential	300 679	6 254 468
R31	2 Wonderland Dr, Eastern Creek	Industrial	301 065	6 257 362
R32	1 Aristida Cl, Kemps Creek	Industrial	297 894	6 254 936
R33	102 Arundel Rd, Horsley Park	Residential	300 424	6 254 155
R34	243 Delaware Rd, Horsley Park	Residential	299 152	6 254 013
R35	27 Interchange Dr, Eastern Creek	Industrial	300 748	6 257 826
R36	213 Delaware Rd, Horsley Park	Residential	299 615	6 253 841
R37	785-811 Wallgrove Rd, Horsley Park	Industrial	301 413	6 254 986
R38	5 Cetus Pl, Erskine Park	Residential	297 420	6 256 600

Receptor ID	Location	Land use	Coordinates (UTM 56S)	
			mE	mS
R39	1A Burley Rd, Horsley Park	Residential	301 272	6 254 661
R40	74-76 Arundel Rd, Horsley Park	Residential	300 410	6 253 910
R41	114 Lockwood Rd, Erskine Park	Industrial	297 229	6 255 743
R42	17 Kangaroo Ave, Eastern Creek	Industrial	299 257	6 258 471
R43	19 Pegasus St, Erskine Park	Residential	297 266	6 256 722
R44	71 Grady Cres, Erskine Park	Industrial	297 138	6 256 324
R45	49 Arundel Rd, Horsley Park	Residential	300 153	6 253 641
R46	98 Walworth Rd, Horsley Park	Residential	301 098	6 254 128
R47	2 Latitude Dr, Horsley Park	Industrial	301 988	6 255 396
R48	4/11 Battalion Glade, Eastern Creek	Industrial	301 672	6 257 580
R49	31 Farrington St, Minchinbury	Residential	300 135	6 258 641
R50	20 Agrafe Pl, Minchinbury	Residential	299 811	6 258 752
R51	1 Aquarius Cres, Erskine Park	Residential	297 077	6 256 936
R52	32 Farrington St, Minchinbury	Residential	300 043	6 258 733
R53	5/60 Wallgrove Rd, Eastern Creek	Industrial	300 791	6 258 450
R54	Kington St, Minchinbury NSW 2770	Industrial	300 388	6 258 647
R55	664 Wallgrove Rd, Horsley Park	Industrial	301 585	6 254 311
R56	14-20 Greenway Pl, Horsley Park	Residential	298 719	6 253 481
R57	1 Sennar Rd, Erskine Park	Residential	297 121	6 257 243
R58	60-62 Walworth Rd, Horsley Park	Residential	301 122	6 253 773
R59	13 Rutherglen Pl, Minchinbury	Residential	299 334	6 258 881
R60	43 Fantail Cres, Erskine Park	Residential	297 291	6 257 633
R61	2 Imperata Cl, Kemps Creek	Industrial	297 511	6 254 139
R62	St Narsai Assyrian Christian College, 217 Horsley Rd, Horsley Park	Educational	299 175	6 253 213
R63	1 Emporium Av, Kemps Creek	Industrial	296 824	6 255 105
R64	All Areas Family Day Care, 1 Cuvee Pl, Minchinbury	Childcare Centre	299 583	6 259 010
R65	1840 The Horsley Dr, Horsley Park	Industrial	300 746	6 253 350
R66	29 Fleurs St, Minchinbury	Residential	300 246	6 258 996
R67	29/55 Lockwood Rd, Erskine Park	Industrial	296 551	6 255 944
R68	Erskin Park High School, 78 Swallow Dr, Erskine Park	Educational	296 703	6 256 945
R69	4 Chablis Pl, Minchinbury	Residential	299 875	6 259 17
R70	10 Cobbler Cres, Minchinbury	Residential	298 726	6 259 053
R71	Minchinbury Public School, 202 McFarlane Dr, Minchinbury	Educational	299 293	6 259 224
R72	Kids Early Learning Minchinbury, 46 Minchin Dr, Minchinbury	Childcare Centre	299 380	6 259 310
R73	123 Lenore Dr, Erskine Park	Industrial	296 341	6 256 313

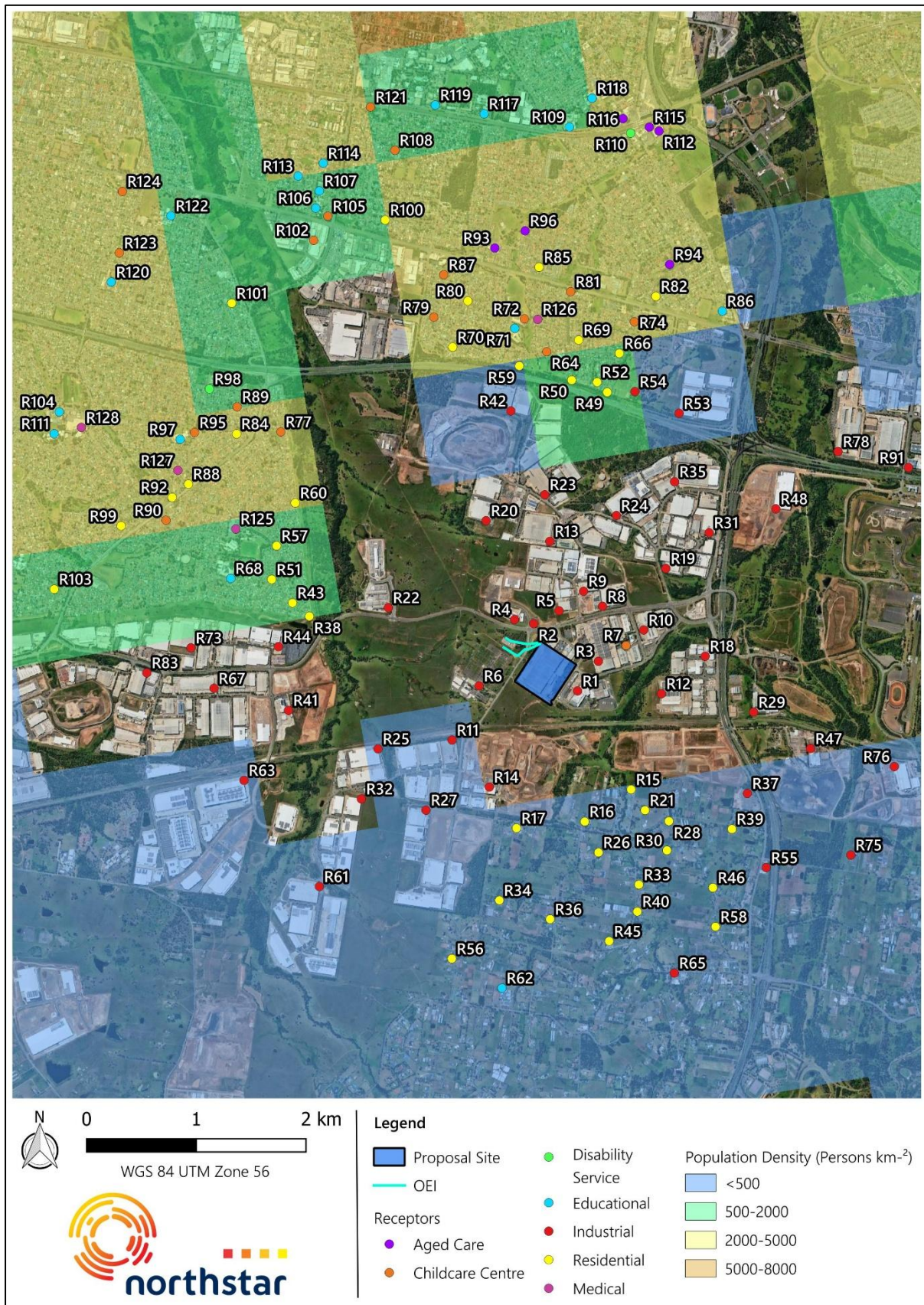
Receptor ID	Location	Land use	Coordinates (UTM 56S)	
			mE	mS
R74	St Anthony's Early Learning Centre Minchinbury, 46-48 Eskdale St, Minchinbury	Childcare Centre	300 383	6 259 283
R75	194-202 Chandos Rd, Horsley Park	Industrial	302 356	6 254 425
R76	2 Latitude Dr, Horsley Park	Industrial	302 752	6 255 232
R77	Sunny Patch Preparation School & Long Day Care Centre, 23 Warbler St, Erskine Park	Childcare Centre	297 160	6 258 280
R78	7 William Dean St, Eastern Creek	Industrial	302 239	6 258 101
R79	Early Stars CCC, 110 McFarlane Dr, Minchinbury NSW	Childcare Centre	298 555	6 259 325
R80	41 Alicante St, Minchinbury	Residential	298 864	6 259 473
R81	Minchinbury Preschool & Nursery, 202-204 Minchin Dr, Minchinbury	Childcare Centre	299 801	6 259 558
R82	70 Minchinbury St, Eastern Creek	Residential	300 579	6 259 515
R83	2 Tyrone Pl, Erskine Park	Industrial	295 938	6 256 085
R84	24 Pasadena Pl, St Clair	Residential	296 757	6 258 262
R85	4 Trees Way, Rooty Hill	Residential	299 513	6 259 781
R86	Eastern Creek Public School, 200 Rooty Hill Rd S, Eastern Creek	Educational	301 184	6 259 380
R87	Minchinbury Early Learning Centre, 68 McFarlane Dr, Minchinbury	Childcare Centre	298 645	6 259 712
R88	7 Lauriston Pl, St Clair	Residential	296 317	6 257 804
R89	Sweetpeas Kindergarten & Long Day Care St Clair, 131 Explorers Way, St Clair	Childcare Centre	296 762	6 258 509
R90	Little Zak's Academy, 1 Fauna Rd, Erskine Park	Childcare Centre	296 113	6 257 475
R91	26 Brabham Dr, Eastern Creek	Industrial	302 881	6 257 956
R92	6 Ashford Grove, St Clair	Residential	296 169	6 257 683
R93	Minchinbury Manor, 57 John St, Rooty Hill	Aged Care	299 110	6 259 955
R94	Our Lady of Consolation, 32 Evans Rd, Rooty Hill	Aged Care	300 704	6 259 806
R95	Little Smarties CCC, 35B Colorado Dr, St Clair	Childcare Centre	296 373	6 258 275
R96	INCCARE Health and Services, 78 Hamrun Cct, Rooty Hill	Aged Care	299 386	6 260 112
R97	Clairgate Public School, 41/43 Colorado Dr, St Clair	Educational	296 243	6 258 212

Receptor ID	Location	Land use	Coordinates (UTM 56S)	
			mE	mS
R98	Vision Care Disability, 99 Explorers Way, St Clair	Disability Service	296 509	6 258 672
R99	1 Omega Pl, St Clair	Residential	295 704	6 257 424
R100	36 Emily St, Mount Druitt	Residential	298 111	6 260 211
R101	7 Kipling Dr, Colyton	Residential	296 713	6 259 453
R102	Bright Stars Montessori Preschool, 11 John Hines Ave, Minchinbury	Childcare Centre	297 459	6 260 025
R103	29 Fontana Cl, St Clair	Residential	295 094	6 256 847
R104	St Clair High School, 6 Endeavour Ave, St Clair	Educational	295 139	6 258 462
R105	Kindy Kollege Early Learning Centre, 1/7 Alan St, Mount Druitt	Childcare Centre	297 588	6 260 246
R106	Mount Druitt Family Study Centre Community School, 43-81 Nelson St, Mount Druitt	Educational	297 478	6 260 319
R107	Colyton Public School, 43-81 Nelson St, Mount Druitt	Educational	297 510	6 260 475
R108	Thrive Early Learning Centre, 50 Tidswell St, Mount Druitt	Childcare Centre	298 200	6 260 846
R109	Rooty Hill High School, N Parade, Rooty Hill	Educational	299 791	6 261 058
R110	Vserve Australia, 1/2 Rooty Hill Rd S, Rooty Hill	Disability Service	300 349	6 261002
R111	St Clair Public School, 4 Timesweep Dr, St Clair	Educational	295 093	6 258 263
R112	Anglicare Hill Village, 11 Mavis St, Rooty Hill	Aged Care	300 607	6 261 021
R113	Bethel Christian School, 106-114 Mount Druitt Rd, Mount Druitt	Educational	297 317	6 260 611
R114	Sacred Heart Primary School, 25 Nelson St, Mount Druitt	Educational	297 547	6 260 728
R115	Anglicare Melva McDonald Lodge, 11 Mavis St, Rooty Hill	Aged Care	300 519	6 261 057
R116	Kalinga Health, 90A N Parade, Rooty Hill	Aged Care	300 279	6 261 134
R117	Chifley College Senior Campus, 67 N Parade, Rooty Hill	Educational	299 013	6 261 178
R118	Rooty Hill Public School, 1 Westminster St, Rooty Hill	Educational	299 997	6 261 320
R119	Tafe NSW - Mount Druitt, N Parade &, Mount St, Mount Druitt	Educational	298 567	6 261 258

Receptor ID	Location	Land use	Coordinates (UTM 56S)	
			mE	mS
R120	Bennett Road Public School, 100-114 Bennett Rd, Colyton	Educational	295 614	6 259 646
R121	Young Academics Early Learning Centre - Mount Druitt, 229 Beames Ave, Mount Druitt	Childcare Centre	297 978	6 261 240
R122	Colyton High School, 37-53 Carpenter St, Colyton	Educational	296 158	6 260 248
R123	Keymer CCC, 27-29 Bentley Rd, Colyton	Childcare Centre	295 687	6 259 911
R124	Five Sense Childcare, 14 Bennett Rd, Colyton	Childcare Centre	295 715	6 260 470
R125	Erskin Park Family Clinic, 184 Swallow Dr, Erskine Park	Medical	296 748	6 257 396
R126	Minchinbury Family Medical Practice, 53 Minchin Dr, Minchinbury	Medical	299 502	6 259 305
R127	Health Care Medical Centre. 53 Arundel Park Dr, St Clair	Medical	296 221	6 257 929
R128	St Clair Medical Practice, 155 Bennett Rd, St Clair	Medical	295 341	6 258 322

Note: The requirements of this AQIA may vary from the specific requirements of other studies, and as such the selection and naming of receptor locations, may vary between technical reports. This does not affect or reduce the validity of those assumptions.

Figure 4 Sensitive receptors and population density surrounding the Proposal site



Source: Northstar

4.3. Meteorology

In accordance with the requirements of the Approved Methods, the AQIA is required to describe and account for the influence of the prevailing meteorological conditions.

The meteorology experienced within an area can govern the generation (in the case of wind-dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorological conditions surrounding the Proposal site have been characterised using data collected by the Australian Government Bureau of Meteorology (BoM) at surrounding Automatic Weather Stations (AWS).

To characterise local wind conditions, meteorological data from the Horsley Park Equestrian Centre AWS was analysed. This station, located approximately 4.4 km south east of the Proposal site, provided data from 2020 to 2024 as presented in Appendix C. Annual wind roses indicate a consistent wind distribution pattern across these years, with predominant south-westerly winds. The majority of wind speeds range between $0.5 \text{ m}\cdot\text{s}^{-1}$ and $5.5 \text{ m}\cdot\text{s}^{-1}$, with higher speeds (more than $8 \text{ m}\cdot\text{s}^{-1}$) occurring from mostly north-westerly directions. Calm conditions (less than $0.5 \text{ m}\cdot\text{s}^{-1}$) are more common, averaging 19.4 % of recorded hours.

Although the Horsley Park Equestrian Centre AWS is nearby, on-site meteorological analysis is required to establish baseline conditions for the Proposal. In the absence of on-site data, site-representative conditions were generated using the CALMET model for use in CALPUFF (refer Section 5.2.1.2).

To ensure representativeness, a correlation analysis of observed wind characteristics (direction and speed) at the Horsley Park Equestrian Centre AWS was conducted (refer Appendix C), along with a comparison of NO_2 concentrations from the St Marys air quality monitoring station (AQMS) (refer Appendix D). Based on this analysis, 2021 was selected as the most representative year for meteorological modelling.

For this AQIA, CALMET was run in no-observations ('no-obs') mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), to determine surface and wind characteristics at the Proposal site. A summary of the inputs and outputs of the meteorological modelling assessment, including validation of those outputs is presented in Appendix C.

4.4. Background Air Quality

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location, will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

When assessing the impact of any particular source of emissions on the potential air quality at a location, the impact of all other sources of an individual pollutant, should also be assessed. These 'background' (sometimes called 'baseline') air quality conditions will vary depending on the pollutants to be assessed and can often be characterised by using representative air quality monitoring data.

Two AQMS have been identified within a 10 km radius of the Proposal site, operated by NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW). These locations (listed by proximity) are briefly summarised in Table 9.

Table 9 NSW DCCEEW AQMS within 10 km of the Proposal site

AQMS Location	Distance to Proposal site (km)	2021 data	Measurements					
			PM ₁₀	PM _{2.5}	TSP	NO ₂	CO	SO ₂
St Marys	6.7	✓	✓	✓	✗	✓	✗	✗
Prospect	7.6	✓	✓	✓	✗	✓	✓	✓

The nearest NSW DCCEEW-operated AQMS to the Proposal site is located at St Marys, approximately 6.7 km to the west-south-west. Commissioned in October 1992, the AQMS is situated on a residential property off Mamre Road, St Marys. The St Marys AQMS monitors fine particles as PM₁₀ and PM_{2.5}, NO₂ and ozone (O₃). Given its proximity to the Proposal site, the St Marys AQMS is considered more representative of local background pollutant concentrations than the Prospect AQMS. However, it does not monitor CO or SO₂ which are pollutants of concern in this AQIA. Accordingly, CO and SO₂ data from the Prospect AQMS have been used to supplement the background data analysis for the purpose of this AQIA.

A summary of the air quality monitoring data and assumptions used to produce this AQIA are presented in Table 10. It is noted that although impacts of O₃ have not been considered in this assessment, O₃ data has been adopted to assist in calculating the conversion of NO_x to NO₂ for the dispersion modelling assessment (refer Section 5.2.7).

It is noted that the St Marys AQMS does not measure concentrations of TSP. As this pollutant is of relevance to the expected emissions from the Proposal, other sources of data have been adopted to allow representation of the TSP environment in the area surrounding the Proposal site, and a discussion is provided in Appendix D.

In addition, a number of pollutants assessed as part of this AQIA are not routinely monitored at AQMS locations in NSW including:

- Polycyclic aromatic hydrocarbons (PAH).
- Benzene (C₆H₆), toluene (C₇H₈), and xylene (C₈H₁₀); and
- Formaldehyde (CH₂O).

For the purposes of this AQIA, it has been assumed that background concentrations of the abovementioned pollutants are negligible. In any case, section 7 of the Approved Methods only requires the assessment of the 99.9th percentile incremental impacts for the pollutants outlined above.

Appendix D provides further analysis of the background air quality monitoring data used in this AQIA.

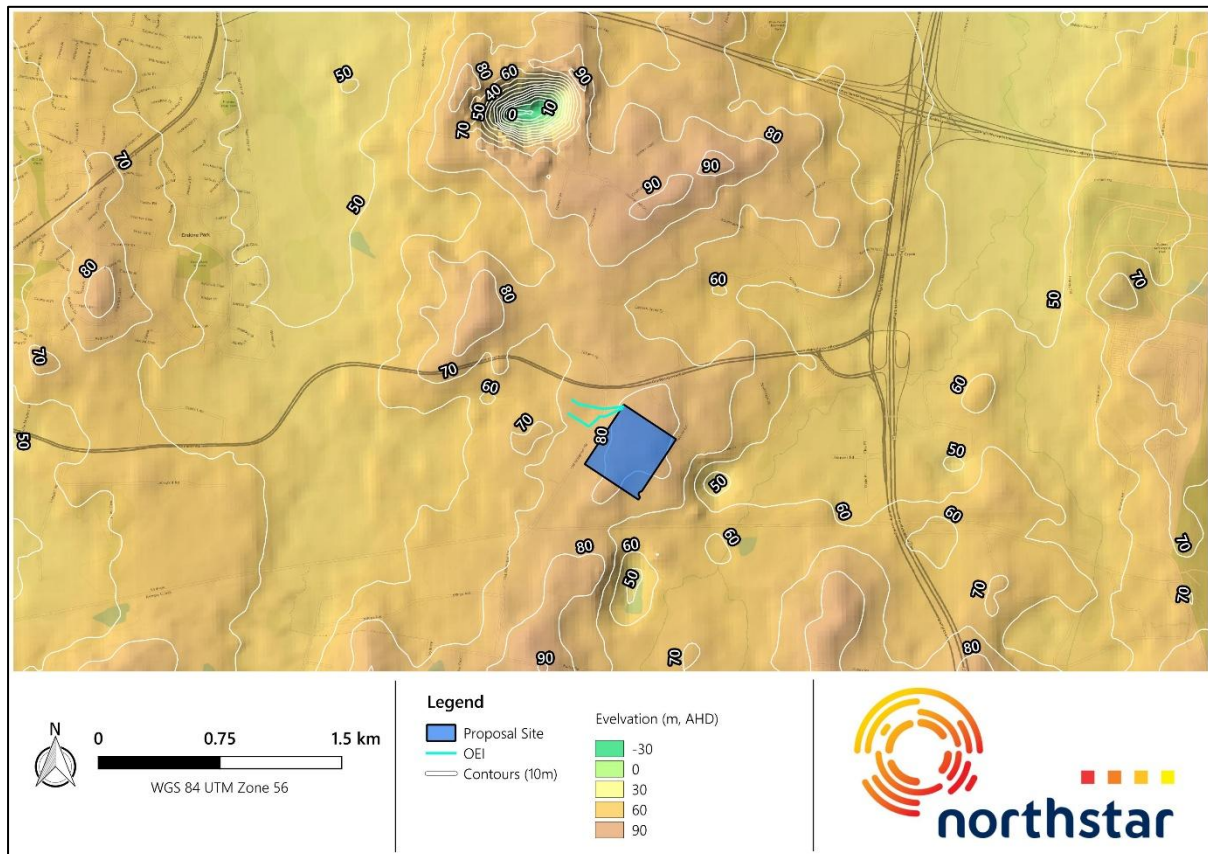
Table 10 Summary of background air quality data used in the AQIA

AQMS	Pollutant	Ave. period	Units	Measured value	Notes
St Marys	Particles (as TSP)	Annual	$\mu\text{g}\cdot\text{m}^{-3}$	33.4	Estimated on a TSP:PM ₁₀ ratio of 2.0551: 1
	Particles (as PM ₁₀)	24-hour	$\mu\text{g}\cdot\text{m}^{-3}$	Daily varying	The 24-hour max concentration in 2021 was 54.9 $\mu\text{g}\cdot\text{m}^{-3}$
		Annual	$\mu\text{g}\cdot\text{m}^{-3}$	16.2	
	Particles (as PM _{2.5})	24-hour	$\mu\text{g}\cdot\text{m}^{-3}$	Daily varying	The 24-hour max concentration in 2021 was 40.3 $\mu\text{g}\cdot\text{m}^{-3}$
		Annual	$\mu\text{g}\cdot\text{m}^{-3}$	5.8	
	Nitrogen dioxide (NO ₂)	1-hour	$\mu\text{g}\cdot\text{m}^{-3}$	Hourly varying	The 1-hour max concentration in 2021 was 67.7 $\mu\text{g}\cdot\text{m}^{-3}$
		Annual	$\mu\text{g}\cdot\text{m}^{-3}$	8.1	Annual average in 2021
Prospect	Carbon monoxide (CO)	15-minutes	$\text{mg}\cdot\text{m}^{-3}$	2.1	Calculated from 1-hour data (Section 5.2.8).
		1-hour	$\text{mg}\cdot\text{m}^{-3}$	1.6	Max 1-hour concentration in 2021
		8-hour	$\text{mg}\cdot\text{m}^{-3}$	1.3	Max 8-hour concentration in 2021
	Sulphur dioxide (SO ₂)	1-hour	$\mu\text{g}\cdot\text{m}^{-3}$	42.9	Max 1-hour concentration in 2021
		24-hour	$\mu\text{g}\cdot\text{m}^{-3}$	7.9	Max 24-hour concentration in 2021

4.5. Topography

The elevation of the Proposal site ranges from approximately 40 m to 50 m AHD (refer Figure 5). While topography between the site and the nearest sensitive receptors is relatively simple from an AQIA perspective, its influence has been accounted for in the dispersion modelling (refer Section 5.2.1.3).

Figure 5 Local topography



Source: Northstar

4.6. Potential for Cumulative Impacts

The background air quality dataset described in Section 4.4 likely reflects the influence of both regional pollutant sources (e.g. particulate matter) and sources local to the monitoring station, such as nearby roads and commercial / industrial activity. However, due to the separation distance between the AQMS and the Proposal site, the data may not fully capture localised pollutant sources relevant to the Proposal area.

Standard environmental assessment practice requires that the impacts of the Proposal be evaluated in the context of the existing environment, including both historical changes and the cumulative contribution of other developments. This includes existing facilities, approved but not yet operational projects, and development proposals currently under assessment. Where multiple sources have the potential to contribute emissions to shared receptor locations, the Approved Methods require cumulative impacts to be considered. While the most rigorous approach involves dispersion modelling of all contributing sources, this is often constrained by:

- A lack of detailed emissions or operational data for external sources, particularly where multiple operators are involved;
- Misalignment in assessment timeframes across developments; and

- Differences in operating patterns, particularly where sources emit intermittently or unpredictably, such as standby backup generators at data centres, which may only be a source of air emissions for a short period in any year.

Given these constraints, a qualitative evaluation has been conducted with reference to the NSW Department of Planning and Environment's 'Cumulative Impact Assessment Guidelines for State Significant proposals' (CIA Guidelines) (NSW DPIE, 2022). The CIA Guidelines state that cumulative assessments should be proportionate to the nature of the potential impacts and focus on interactions between the Proposal and 'relevant future projects' that is those within the same locality and timeframe.

Relevant future projects are defined as including:

- Other SSD or SSI Proposals;
- Designated developments requiring an EIS under Division 5.1 of the EP&A Act
- Controlled actions under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- Major greenfield or urban renewal developments identified via rezoning or government strategies.

Emerging projects may also be considered where there is a reasonable expectation of progression, such as:

- Projects with issued SEARs or undergoing pre-SEARs consultation;
- Publicly announced developments with demonstrated market interest; and
- Projects identified in strategic plans (e.g. the State Infrastructure Strategy).

A desktop assessment has been conducted to identify nearby existing and proposed developments with potential to contribute to cumulative air quality impacts. This included analysis of publicly available information such as satellite imagery, government databases, and local planning registers. Particular focus was given to the NSW Government Major Projects register to identify SSDs and other proposals with similar emission profiles (i.e. data centres).

While broader industrial operations exist in the surrounding locality, including premises regulated under the POEO Act, many of these sources operate under different duty cycles, emit different pollutant profiles or lack sufficient publicly available data for inclusion within the dispersion modelling.

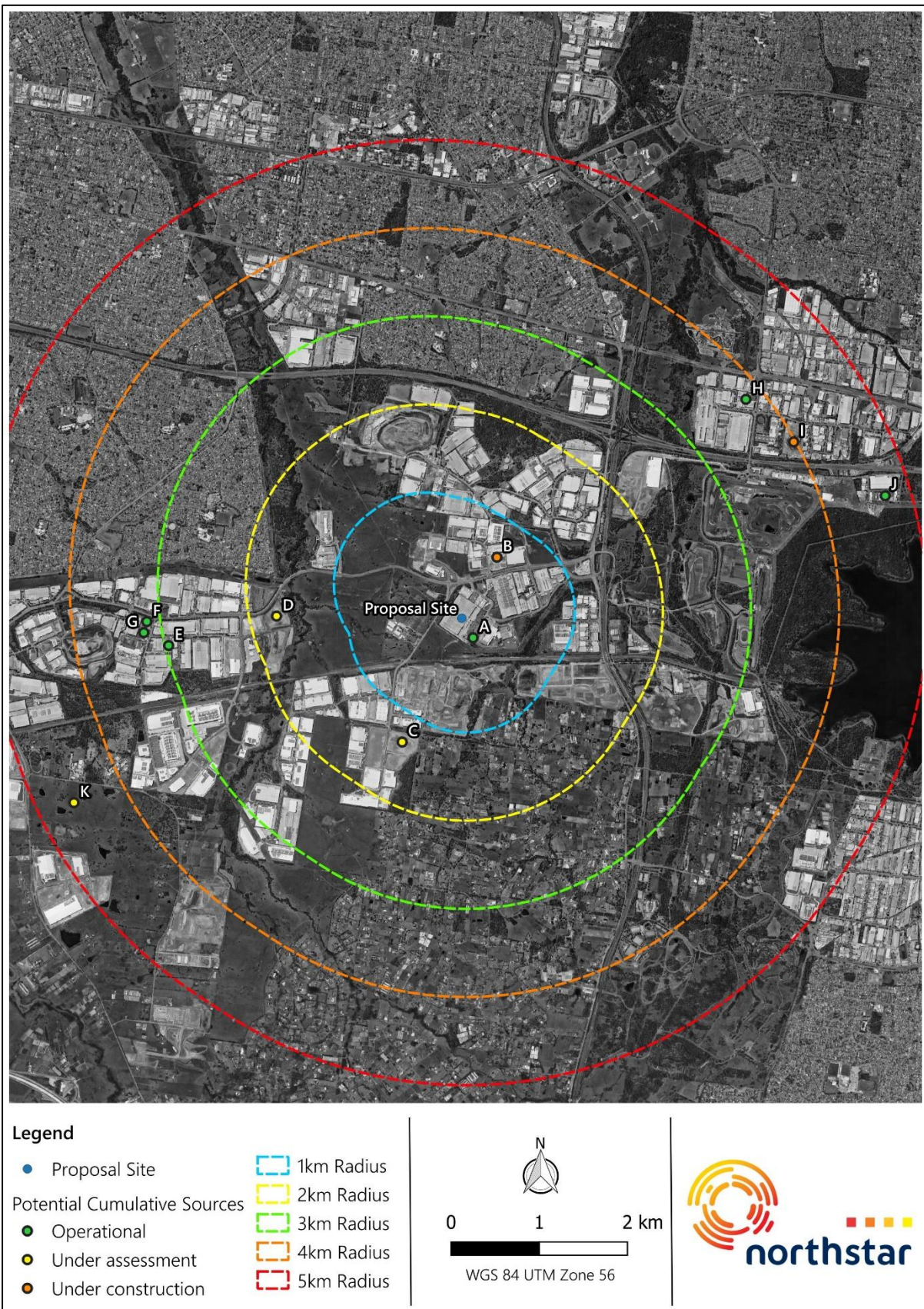
For the purposes of this AQIA, and in line with the principle of proportionality, all relevant data centre developments within the assessment dispersion modelling domain (refer Table C3, Appendix C) have been identified and included in the cumulative impact assessment, in accordance with the CIA Guidelines (NSW DPIE, 2022).

The outcomes of this review informed the cumulative impact assessment presented in Section 7.5. A summary of relevant developments is provided in Table 11 and their locations illustrated in Figure 7. Further discussion of the cumulative assessment methodology is provided in Section 5.3, with the results presented in Section 7.5.

Table 11 Potential sources of air emissions proximate to the Proposal site

Ref	Facility	Status	Location	Approx. distance to Proposal site (km)
A	CDC Data Centre (SSD-10330)	Operational	17 Roberts Road, Eastern Creek	0.04
B	Project Echidna (SSD-47320208)	Under construction	10 Eastern Creek Drive, Eastern Creek	0.6
C	NEXTDC S4 Data Centre (SSD-63741210)	Under construction	16 Johnston Cresnet, Horsley Park	1.3
D	Erskine Park Data Centre (SSD-82211208)	Under assessment	78 Lockwood Road, Erskine Park	1.8
E	Sydney SYD14 Data Centre (Digital Realty)	Operational	16 Lockwood Road, Erskine Park	3.1
F	Sydney SYD10 Data Centre (Digital Realty)	Operational	1-2 Templar Road, Erskine Park	3.3
G	Sydney SYD11 Data Centre (Digital Realty)	Operational	18-23 Templar Road, Erskine Park	3.3
H	Sydney SYD51 Data Centre (AWS)	Operational	1 William Dean Street, Eastern Creek	3.8
I	Sydney SYD3 Data Centre (Airtrunk) (SSD-41589232)	Under construction	51 Huntingwood Drive, Huntingwood	4.0
J	DCI Sydney 01 Data Centre	Operational	90 Peter Brock Drive, Eastern Creek	4.7
K	Mamre Road Data Centre (SSD-92743706)	SEARs issued	706-752 Mame Road, Eastern Creek	4.6

Figure 6 Locations of proximate neighbouring air emission sources



Source: Northstar

5. APPROACH TO ASSESSMENT

This report provides a qualitative assessment of dust impacts (soiling and human health) during the construction phase, adapted from (IAQM, 2024) (refer Section 5.1) and a quantitative assessment aligned with (NSW EPA, 2022) for evaluating operational phase air quality impacts (refer Section 5.2).

5.1. Construction Phase

Construction phase activities have the potential to generate short-term emissions of particulates. Generally, these are associated with uncontrolled (or 'fugitive') emissions and are typically experienced by neighbours as amenity impacts, such as dust deposition and visible dust plumes, rather than associated with health-related impacts. Localised engine-exhaust emissions from construction machinery and vehicles may also be experienced but given the scale of the proposed works, fugitive dust emissions would have the greatest potential to give rise to downwind air quality impacts.

Modelling of dust from construction projects is generally not considered appropriate as there is a lack of reliable emission factors from construction activities upon which to make predictive assessments, and the rates would vary significantly, depending upon local conditions. In lieu of a modelling assessment, the construction-phase impacts associated with the Proposal have been assessed using a risk-based assessment procedure. The advantage of this approach is that it determines the activities that pose the greatest risk, which allows the Construction Environmental Management Plan (CEMP) to focus controls to manage that risk appropriately and reduce the impact through proactive management.

For this risk assessment, Northstar has adapted the published information contained in (IAQM, 2024). The IAQM construction phase assessment approach is commonly used for evaluating fugitive dust and particulate matter emissions from construction activities in development projects across NSW and Australia.

Briefly, the adapted method uses a six-step process for assessing dust impact risks from construction activities, and to identify key activities for control as outlined in Appendix B.

5.2. Operational Phase

5.2.1. Dispersion Modelling Approach

The air emissions assessment for the operational phase has utilised quantitative dispersion modelling techniques. This section outlines the approach taken in the AQIA for the operational phase of the Proposal.

5.2.1.1. Dispersion Model

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF Atmospheric Dispersion Model. CALPUFF is a Lagrangian Gaussian (steady-state) plume dispersion model, recognised in the Approved Methods as a widely accepted model for regulatory applications in NSW, and is considered an appropriate model for this AQIA. It is used to predict pollutant concentrations from various sources typically found at industrial facilities.

The CALPUFF model uses hourly meteorological data to define conditions for plume rise, transport, diffusion, and deposition. It estimates concentrations or deposition values for each source-receptor combination on an hourly basis and calculates user-selected short-term averages. CALPUFF also accounts for local terrain, making it well-suited for modelling complex terrains, including slope flows, valley flows, terrain blocking, and kinematic effects.

Since most air quality standards are based on averages or percentiles, CALPUFF enables further analysis of results for comparison. The CALPUFF-percent post-processing utility calculates the maximum concentration of a pollutant at a specific percentile over a given period, across all receptors. This percentile approach helps omit unusual short-term meteorological events that may cause elevated concentrations, providing a more accurate representation of likely average pollutant concentrations over the averaging period.

Table 12 provides the model input configuration to assess the impact of generator emissions from the Proposal, in consideration of the Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods (Barclay & Scire, 2011).

Table 12 General model parameters for CALPUFF dispersion modelling

Model parameter	Input
Model mode	CALPUFF Refined Mode CALMET No-Observations (No-Obs) Mode
Meteorological data	Prognostic Data (TAPM)
Terrain topography	SRTM1
Model / Grid domain size	12.5 km × 12.5 km × 4 km
Grid resolution / spacing	0.1 km

(Barclay & Scire, 2011) recommend using CALMET No-Obs mode for regulatory screening when good-quality gridded prognostic meteorological data are available, which has been applied in the dispersion modelling process.

Given the variable topography, the terrain radius of influence (TERRAD) was set at 5 km, with a minimum of 0.1 km. Terrain data with a 1 arc-second resolution (approximately 30 m) were used, in consideration of (Barclay & Scire, 2011). The dispersion model was run over a 12.5 km × 12.5 km grid at ground level,

encompassing the nearest sensitive receptors (see Section 4.2) and covering all potentially impacted nearby land uses.

5.2.1.2. Meteorological Modelling

Section 4 of the Approved Methods requires one-year of site-specific meteorological data or site-representative meteorological data, in the absence of site-specific data, to be used for dispersion modelling.

The 3-D meteorological dataset was derived using gridded prognostic data generated from The Air Pollution Model (TAPM, v 4.0.5) as developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), in conjunction with CALMET (refer Appendix C). Section 4.5 of the Approved Methods identifies TAPM as a commonly used prognostic meteorological model in NSW.

TAPM predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

Appendix C contains details on the meteorological model configuration and input parameters.

5.2.1.3. Terrain Effects

The CALPUFF model incorporates terrain information with heights being applied to all receptors and sources. In order to account for the potential influence on pollution dispersion and varying receptor elevations across the modelling domain, a gap filled and filtered (vegetation and obstacles removed) topography file with 1 second resolution (approximately 30 m) derived from the Shuttle Radar Topography Mission (SRTM) data was processed using CALPUFF's terrain pre-processing tools to prepare it for use in the dispersion modelling.

5.2.1.4. Building Wake Effects

For dispersion modelling assessments, the influence of surrounding buildings on emission transport is a material consideration. Nearby buildings can create turbulence and a building wake that can affect pollutant dispersion, particularly through a phenomenon known as building downwash. The ratio of stack height to building height also impacts this effect; if the stack is significantly taller than the building, downwash is minimal.

Section 5.3 of the Approved Methods outlines the following requirements for determining which buildings to consider within a dispersion modelling assessment:

“The location and dimensions of buildings located within a distance of $5L$ (where L is the lesser of the height or width of the building) from each release point for buildings with a height greater than 0.4 times the stack height...”

The Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME) uses building heights and corner locations near the stack to simulate effective dimensions. The BPIP-PRIME downwash algorithm computes these dimensions in ten-degree intervals, allowing CALPUFF to assess the impact on plume dispersion and ground-level concentrations. While simplified, this building geometry offers a reasonable estimate of how structures disrupt wind flow nearby.

Therefore, to analyse downwash effects from point sources mimicking air emissions, the buildings surrounding the Proposal site were incorporated into the CALPUFF model.

With reference to the requirements outlined in the Approved Methods, Figure 7 and Figure 8 illustrates the locations of the buildings included in the BPIP-PRIME model for downwash calculations, which are subsequently incorporated into the CALPUFF dispersion modelling process. Also shown are the emission discharge points for each scenario modelled (refer Section 5.2.2).

It is noted that the BPIP-PRIME model has a number of limitations. It identifies a single influencing building/tier for 36 wind directions, and depending on the wind direction, the algorithm selects the largest of the building width or length, which effectively overrides any intricacies in the buildings which may be presented in the model. The main components are the largest of the length, width and height of the building. Even with the adoption of tiered structures, the algorithm has analytical and logical relationships that merge buildings and ultimately calculate one effective width, length, height, and position to represent all buildings relative to the stack(s).

The BPIP-PRIME algorithm has been shown in some studies to result in the overprediction of concentrations by a factor two to eight for certain building types, whilst result in underpredictions for certain building and terrain configurations (Petersen, 2017). In conclusion, the use of the BPIP-PRIME algorithm is required by the NSW Approved Methods, although is not an advanced method, such as computational fluid dynamics, or wind tunnel modelling. Any minor disparities in building length, height, width and stack locations are most likely within the large margin of error associated with the use of the BPIP-PRIME algorithm.

Figure 7 Buildings and discharge points considered in dispersion modelling (Scenario 1)

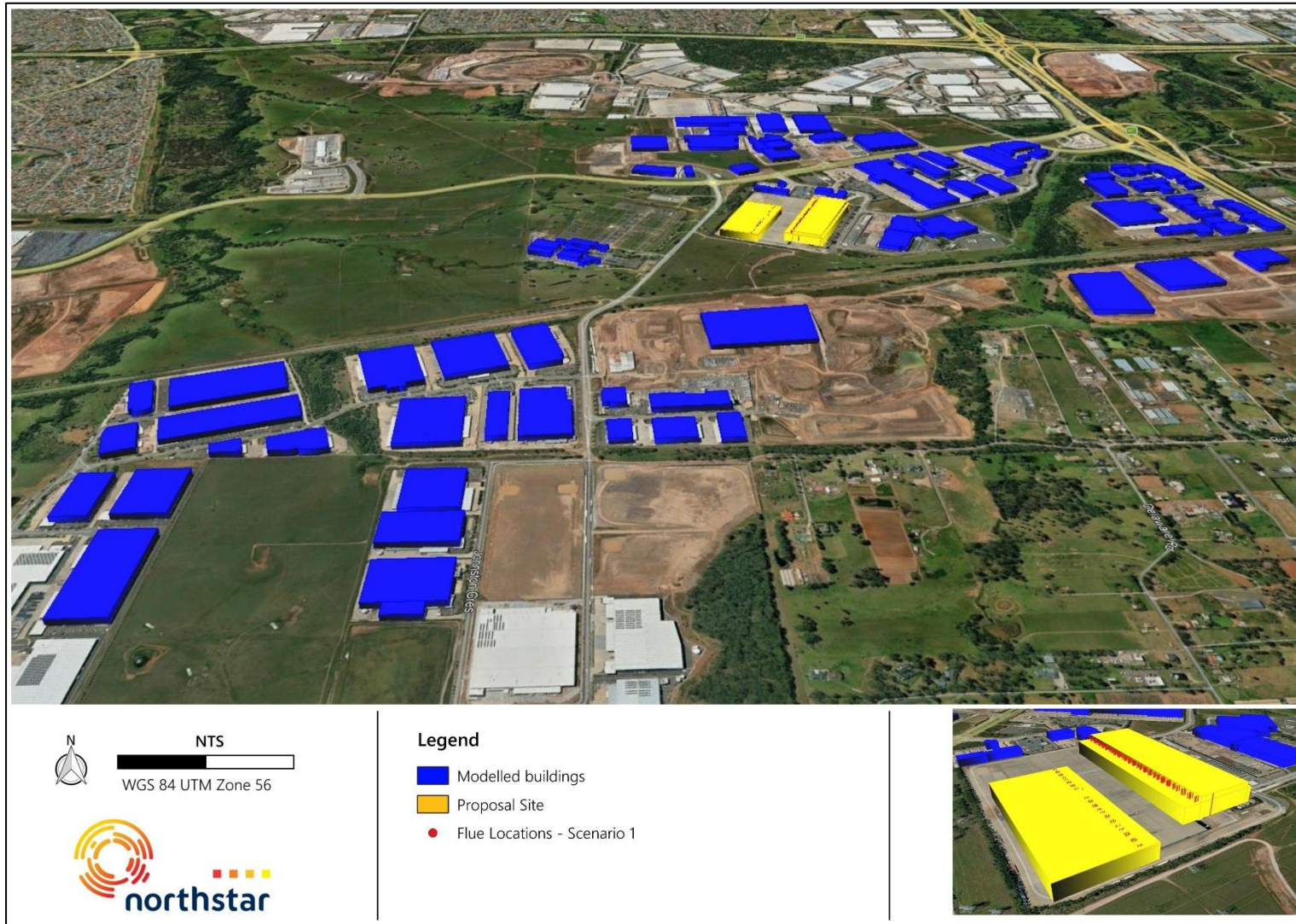


Figure 8 Buildings and discharge points considered in dispersion modelling (Scenario 2)



5.2.2. Modelling Scenarios

The following modelling scenarios have been completed to determine the potential impact under the anticipated operational conditions of the standby generators.

- **Scenario 1 – justified worst case scenario** – Operating all 249 emergency standby generators at one time.
 - This represents an unlikely scenario, assumed to result from an unexpected power outage.
 - The Proposal includes a total of 249 emergency standby generator units supporting the critical IT load and associated operational functions.
 - The AQIA assesses cumulative air quality impacts from all 249 emergency standby generators operating at 100 % load. The modelling assumes full concurrent operation at maximum capacity, with no redundancy applied, to provide a conservative (worst-case) estimate.
 - Each generator has been modelled as operating for all 8 760 hours of the year. Should a power outage event occur it likely to be for a short-term period, and therefore the modelling presents a conservative assessment of the potential impacts.
 - As the emergency standby generators are intended for short-duration use, only assessment against the short-term impact assessment criteria have been performed. Annual average concentrations are not presented, as results would be essentially meaningless.
 - The AQIA contextualises the likelihood of any exceedance of air quality criteria, considering the improbability of full-capacity operation through catastrophic failure.
- **Scenario 2 - realistic (maintenance testing) scenario** – The anticipated testing schedule involves five (5 no.) emergency standby generators tested for 60-minutes at any one time, within the specified testing hours (see Table 4).
 - This scenario is likely to occur regularly, as detailed in Table 4, where five (5 no.) emergency standby generators are tested simultaneously at any one time at 100 % load during daytime hours (assumed to occur at any time between 7:00 am and 6:00 pm [11 hours]).
 - The generators assumed to be tested are shown in Figure 8.
 - Given that up to 249 no. generators may be tested in different configurations over the course of a year, a one-hour NO_x sensitivity analysis has been completed to identify which combinations produce the highest incremental and cumulative impacts at each receptor. The results presented in this AQIA reflect those maximum potential impacts. The admin generator was also included in this analysis for completeness.
 - The AQIA assumes testing over a full hour for modelling purposes in order to maintain a realistic prediction of incremental impacts.

- Comparison of impacts against both short- and long-term criteria are performed, providing another level of conservatism, as the testing schedule is modelled as occurring for every one of the hours between 7:00 am and 6:00 pm, on each and every day of the year.
- The Proposal will be constrained to a total of 190 hours of testing time per year, in accordance with the POEO Act (refer Section 3.1). For the purposes of dispersion modelling, a total of 4 015 hourly events were assumed (based on 11 hours of testing per day over 365 days).
- This conservative approach ensures that all potential combinations of emissions and meteorological conditions are captured. As the Proposal is constrained to 190 testing hours annually, annual average incremental concentrations have been scaled (i.e. weighted) based on the ratio of actual permitted operating hours (190 hours) to the total hours represented in the modelling (4 015 hours). This adjustment ensures that predicted annual average concentrations reflect the Proposal's actual emission load (refer Table 4).

The AQIA includes justification for the selected maintenance testing scenario to demonstrate that the assessed combination of generator flue locations represents a potential worst-case impact at surrounding receptors. A structured combinatorial optimisation framework was applied to identify the flue combinations that produce the maximum incremental impacts during operations. The following provides a summary of the approach adopted:

- Operational information provided by the Applicant indicates that five (5 no.) IT generators would be tested concurrently at the site at 100 % load. To enable assessment of emissions from the five generator flues, a combinatorial optimisation approach was adopted. Based on the constraint of five generators operating simultaneously, 276 299 424 possible testing combinations were required to be assessed.
- Given the large number of possible combinations (computationally constraining), a random sampling strategy was performed to identify the combinations with the potential for maximum impact, which represented 500 000 combinations (approximately 0.18 % of the total combinations). This sampling rate is considered to provide a ± 1 % precision rate at the 99.9% confidence interval.
- Incremental 1-hour NO_x impacts were modelled for each combination by evaluating all 249 flue locations. Impacts were assessed on an incremental NO_x basis (i.e. prior to NO_2 conversion), with the spatial relationship between emission points and receptors for all 249 stacks accounted for in the analysis.
- For each receptor, the maximum incremental 1-hour NO_x impact arising from the sample set of combinations was identified, along with the specific flue combination responsible. This process establishes the worst-case flue locations for maintenance-testing activities and confirms that the scenario adopted in the AQIA reflects the upper-bound operational impact.

5.2.3. Generator Emission Rates and Source Characteristics

As previously described, the specific make and model of emergency standby generators to be included as part of the Proposal have not yet been selected, although the specifications for four potential candidate generators have been provided (refer to Section 2.3.2.1). To ensure that the worst-case impacts associated with the choice of any generator are presented within this AQIA, the most conservative parameters from each option (MTU 20V4000G94F, CAT 3516E, Baudouin 16M55G37505_5 or Cummins QSK95-G4) have been selected for use in the quantitative assessment.

The lowest emission velocity and temperature from the four generators has been adopted, while the highest calculated emission rates from each generator have been utilised in the dispersion modelling. For clarity, the modelled impacts do not reflect the actual impacts from any specific generator but rather the worst-case components of any of the four, making the results conservative in nature.

A summary of the standby generator stack design components used to model each scenario is provided in Table 13. Details of the technical specifications for the standby generators are provided in Appendix E.

For the justified worst-case scenario (Scenario 1), 249 no. emergency standby generators would operate at 100 % load, comprised of 246 no. IT generators (90 no. at Building 1 and 156 no. at Building 2) and 3 no. admin generators (1 no at Building 1 and 2 no at Building 2).

For the maintenance testing scenario (Scenario 2), 5 no. generators would operate at 100 % load.

The values adopted in the dispersion modelling assessment for the Proposal are provided in Table 13, the worst-case data between the four candidate IT generators and one candidate admin generator is highlighted.

The locations of the modelled emissions sources at the Proposal site under Scenario 1 and Scenario 2 are illustrated in Figure 7 and Figure 8 respectively (refer Section 5.2.1.4).

Table 13 Emergency standby generator emissions and stack parameters

Parameter	Units	Scenario 1 (Justified worst case)				
Hour start	Hr	00:00				
Hour end	Hr	23:00				
% load	%	100				
Emergency standby generator model		OPTION 1 MTU 20V4000G94F	OPTION 2 CAT 3516E	OPTION 3 Baudouin 16M55G37505_5	OPTION 4 Cummins QSK95-G4	-
Admin emergency standby generator model		-	-	-	-	Admin Gen MTU 16V2000G76F
Number of generators active	no.	90 (Building 1) 156 (Building 2)				1 (Building 1) 2 (Building 2)
Diesel consumption rate (per gen)	L·hr ⁻¹	756.0	750.9	755.1	608.0	237
Maximum nominal electrical capacity	kW	3 090	3 085	3 300	2 716	979
Stack height	m AGL	26.2 (Building 1) 34.88 (Building 2)				
	mm RL ^(h)	104 820 ^f (Building 1) 114 630 ^g (Building 2)				
Stack diameter	mm ID	700	700	700	700	700
Stack CSA	m ²	0.38	0.38	0.38	0.38	0.38
Actual discharge rate	Am ³ ·s ⁻¹	11.1	10.7	12.3	8.6	3.4
Exit temperature	°C	642	491	740	394	530
Exit velocity	m·s ⁻¹	28.8	27.7	31.9	22.3	8.7
Generator emission specification						
NO _x	g·kWh ⁻¹	7.1	4.2	15.2	5.2	7.2
CO	g·kWh ⁻¹	0.4	1.1	0.3	0.1	0.6

Parameter	Units	Scenario 1 (Justified worst case)				
TVOC	g·kWh ⁻¹	0.12	0.07	0.2	0.05	0.14
PM	g·kWh ⁻¹	0.03	0.07	0.06	0.01	0.05
SO ₂	g·kWh ⁻¹	-	-	-	0.003	-
Pollutant emission rates						
NO _x ^(a)	g·s ⁻¹	6.10E+00	6.44E+00	1.39E+01	3.90E+00	1.958E+00
CO ^(a)	g·s ⁻¹	3.43E-01	1.62E+00	2.29E-01	5.63E-02	1.523E-01
TVOC ^(a)	g·s ⁻¹	1.03E-01	1.13E-01	1.83E-01	3.94E-02	3.81E-02
PM (PM ₁₀ and PM _{2.5}) ^{(a)(d)}	g·s ⁻¹	2.40E-02	1.18E-01	5.50E-02	3.94E-03	1.251E-02
SO ₂	g·s ⁻¹	3.57E-06 ^(c)	3.55E-06 ^(c)	3.57E-06 ^(c)	2.25E-03	1.12E-06 ^(c)
Benzene (C ₆ H ₆) ^(b)	g·s ⁻¹	9.99E-04	1.09E-03	1.78E-03	3.82E-04	3.69E-04
Toluene (C ₇ H ₈) ^(b)	g·s ⁻¹	3.61E-04	3.94E-04	6.42E-04	1.38E-04	1.33E-04
Xylene (C ₈ H ₁₀) ^(b)	g·s ⁻¹	2.51E-04	2.74E-04	4.47E-04	9.61E-05	9.29E-05
PAHs ^(b)	g·s ⁻¹	1.48E-08	1.62E-08	2.64E-08	5.67E-09	5.480E-09
Formaldehyde (CH ₂ O) ^(b)	g·s ⁻¹	1.01E-04	1.11E-04	1.81E-04	3.88E-05	3.750E-05

- Notes:
- (a): Emission rates based on values contained in technical specification (refer Appendix E).
 - (b): Emission rates factored from TVOC using the emission factors from Table 43 of (NPI, 2008). Refer Section 5.2.5.
 - (c): Based on permissible level of sulphur content in non-road diesel fuel (10 ppm).
 - (d): 100 % of PM is emitted as PM_{2.5}, and PM_{2.5} = PM₁₀.
 - (e): Both scenarios assume that each standby generator considered is operating at 100 % load, consistent with the emission data within the technical specifications presented in Appendix E.
 - (f): The base RL for Building 1 is 80 800 mm.
 - (g): The base RL for Building 2 is 79 750 mm.

5.2.4. POEO CAR Calculated Standards of Concentration

As listed in Table 2, NSW EPA has requested that the generator emission concentrations are compared to the standards of concentration, specified in Schedule 2 Part 2 Division 3 Group 6 of the POEO CAR. It is noted that those standards of concentration relate to scheduled activities – general activities and plant.

As discussed in Section 3.1 and Section 3.2, the Proposal is defined as a scheduled activity under the POEO Act and is therefore subject to the standards of concentration outlined in Schedule 2, Part 2 of the POEO CAR.

The calculated in stack emissions concentrations for the four generator candidates for the Proposal is provided in Table 14 below.

Table 14 Comparison of emissions concentrations against Schedule 2 Part 2 of POEO CAR

Parameter	MTU 20V4000G94F	CAT 3516E	Baudouin 16M55G3750_5	Cummins QSK95-G4
	Adjusted to 7 % O ₂ (mg·Nm ⁻³)			
Solid particles (total)	8.5	34.8	-	2.6
VOCs	36.3	35.0	34.2	31.5
CO	120.5	578.5	82.2	44.6

Note: Nitrogen dioxide (NO₂) is exempt from the standards of concentration under Clause 73, Part 5, Division 6 of the POEO CAR, as the Proponent is anticipated to operate the generators under the 200-hour exemption (refer Section 3.2). Accordingly, NO₂ has not been included in the benchmarking assessment.

The emission specifications for each of the four generators are sourced from the corresponding exhaust gas emissions test report (refer Appendix E), with values expressed at standard temperature and pressure (STP), dry gas, and corrected to 5 % oxygen (O₂) content. For the purposes of comparison with the POEO CAR Schedule 2 standards of concentration, these values have been adjusted to 7 % O₂ in accordance with regulatory requirements.

A comparison against the respective POEO CAR standards of concentrations applicable for the Proposal is provided in Section 7.4.

5.2.5. Speciated VOCs

To appropriately factor the emissions for benzene (C₆H₆), toluene (C₇H₈) and xylene (C₈H₁₀), reference has been made to the emission factors (EF) presented in table 43 of (NPI, 2008) which relate to stationary large (more than 450 kW) diesel engines. The emission factors for TVOC and the respective speciated VOCs have been factored to calculate the mass fractions of those species within TVOC. Table 15 presents the speciated VOC fraction assumptions that are used for this AQIA.

The impacts of odorants (toluene (C_7H_8) and xylene (C_8H_{10})) have been similarly assessed on a *pro-rata* basis as a fraction of TVOC as published in the NPI (NPI, 2008) multiplied by the measured source-specific TVOC emission rate.

Table 15 Speciated VOC fractions

Substance	EF % (of TVOC)
TVOC ^{(a)(b)}	100 %
Benzene (C_6H_6) ^(c)	0.97 %
Toluene (C_7H_8) (odour) ^(c)	0.35 %
Xylene (C_8H_{10}) (odour) ^(c)	0.24 %

5.2.6. Particle Size Fractions

In regard to particulates from diesel, virtually 100 % of diesel particles are less than 1 μm in diameter (i.e. PM_{10}) and consequently particulates from diesel combustion are assessed as $PM_{2.5}$. In this AQIA, the emission rate of $PM_{2.5}$ is numerically identical to PM_{10} , as all PM_{10} particles are assessed as being $\leq 2.5 \mu m$ in diameter ($PM_{2.5}$).

5.2.7. NO_x to NO_2 Conversion

Emissions of NO_x have been calculated, with subsequent ground-level concentrations predicted using dispersion modelling techniques. Given that NO_x is a mixture of NO_2 and nitric oxide (NO), conversion of NO_x predictions to NO_2 concentrations is necessary to appropriately assess potential NO_2 impacts.

NO_x from a combustion process will be emitted as NO and NO_2 . Over time and after the point of discharge, NO in ambient air will be transformed by secondary atmospheric reactions with atmospheric ozone (O_3) to form NO_2 , and this reaction often occurs at a considerable distance downwind from the point of emission, and by which time the plume will have dispersed and diluted significantly from the concentration at point of discharge.

AQIAs need to account for the conversion of NO to NO_2 to enable a comparison against the air quality criteria for NO_2 . The Approved Methods outlines various methods of assessment, which range from the simple to the more detailed. The three methods outlined in the Approved Methods are briefly outlined below:

- **Method 1 - 100 % conversion:** the most conservative assumption is to assume that 100 % of the total NO_x emitted is discharged as NO_2 , and that further reactions do not occur.
- **Method 2 - Ozone limiting method (OLM):** this method uses contemporaneous ozone data to estimate that rate at which NO is oxidised to NO_2 hour-on-hour using an established relationship.
- **Method 3 – Janssen method:** where the location is represented by good monitoring data for NO and NO_x , the empirical relationship between NO and NO_2 to derive 'steady state' relationships.

Section 8.1 of the Approved Methods outlines the approach to NO₂ assessment, which clearly indicates that each stage should be performed sequentially. That is, Method 1, Level 1 should be performed first and *“if the impact assessment criteria are exceeded, a more refined assessment should be undertaken and/or additional management practices or emission controls applied”*.

If exceedances are predicted, then Method 1, Level 2 should be performed, with the same assessment of the potential for exceedance of the 1-hour NO₂ criterion applied. The process then continues through Method 2 (Level 1 and Level 2), and Method 3 (Level 1 and Level 2).

This AQIA utilises Method 3 to approximate the conversion of NO_x to NO₂, in accordance with the empirical equation described in (NSW EPA, 2022):

$$NO_2 / NO_x = A(1 - \exp(-\alpha x))$$

Where:

x = distance from the source (km)

A and α are classified according to O₃ concentration, wind speed and season, with (Janssen, Van Wakeren, Van Duuren, & Elshout, 1988) providing values for A and α .

At each receptor, the hourly varying NO₂/NO_x relationship has been calculated, based on the season, hourly varying O₃ concentration, and wind speed. Results are presented in Section 7.1.2 and Section 7.2.2 for the maximum predicted incremental NO_x / NO₂ concentration and the maximum predicted cumulative NO₂ concentration using the relevant NO_x / NO₂ conversion method(s).

5.2.8. Short Term Pollutant Concentrations

With reference to criteria air pollutants with sub-hourly criteria (CO, refer Section 3.3), hourly dispersion model outputs have been adjusted using the following Power Law adjustment:

$$C_{p,t} = C_{p,60} \left[\frac{60}{t} \right]^{0.2}$$

Where:

$C_{p,t}$ = concentration of pollutant (p) at averaging time (mins) (t)
 $C_{p,60}$ = concentration of pollutant (p) at averaging time (60 mins)
 t = time (mins)

5.3. Assessment of Cumulative Impacts

The cumulative impact assessment (CIA) methodology adopted for this AQIA is based on the CIA Guidelines (NSW DPIE, 2022), which recognise that cumulative assessments can be carried out at either a strategic or project level.

This AQIA represents a Project-level CIA, following the approach outlined in the CIA Guidelines. These Guidelines define cumulative impacts as those arising from the incremental, sustained, and combined effects of human actions and natural variations over time, which may be either adverse or beneficial. Such impacts can result from the compounding impacts of a single project or multiple projects in an area, and from the accumulation of impacts associated with past, present, and foreseeable future activities.

As noted in the CIA Guidelines (NSW DPIE, 2022):

“The cumulative impact assessment undertaken for a particular State significant projects are to be proportionate to the scale and potential significance of the cumulative impacts of the project combined with the impacts of other relevant future projects. This assessment is to focus on the key matters that could be materially affected by the cumulative impacts of the project and other relevant future projects - not on every conceivable cumulative impact on every matter.”

5.3.1. Assessment Approach

The methodology for the CIA involved the following steps:

- Identification of relevant future projects, based on publicly available information, and the associated issues that could contribute to cumulative impacts, using the screening criteria outlined in Section 3.4 of the CIA Guidelines;
- Determination of the applicable level of assessment (detailed, standard, or not applicable) for air quality matters, in accordance with Appendix B of the CIA Guidelines;
- Identification of the proposed approach and key uncertainties associated with assessing cumulative impacts; and
- Assessment and evaluation of cumulative impacts, including the recommendation of mitigation and management measures, where appropriate, to minimise the Proposal's contribution to those impacts.

5.3.2. Study Area and Scope

The study area for the CIA assessment aligns with the dispersion modelling domain, which broadly encompasses a 5 km radius around the Proposal site (refer Appendix C). This approach is consistent with section 2.3 of the CIA Guidelines, which state:

"This assessment need only focus on the key matters that are within the immediate geographical area of influence of the project (i.e. within proximity to the project site) and within the relevant strategic context. It is not practical or reasonable to require proponents to assess cumulative impacts for all matters or across large areas."

The scope of assessment includes:

- Review of the nature and scale of potential air quality impacts anticipated during the Proposal's timeframe, based on publicly available planning documents for relevant future Proposals;
- Evaluation of the potential for cumulative air quality impacts arising from these identified projects in combination with this Proposal, including dust generation and gaseous emissions during construction, and gaseous emissions during operation; and,
- Identification and recommendation of mitigation measures, where necessary.

The assessment of cumulative impacts from this Proposal and other nearby relevant sources is presented in Section 7.5.

6. CONSTRUCTION PHASE RISK ASSESSMENT

Northstar have adapted the methodology from the IAQM construction dust guidance (IAQM, 2024) to assess construction phase risk. This approach employed a six-step process to evaluate the risks associated with dust impact from construction activities (refer Appendix B). It considers receptor sensitivity and potential impact magnitude to identify key control measures, as detailed in Section 5.1.

6.1. Risk (Pre-Mitigation)

Given the sensitivity of the identified receptors is classified as low for dust soiling, and low for health impacts, and the dust emission magnitudes for the various construction phase activities as presented in Appendix B, the resulting risk of air quality impacts (without mitigation) is as presented in Table 16.

Table 16 Risk of air quality impacts from construction activities

Sensitivity of area	Dust emission magnitude					Preliminary risk				
	Demolition	Earthworks	Construction	Track-out	Const. traffic	Demolition	Earthworks	Construction	Track-out	Const. traffic
Dust soiling										
Low	Large	Large	Large	Large	N/A	Med.	Low	Low	Low	N/A
Human health										
Low	Large	Large	Large	Large	N/A	Med.	Low	Low	Low	N/A

Note: Med. = Medium, N/A. = Not Applicable

Table 16 summarises that dust soiling and human health impacts are considered a medium risk for demolition, and a low risk for all other construction activities, assuming no mitigation measures are in place to control emissions during the construction phase. Consequently, the mitigation measures in Appendix B are aligned with the Proposal's risks and should be applied throughout the construction phase to ensure proper management of construction dust.

6.2. Risk (Post-Mitigation)

The adapted methodology emphasises the aim of preventing significant effects on receptors during construction activities through the implementation of effective mitigation measures. Experience demonstrates that achieving this goal is feasible. Considering the size of the Proposal site, the distance to sensitive receptors, and the nature of activities involved, residual impacts related to fugitive dust emissions from the Proposal are expected to be 'negligible' if the mitigation measures outlined in Appendix B are implemented appropriately.

7. OPERATIONAL PHASE IMPACT ASSESSMENT

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- **Incremental impact** – relates to the concentrations predicted as a result of the operation of the Proposal in isolation.
- **Cumulative impact** – relates to the incremental concentrations predicted as a result of the operation of the Proposal PLUS the background air quality concentrations discussed in Section 4.4.

The results are presented in this manner to allow examination of the likely impact of the facility in isolation and the contribution to air quality impacts in a broader sense. In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	Pollutant concentration / deposition rate equal to, or greater than the relevant criterion
------------------	--	--

Details of each scenario under each modelled scenario are provided in Section 5.2.2.

7.1. Scenario 1 – Justified Worst-Case

The following presents modelling results for Scenario 1 (refer Section 5.2.2), which assumes all 249 emergency standby generators operating at 100 % load, with background pollutant concentrations included where appropriate (refer Section 4.4). Results in this section are focused on short term criteria only (i.e. ≤ 24 hours).

Note: Care should be taken when interpreting 24-hour average impacts, as power outages are typically much shorter in duration. The assessment adopts a conservative approach by assuming generator operation over a full 24-hour period. Comparison against annual average criteria is not meaningful in this context given that generator use is limited to occasional, short-term operation during emergency scenarios.

Assessment of annual average impacts is presented separately under Scenario 2 (maintenance testing).

7.1.1. Particulate Matter

Results are presented in this section for the predictions of particulate matter (PM₁₀ and PM_{2.5}) associated with Scenario 1. The averaging periods associated with the criteria for these pollutants is 24-hour as specified in Table 6. The emissions adopted for Scenario 1 reflect the operational profile of the Proposal over that averaging period (refer Section 5.2.2).

7.1.1.1. Daily (24-Hour) PM₁₀ and PM_{2.5} Concentrations

Table 17 shows the predicted 24-hour PM₁₀ and PM_{2.5} concentrations at the considered receptors under Scenario 1, for the top 20 impacted receptors. No background concentrations are included within this table.

Table 17 Predicted incremental 24-hour PM₁₀ and PM_{2.5} concentrations – Scenario 1

Receptor	Maximum incremental 24-hour average concentration (µg·m ⁻³)	
	PM ₁₀	PM _{2.5}
Criterion	50	25
Max. % of criterion	537.4	1 074.9
R1	268.7	268.7
R3	147.2	147.2
R2	107.0	107.0
R7	103.7	103.7
R8	93.7	93.7
R5	90.4	90.4
R10	85.6	85.6
R4	85.6	85.6
R19	76.0	76.0
R16	70.1	70.1
R9	67.1	67.1
R6	66.9	66.9
R17	64.1	64.1
R14	59.9	59.9
R15	58.3	58.3
R31	55.9	55.9
R26	55.6	55.6
R21	52.9	52.9
R28	51.1	51.1
R11	50.1	50.1

Note: All PM is assumed to be < 1 µm in diameter and therefore assessed as PM_{2.5}. In this instance, emissions of PM_{2.5} will be the same as PM₁₀ (PM_{2.5} is a subset of PM₁₀) and therefore the results will be consistent between PM₁₀ and PM_{2.5}.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. reflective of the operation of emergency standby generators for an entire 24-hour period).

Table 17 indicates that the highest 24-hour average PM₁₀ and PM_{2.5} incremental concentrations related to the Proposal are predicted at receptor R1.

A contemporaneous analysis of the 24-hour PM_{10} and $PM_{2.5}$ data has been performed where each predicted incremental concentration is added to the corresponding monitored background concentration, in accordance with Section 11.2.3(b) of the Approved Methods.

Table 18 and Table 19 present the predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations resulting from the operation of the Proposal through Scenario 1, with the corresponding background included for each day. Results are presented in Table 18 and Table 19 for those receptors at which the greatest impacts have been predicted (refer Table 17).

The left side of the tables show the predicted maximum cumulative impacts (typically the days with the highest regional background), and the right side shows the total predicted concentration on days with the highest predicted incremental concentrations respectively.

For both PM_{10} and $PM_{2.5}$, the maximum cumulative impact (the left-hand side of Table 18 and Table 19), and the highest maximum incremental impact (the right-hand side of Table 18 and Table 19) is predicted at receptor R1. Both tables highlight that exceedances of the respective air quality criteria are primarily driven by the additional of incremental impacts to background concentrations.

A contour isopleth plot of the predicted incremental 24-hour PM_{10} concentrations associated with the Proposal under Scenario 1 is presented in Figure 9 to illustrate the spatial distribution of particulate matter in the area surrounding the Proposal site.

The number of additional exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criteria predicted at various receptors resulting from emergency generator operation is presented in Section 7.3.

Further analysis and interpretation of the above predictions are discussed in Section 8.2.

Table 18 Summary of contemporaneous 24-hour PM₁₀ concentrations – Scenario 1

Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor R1			Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor R1		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
20/04/2021	230.0	46.2	276.2	24/03/2021	268.7	6.7	275.4
24/03/2021	268.7	6.7	275.4	24/07/2021	252.3	9.9	262.2
24/07/2021	252.3	9.9	262.2	20/07/2021	249.1	7.6	256.7
09/09/2021	243.5	13.8	257.3	09/09/2021	243.5	13.8	257.3
20/07/2021	249.1	7.6	256.7	14/11/2021	242.6	6.0	248.6
14/11/2021	242.6	6.0	248.6	25/06/2021	239.0	7.9	246.9
25/06/2021	239.0	7.9	246.9	19/09/2021	230.5	9.7	240.2
19/09/2021	230.5	9.7	240.2	20/04/2021	230.0	46.2	276.2
23/09/2021	219.3	20.0	239.3	17/06/2021	226.3	4.3	230.6
14/04/2021	215.0	16.0	231.0	23/09/2021	219.3	20.0	239.3
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions (outlined in red) as a result of the operation of the Proposal				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 19 Summary of contemporaneous 24-hour PM_{2.5} concentrations – Scenario 1

Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor R1			Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor R1		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
24/03/2021	268.7	1.6	270.3	24/03/2021	268.7	1.6	270.3
24/07/2021	252.3	7.2	259.5	24/07/2021	252.3	7.2	259.5
20/07/2021	249.1	4.0	253.1	20/07/2021	249.1	4.0	253.1
09/09/2021	243.5	4.9	248.4	09/09/2021	243.5	4.9	248.4
14/11/2021	242.6	2.0	244.6	14/11/2021	242.6	2.0	244.6
25/06/2021	239.0	4.6	243.6	25/06/2021	239.0	4.6	243.6
20/04/2021	230.0	10.5	240.5	19/09/2021	230.5	2.8	233.3
19/09/2021	230.5	2.8	233.3	20/04/2021	230.0	10.5	240.5
17/06/2021	226.3	2.7	229.0	17/06/2021	226.3	2.7	229.0
23/09/2021	219.3	2.6	221.9	23/09/2021	219.3	2.6	221.9
These data represent the highest Cumulative Impact 24-hour PM _{2.5} predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour PM _{2.5} predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. reflective of the operation of emergency standby generators for an entire 24-hour period).

Figure 9 Predicted incremental 24-hour PM₁₀ impacts – Scenario 1



Legend

 Proposal Site

 Receptors

S1 24-hour Average PM₁₀ (µg/m³)

 Incremental



0 0.5 1 km

WGS 84 UTM Zone 56

Source: Northstar

7.1.2. Nitrogen Dioxide

Results are presented in this section for the predictions of nitrogen dioxide (NO₂) under the assumptions of Scenario 1 (refer Section 5.2.2). The averaging period associated with the criterion for NO₂ is 1-hour as specified in Table 6. Note that impacts have not been compared with the annual average criterion for NO₂ as the generators would not be operating for an entire year, and the results would be meaningless.

Emissions of NO_x have been calculated with subsequent ground-level concentrations predicted using dispersion modelling techniques. Given that NO_x is a mixture of NO₂ and nitric oxide (NO), conversion of NO_x predictions to NO₂ concentrations may be performed. Within this assessment, the Janssen method (Method 3) has been adopted as outlined in Section 5.2.7.

The predicted 1-hour average NO₂ concentrations resulting from the Proposal's operations and using the Janssen method, for the top 20 impacted receptors under Scenario 1 are presented in Table 20.

Table 20 Predicted 1-hour NO₂ concentrations – Scenario 1

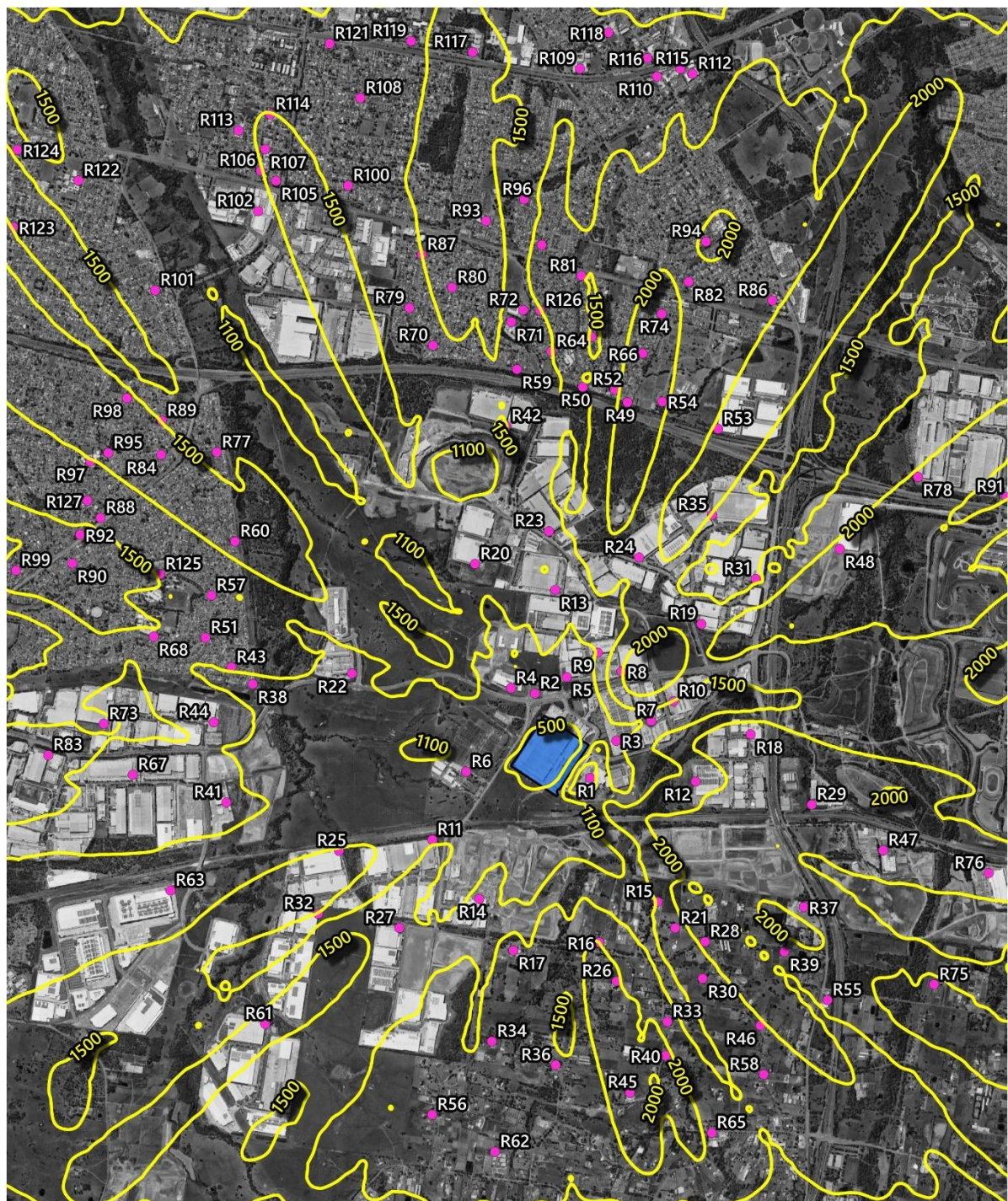
Receptor	Nitrogen dioxide (NO ₂) concentration (µg·m ⁻³)		
	1-hour average		
	Incremental impact	Background	Cumulative impact
Criterion	164		
Max % of criterion	1 731.4	12.5	1 732.6
R47	2 839.4	2.1	2 841.5
R18	2 467.6	10.3	2 477.8
R76	2 442.9	2.1	2 444.9
R29	2 436.9	2.1	2 438.9
R37	2 295.4	16.4	2 311.8
R1	2 286.0	10.3	2 296.3
R55	2 269.7	16.4	2 286.1
R45	2 260.5	2.1	2 262.5
R48	2 215.0	2.1	2 217.0
R28	2 165.7	20.5	2 186.2
R66	2 177.9	4.1	2 182.0
R39	2 164.0	16.4	2 180.4
R53	2 164.4	<0.1	2 164.4
R49	2 144.3	4.1	2 148.4
R78	2 141.4	2.1	2 143.4
R74	2 120.1	4.1	2 124.2
R26	2 106.7	2.1	2 108.8
R54	2 093.7	4.1	2 097.8
R94	2 085.8	8.1	2 093.9
R40	2 076.8	8.2	2 085.0

The results indicate that there are a number of exceedances associated with cumulative concentrations of NO_2 under Scenario 1.

Figure 10 presents a contour plot of the predicted 1-hour incremental NO_2 impacts for Scenario 1, based on the Janssen method for converting NO_x to NO_2 (refer Section 5.2.7).

The number of additional exceedances of the 1-hour NO_2 criterion predicted at each receptor resulting from emergency generator operation is presented in Section 7.3. These values are discussed further in Section 8.2.

Figure 10 Predicted incremental 1-hour NO₂ impacts – Scenario 1



Legend

 Proposal Site

 Receptors

S1 1-hour Average NO₂ (µg/m³)

 Incremental



0 0.5 1 km



WGS 84 UTM Zone 56

Source: Northstar

7.1.3. All Other Pollutants

The following presents the predicted concentrations associated with Scenario 1 for all other pollutants assessed in this AQIA (refer Section 5.2.2).

Presented in Table 21 to Table 23 are the predicted concentrations of CO, SO₂, PAHs, VOCs and formaldehyde at varying averaging periods (≤ 24 hours) at the top 20 impacted receptors.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. reflective of the operation of emergency standby generators for an entire 24-hour period).

- The predicted cumulative concentrations for CO are below the relevant criteria for all averaging periods at all receptors as shown in Table 21.
- The results presented in Table 22 indicate that predicted incremental impacts of SO₂ at all receptors are less than 10 % of the relevant criteria for all averaging periods. The addition of background concentrations does not result in any exceedances at any receptor.
- Results in Table 23 indicate no exceedances of the 1-hour criteria for benzene are predicted at any identified receptors. The maximum predicted impact for benzene is experienced at receptor R1 (32.8 % of the relevant criterion).

Table 21 Predicted 15-minutes, 1-hour and 8-hour average CO concentrations – Scenario 1

Receptor	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15-minute			1-hour			8-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	100			30			10		
Max. % of criterion	17.5	2.1	19.6	44.1	5.3	49.5	59.6	13.0	72.6
R1	17.5	2.1	19.6	13.2	1.6	14.8	6.0	1.3	7.3
R3	10.3	2.1	12.4	7.8	1.6	9.4	3.0	1.3	4.3
R8	7.9	2.1	10.0	6.0	1.6	7.6	2.4	1.3	3.7
R7	6.2	2.1	8.3	4.7	1.6	6.3	2.4	1.3	3.7
R5	5.1	2.1	7.2	3.9	1.6	5.5	2.3	1.3	3.6
R2	5.1	2.1	7.2	3.8	1.6	5.4	2.9	1.3	4.2
R10	4.9	2.1	7.0	3.7	1.6	5.3	2.2	1.3	3.5
R16	4.8	2.1	6.9	3.6	1.6	5.2	1.8	1.3	3.1
R12	4.7	2.1	6.8	3.6	1.6	5.2	1.6	1.3	2.9
R9	4.7	2.1	6.8	3.5	1.6	5.1	2.2	1.3	3.5
R4	4.3	2.1	6.4	3.3	1.6	4.9	2.1	1.3	3.4
R18	3.9	2.1	6.0	3.0	1.6	4.6	1.5	1.3	2.8
R19	3.7	2.1	5.8	2.8	1.6	4.4	1.8	1.3	3.1
R6	3.6	2.1	5.7	2.8	1.6	4.4	1.4	1.3	2.7

Receptor	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15-minute			1-hour			8-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
R26	3.6	2.1	5.7	2.7	1.6	4.3	1.5	1.3	2.8
R28	3.5	2.1	5.6	2.6	1.6	4.2	1.3	1.3	2.6
R15	3.4	2.1	5.5	2.6	1.6	4.2	1.7	1.3	3.0
R21	3.4	2.1	5.5	2.6	1.6	4.2	1.6	1.3	2.9
R17	3.2	2.1	5.3	2.4	1.6	4.0	1.5	1.3	2.8
R13	3.2	2.1	5.3	2.4	1.6	4.0	1.5	1.3	2.8

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 22 Predicted 1-hour and 24-hour SO₂ concentrations – Scenario 1

Receptor	Sulphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1-hour			24-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	215			57		
Max. % of criterion	8.5	20.0	28.5	9.0	13.9	22.9
R1	18.3	42.9	61.2	5.1	7.9	13.0
R3	10.8	42.9	53.7	2.8	7.9	10.7
R8	8.3	42.9	51.2	1.8	7.9	9.7
R7	6.5	42.9	49.4	2.0	7.9	9.9
R5	5.3	42.9	48.2	1.7	7.9	9.6
R2	5.3	42.9	48.2	2.0	7.9	9.9
R10	5.1	42.9	48.0	1.6	7.9	9.5
R16	5.0	42.9	47.9	1.3	7.9	9.2
R12	5.0	42.9	47.9	0.8	7.9	8.7
R9	4.9	42.9	47.8	1.3	7.9	9.2
R4	4.5	42.9	47.4	1.6	7.9	9.5
R18	4.1	42.9	47.0	0.9	7.9	8.8
R19	3.9	42.9	46.8	1.4	7.9	9.3
R6	3.8	42.9	46.7	1.3	7.9	9.2
R26	3.8	42.9	46.7	1.1	7.9	9.0
R28	3.7	42.9	46.6	1.0	7.9	8.9
R15	3.6	42.9	46.5	1.1	7.9	9.0
R21	3.6	42.9	46.5	1.0	7.9	8.9
R17	3.4	42.9	46.3	1.2	7.9	9.1
R13	3.3	42.9	46.2	0.8	7.9	8.7

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 23 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations – Scenario 1

Receptor	Predicted 1-hour (99.9 th %ile) average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene (odour)	Xylene (odour)	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	<0.1	32.8	1.0	1.3	4.8
R1	1.41E-07	9.52E-03	3.44E-03	2.40E-03	9.67E-04
R3	6.57E-08	4.42E-03	1.60E-03	1.11E-03	4.49E-04
R2	5.05E-08	3.40E-03	1.23E-03	8.56E-04	3.46E-04
R5	4.89E-08	3.29E-03	1.19E-03	8.28E-04	3.34E-04
R7	4.75E-08	3.20E-03	1.15E-03	8.05E-04	3.25E-04
R8	4.52E-08	3.05E-03	1.10E-03	7.67E-04	3.10E-04
R10	4.09E-08	2.75E-03	9.94E-04	6.93E-04	2.80E-04
R4	4.08E-08	2.75E-03	9.92E-04	6.91E-04	2.79E-04
R9	4.07E-08	2.74E-03	9.89E-04	6.90E-04	2.78E-04
R12	3.83E-08	2.58E-03	9.32E-04	6.50E-04	2.62E-04
R15	3.35E-08	2.26E-03	8.16E-04	5.69E-04	2.30E-04
R16	3.31E-08	2.23E-03	8.04E-04	5.61E-04	2.26E-04
R19	3.27E-08	2.20E-03	7.95E-04	5.54E-04	2.24E-04
R24	3.20E-08	2.16E-03	7.78E-04	5.42E-04	2.19E-04
R13	3.13E-08	2.11E-03	7.62E-04	5.31E-04	2.14E-04
R21	2.87E-08	1.93E-03	6.97E-04	4.86E-04	1.96E-04
R18	2.86E-08	1.93E-03	6.96E-04	4.85E-04	1.96E-04
R14	2.86E-08	1.93E-03	6.96E-04	4.85E-04	1.96E-04
R26	2.79E-08	1.88E-03	6.79E-04	4.73E-04	1.91E-04
R17	2.76E-08	1.86E-03	6.70E-04	4.67E-04	1.89E-04

As the predicted concentrations for these pollutants are low compared to the respective criteria, the contour plots are not presented for these pollutants.

7.2. Scenario 2 – Maintenance Testing

Presented below are the results of the modelling assessment under the assumptions of Scenario 2 (refer Section 5.2.2) with five emergency standby generators operating for each specified testing hour. It is noted that the likely maintenance scenario involves five generators operating simultaneously during daytime hours (7:00 am to 6:00 pm).

Annual average increments under this scenario have been factored according to the anticipated number of hours of testing each year (refer Section 2.3.2).

7.2.1. Particulate Matter

7.2.1.1. Annual Average TSP, PM₁₀ and PM_{2.5} Concentrations

The predicted annual average particulate matter concentrations (as TSP, PM₁₀ and PM_{2.5}) resulting from Scenario 2 operations are presented in Table 24. Predicted incremental concentrations of TSP, PM₁₀ and PM_{2.5} at the top 20 impacted receptor locations are low. The Proposal's operation under the modelled testing regime is predicted to not result in any exceedances of the relevant criteria.

Table 24 Predicted annual average TSP, PM₁₀ and PM_{2.5} concentrations – Scenario 2

Receptor	Annual average concentration (µg·m ⁻³)								
	TSP			PM ₁₀			PM _{2.5}		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	90			25			8		
Max % of crit.	0.0	37.1	37.1	0.0	65.0	65.2	0.0	72.5	73.1
R1	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R2	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R3	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R4	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R5	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R6	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R7	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R8	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R9	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R10	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R11	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R12	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R13	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R14	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R15	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9

Receptor	Annual average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)								
	TSP			PM ₁₀			PM _{2.5}		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
R16	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R17	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R18	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R19	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9
R20	<0.1	33.4	33.4	<0.1	16.2	16.3	<0.1	5.8	5.9

Notes: Incr. – Incremental, Bkg. – Background, – Cumul. – Cumulative.

7.2.1.2. Daily (24-Hour) PM₁₀ and PM_{2.5} Concentrations

Table 25 shows the predicted 24-hour PM₁₀ and PM_{2.5} concentrations at the considered receptors under Scenario 2, for the top 20 impacted receptors. No background concentrations are included within this table.

Table 25 Predicted incremental 24-hour PM₁₀ and PM_{2.5} concentrations – Scenario 2

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
Criterion	50	25
Max. % of criterion	5.6	11.2
R1	2.8	2.8
R3	1.2	1.2
R5	1.0	1.0
R6	1.0	1.0
R2	0.9	0.9
R4	0.8	0.8
R7	0.7	0.7
R8	0.7	0.7
R10	0.7	0.7
R11	0.5	0.5
R9	0.5	0.5
R13	0.5	0.5
R12	0.4	0.4
R14	0.4	0.4
R17	0.4	0.4
R15	0.4	0.4
R18	0.4	0.4
R16	0.3	0.3
R27	0.3	0.3
R28	0.3	0.3

Note: All PM is assumed to be < 1 μm in diameter and therefore assessed as PM_{2.5}. In this instance, emissions of PM_{2.5} will be the same as PM₁₀ (PM_{2.5} is a subset of PM₁₀) and therefore the results will be consistent between PM₁₀ and PM_{2.5}.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a testing event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative.

Table 25 indicates that the highest 24-hour average PM_{10} and $PM_{2.5}$ incremental concentrations related to the Proposal are predicted at receptor R1 (refer Figure 4).

A contemporaneous analysis of the 24-hour PM_{10} and $PM_{2.5}$ data has been performed where each predicted incremental concentration is added to the corresponding monitored background concentration, in accordance with Section 11.2.3(b) of the Approved Methods.

Table 26 and Table 27 present the predicted 24-hour average PM_{10} and $PM_{2.5}$ concentrations resulting from operation of the Proposal through Scenario 2, with corresponding background included for each day. Results are presented in Table 26 and Table 27 for those receptors at which the greatest impacts have been predicted (see Table 25). The left side of the tables show the predicted maximum cumulative impacts (typically the days with the highest regional background), and the right side shows the total predicted concentration on days with the highest predicted incremental concentrations respectively.

For PM_{10} and $PM_{2.5}$ the maximum cumulative impact (left side of Table 26 and Table 27) are predicted at receptor R8, whilst the maximum incremental impact (right side of Table 26 and Table 27) are predicted at receptor R1.

Both Table 26 and Table 27 each show a single exceedance of the relevant 24-hour criteria for cumulative PM_{10} and $PM_{2.5}$ impacts, respectively. These exceedances are attributed to elevated background concentrations of $54.9 \mu\text{g}\cdot\text{m}^{-3}$ (for PM_{10}) and $40.3 \mu\text{g}\cdot\text{m}^{-3}$ (for $PM_{2.5}$), rather than incremental emissions associated from the Proposal. Importantly, the addition of the Proposal's predicted contributions, as presented in Table 25, does not result in any further exceedances of the applicable air quality criteria.

The 2021 NSW air quality compliance report (NSW DPE, 2023) notes that these readings were recorded at the St Marys AQMS on 4 May, due to an exceptional event (as a hazard reduction burn). In NSW, exceedances caused by exceptional events are not counted toward the National Environment Protection (Ambient Air Quality) Measure (NEPM) goal of *"no days exceeding the particle standards in a year."*

A contour isopleth plot of the predicted incremental 24-hour PM_{10} concentrations associated with the Proposal under Scenario 2 is presented in Figure 11 to illustrate the spatial distribution of particulate matter in the area surrounding the Proposal site.

Table 26 Summary of contemporaneous 24-hour PM₁₀ concentrations – Scenario 2

Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor R8			Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor R1		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
04/05/2021	0.7	54.9	55.6	20/07/2021	2.8	7.6	10.4
20/04/2021	<0.1	46.2	46.3	25/06/2021	2.6	7.9	10.5
28/10/2021	<0.1	36.6	36.7	14/04/2021	2.6	16.0	18.6
29/04/2021	0.3	36.0	36.3	10/05/2021	2.5	10.5	13.0
02/09/2021	<0.1	36.0	36.1	24/07/2021	2.5	9.9	12.4
18/01/2021	0.1	35.8	35.9	11/06/2021	2.5	8.6	11.1
10/09/2021	0.2	35.5	35.7	09/06/2021	2.4	4.9	7.3
27/04/2021	0.3	35.4	35.7	16/07/2021	2.4	8.9	11.3
21/08/2021	<0.1	34.6	34.7	14/11/2021	2.3	6.0	8.3
20/08/2021	<0.1	34.1	34.2	09/09/2021	2.3	13.8	16.1
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions (outlined in red) as a result of the operation of the Proposal				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 27 Summary of contemporaneous 24-hour PM_{2.5} concentrations – Scenario 2

Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor R8			Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor R1		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
04/05/2021	0.7	40.3	41.0	20/07/2021	2.8	4.0	6.8
29/04/2021	0.3	21.8	22.1	25/06/2021	2.6	4.6	7.2
23/04/2021	0.4	19.5	19.9	14/04/2021	2.6	4.2	6.8
20/08/2021	<0.1	19.2	19.3	10/05/2021	2.5	5.4	7.9
10/10/2021	<0.1	16.9	17.0	24/07/2021	2.5	7.2	9.7
15/08/2021	<0.1	16.1	16.2	11/06/2021	2.5	5.0	7.5
03/05/2021	<0.1	14.9	15.0	09/06/2021	2.4	4.6	7.0
23/08/2021	<0.1	14.7	14.8	16/07/2021	2.4	3.5	5.9
14/08/2021	0.3	14.3	14.6	14/11/2021	2.3	2.0	4.3
30/04/2021	0.2	13.7	13.9	09/09/2021	2.3	4.9	7.2
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions (outlined in red) as a result of the operation of the Proposal				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Figure 11 Predicted incremental 24-hour PM₁₀ impacts – Scenario 2



Source: Northstar

7.2.2. Nitrogen Dioxide

This section presents the predicted nitrogen dioxide (NO₂) concentrations under Scenario 2, for the top 20 impacted receptors. The relevant assessment criteria for NO₂, as specified in Table 6 are based on 1-hour and annual averaging periods. The predicted maximum 1-hour and annual average NO₂ concentrations resulting from the assumptions under Scenario 2 are presented in Table 28.

The results indicate that predicted incremental and cumulative NO₂ concentrations are below the criteria at all surrounding receptor locations. The performance of the Proposal under Scenario 2 does not result in any exceedances of the criteria for NO₂.

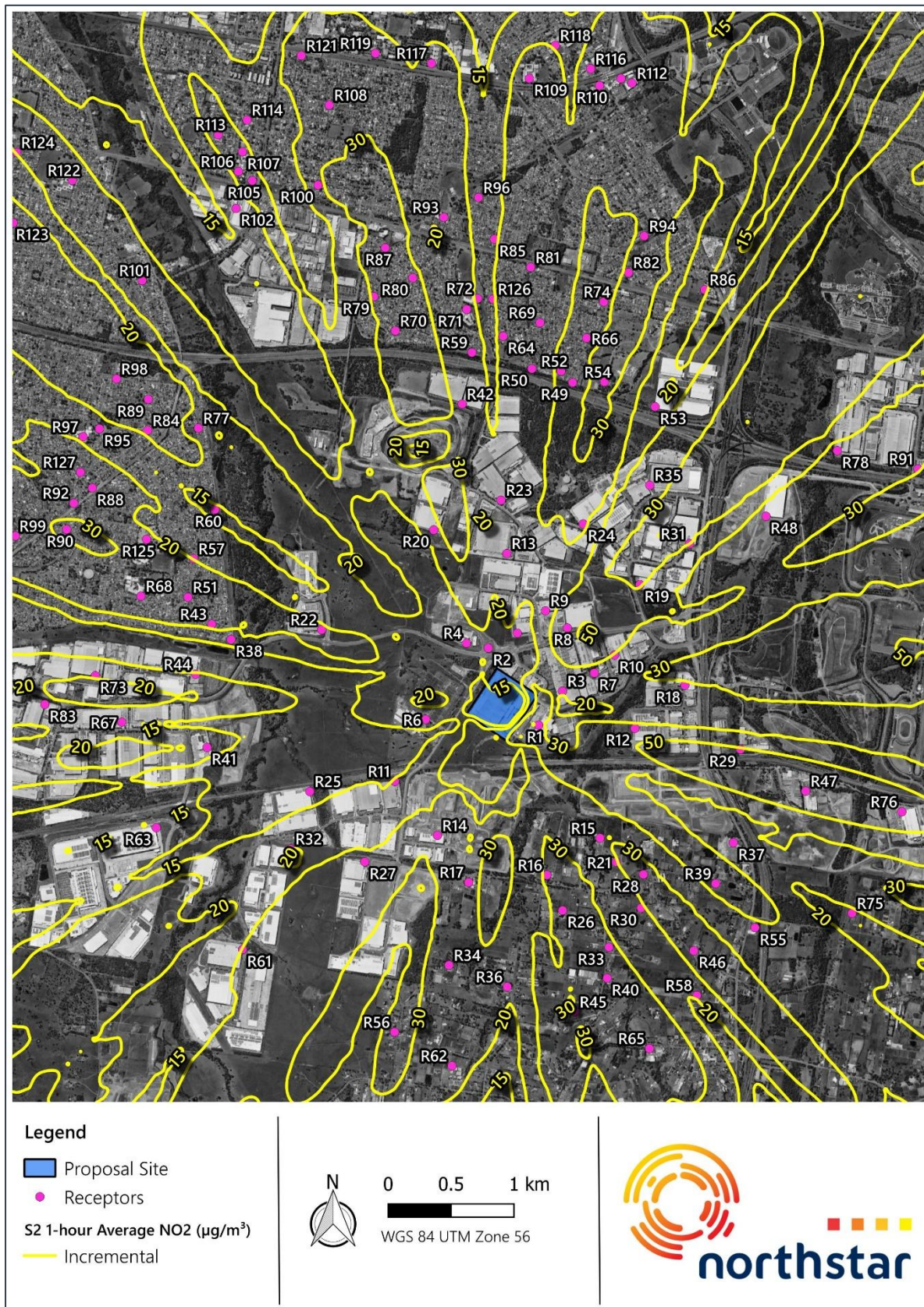
Table 28 Predicted 1-hour and annual average NO₂ concentrations – Scenario 2

Receptor	Nitrogen dioxide (NO ₂) concentration (µg·m ⁻³)					
	1-hour average			Annual average		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	164			31		
Max % of crit.	38.9	18.8	40.2	2.0	26.1	28.1
R47	63.8	2.1	65.9	0.1	8.1	8.2
R39	32.9	30.8	63.6	<0.1	8.1	8.2
R55	27.8	30.8	58.5	<0.1	8.1	8.2
R76	56.5	2.1	58.5	0.1	8.1	8.2
R8	44.2	12.3	56.5	0.5	8.1	8.6
R46	37.9	16.4	54.3	<0.1	8.1	8.2
R90	31.4	22.6	54.0	<0.1	8.1	8.2
R29	51.6	2.1	53.6	0.2	8.1	8.3
R28	35.6	16.4	52.0	0.1	8.1	8.2
R119	22.3	28.7	51.0	0.1	8.1	8.2
R40	41.8	8.2	50.0	0.1	8.1	8.2
R1	43.7	6.2	49.9	0.6	8.1	8.7
R92	24.6	22.6	47.2	<0.1	8.1	8.2
R99	23.8	22.6	46.4	<0.1	8.1	8.2
R21	29.9	16.4	46.3	0.1	8.1	8.2
R26	37.8	8.2	46.0	0.2	8.1	8.3
R125	23.4	22.6	45.9	0.1	8.1	8.2
R15	28.8	16.4	45.2	0.2	8.1	8.3
R121	22.6	22.6	45.2	0.1	8.1	8.2
R35	38.7	6.2	44.9	0.2	8.1	8.3

Notes: Incr. – Incremental, Bkg. – Background, – Cumul. – Cumulative.

Figure 12 shows a contour plot of the predicted 1-hour incremental NO₂ impacts for Scenario 2, based on the Janssen method for converting NO_x to NO₂ (refer Section 5.2.7).

Figure 12 Predicted incremental 1-hour NO₂ impacts – Scenario 2



Source: Northstar

7.2.3. All Other Pollutants

The following presents the predicted concentrations associated with Scenario 2 for all other pollutants assessed in this AQIA (refer Section 5.2.2).

Presented in Table 29 to Table 31 are the predicted concentrations of CO, SO₂, PAHs, VOCs and formaldehyde at varying averaging periods at the top 20 impacted receptors. The predicted incremental concentrations for all of the abovementioned pollutants are below the relevant criteria for all averaging periods at all receptors.

Table 29 Predicted 15-minute, 1-hour and 8-hour average CO concentrations – Scenario 2

Receptor	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15-minute			1-hour			8-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	100			30			10		
Max. % of criterion	0.3	2.1	2.4	0.8	5.3	6.1	1.1	13.0	14.1
R1	0.3	2.1	2.4	0.2	1.6	1.8	0.1	1.3	1.4
R3	0.2	2.1	2.3	0.2	1.6	1.8	<0.1	1.3	1.4
R8	0.1	2.1	2.2	0.1	1.6	1.7	<0.1	1.3	1.4
R7	0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R16	0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R2	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R4	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R5	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R6	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R9	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R10	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R11	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R12	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R13	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R14	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R15	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R17	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R18	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R19	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R20	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 30 Predicted 1-hour and 24-hour SO₂ concentrations – Scenario 2

Receptor	Sulphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1-hour			24-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	215			57		
Max. % of criterion	0.1	20.0	20.1	0.0	13.9	13.9
R1	0.3	42.9	43.2	<0.1	7.9	8.0
R3	0.2	42.9	43.1	<0.1	7.9	8.0
R8	0.2	42.9	43.1	<0.1	7.9	8.0
R7	0.1	42.9	43.0	<0.1	7.9	8.0
R16	0.1	42.9	43.0	<0.1	7.9	8.0
R2	<0.1	42.9	43.0	<0.1	7.9	8.0
R4	<0.1	42.9	43.0	<0.1	7.9	8.0
R5	<0.1	42.9	43.0	<0.1	7.9	8.0
R6	<0.1	42.9	43.0	<0.1	7.9	8.0
R9	<0.1	42.9	43.0	<0.1	7.9	8.0
R10	<0.1	42.9	43.0	<0.1	7.9	8.0
R11	<0.1	42.9	43.0	<0.1	7.9	8.0
R12	<0.1	42.9	43.0	<0.1	7.9	8.0
R13	<0.1	42.9	43.0	<0.1	7.9	8.0
R14	<0.1	42.9	43.0	<0.1	7.9	8.0
R15	<0.1	42.9	43.0	<0.1	7.9	8.0
R17	<0.1	42.9	43.0	<0.1	7.9	8.0
R18	<0.1	42.9	43.0	<0.1	7.9	8.0
R19	<0.1	42.9	43.0	<0.1	7.9	8.0
R20	<0.1	42.9	43.0	<0.1	7.9	8.0

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 31 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations - Scenario 2

Receptor	Predicted 1-hour (99.9 th %ile) average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene (odour)	Xylene (odour)	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	<0.1	0.7	<0.1	<0.1	0.1
R1	2.83E-09	1.90E-04	6.87E-05	4.79E-05	1.93E-05
R3	1.16E-09	7.81E-05	2.82E-05	1.97E-05	7.94E-06
R7	8.44E-10	5.68E-05	2.05E-05	1.43E-05	5.77E-06
R8	8.16E-10	5.50E-05	1.98E-05	1.38E-05	5.58E-06
R10	7.59E-10	5.11E-05	1.85E-05	1.29E-05	5.19E-06
R2	7.14E-10	4.81E-05	1.74E-05	1.21E-05	4.88E-06
R12	6.59E-10	4.44E-05	1.60E-05	1.12E-05	4.51E-06
R5	6.50E-10	4.38E-05	1.58E-05	1.10E-05	4.45E-06
R4	5.95E-10	4.01E-05	1.45E-05	1.01E-05	4.07E-06
R15	5.91E-10	3.98E-05	1.44E-05	1.00E-05	4.04E-06
R6	5.65E-10	3.81E-05	1.37E-05	9.58E-06	3.87E-06
R16	5.58E-10	3.76E-05	1.36E-05	9.46E-06	3.82E-06
R18	5.49E-10	3.70E-05	1.33E-05	9.30E-06	3.75E-06
R9	5.45E-10	3.67E-05	1.32E-05	9.23E-06	3.73E-06
R14	5.12E-10	3.45E-05	1.25E-05	8.68E-06	3.50E-06
R19	5.10E-10	3.44E-05	1.24E-05	8.64E-06	3.49E-06
R26	5.08E-10	3.42E-05	1.24E-05	8.62E-06	3.48E-06
R21	4.96E-10	3.34E-05	1.21E-05	8.40E-06	3.39E-06
R28	4.05E-10	2.73E-05	9.85E-06	6.86E-06	2.77E-06
R29	3.82E-10	2.57E-05	9.29E-06	6.47E-06	2.61E-06

As the predicted concentrations for these pollutants are low compared to the respective criteria, the contour plots are not presented for these pollutants.

7.3. Assessment of Criteria Exceedances

Presented in is a summary of the number of additional exceedances of the short-term PM₁₀, PM_{2.5} and NO₂ criteria predicted under Scenario 1 (justified worst case) for the top 20 impacted receptors, and those values presented as a probability (p) ($p=0$ being impossible, $p=1$ being certain). These values are discussed further in Section 8.2.

Table 32 Assessment of the number of additional exceedances – Scenario 1, PM₁₀ and PM_{2.5}

Receptor	Number of additional exceedances of the criterion		Probability that an exceedance is predicted in one year	
	24-hour PM ₁₀	24-hour PM _{2.5}	24-hour PM ₁₀	24-hour PM _{2.5}
R3	95	126	0.2603	0.3452
R8	76	123	0.2082	0.3370
R1	111	122	0.3041	0.3342
R5	57	105	0.1562	0.2877
R2	61	97	0.1671	0.2658
R9	43	91	0.1178	0.2493
R7	55	88	0.1507	0.2411
R10	38	77	0.1041	0.2110
R4	48	76	0.1315	0.2082
R14	29	74	0.0795	0.2027
R19	19	70	0.0521	0.1918
R17	30	64	0.0822	0.1753
R6	18	38	0.0493	0.1041
R34	9	38	0.0247	0.1041
R16	16	37	0.0438	0.1014
R12	11	37	0.0301	0.1014
R31	9	36	0.0247	0.0986
R24	10	35	0.0274	0.0959
R11	11	33	0.0301	0.0904
R13	2	27	0.0055	0.0740

Note: Sorted by descending order for 24-hour average PM_{2.5}.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of emergency standby generators for an entire 24-hour period).

Table 33 Assessment of the number of additional exceedances – Scenario 1, NO₂

Receptor	Number of additional exceedances of the criterion	Probability that an exceedance is predicted in one year
	1- hour NO ₂	1- hour NO ₂
R45	1313	0.1499
R49	1114	0.1272
R47	1088	0.1242
R26	1071	0.1223
R48	1062	0.1212
R37	1062	0.1212
R18	1060	0.1210
R94	1021	0.1166
R29	1009	0.1152
R28	993	0.1134
R55	963	0.1099
R76	953	0.1088
R65	876	0.1000
R86	814	0.0929
R19	797	0.0910
R91	772	0.0881
R99	747	0.0853
R53	723	0.0825
R66	705	0.0805
R46	685	0.0782

7.4. Comparison with POEO CAR Standards of Concentrations

Section 3.2 outlines the context of the POEO CAR and the emission standards applicable to activities and plants, categorised as scheduled or non-scheduled under the regulation. As detailed in Section 2.2 and Section 2.3, the Proposal is expected to include the following relevant characteristics:

- 249 diesel-fuelled emergency standby generators;
- A maintenance testing regime anticipated to be less than 200 hours per year; and
- Diesel fuel storage capacity of up to 4 097 kL or approximately 3 482 t.

Clause 73, Part 5, Division 6 of the POEO CAR exempts emergency electricity generation using stationary reciprocal internal combustion engines from the air impurities standards for nitrogen dioxide (NO₂) and nitric oxide (NO) specified in Schedule 2, Part 2, Division 3, provided the engines operate for no more than 200 hours per year.

Based on the information presented in Section 2.3.2, the Proposal site is considered a non-scheduled activity for electricity generation and a scheduled activity for chemical storage under the POEO Act. Correspondingly, the Proposal must comply with the concentration standards as outlined in Table 5.

Table 34 below compares the emissions from the maximum estimated concentrations for generator types at the Proposal site against the respective concentration standards.

Table 34 POEO CAR – Standards of concentrations comparison

Air impurity	Standard of concentration (mg·Nm ⁻³) (A)	Standby generator emissions (mg·Nm ⁻³) (per generator)
Solid particles (Total)	50	34.8
Volatile organic compounds (VOCs), as <i>n</i> -propane	1 140	36.3
Carbon monoxide (CO)	5 880	578.5

Notes: (A) Standard of emissions concentration under dry, 273 K, 101.3 kPa, 7 % O₂ conditions

Table 34 shows that the respective concentration standards can be met with the use of the standby diesel generators at the Proposal site.

7.5. Cumulative Impact Assessment

Table 35 presents an assessment of potential cumulative air quality impacts arising from the Proposal in combination with other relevant emission sources identified in Section 4.6.

The assessment considers cumulative impacts on nearby sensitive receptors during both the construction and operational phases. This includes potential dust soiling and human health effects from overlapping construction activities, as well as operational impacts under grid outage scenarios, where emergency generators at the Proposal site and nearby facilities may operate concurrently and during routine maintenance testing, which may also present limited potential for overlap.

While the CIA Guidelines recommend consideration of all relevant future projects, this assessment applies a proportionate approach based on the status and likely influence of surrounding developments. Background air quality data has been used to characterise existing ambient conditions, independent of the Proposal. However, given the location of the St Marys and Prospect AQMS (6.7 km and 7.6 km from the Proposal site, respectively (refer Table 9)), and the separation between these stations and the identified sources (refer Figure 6 and Table 11), emissions from some nearby operations, particularly those newly approved, under construction, or still in planning may not be fully reflected in the adopted background dataset.

Accordingly, all identified sources, regardless of their current or future status, are discussed in Table 35 below. Reference should be made to Section 8.3 which discusses the outcomes of the CIA.

Table 35 Local air pollutant sources with potential for cumulative impacts

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
A) CDC Data Centre (SSD-10330) 17 Roberts Road, Eastern Creek	0.04	Operational	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.
			There is potential for cumulative operational impacts between this data centre (169 MW) and the Proposal (348 MW), particularly under emergency conditions. In the event of a widespread grid outage affecting the area, it is likely that both facilities would be impacted simultaneously, triggering concurrent operation of backup generators. Generator testing to occur for approximately 20 minutes per session, between 9:00 am and 4:00 pm, two days per week, with no more than five generators tested per day (not necessarily concurrently). Total annual testing time is estimated at 174 hours or less. There is limited potential for cumulative impacts if testing overlaps with this project's schedule, though this is considered unlikely due to limited duration and staggered operation.	The Proposal may result in significant cumulative air quality impacts. Most likely in winds with south-easterly and north-westerly components

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
B) Project Echidna (SSD-47320208) 10 Eastern Creek Drive, Eastern Creek	0.6	Under construction	The project will be delivered as a single planning stage, constructed in two phases: Phase 1 with Initial construction and fit-out (data centre shell, admin areas) and Phase 2 with remaining internal fit-out, subject to demand. Construction is expected to take around two years, with Phase 1 spanning 18 months and Phase 2 an additional six months. A gap may occur between phases. Construction started in early 2023.	The Proposal is unlikely to result in significant cumulative impacts during construction, due to the physical separation between construction sites and the implementation of CEMPs with appropriate mitigation measures at each location.
			Up to three generators will be tested concurrently under the fortnightly no-load scenario, while quarterly and yearly tests (at 70 % and 100 % load, respectively) will involve one generator at a time. Total annual test runtime is estimated at 162 hours. As a mission-critical facility, the data centre includes 18 standby generators (2.8 MW each) to support critical loads. While there is limited potential for cumulative impacts if testing overlaps with the Proposal, this is considered unlikely due to the short duration and staggered nature of testing. However, under emergency conditions, concurrent operation of backup generators at this facility (35.2 MW) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal may result in significant cumulative air quality impacts. Most likely in winds with south-westerly and north-easterly components.

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
C) NEXTDC S4 Data Centre (SSD-63741210) 16 Johnston Crescent, Horsley Park	1.3	Under assessment (Approved 24/12/2025)	The SSDA seeks consent for site preparation, bulk earthworks, and tree removal; construction and operation of five data centre buildings totalling 63 654 m ² (including 52 916 m ² technical halls and 10 738 m ² ancillary spaces); ancillary works such as parking for 200 cars, signage, stormwater management, and landscaping; and delivery of 232 MW power.	The project will be constructed in stages over approximately 58 months, from June 2025 to March 2030. Site preparation will occur from June to October 2025, followed by staged construction of Buildings B, C, A, D, and E through to March 2030.
			There are 98 generators, each tested four times annually for a total of 170 minutes per generator. Tests involve up to two generators running concurrently, with up to 33 tests per day. Testing occurs between 7:00 am and 6:00 pm (Mon–Sat/ PH) and 8:00 am to 6:00 pm Sundays, totalling about 153 hours annually. Routine testing poses limited cumulative impact risk due to short, staggered schedules. However, during widespread grid outages, simultaneous backup generator operation at this facility (232 MW) and the Proposal (348 MW) may temporarily increase local emissions.	The Proposal may result in significant cumulative air quality impacts. Most likely in winds with south westerly and north easterly components.

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
D) Erskine Park Data Centre (SSD-82211208) 78 Lockwood Road, Erskine Park	1.8	Under assessment (under exhibition 5/12/26-23/01/26)	The SSDA seeks consent for site preparation, bulk earthworks, construction and operation of three storey data centre buildings of GFA totalling 55 651 m ² (including technical data halls and ancillary spaces); and delivery of 450 MW power.	The Proposal is unlikely to result in significant cumulative impacts during construction, due to the physical separation between construction sites and the implementation of CEMPs with appropriate mitigation measures at each location.
			There are 170 generators, each tested twice annually for a total of 282.5 minutes per generator. Tests involve up to two generators running concurrently, with up to 7 tests per day. Testing occurs between 7:00 am and 6:00 pm, totalling about 198 hours annually. Routine testing poses limited cumulative impact risk due to short, staggered schedules. However, during widespread grid outages, simultaneous backup generator operation at this facility (450 MW) and the Proposal (348 MW) may temporarily increase local emissions.	The Proposal may result in significant cumulative air quality impacts. Most likely in winds with westerly and easterly components.
E) Sydney SYD14 Data Centre (Digital Realty)	3.1	Operational	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
16 Lockwood Road, Erskine Park		Commissioned in 2021, the facility is designed to support customer colocation needs and features a dual-feed power supply. It is located within one mile of key digital infrastructure and has a total capacity of 7.2 MW.	There is no publicly available information on standby generator use, maintenance schedules, or the number of generators at this facility. While routine testing may present limited potential for cumulative impacts if it overlaps with the Proposal, this is considered unlikely due to the short duration and staggered timing of activities. In the event of a widespread grid outage, however, concurrent operation of backup generators at this facility (7.2 MW) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>3 km), and the difference in capacity (7.2 MW vs 348 MW).
F) Sydney SYD10 Data Centre (Digital Realty) 1-12 Templar Road, Erskine Park	3.3	Operational	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.
		Located in Erskine Park, within the Western Sydney Employment Hub, 1-23 Templar Road was opened in November 2012. The site features 6 MW of power.	There is no publicly available information on standby generator use, maintenance schedules, or the number of generators at this facility. While routine testing may present limited potential for cumulative impacts if it overlaps with the Proposal, this is considered unlikely due to the short duration and staggered timing of activities. In the event of a widespread grid outage, however, concurrent operation of backup generators at this facility (6 MW) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>3 km), and the difference in capacity (6.0 MW vs 348 MW).

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
G) Sydney SYD11 Data Centre (Digital Realty) 13-23 Templar Road, Erskine Park	3.3	Operational Construction of a two-level data centre incorporating six data halls and an administration office. It is a 19 MW facility built in phases with 9 MW ready in Q4, 2018	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.
			No publicly available information is available regarding standby generator use, maintenance schedules, or the number of generators at this facility. While there is limited potential for cumulative impacts if routine testing overlaps with the Proposal, this is considered unlikely due to the short duration and staggered timing of such activities. Under emergency conditions, such as a widespread grid outage, concurrent operation of backup generators at this facility (19 MW) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>3 km), and the difference in capacity (6.0 MW vs 348 MW).
H) Sydney SYD51 Data Centre (AWS)	3.8	Operational	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
1 William Dean Street, Eastern Creek			No publicly available information is available regarding standby generator use, maintenance schedules, or the number of generators at this facility. While there is limited potential for cumulative impacts if routine testing overlaps with the Proposal, this is considered unlikely due to the short duration and staggered timing of such activities. Under emergency conditions, such as a widespread grid outage, concurrent operation of backup generators at this facility (unknown capacity) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>3 km).
'l) Sydney SYD3 Data Centre (Airtrunk) (SSD-41589232)	4.0	Under construction	There is no potential for cumulative air quality impacts during construction, as this development is already under construction, and construction of the Proposal will unlikely coincide with this Project.	The Proposal does not result in cumulative air quality impacts during construction.
51 Huntingwood Drive, Huntingwood			There are 316 generators, each tested four times annually for a total of 60 minutes per generator. Tests involve up to three generators running concurrently,. Testing occurs between 7:00 am and 6:00 pm, totalling about 106 hours annually. Routine testing poses limited cumulative impact risk due to short, staggered schedules. However, during widespread grid outages, simultaneous backup generator operation at this facility (400 MW) and the Proposal (348 MW) may temporarily increase local emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (~4 km).

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
J) DCI Sydney 01 Data Centre 90 Peter Brock Drive, Eastern Creek	4.7	Operational	There is no potential for cumulative air quality impacts during construction, as this development is already operational.	The Proposal does not result in cumulative air quality impacts during construction.
			No publicly available information is available regarding standby generator use, maintenance schedules, or the number of generators at this facility. While there is limited potential for cumulative impacts if routine testing overlaps with the Proposal, this is considered unlikely due to the short duration and staggered timing of such activities. Under emergency conditions, such as a widespread grid outage, concurrent operation of backup generators at this facility (unknown capacity) and the Proposal (348 MW) could temporarily increase localised emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>4.5 km).
K) Mamre Road Data Centre (SSD-92743706)	4.6	Under assessment (SEARs issued 30 September 2025)	There is no potential for cumulative air quality impacts during construction, due to the distance.	The Proposal does not result in cumulative air quality impacts during construction.

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
706-752 Mame Road, Eastern Creek		Construction and operation of a data centre campus with a power capacity of 1 GW including six four-storey data centre buildings, 936 cooling units, 852 diesel emergency standby generators and 14,430 kl of diesel storage, internal roads and car parking.	There are 852 generators proposed, with no information available about testing regime. However the tests are likely to run during day time hours. Routine testing poses limited cumulative impact risk due to short, staggered schedules. However, during widespread grid outages, simultaneous backup generator operation at this facility (1 000 MW) and the Proposal (348 MW) may temporarily increase local emissions.	The Proposal is unlikely to result in significant cumulative air quality impacts, due to the separation distance (>4 km).

8. DISCUSSION AND CONCLUSION

This AQIA has been prepared by Northstar for Goodman Property (Australia) Pty Ltd for the proposed data centre, located at 10 Roberts Road, Eastern Creek NSW.

The assessment evaluates the potential air quality impacts during both construction and operation phases, with a focus on dust soiling and increased ambient PM₁₀ (including PM_{2.5}) concentrations due to dust arising from construction activities at the Proposal site, and combustion emissions from standby diesel generator engines during operations.

Data from available sources, including publicly accessible environmental data, were utilised. The routine testing and emergency use of diesel generators has the potential to lead to the exceedance of air quality criteria at nearby sensitive receptor locations from associated emissions to air. Therefore, operational impacts were evaluated based on a realistic and justified worst case emissions scenarios.

8.1. Construction Phase Risk Assessment

The construction phase risk assessment for the Proposal, presented in Section 6 indicates that dust soiling and human health impacts equate to a medium risk level for demolition and low risk level for earthworks, construction and trackout related activities, if no mitigation measures were to be applied to control emissions.

Based upon that assessment, a range of mitigation measures are recommended to ensure that short-term impacts associated with construction phase activities are minimised, as presented in Appendix B.

8.2. Operational Phase Impact Assessment

The predicted impacts of operational phase activities under a worst-case scenario (Scenario 1) and realistic operational scenario (Scenario 2) are presented in Section 7.

8.2.1. Scenario 1 – Justified Worst-Case

Under the justified worst-case emergency standby generator operational scenario (Scenario 1), a number of additional exceedances of the short-term air quality criteria for NO₂, PM₁₀ and PM_{2.5} are predicted.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of emergency standby generators for an entire 24-hour period).

That scenario assumes that all 249 generators would be operational at one time. The predicted incremental concentrations under Scenario 1 show exceedances of particulate matter and NO₂ criteria at sensitive receptor locations if a power outage occurred, and all 249 emergency generators were operating at 100 % load continuously (refer Section 7.1) to assess emissions under all potential meteorological conditions.

An assessment of the probability (p) of an exceedance of the relevant short-term criteria has been performed and is presented in Section 7.3. As a maximum across all receptors, the probability of an exceedance of the NO₂, PM₁₀ or PM_{2.5} criterion (where $p=0$ is an impossible event, and $p=1$ is a certain event) in any year is:

- NO₂: $p = 0.0360$;
- PM₁₀: $p = 0.3041$; and
- PM_{2.5}: $p = 0.3342$.

To predict the likelihood of exceedances under the worst-case scenario (i.e. all 249 generators operating continuously at 100 % load), the reliability of the power network has been considered against the latest information contained in the Endeavour Energy 2024 Distribution Annual Planning Report (DAPR) (Endeavour Energy, 2024).

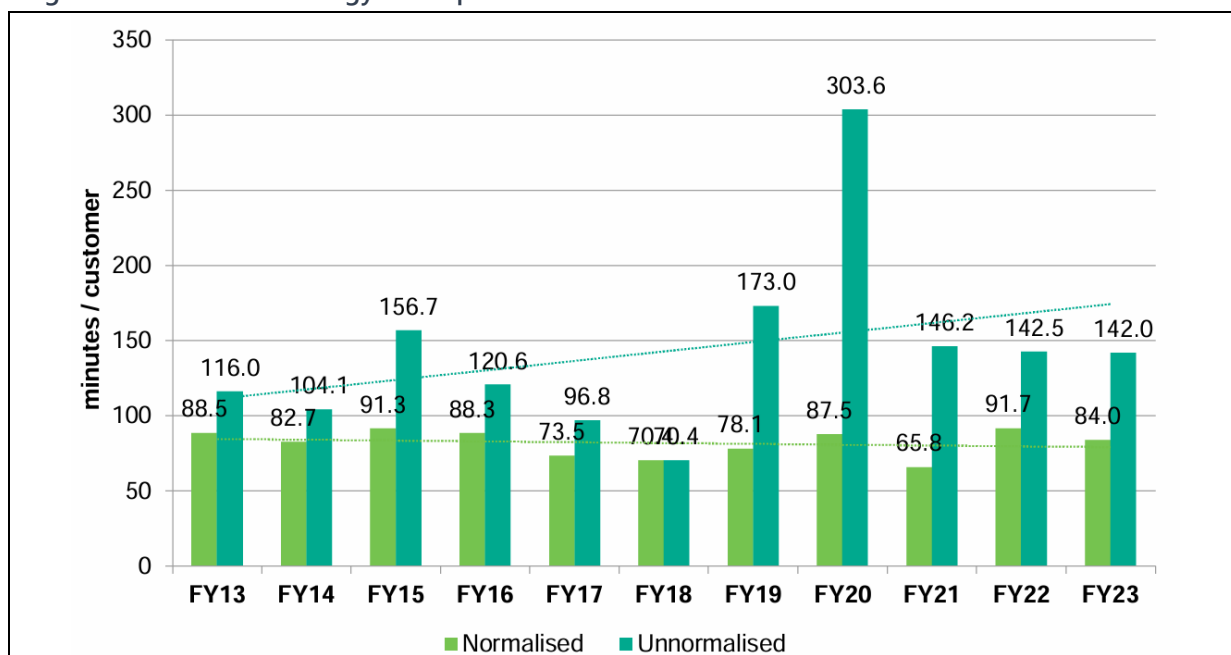
Based on the DAPR and associated network reliability statistics, the average unplanned outage duration per year per customer over a 10-year period from financial-year 2013 (2013/14) to financial-year 2023 (2023/24) equated to approximately 82.0 minutes, although exact duration of power outages requiring standby generators cannot be determined. Correspondingly, the likelihood of power interruptions occurring is approximately 0.016 % of the time per year ($82.0 / (8\,760 \times 60)$) or have a probability of $p=0.00016$.

Figure 17 depicts the normalised (i.e. Major Event Days data excluded) system average interruption duration index (SAIDI, in minutes) and unnormalised (i.e. inclusion of all events) SAIDI trends over the 10-year period from financial year 2013/2014 to financial year 2023/2024.

The probability of both the interruption to the power supply, and an exceedance of the relevant air quality criteria occurring can be calculated through the multiplication of the probability of each event occurring. Those values are incredibly small and have been placed into context by calculating the percentage chance that the event could occur in a number of years. Table 36 presents the results of those calculations.

The results indicate that the chance of an additional exceedance of the air quality criteria during a power outage is low.

Figure 13 Endeavour Energy SAIDI performance information



Source: (Endeavour Energy, 2024)

Table 36 Probability of an exceedance during a power outage

Number of years	Probability of an additional exceedance of the short-term criterion during a power outage (expressed as %)		
	1-hour NO ₂	24-hour PM ₁₀	24-hour PM _{2.5}
100	0.2	0.5	0.5
200	0.5	0.9	1.1
500	1.2	2.3	2.7
1 000	2.3	4.6	5.2
1 250	2.9	5.8	6.5

8.2.2. Scenario 2 – Maintenance Testing

Annual average particulate matter concentrations (as TSP, PM₁₀ and PM_{2.5}) resulting from Scenario 2 are predicted to comply with the relevant impact assessment criteria, with no exceedances predicted.

Under Scenario 2, no additional exceedances of the cumulative impact assessment criteria for 24-hour PM₁₀ and 24-hour PM_{2.5} are predicted as a result of the Proposal. While an exceedance of the 24-hour PM₁₀ and PM_{2.5} criteria are identified in Table 26 and Table 27 these are attributable to elevated background concentrations that already exceed the respective criteria and are not related to emissions from the Proposal.

For 1-hour and annual average NO_2 , no cumulative exceedances are predicted due to the Proposal. Predicted incremental and cumulative 1-hour NO_2 concentrations remain below the relevant criteria at all considered receptor locations.

Predicted concentrations of CO , SO_2 , PAHs, VOCs, and CH_2O across all assessed averaging periods are also below the relevant impact assessment criteria at all receptor locations under Scenario 2.

Correspondingly, it is anticipated that under operation of the testing schedule, as outlined in Section 2.3.2, no significant air quality impacts are predicted to be experienced at sensitive receptors during routine operations.

8.2.3. Odour

Operational phase activities will not result in any odour emissions, except for the periodic operation of the diesel-fuelled generators for testing and back-up power generation purposes, as outlined in Section 2.3.3.

Toluene (C_7H_8) and xylene (C_8H_{10}) emissions have been assessed and compared against the relevant odour impact assessment criteria.

No exceedances of the relevant odour criteria are predicted during either emergency or realistic operations.

8.2.4. POEO (Clean Air) Regulation – Standard of Concentrations

Section 7.4 assesses generator emissions against the applicable POEO CAR concentration standards for the Proposal, demonstrating compliance with the relevant standards.

Although the operations may be exempt from the relevant emission limit regulations pertaining to NO_2 (i.e. in-stack emission concentrations), the Applicant would not be exempt from ensuring the emissions do not exceed ambient air quality criteria.

8.2.5. Mitigation and Regulatory Controls

Dispersion modelling under Scenario 2 indicates that maintenance testing is unlikely to cause exceedances of the considered impact assessment criteria (refer Table 6 and Table 7) at sensitive receptor locations surrounding the Proposal site. To further minimise potential impacts, maintenance must be carried out as outlined in Section 2.3.2.1, and operation of the emergency generators should be limited to the minimum practicable extent.

As the Proposal is likely to constitute a scheduled activity under the POEO Act (refer Section 3.1), it is anticipated that an EPL will be required. In this context, NSW EPA may impose conditions of consent and /

or EPL limits to manage and mitigate potential air quality impacts associated with the operation of the Proposal.

To reduce pollutant emissions and ensure future flexibility for emissions control, the following measures may be implemented:

- Design Safeguards
 - The Applicant must ensure that the design, installation and operation of the emergency standby generators and associated enclosures do not preclude the future retrofitting of additional air pollution control equipment (e.g. Selective Catalytic Reduction).
- Operational Limits
 - The Applicant must ensure that the operation of the emergency standby generators (including testing) does not exceed 200 hours per year.
 - The performance of the maintenance testing should not be performed at times during periods of elevated background air quality conditions (e.g. in regional events such as bush fires, dust storms).
 - The performance of maintenance testing may be performed at times when other proximate data centres are not performing similar maintenance testing (e.g. maintenance on alternative days). This will involve communication and co-ordination between data centre operators to minimise simultaneous emissions.

Note: For the purposes of calculating annual operational hours, concurrent testing of multiple generators is counted as a single hour. For example, five generators tested simultaneously over one hour would count as one hour toward the annual limit.

It is anticipated that any development approval conditions or EPL requirements will restrict the use of standby generators, preventing their operation for off-site electricity export or load curtailment purposes. Should SSDA approval be granted, it is expected that a condition will also require periodic emissions testing of the standby generators.

8.3. Cumulative Impacts

The potential for cumulative air quality impacts has been evaluated in accordance with the relevant CIA guidance (NSW DPIE, 2022), as presented in Section 7.5. That procedure identifies a potential for cumulative operational air quality impacts with a number of proximate sources, including the data centres identified in Section 4.6 and Table 11. That procedure identifies potential for cumulative impacts but does not offer further guidance on evaluating the potential risk of such impacts.

The risk of cumulative air quality impacts should consider various factors including:

- The physical distance between the contributing sources;
- The incidence of contributing sources operating on common electricity power supplies;
- The respective system average interruption duration indices for the respective power supplies;
- The physical distance from the contributing sources and common receptors along common wind vectors;
- The prevalence of those wind vectors occurring; and
- The probability of emissions from (a) emergency operation and (b) during routine testing.

There is the potential for cumulative air quality impacts to arise from four nearby data centres during concurrent operations (see Section 7.5), especially in the event of a regional grid outage where all facilities, including the Proposal, simultaneously activate standby diesel generators. Such emergency operation scenarios, which may occur during widespread grid failures, are recognised by the NSW EPA and subject to regulatory allowances. The probability of concurrent power feeder failures is considered to be low, particularly as it is common for data centres to be served by multiple power supply feeders to reduce this risk.

Routine maintenance testing could also contribute to cumulative impacts since most identified facilities conduct tests during daytime hours. However, due to the distances between the Proposal, other facilities, and sensitive receptors, as well as the low likelihood of concurrent testing with emissions transported downwind these impacts are expected to be limited. Furthermore, the POEO Act restricts generator operating hours to 200 hours per year, and testing is regulated to control pollutant emissions.

Limited cumulative impacts may also arise during overlapping construction phases, primarily related to dust soiling and human health risks. Nonetheless, each development is required to have a CEMP, including waste and traffic management measures. Dust emissions from construction are well understood and can be effectively mitigated to minimise significant cumulative impacts.

8.4. Conclusion

During the construction phase, potential dust soiling and human health risks are considered manageable through the implementation of recommended mitigation measures. With these controls in place as part of a CEMP, the residual construction-phase air quality impacts associated with the Proposal are considered acceptable.

During the operational phase, based on the assessment findings, the Proposal is not expected to cause exceedances of relevant air quality criteria at any identified receptor. Both worst-case and realistic scenarios for maintenance testing have been assessed. Under realistic operating conditions, where backup generators are operated under an appropriate testing regime, predicted pollutant concentrations remain below the applicable air quality criteria.

In accordance with the CIA Guidelines, this AQIA has proportionately addressed relevant cumulative air quality issues based on available information, the regulatory context, and the likely scale and influence of surrounding

future developments. Potential cumulative impacts during overlapping construction phases, primarily related to dust emissions and human health risks have been evaluated. These impacts are expected to be effectively mitigated through site-specific CEMPs and appropriate controls implemented across each project.

During the operational phase, a potential cumulative scenario was identified in the event of a regional or catastrophic grid outage, where multiple data centres, including the Proposal could activate emergency standby generators simultaneously, resulting in a temporary increase in emissions from each data centre. Such emergency events are recognised by the NSW EPA and are subject to regulatory allowances and controls. Routine maintenance testing presents limited potential for cumulative impacts, due to the short duration, staggered timing, and physical separation of facilities, alongside regulatory limits such as the 200-hour annual operating cap under the POEO Act.

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APPENDIX A

Commonly Used Abbreviations and Units

Units Used in the Report

Units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units.

Commonly used SI units

The following units are commonly used in Northstar reports.

Symbol	Name	Quantity
SI base units		
K	Kelvin	thermodynamic temperature
kg	kilogram	mass
m	metre	length
mol	mole	amount of substance
s	seconds	time
Non-SI units mentioned in the SI or accepted for use		
°	degree	plane angle
d	day	time
h	hour	time
ha	hectare	area
J	joule	energy
L	litre	volume
min	minute	time
N	newton	force or weight
t	tonne	mass
V	volt	electrical potential
W	watt	power

Multiples of SI and non-SI units

The following prefixes are added to unit names to produce multiples and sub-multiples of units:

Prefix	Symbol	Factor
T	tera-	10^{12}
G	giga-	10^9
M	mega-	10^6
k	kilo-	10^3
h	hector-	10^2
da	deca-	10^1

Prefix	Symbol	Factor
p	pico-	10^{-12}
n	nano-	10^{-9}
μ	micro-	10^{-6}
m	milli-	10^{-3}
c	centi-	10^{-2}
d	deci-	10^{-1}

In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol.

For example:

- 50 micrograms per cubic metre would be presented as 50 $\mu\text{g}\cdot\text{m}^{-3}$ and not 50 $\mu\text{g}/\text{m}^3$; and,
- 0.2 kilograms per hectare per hour would be presented as 0.2 $\text{kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$ and not 0.2 $\text{kg}/\text{ha}/\text{hr}$.

Commonly used SI-derived and non-SI units

Symbol	Name	Quantity
$\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$	gram per square metre per second	rate of mass deposition per unit area
$\text{g}\cdot\text{s}^{-1}$	gram per second	rate of mass emission
$\text{kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$	kilogram per hectare per hour	rate of mass deposition per unit area
$\text{kg}\cdot\text{m}^{-3}$	kilogram per cubic metre	density
$\text{L}\cdot\text{s}^{-1}$	litres per second	volumetric rate
m^2	square metre	area
m^3	cubic metre	volume
$\text{m}\cdot\text{s}^{-1}$	metre per second	speed and velocity
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{Nm}^{-3}$	milligram per normalised cubic metre (of air)	mass concentration per unit volume
$\mu\text{g}\cdot\text{m}^{-3}$	microgram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
Pa	pascal	pressure
ppb	parts per billion (1×10^{-9})	volumetric concentration
pphm	parts per hundred million (1×10^{-5})	volumetric concentration
ppm	parts per million (1×10^{-6})	volumetric concentration

Commonly used abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
ACT	Australian Commonwealth Territory
AGL	above ground level
AHD	Australian height datum
APC	air pollution control
AQI	air quality index
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AQRA	air quality risk assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standard / New Zealand Standard
AWS	automatic weather station
BCA	Building Code of Australia
BGL	below ground level
BOM	Bureau of Meteorology

Abbreviation	Term
CEMP	construction environment management plan
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	digital elevation model
EETM	emission estimation technique manual
EPA VIC	Environmental Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation Act
FIBC	flexible intermediate bulk container
GIS	geographical information system
IAQM	UK Institute of Air Quality Management
IBC	intermediate bulk container
ID	internal diameter
LLV	low level waste
LoM	life of mine
MSDS	Material Safety Data Sheet
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
NH ₃	ammonia
NO	nitric oxide
NO _x	oxides of nitrogen
NO ₂	nitrogen dioxide
NORM	naturally occurring radioactive material
NSW	New South Wales
NSW DCCEEW	New South Wales Department of Climate Change, Energy, the Environment and Water
NSW DPE	New South Wales Department of Planning and Environment
NSW DPHI	New South Wales Department of Planning, Housing and Infrastructure
NSW EPA	New South Wales Environment Protection Authority
NT	Northern Territory
OEMP	operational environmental management plan
O ₃	ozone
OU	odour unit
OU·m ³ ·s ⁻¹	odour units times metres cubed per second
OU·s ⁻¹	odour units per second
Pb	lead
PM	particulate matter
PM ₁₀	particulate matter with an aerodynamic diameter of 10 µm or less
PM _{2.5}	particulate matter with an aerodynamic diameter of 2.5 µm or less
ROM	run of mine
SA	South Australia

Abbreviation	Term
SEPP	State Environmental Protection Policy
SO _x	oxides of sulphur
SO ₂	sulphur dioxide
SRTM3	Shuttle Radar Topography Mission
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TAS	Tasmania
TEU	twenty-foot equivalent unit
TSP	total suspended particulates
TVOC	total volatile organic compounds
TWA	time weighted average
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VIC	Victoria
VLLW	very low-level waste
VOC	volatile organic compound

APPENDIX B

Construction Phase Dust Risk Assessment

Provided below is a summary of the risk assessment methodology applied in this AQIA which is based upon the UK IAQM's *Guidance on the assessment of dust from demolition and construction* (IAQM, 2024) and adapted by Northstar.

Adaptions to the Published Methodology Made by Northstar

The adaptations made by Northstar from the IAQM published methodology are:

- **PM₁₀ criterion:** an amended criterion representing the annual average PM₁₀ criterion relevant to Australia rather than the UK;
- **Nomenclature:** a change in nomenclature from 'receptor sensitivity' to 'land use value' to avoid misinterpretation of values attributed to 'receptor sensitivity' and 'sensitivity of the area' which may be assessed as having different values;
- **Construction traffic:** the separation of construction vehicle movements as a discrete risk assessment profile from those associated with the 'on-site' activities of demolition, earthworks and construction. The IAQM methodology considers four risk profiles of: 'demolition', 'earthworks', 'construction' and 'trackout'. The adaption by Northstar introduces a fifth risk assessment profile of 'construction traffic' to the existing four risk profiles; and,
- **Tables:** minor adjustments in the visualisation of some tables.

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located:

- Beyond a distance of 250 m from the Proposal site boundary; and,
- At a distance greater than 50 m from the route(s) used by construction vehicles on public roads, beginning from the Proposal site entrance and extending past 250 m from the Proposal site entrance.

This step is noted as having deliberately been chosen to be conservative and would require assessments for the vast majority of development projects. Table B1 overleaf presents the identified discrete sensitive receptors, with the corresponding estimated screening distances as compared to the screening criteria.

It is noted that given the volume of receptors in this AQIA, only receptors within the screening distances have been presented in Table B1. It is also noted that screening distance to the Proposal site boundary includes both the Proposal site and the OEI.

Table B1 Construction phase impact screening criteria distances

Receptor ID	Location	Land use	Screening distance (m)		
			Proposal site boundary (250 m)	Proposal site entrance(s) (250 m)	Construction route(s) (50 m)
R1	17 Roberts Rd, Eastern Creek	Industrial	141	260	129
R2	2 Telopea Pl, Eastern Creek	Industrial	174	733	213
R3	716 Old Wallgrove Rd Eastern Creek	Industrial	202	568	149
R4	1 Telopea Place, Eastern Creek	Industrial	187	825	391

With reference to Table B1 sensitive receptors are noted to be within the screening distance thresholds and therefore require further risk assessment as summarised in Table B2.

Table B2 Application of Step 1 screening

Construction impact	Screening criteria	screening	Comments
Demolition	250 m from boundary, 250 m from site entrance(s)	Not screened	Receptors identified within the screening distance.
Earthworks	250 m from boundary, 250 m from site entrance(s)		
Construction	250 m from boundary, 250 m from site entrance(s)		
Trackout	250 m from site entrance(s)		
Construction Traffic	50 m from roadside, 250 m from site entrance(s)	Screened	Construction traffic screened as receptors are >50 m from roadside

Step 2 – Define the Potential Dust Emission Magnitude

Step 2 of the assessment categorises dust-generating activities as demolition, earthworks, construction, track-out (material transported onto public roads), and construction traffic, by their 'dust emissions magnitude' (Small, Medium, or Large), as defined in Table B3.

Table B3 Dust emission magnitude activities

Activity	Small	Medium	Large
Demolition			
Total building volume	< 12 000 m ³	12 000 m ³ to 75 000 m ³	> 75 000 m ³
Demolition height	< 6 m AGL	6 m and 12 m AGL	> 12 m AGL
Onsite crushing	no	no	yes
Onsite screening	no	no	yes

Activity	Small	Medium	Large
Demolition of materials with high dust potential	no	yes	yes
Demolition timing	wet months only	any time of the year	any time of the year
Earthworks			
Total area	< 18 000m ²	18 000 m ² to 110 000 m ²	> 110 000 m ²
Soil types	soil type with large grain size (e.g. sand)	moderately dusty soil type (e.g. silt)	potentially dusty soil type (e.g. clay)
Heavy earth moving vehicles	< 5 heavy earth moving vehicles active at any one time	5 to 10 heavy earth moving vehicles active at any one time	> 10 heavy earth moving vehicles active at any time
Formation of bunds	< 3 m AGL	3 m to 6 m AGL	> 6 m AGL
Construction			
Total building volume	< 12 000 m ³	12 000 m ³ to 75 000 m ³	> 75 000 m ³
Concrete batching	no	yes	yes
Sandblasting	no	no	yes
Materials	metal cladding or timber	concrete	concrete
Trackout			
Outward heavy vehicles movements per day	< 20	20 to 50	> 50
Surface materials	low potential	moderate potential	high potential
Unpaved road length	< 50 m	50 m to 100 m	> 100 m
Construction traffic (from construction site entrance to construction vehicle origin)			
Demolition traffic - total building volume	< 12 000 m ³	12 000 m ³ to 75 000 m ³	> 75 000 m ³
Earthworks traffic total area	< 18 000m ²	18 000 m ² to 110 000 m ²	> 110 000 m ²
Earthworks traffic soil types	soil type with large grain size (e.g. sand)	moderately dusty soil type (e.g. silt)	potentially dusty soil type (e.g. clay)
Construction traffic total building volume	< 12 000 m ³	12 000 m ³ to 75 000 m ³	> 75 000 m ³
Total traffic outward heavy vehicles Movements per day	< 20	20 to 50	> 50

Demolition activities are required for the Proposal to remove existing structures on site including the existing industrial warehouse. Based on the scale of the existing infrastructure on site, demolition activities are

expected to generate more than 75 000 m³ of building volume, consistent with the 'large' dust emission magnitude category.

The construction phase of the Proposal would involve construction of two three (3) storey data centre buildings with inclusion of an ancillary office, amenities, utilities including diesel storage tanks, water tanks and substations on site, on-site carparking and vehicle access and other associated infrastructure. Construction phase activities would involve bulk earthworks for site preparation and associated vehicle movements.

Earthworks at the Proposal site are required for site preparation, achieving target cut/fill balances for both buildings and road levels, and ensuring stable foundations for the buildings, infrastructure, landscaping, and associated public domain works. The affected area of earthworks covers the primary data centre land, ancillary office spaces, the onsite substation, the Offsite Enabling Infrastructure and other associated infrastructure and has been estimated using Geographic Information System (GIS) software and are based on the provided site layout (refer Figure 2). For earthworks activities, the impacted area is estimated as being approximately 172 500 m², corresponding to a 'large' dust magnitude.

Based on review of the layouts provided in Figure 2 and Figure 3, construction works at the Proposal site will generate over 75 000 m³ of building volume, which align with the 'large' dust emission magnitude category. Vertical structural elements will primarily be formed from structural steelwork, rather than concrete, to reduce dead weight and maximise off-site prefabrication. Construction materials incorporated into the Proposal site design, such as metal wall cladding panels, acoustic screens, and perforated metal screens, are expected to have a low potential for dust release. On-site concrete batching is not anticipated at the Proposal site.

The Proposal site is easily accessible via the local road Roberts Road which connects to the collector road Old Wallgrove Road. Construction traffic will primarily use the existing road network to access the Proposal site, with ingress and egress via a dedicated entrance positioned at Roberts Road. From there, vehicles will proceed onto Old Wallgrove Road to access Wallgrove Road, which links up to the M7 Motorway to the east.

Given the volume of construction to be performed, it is expected that the number of vehicle movements to service the Proposal site each day would be more than 50 movements. This aligns with a 'large' dust emission magnitude.

It is noted that construction traffic is screened, as outlined in Table B2, and therefore does not require further assessment.

Based upon the discussion provided above and the criteria presented in Table B3, the assessed dust emission magnitudes are as presented in Table B4.

Table B4 Construction phase impact categorisation of dust emission magnitude

Activity	Dust emission magnitude
Demolition	Large
Earthworks and enabling works	Large
Construction	Large
Track-out	Large
Construction traffic routes	Not Applicable

Step 3 – Sensitivity of the Area

Step 3 of the process requires the sensitivity of the area to be defined. The sensitivity of the area considers:

- Specific sensitivities that identified land use values may have to dust deposition and health impacts;
- The proximity and number of those receptors locations;
- In the case of PM₁₀, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Land Use Value

Individual receptor locations are assigned land use values (low, medium, or high) based on the land use and its sensitivity to dust deposition and human health impacts. The land use value reflects the expected level of amenity for a given land use. The IAQM methodology provides guidance on assigning land use values for dust soiling and human health impacts, as shown in Table B5. It is noted that amenity expectations (e.g. tolerance to dust soiling) depend on existing background deposition levels.

Table B5 IAQM guidance for categorising land use value

Land use value	Low	Medium	High
Dust soiling	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal land use pattern.	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.
Examples	<i>Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.</i>	<i>Parks and places of work.</i>	<i>Dwellings, museums, and other culturally important collections, medium- and long-term car parks and car showrooms</i>
Health impacts	Locations where human exposure is transient.	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for 8 hours or more a day).	Locations where the public are exposed over a time period relevant to the air quality objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for 8 hours or more in a day).
Examples	<i>Public footpaths, playing fields, parks, and shopping street.</i>	<i>Office and shop workers but would generally not include workers occupationally exposed to PM₁₀.</i>	<i>Residential properties, hospitals, schools, and residential care homes.</i>

In the surrounding locality, receptors within 250 m of the Proposal site boundary are predominantly industrial in nature, corresponding to a 'medium' land use sensitivity with respect to dust soiling and health impacts. The nearest residential dwellings and educational facilities are located outside of the 250 m screening distance. Correspondingly, the land use sensitivity has been classified as 'medium', due to the presence of industrial

receptors within the screening distance of 250 m, which are considered medium sensitivity to air quality impacts (refer Table B1 and Table B5).

Dust Soiling Impacts

To assess dust soiling impacts, the sensitivity of the local area is determined by considering the receptors and their quantity, as detailed in Table B6.

Table B6 IAQM guidance for categorising the sensitivity of an area to dust soiling impacts

Land use value	Number of receptors ^(a)	Distance from the source (m) ^(b)			
		< 20	< 50	< 100	< 250
Low	> 1	Low	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
High	1 – 10	Medium	Low	Low	Low
	10 – 100	High	Medium	Low	Low
	> 100	High	High	Medium	Low

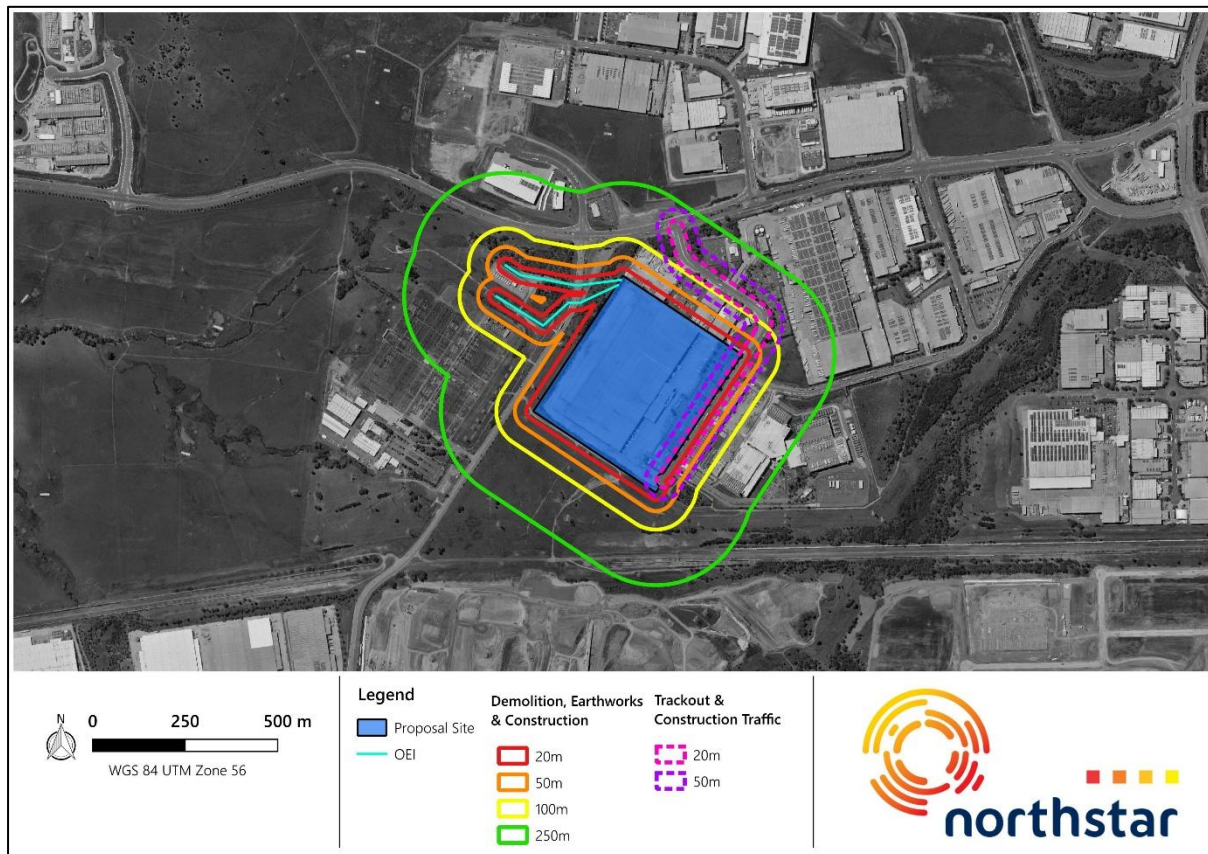
Notes: (a) Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered.

(b) With regard to potential 'construction traffic' impacts, the distance criteria of less than 20 m and less than 50 m from the source (roadside) are used (i.e. the first two columns only). Any locations beyond 50 m may be screened out of the assessment (as per Step 1) and the corresponding sensitivity is negligible'.

Figure B1 illustrates the extent of works considered for this AQIA, delineating the outer envelope boundary of the anticipated construction works, the IAQM distance bands and the positions of receptors. Note that the buffers for trackout and construction traffic have been produced to account for potential construction routes.

The IAQM guidance does not require an exact count of human receptors, instead recommending professional judgment to estimate the number of buildings within each distance band and considering only the highest area sensitivity level from Table B5. The Proposal site is situated in a largely industrial area, including warehousing, logistics, and bulky goods premises, zoned IN1 General Industrial under the provisions of TISEPP. It is estimated that there are no receptors located within 50 m and up to 10 receptors within 250 m from the Proposal site boundary. Based on land use and receptor density, the sensitivity to dust soiling impacts is considered 'low.'

Figure B1 Scope of construction activities, buffer distances and surrounding environment



Source: Northstar

Human Health Impacts

The assessed land use value (as described in Table B5) is then used to assess the sensitivity of the area surrounding the active construction area, considering the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors.

Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant, the season during which the works would take place;
- Any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in (IAQM, 2024)

The IAQM guidance for assessing the sensitivity of an area of human health impacts is shown in Table B7. The background annual average PM_{10} concentration at St Marys AQMS in 2021 was $16.2 \mu g \cdot m^{-3}$ (refer

Table D2). Together with the calculated land use value, this classifies the sensitivity as 'low' for human health impacts related to the Proposal.

Table B7 IAQM guidance for categorising the sensitivity of an area to human health impacts

Land use value	Annual mean PM ₁₀ concentration (µg·m ⁻³)	Number of receptors ^(a)	Distance from the source (m) ^(b)			
			< 20	< 50	< 100	< 250
Low	-	> 1	Low	Low	Low	Low
Medium	≤ 22	1-10	Low	Low	Low	Low
		> 10	Low	Low	Low	Low
	22 - 26	1-10	Low	Low	Low	Low
		> 10	Low	Low	Low	Low
	26 - 30	1-10	Low	Low	Low	Low
		> 10	Medium	Low	Low	Low
	> 30	1-10	Medium	Low	Low	Low
		>10	High	Medium	Low	Low
High	≤ 22	1-10	Low	Low	Low	Low
		10-100	Low	Low	Low	Low
		> 100	Medium	Low	Low	Low
	22 – 26	1-10	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low
		> 100	High	Medium	Low	Low
	26 – 30	1-10	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		> 100	High	High	Medium	Low
	> 30	1-10	High	Medium	Low	Low
		10-100	High	High	Medium	Low
		> 100	High	High	High	Medium

Notes: (a) Estimate the total within the stated distance (e.g. the total within 250 m and not the number between 100 m and 250 m), noting that only the highest level of area sensitivity from the table needs to be considered. In the case of high sensitivity areas with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

(b) With regard to potential 'construction traffic' impacts, the distance criteria of less than 20 m and less than 50 m from the source (roadside) are used (i.e. the first two columns only). Any locations beyond 50 m may be screened out of the assessment (as per Step 1) and the corresponding sensitivity is negligible'.

Step 4 - Risk Assessment (Pre-Mitigation)

The matrices shown in Table B8 for each activity determine the risk category with no mitigation applied.

Table B8 Pre-mitigated risk of dust impacts from construction related activities

Sensitivity of area	Pre-mitigated dust emission magnitude		
	Small	Medium	Large
Demolition			
Low	Negligible risk	Low risk	Medium risk
Medium	Low risk	Medium risk	High risk
High	Medium risk	Medium risk	High risk
Earthworks, Construction and Trackout			
Low	Negligible risk	Low risk	Low risk
Medium	Low risk	Medium risk	Medium risk
High	Low risk	Medium risk	High risk
Construction traffic (from construction site entrance to origin)			
Low	Negligible risk	Low risk	Low risk
Medium	Negligible risk	Low risk	Medium risk
High	Low risk	Medium risk	High risk

Given the sensitivity of the identified receptors is classified as low for dust soiling and low for human health impacts, and the dust emission magnitudes for the various construction phase activities as shown in Table B5, the resulting risk of air quality impacts (without mitigation) is presented in Table B9.

Table B9 Risk of air quality impacts from construction activities – pre-mitigation

Sensitivity of area	Dust emission magnitude					Preliminary risk				
	Demolition	Earthworks	Construction	Track-out	Const. traffic	Demolition	Earthworks	Construction	Track-out	Const. traffic
Dust soiling										
Low	Large	Large	Large	Large	N/A	Med.	Low	Low	Low	N/A
Human health										
Low	Large	Large	Large	Large	N/A	Med.	Low	Low	Low	N/A

Note: Med. = Medium, N/A = Not Applicable, Neg. = Negligible

Table B9 shows that dust soiling and human health impacts are considered a medium risk for demolition, and a low risk for all other construction activities, assuming no mitigation measures are in place to control emissions during the construction phase.

The dust risk assessment therefore provides recommendations for construction phase mitigation, commensurate with those identified risks.

Step 5 – Identify Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the site is a low, medium or high-risk site.

The identified mitigation measures are presented as follows:

N = not required (although they may be implemented voluntarily);

D = desirable (to be considered as part of the CEMP, but may be discounted if justification is provided);

H = highly recommended (to be implemented as part of the CEMP and should only be discounted if site-specific conditions render the requirement invalid or otherwise undesirable).

The mitigation measures presented in Table B10 are commensurate with the risks associated for the Proposal and are recommended to be applied during the construction stage to ensure construction dust will be adequately managed.

Step 6 – Risk Assessment (post-mitigation)

Following Step 5, the residual impact is then determined.

The objective of the mitigation is to manage the construction phase risks to an acceptable level, and therefore it is assumed that application of the identified mitigation would result in a low or negligible residual risk (post mitigation).

Given the size of the Proposal site, the distance to sensitive receptors and the activities to be performed, residual impacts associated with fugitive dust emissions from the Proposal would be anticipated to be 'negligible', should the implementation of the mitigation measures outlined above be performed appropriately.

Table B10 Site specific management and mitigation measures

Identified mitigation		Unmitigated risk
1	Communications	Medium
1.1	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
1.2	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
1.3	Display the head or regional office contact information.	H
1.4	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the relevant regulatory bodies.	H
2	Site management	Medium
2.1	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
2.2	Make the complaints log available to the relevant authority when asked.	H
2.3	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H
2.4	Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are coordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N
3	Monitoring	Medium
3.1	Undertake daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the relevant authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.	D
3.2	Carry out regular site inspections to monitor compliance with the dust management plan / CEMP, record inspection results, and maintain an inspection log available to the relevant authority when asked.	H
3.3	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
4	Preparing and maintaining the site	Medium
4.1	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
4.2	Erect solid screens or barriers around dusty activities or the site boundary that they are at least as high as any stockpiles on site.	H
4.3	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H
4.4	Avoid site runoff of water or mud.	H
4.5	Keep site fencing, barriers and scaffolding clean using wet methods.	H

Identified mitigation		Unmitigated risk
4.6	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below	H
4.7	Cover, seed or fence stockpiles to prevent wind erosion	H
5	Operating vehicle/machinery and sustainable travel	Medium
5.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	H
5.2	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
5.3	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable	H
5.4	Impose and signpost a maximum-speed-limit of 25 km·h ⁻¹ on surfaced and 15 km·h ⁻¹ on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the relevant authority, where appropriate)	D
5.5	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N
5.6	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	D
6	Operations	Medium
6.1	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems	H
6.2	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
6.3	Use enclosed chutes and conveyors and covered skips	H
6.4	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	H
6.5	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	H
7	Waste management	Medium
7.1	Avoid bonfires and burning of waste materials.	H
8	Measures Specific to demolition	Medium
8.1	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D
8.2	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H
8.3	Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H

Identified mitigation		Unmitigated risk
8.4	Bag and remove any biological debris or damp down such material before demolition.	H
9	Measures specific to earthworks	Low
9.1	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N
9.2	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	N
9.3	Only remove the cover in small areas during work and not all at once.	N
10	Measures specific to construction	Low
10.1	Avoid scabbling (roughening of concrete surfaces) if possible	D
10.2	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place	D
10.3	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	N
10.4	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust	N
11	Measures specific to Trackout	Low
11.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	D
11.2	Avoid dry sweeping of large areas.	D
11.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D
11.4	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N
11.5	Record all inspections of haul routes and any subsequent action in a site log book.	D
11.6	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N
11.7	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D
11.8	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permit.	N
11.9	Access gates to be located at least 10 m from receptors where possible.	N

APPENDIX C

Meteorology

Meteorological Stations

A meteorological modelling exercise has been performed to characterise the meteorology of the Proposal site in the absence of site-specific measurements. The meteorological monitoring has been based on measurements acquired from surrounding automatic weather stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM).

A summary of the relevant monitoring sites located within a distance of 20 km of the Proposal site is provided in Table C1.

Table C1 BoM meteorological monitoring sites within 20 km of the Proposal site

Site name	Station #	Approximate location		Approximate distance (km)
		mE	mS	
Horsley Park Equestrian Centre AWS	067119	301 708	6 252 298	4.2
Badgerys Creek AWS	067108	289 920	6 246 951	13.1
Penrith Lakes AWS	067113	284 871	6 266 524	17.9

Note: Climate statistics available at <http://www.bom.gov.au/climate/data/index.shtml>

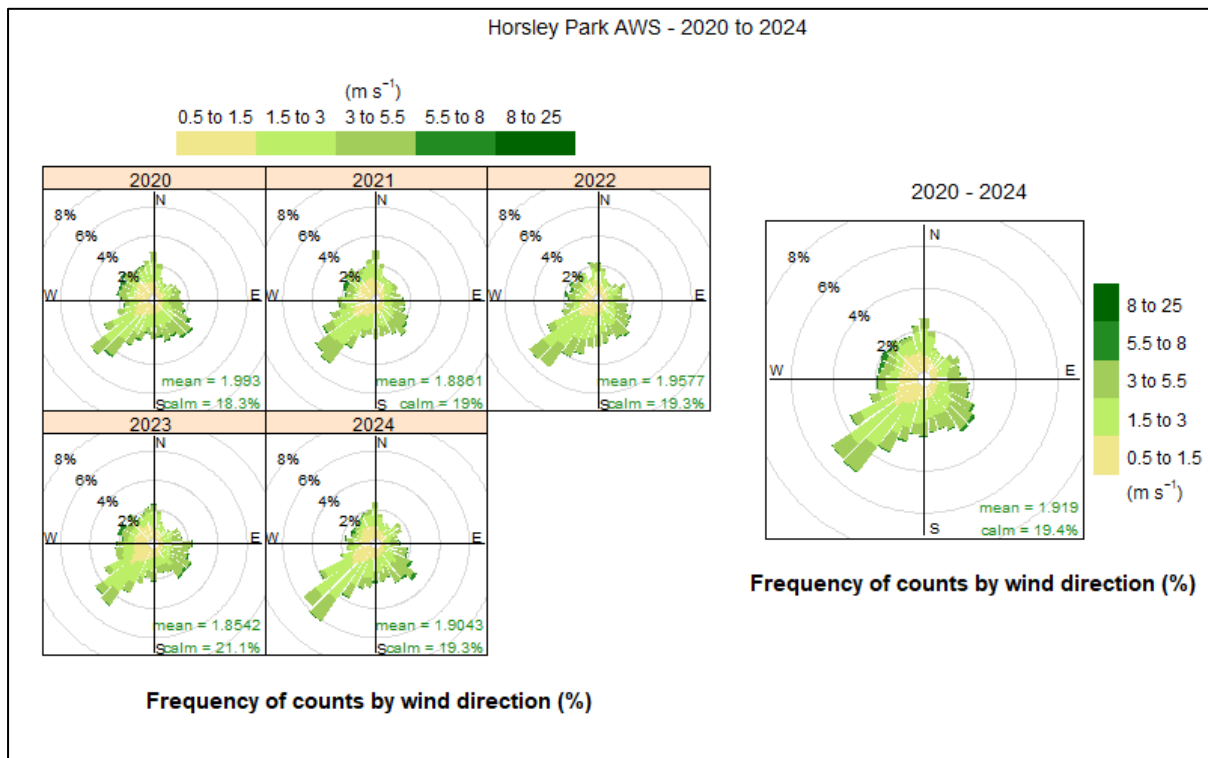
As outlined in Section 4.3, meteorological conditions at Horsley Park Equestrian Centre AWS have been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent years of data (2020 to 2024) are presented in Figure C1. The annual wind speed frequency distribution for the five-year period is presented in Figure C2.

The wind roses indicate that from 2020 to 2024, winds at Horsley Park Equestrian Centre AWS show generally similar wind distribution patterns across the years assessed, with predominant south-westerly wind directions evident.

The majority of wind speeds experienced at Horsley Park Equestrian Centre AWS between 2020 and 2024 are generally in the range 0.5 meters per second ($\text{m}\cdot\text{s}^{-1}$) to $5.5 \text{ m}\cdot\text{s}^{-1}$ with the highest wind speeds (greater than $8 \text{ m}\cdot\text{s}^{-1}$) occurring from mostly north-westerly directions. Calm winds (less than $0.5 \text{ m}\cdot\text{s}^{-1}$) are more common and occur during 19.4 % of hours on average across the years between 2020 and 2024.

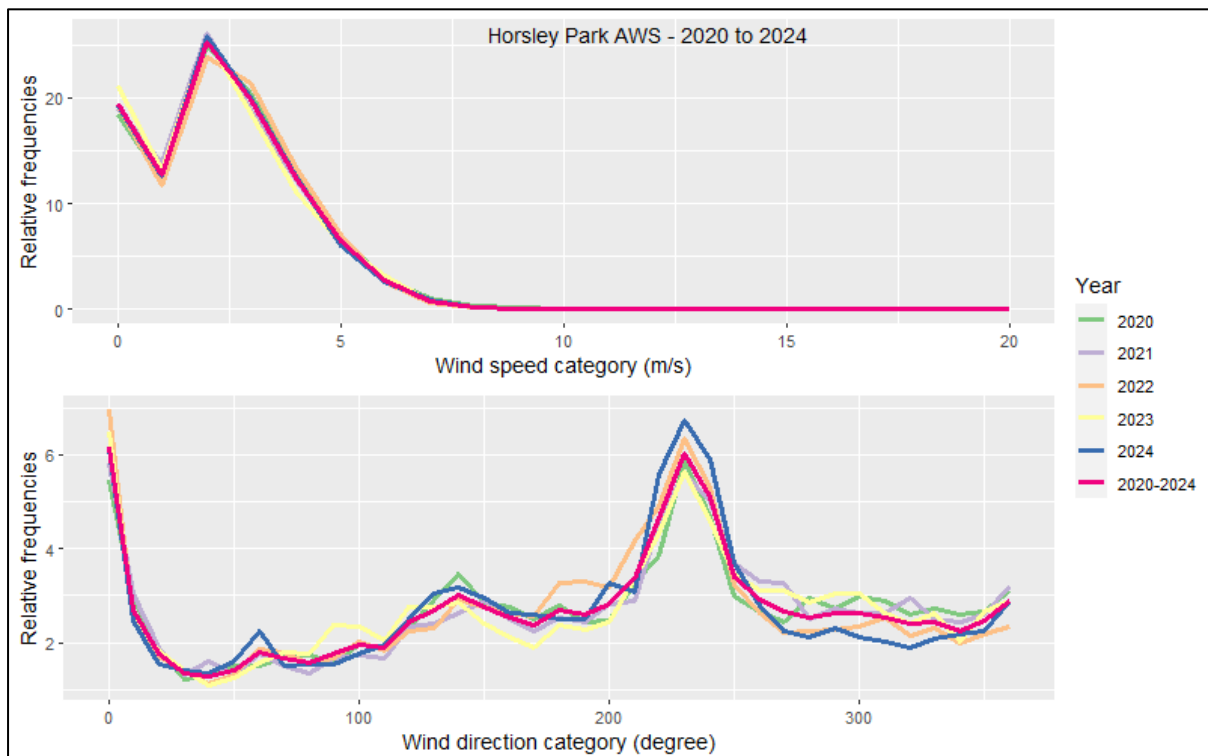
The correlation coefficient between each year and the five-year period for the distribution of wind characteristics (direction and speed), and NO_2 are summarised in Table C2. The correlation coefficients were ranked and aggregated to select the representative year for the meteorological modelling. The rankings are also presented in Table C2.

Figure C1 Annual wind roses – Horsley Park Equestrian Centre AWS (2020 – 2024)



Source: Northstar

Figure C2 Wind direction and speed frequency distribution – Horsley Park Equestrian Centre AWS (2020 – 2024)



Source: Northstar

Table C2 Correlation – Horsley Park Equestrian Centre AWS and St Marys AQMS (2020 – 2024)

Parameter	Wind speed		Wind direction		Nitrogen dioxide (NO ₂)		Aggregated rank
	Corr.	Rank	Corr.	Rank	Corr.	Rank	
2020	0.9993	2	0.9680	4	0.9806	4	4
2021	0.9989	3	0.9744	1	0.9903	2	1
2022	0.9974	5	0.9730	2	0.9984	1	3
2023	0.9975	4	0.9640	5	0.9596	5	5
2024	0.9998	1	0.9708	3	0.9829	3	2
2020-2024	1	-	1	-	1	-	-

Note: Corr. = Correlation

Wind speed observations for each year correlated well against the wind speed over the five-year period, with each year having a correlation coefficient greater than 0.99. The year 2024 is the highest ranked for correlation against the wind speed over the five-year period. Wind direction observations for each year are well correlated against the wind direction over the five-year period, with each year having a correlation coefficient greater than of 0.96. The year 2021 is the highest ranked for correlation against the wind direction over the five-year period.

NO₂ concentrations for each year are also well correlated against NO₂ concentrations over the five-year period. Each year resulted in having a correlation coefficient greater than 0.95. The year 2022 is the highest ranked year for NO₂.

The correlation coefficient analysis indicates that 2021 is the most appropriate representative year for meteorological modelling.

Meteorological Processing

The BoM data adequately covers the issues of data quality assurance; however, it is limited by its location compared to the Proposal site. To address these uncertainties, a multi-phased assessment of the meteorology data has been performed.

In absence of any measured onsite meteorological data, site representative meteorological data for this Proposal was generated using the CALMET meteorological model in a format suitable for using in the CALPUFF dispersion model (refer Section 5.2.1).

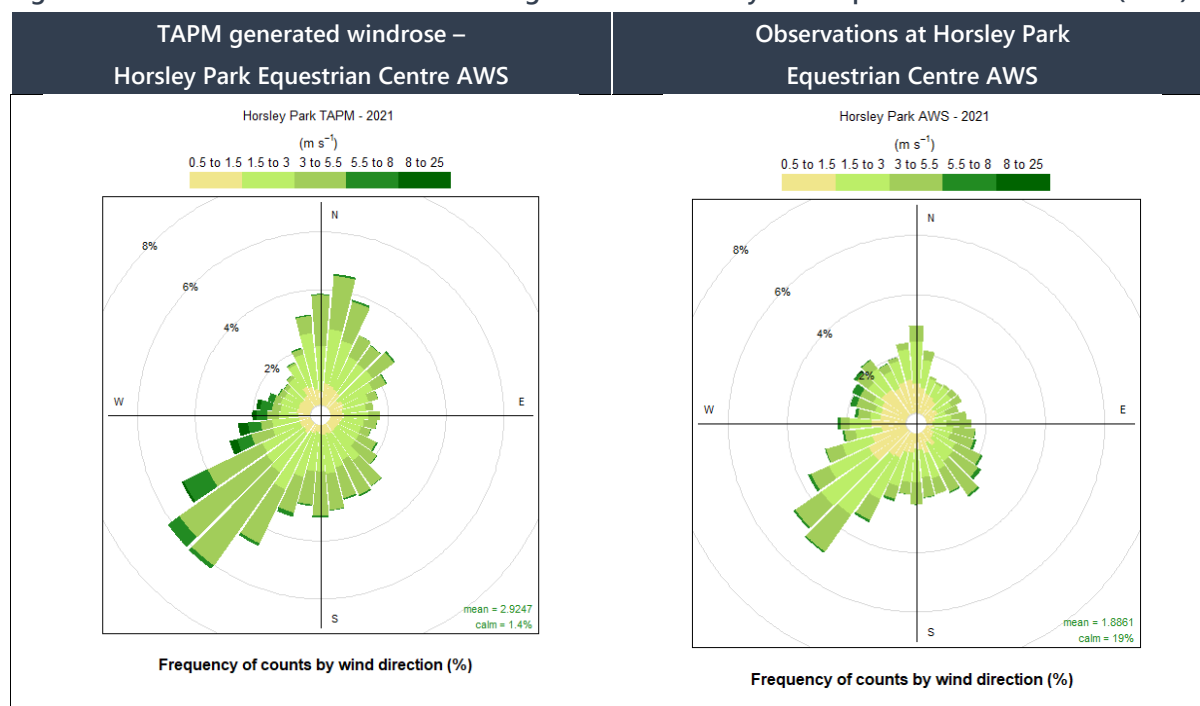
CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

For this AQIA, CALMET has been run in no-observations (no-obs) mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The TAPM model is cited in the 'Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia' (Barclay & Scire, 2011) as a suitable prognostic meteorological model for applications involving complex meteorological conditions.

TAPM is a prognostic model which predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater, and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

It is noted that outputs from the TAPM meteorological modelling run were validated through comparison with observed meteorological data collected at the Horsley Park Equestrian Centre AWS. This comparison is presented in Figure C3. These data generally compare well and correspondingly, the initial TAPM modelling run is considered sufficient to represent meteorological parameters at the Proposal site for use in CALMET.

Figure C3 Observed and TAPM meteorological data – Horsley Park Equestrian Centre AWS (2021)



The parameters used in TAPM and CALMET modelling are presented in Table C3. Further, as per (Barclay & Scire, 2011), the seven critical parameters used in the CALMET modelling are presented in Table C4.

Table C3 CALMET and TAPM meteorological modelling parameters

TAPM v 4.0.5	
Modelling period	1 January 2021 to 1 January 2022
Centre of analysis	297 923 mE, 6 256 028 mS (UTM Coordinates)
Number of grid points	50 × 50 × 25
Number of grids (spacing)	5 (30 km, 10 km, 3 km, 1 km, 300 m)
Terrain	AUSLIG 9 second DEM
Data assimilation	No data assimilation
CALMET	
Modelling period	1 January 2021 to 1 January 2022
Southwest corner of analysis	291 673 mE, 6 249 777 mS (UTM Coordinates)
Meteorological grid domain (resolution)	12.5 km × 12.5 km (0.1 km)
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1 200 m, 2 000 m, 3 000 m, 4 000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

Table C4 Seven critical meteorological parameters used in CALMET

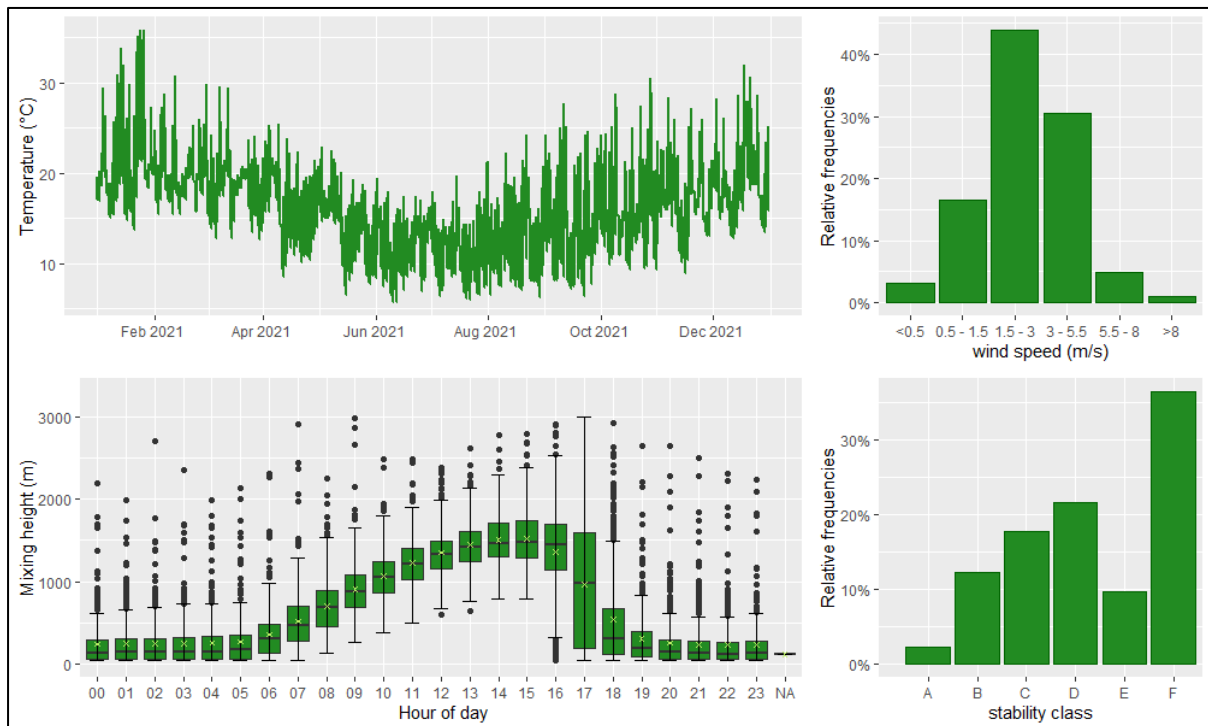
Parameter	Value
TERRAD	5.0
IEXTRP	1
BIAS (NZ)	0 × 10
R1 and R2	0, 0
RMAX1 and RMAX2	0, 0

As generally required by NSW EPA, the following provides a summary of the modelled meteorological dataset at the Proposal Site. Given the nature of the pollutant emission sources at the Proposal site, detail discussion of the humidity, evaporation, cloud cover, katabatic air drainage and air recirculation potential of the Proposal site has not been provided. Details of the predictions of wind speed and direction, mixing height and temperature at the Proposal site are provided below.

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Proposal site during 2021 are illustrated in Figure C4.

As expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and growth of the convective mixing layer.

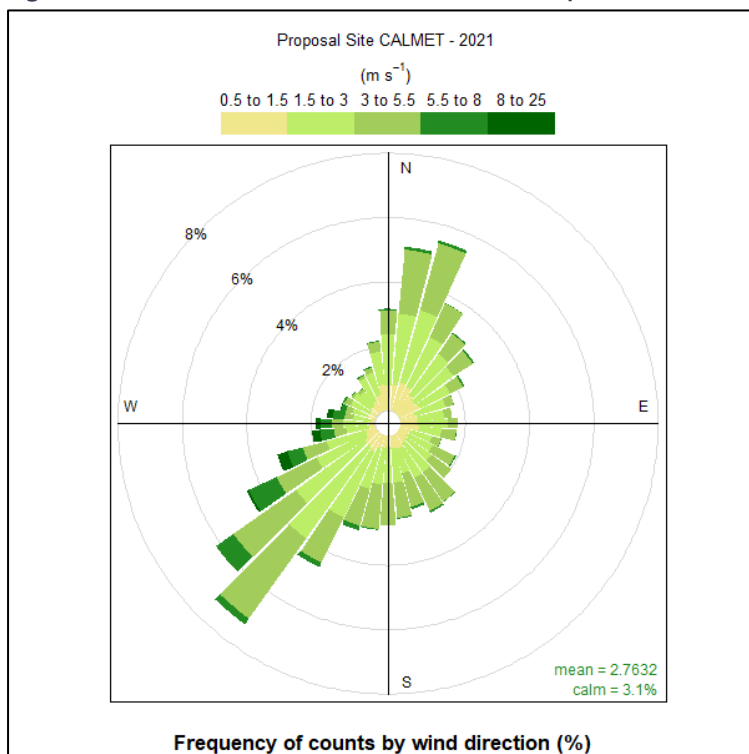
Figure C4 Predicted mixing height, wind speed and stability class frequency at the Proposal site (2021)



Source: Northstar

The modelled wind speed and direction at the Proposal site during 2021 are presented in Figure C5.

Figure C5 Predicted wind characteristics – Proposal site (2021)



Source: Northstar

APPENDIX D

Background Air Quality

Air quality is not monitored at the Proposal site and therefore air quality monitoring data measured at a representative location has been adopted for the purposes of this AQIA. Determination of data to be used as a location representative of the Proposal site and during a representative year can be complicated by factors which include:

- The sources of air pollutant emissions around the Proposal site and representative AQMS; and
- The variability of particulate matter concentrations (often impacted by natural climate variability).

Air quality monitoring is performed by NSW DCCEEW at stations positioned within 10 km of the Proposal site, with details provided in Table 9 of this AQIA. As outlined in Section 4.4, the nearest NSW DCCEEW-operated AQMS to the Proposal site is located at St Marys, approximately 4.8 km to the west-south-west and monitors key pollutants of relevance for this AQIA, specifically fine particles as PM_{10} and $PM_{2.5}$, NO_2 and O_3 .

Given its proximity to the Proposal site, the data acquired from the St Marys AQMS is considered representative of local background pollutant concentrations. However, it does not monitor CO or SO_2 which are pollutants also of concern in this AQIA. Accordingly, CO and SO_2 data from the Prospect AQMS, located approximately 9.0 km to the east have been used to supplement the background data analysis for the purpose of this AQIA.

Concentrations of TSP are not measured at any AQMS surrounding the Proposal site. An analysis of co-located measurements of TSP and PM_{10} in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in Figure D2.

The analysis concludes that, on the basis of the measurements collected in all regions between 1999 to 2011, the derivation of a broad TSP: PM_{10} ratio of 2.0551 : 1 (i.e. PM_{10} represents ~ 49 % of TSP) from the Sydney Metropolitan location is appropriate. In the absence of any more specific information, this ratio has been adopted within this AQIA, resulting in a background annual average TSP concentration of $33.4 \mu g \cdot m^{-3}$.

Summary statistics for the selected data from the considered AQMSs are provided in Table D1.

Graphs presenting the daily varying PM_{10} , $PM_{2.5}$, and hourly varying NO_2 and O_3 data recorded at St Marys AQMS in 2021 are presented in Figure D3 to Figure D6 respectively.

Table D1 Background air quality statistics – St Marys and Prospect AQMS (2021)

Pollutant	TSP	PM ₁₀	PM _{2.5}	NO ₂	O ₃	CO	CO	CO	SO ₂	SO ₂
Averaging period	Annual	24-hour	24-hour	1-hour	1-hour	15-minute	1-hour	8-hour (rolling)	1-hour	24-hour
Units	µg·m ⁻³	µg·m ⁻³	µg·m ⁻³	µg·m ⁻³	µg·m ⁻³	mg·m ⁻³	mg·m ⁻³	mg·m ⁻³	µg·m ⁻³	µg·m ⁻³
AQMS	St Marys					Prospect				
Statistics										
Data Points	351	351	349	8 055	7 894	8 190	8 190	8 549	8 193	354
Mean	33.4	16.2	5.8	8.1	32.7	0.1	0.1	0.1	1.5	1.3
Standard deviation	-	7.7	3.7	8.0	25.7	0.2	0.2	0.1	2.8	1.8
Skew ¹	-	1.1	3.4	1.5	0.6	2.8	2.8	2.4	4.6	1.3
Kurtosis ²	-	1.9	23.7	3.1	- 0.1	11.5	11.5	7.9	36.9	1.2
Minimum	-	2.4	- 0.2	- 4.1	- 2.1	- 0.2	- 0.1	- 0.1	- 2.9	0.0
Percentiles										
25 th	-	10.6	3.6	2.1	8.6	0.0	0.0	0.0	0.0	0.0
50 th	-	14.5	5.1	6.2	30.0	0.0	0.0	0.0	0.0	0.0
75 th	-	20.2	7.0	12.3	51.4	0.2	0.1	0.1	2.9	2.6
90 th	-	26.1	9.5	18.5	66.3	0.3	0.3	0.3	2.9	2.6
95 th	-	31.5	12.0	24.6	74.9	0.5	0.4	0.4	5.7	5.2
97 th	-	33.7	13.8	28.7	85.6	0.7	0.5	0.5	8.6	5.2
98 th	-	35.4	14.7	30.8	92.0	0.8	0.6	0.5	8.6	5.2
99 th	-	36.0	18.1	34.9	98.4	1.0	0.8	0.6	11.4	6.5
Maximum	33.4	54.9	40.3	67.7	149.8	2.1	1.6	1.3	42.9	7.9
Data Capture (%)	95.9	95.9	95.4	91.7	89.9	93.2	93.2	97.3	93.3	96.7

Notes: 1: Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless. 2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive kurtosis represents a more peaked distribution, and negative kurtosis represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Figure D1 Co-located TSP and PM₁₀ measurements – Lower Hunter, Sydney Metro and Illawarra

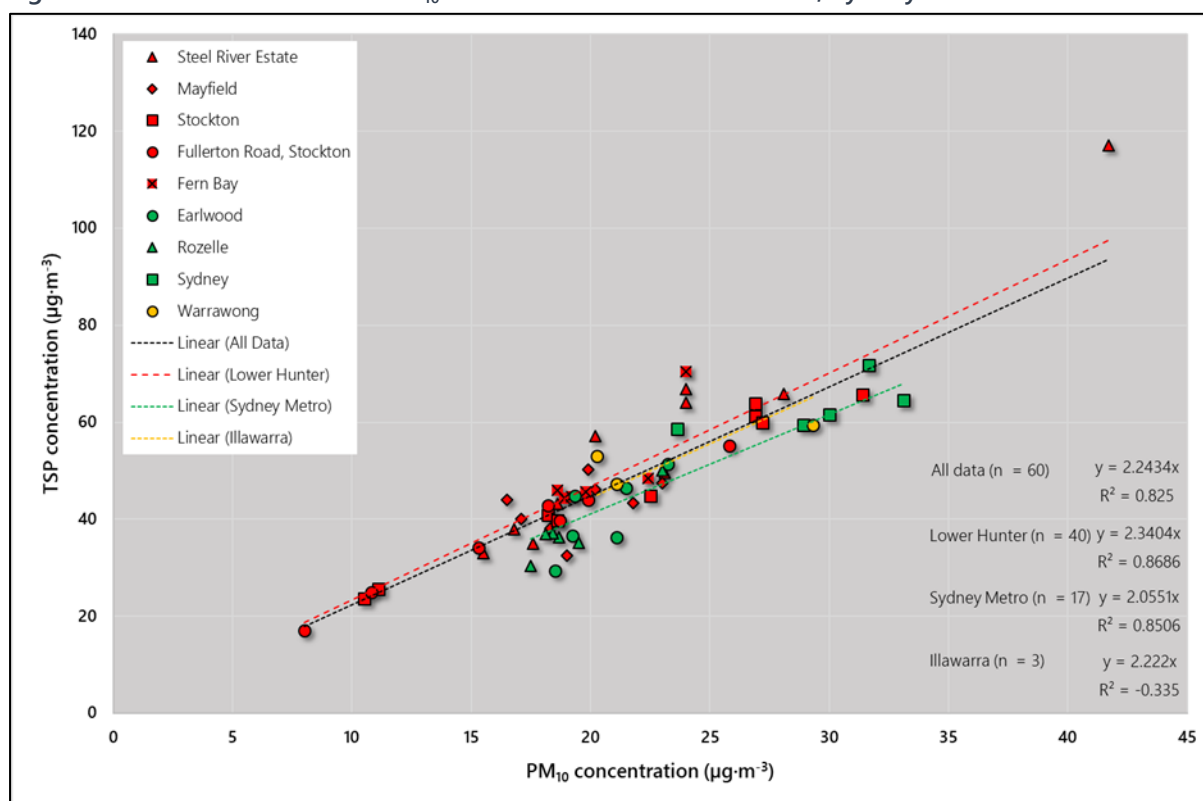
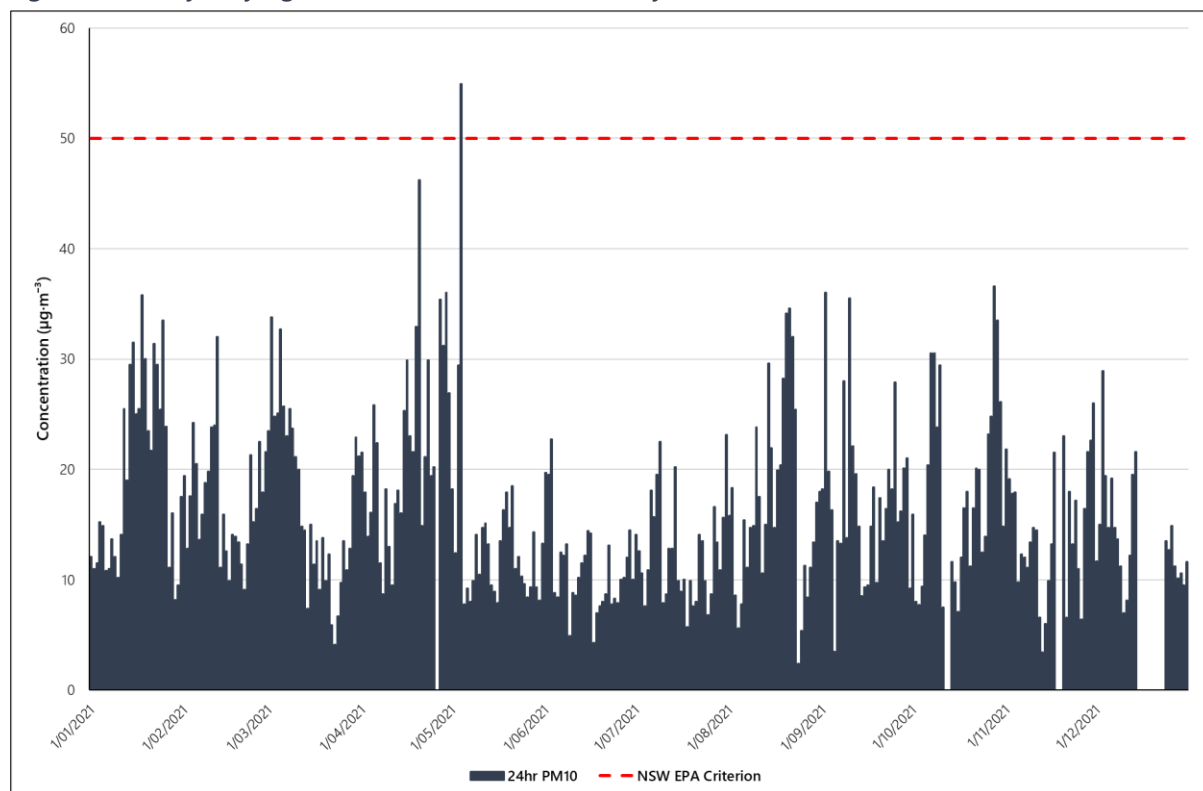
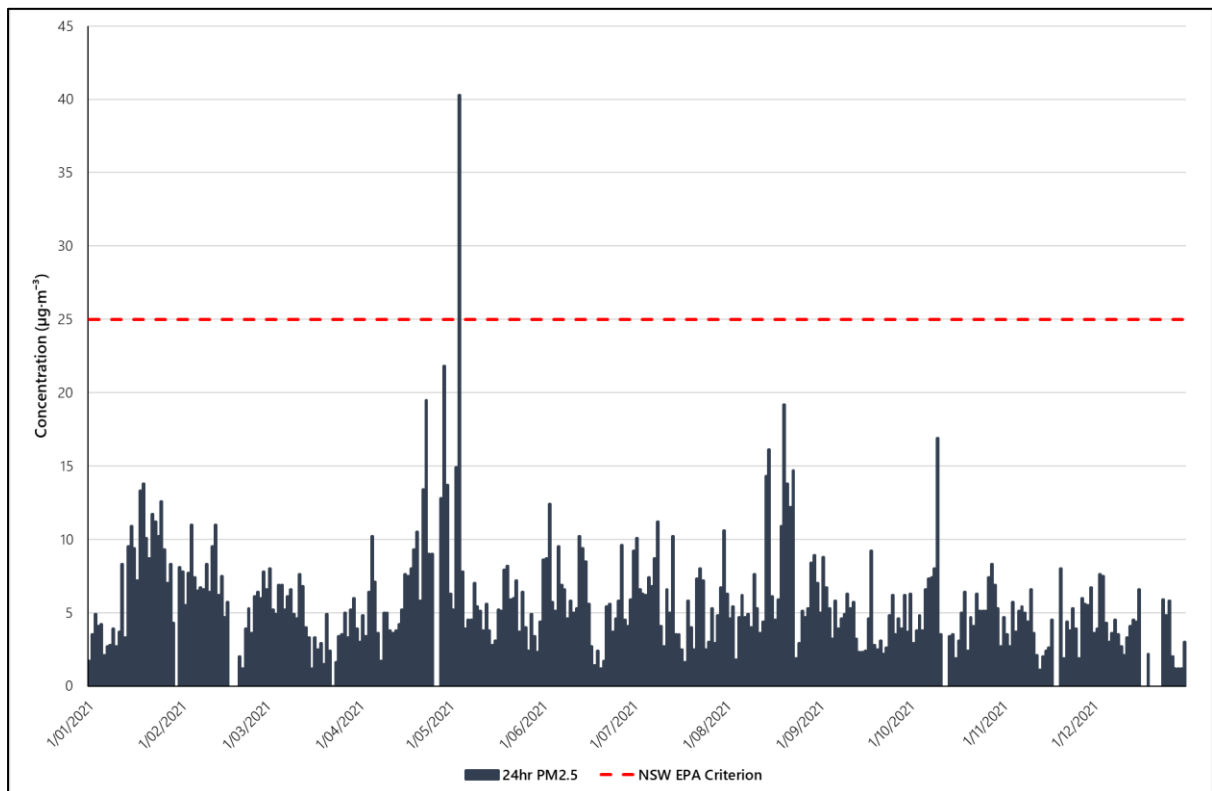


Figure D2 Daily varying PM₁₀ measurements – St Marys AQMS (2021)



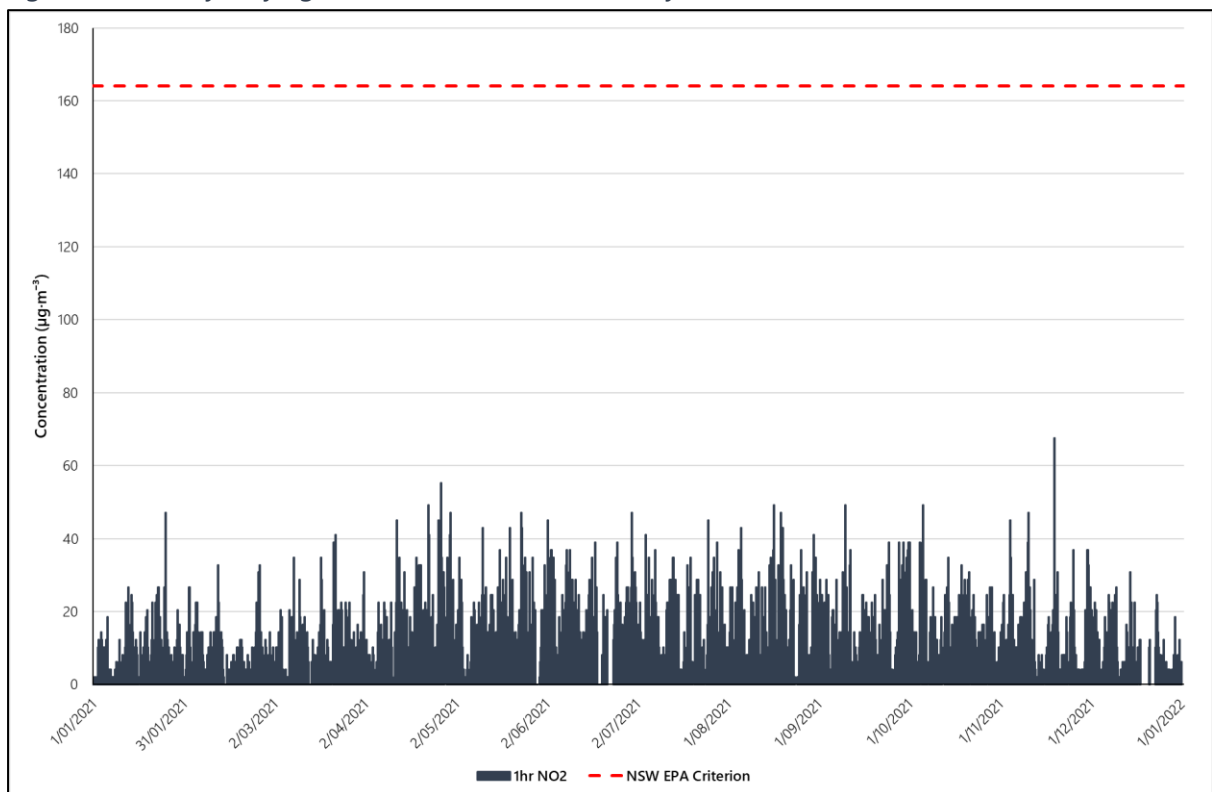
Source: Northstar

Figure D3 Daily varying PM_{2.5} measurements – St Marys AQMS (2021)



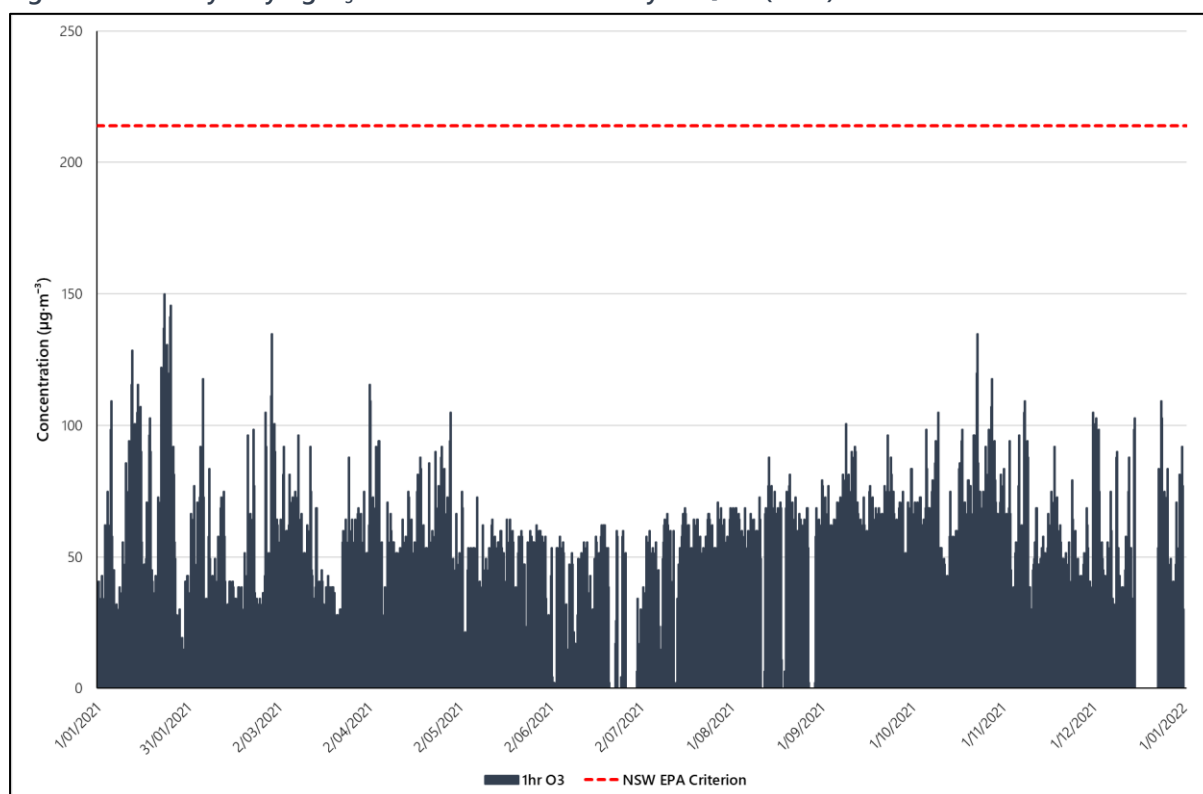
Source: Northstar

Figure D4 Hourly varying NO₂ measurements – St Marys AQMS (2021)



Source: Northstar

Figure D5 Hourly varying O₃ measurements – St Marys AQMS (2021)



Source: Northstar

It can be observed from Figure D3 and Figure D4 that in 2021, the St Marys AQMS recorded exceedances of the respective 24-hour PM₁₀ and PM_{2.5} criteria. Table D2 provides further details on the 24-hour PM₁₀ and PM_{2.5} exceedances recorded at the St Marys AQMS in 2021.

Table D3 Calendar days in 2021 when 24-hour PM₁₀ and PM_{2.5} criteria were exceeded at St Marys AQMS

Date	Measured concentration (µg·m ⁻³)	Comments
24-hour PM₁₀ concentrations		
4 May 2021	54.9	Exceptional – hazard reduction burning
24-hour PM_{2.5} concentrations		
4 May 2021	40.3	Exceptional – hazard reduction burning

The NSW 2021 annual compliance report (NSW DPE, 2023) attributes 2021 PM₁₀ and PM_{2.5} exceedances primarily to hazard reduction burns in the Sydney region. These were classified as exceptional events under the National Environment Protection (Ambient Air Quality) Measure (NEPM) framework.

APPENDIX E

Generator Technical Specifications



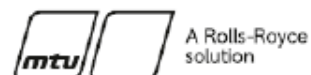
Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94F				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	7				
mg/mN ³ values base on residual oxygen value of [%]	5				

Not to exceed emission values*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3090	2317	1545	772	309
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1500
Engine speed relative	[-]	1	1	1	1	1
NOX-Emissions specific	g/kWh	7.11	6.92	6.22	6.84	17.44
CO-Emissions specific	g/kWh	0.4	0.49	2.08	2.72	6.4
HC1-Emissions specific	g/kWh	0.12	0.13	0.18	0.36	2.43
NMHC-Emissions specific	g/kWh	0.12	0.13	0.18	0.35	
NOX+HC1-Emissions specific	g/kWh	7.23	7.05	6.4	7.21	19.87
NOX+NMHC-Emissions specific	g/kWh	7.22	7.05	6.4	7.2	
PM-Emissions specific (Meas.)	g/kWh	0.028	0.037	0.134	0.209	0.227
NOX-Emissions (based on 5% O ₂)	mg/m ³ N	2537	2424	2111	2143	4464
NOX+HC1-Emissions (based on 5% O ₂)	mg/m ³ N	1384	2469	1181	2254	2982
NOX+NMHC-Emissions (based on 5% O ₂)	mg/m ³ N	1383	2468	1179	2252	

Description of Revision Frequency		All industrial property rights reserved. Disclosure, reproduction or use for any other purpose is prohibited unless our express permission has been given. Any infringement results in liability to pay damages.	PDF	Name	Project no.	Size
			Configurator	Leinhol, Torsten (TARC)	Order no.	
			Approver1	Knaflitz, Alexander (TSL)	EDS-ID	
			Approver2	Koller, Michael (TV)	1503-13.05.2022	
			Approver3			
Data generated by EDS Creator version 1.0 and unipilot. Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 In EDS platform.			Approver4		Title Emission data sheet	
			User	FKZ/gretter		
			Engine model			
			20V4000G94F			
		Emissionstage				
		NEA Singapore for ORDE				
		Emissionstage basis				
		NEA Singapore for ORDE				
Configuration-ID	Documentation	Sheet				
294	Request AWS 2.8 MWe	5 of 6				



CO-Emissions (based on 5% O2)	mg/m3N	137.7	166.9	693.4	836.1	1606.7
HC1-Emissions (based on 5% O2)	mg/m3N	41.5	45.4	61.4	111	610.2
PM-Emissions (based on 5% O2)	mg/m3N	9.7	12.6	44.5	64.3	57

Description of Revision		Frequency	All industrial property rights reserved. Disclosure, reproduction or use for any other purpose is prohibited unless our express permission has been given. Any infringement results in liability to pay damages.	PDF	Name	Project no.	Size
Data generated by EDG Creator version 1.0 and unplot. Ref.-dataset: 420122_364_NEA_G94F_D2.nc for 294 in EDG platform.				Configurator	Lienhof, Tonten (TARC)	Order no.	A4
				Approver1	Knefel, Alexander (TSLG)	EDG-ID	1503-13.05.2022
				Approver2	Koller, Michael (TV)		
				Approver3			
				Approver4		Title Emission data sheet	
				User	FNZgwater		
			Engine model 20V4000G34F				

Configuration-ID 294		Documentation Request AWS 2.0 MW	Emissionstage NEA Singapore for ORDE	Sheet 6 of 6
			Emissionstage basis NEA Singapore for ORDE	

PERFORMANCE DATA[EM7054]

April 16, 2024

Performance Number: EM7054

Change Level: 05

SALES MODEL:	3516E	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
MACHINE SALES MODEL:		HERTZ:	50
ENGINE POWER (BKW):	3,085.0	FAN POWER (KW):	120.0
GEN POWER WITH FAN (EKW):	2,800.0	ADDITIONAL PARASITICS (KW):	18.0
COMPRESSION RATIO:	14.7	ASPIRATION:	TA
RATING LEVEL:	STANDBY	AFTERCOOLER TYPE:	ATAAC
PUMP QUANTITY:	1	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
FUEL TYPE:	DIESEL	INLET MANIFOLD AIR TEMP (C):	52
MANIFOLD TYPE:	DRY	JACKET WATER TEMP (C):	104
GOVERNOR TYPE:	ADEMS	TURBO CONFIGURATION:	PARALLEL
ELECTRONICS TYPE:	ADEMS	TURBO QUANTITY:	4
CAMSHAFT TYPE:	STANDARD	TURBOCHARGER MODEL:	GTB6051N-44T-1.25
IGNITION TYPE:	CI	CERTIFICATION YEAR:	2023
INJECTOR TYPE:	EUI	CRANKCASE BLOWBY RATE (M3/HR):	117.0
FUEL INJECTOR:	3920221	FUEL RATE (RATED RPM) NO LOAD (L/HR):	61.3
UNIT INJECTOR TIMING (MM):	64.34	PISTON SPD @ RATED ENG SPD (M/SEC):	12.9
REF EXH STACK DIAMETER (MM):	356		
MAX OPERATING ALTITUDE (M):	400		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data

THE INLET MANIFOLD AIR TEMP LISTED IN THE HEADER, AND IN THE GENERAL PERFORMANCE DATA, IS THE AVERAGE INLET MANIFOLD TEMP FRONT TO REAR ON THE ENGINE.

THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A STANDARD PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (B3FC)	I80 BRAKE SPEC FUEL CONSUMPTN (B3FC)	VOL FUEL CONSUMPTN (VFC)	I80 VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (E3FC)	I80 ELEC SPEC FUEL CONSUMPTN (E3FC)
EKW	%	BKW	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR	G/EKW-HR	G/EKW-HR
2,800.0	100	3,085	2,634	210.9	206.9	765.5	750.9	232.4	228.0
2,520.0	90	2,791	2,383	206.9	202.9	679.1	666.2	229.1	224.7
2,240.0	80	2,496	2,131	207.7	203.8	610.0	598.4	231.5	227.1
2,100.0	75	2,349	2,005	208.9	205.0	577.3	566.3	233.7	229.2
1,960.0	70	2,201	1,879	210.5	206.5	545.2	534.8	236.4	231.9
1,680.0	60	1,906	1,628	214.9	210.9	482.1	472.9	243.9	239.3
1,400.0	50	1,612	1,376	222.1	217.9	421.1	413.1	255.7	250.8
1,120.0	40	1,317	1,124	228.2	223.9	353.6	346.8	268.3	263.2
840.0	30	1,022	873	234.2	229.8	281.7	276.3	285.1	279.6
700.0	25	875	747	238.8	234.2	245.8	241.1	298.4	292.7
560.0	20	727	621	245.8	241.1	210.3	206.3	319.3	313.2
280.0	10	433	369	270.4	265.2	137.6	135.0	417.9	409.9

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BKW	KPA	DEG C	DEG C	KPA	DEG C	KPA	DEG C
2,800.0	100	3,085	310.6	51.1	691.0	239.8	490.6	327	245.8
2,520.0	90	2,791	273.2	41.5	652.9	207.6	471.2	289	223.6
2,240.0	80	2,496	245.2	38.3	627.4	184.8	459.2	260	203.0
2,100.0	75	2,349	231.6	37.4	618.0	174.3	455.7	246	195.1
1,960.0	70	2,201	218.1	36.6	609.4	163.8	453.2	232	187.4
1,680.0	60	1,906	190.2	35.2	593.4	143.0	450.0	203	172.0
1,400.0	50	1,612	162.5	34.1	579.0	123.5	448.7	174	156.1
1,120.0	40	1,317	128.0	34.9	560.7	99.5	446.5	138	135.3
840.0	30	1,022	89.1	37.5	531.5	73.6	438.7	98	109.5
700.0	25	875	70.9	38.0	509.1	61.6	428.4	78	96.6
560.0	20	727	54.9	37.5	477.3	51.1	406.6	62	84.5
280.0	10	433	26.7	35.8	369.4	32.5	314.0	32	62.1

General Performance Data (Continued)

PERFORMANCE DATA[EM7054]

April 16, 2024

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
EKW	%	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
2,800.0	100	3,085	238.5	639.6	16,754.2	17,405.5	228.7	208.7
2,520.0	90	2,791	226.6	593.5	15,716.0	16,292.7	214.1	196.1
2,240.0	80	2,496	213.1	536.0	14,693.0	15,211.3	199.9	183.6
2,100.0	75	2,349	205.9	514.1	14,164.5	14,855.1	192.7	177.1
1,960.0	70	2,201	198.6	492.2	13,621.0	14,084.5	185.1	170.4
1,680.0	60	1,906	182.7	448.3	12,474.8	12,885.2	169.3	156.2
1,400.0	50	1,612	166.3	405.2	11,312.3	11,670.4	153.3	141.8
1,120.0	40	1,317	144.8	350.2	9,806.4	10,107.1	132.9	123.1
840.0	30	1,022	119.9	285.5	8,088.7	8,328.1	109.6	101.7
700.0	25	875	108.2	253.0	7,289.8	7,498.7	96.5	91.6
560.0	20	727	97.9	221.4	6,588.9	6,767.8	89.0	83.0
280.0	10	433	79.5	157.2	3,346.1	3,463.7	73.1	68.9

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
2,800.0	100	3,085	926	171	3,102	1,622	413	982	3,085	7,761	8,267
2,520.0	90	2,791	812	152	2,714	1,418	365	839	2,791	6,860	7,308
2,240.0	80	2,496	737	143	2,476	1,266	328	713	2,496	6,162	6,564
2,100.0	75	2,349	704	140	2,362	1,204	311	668	2,349	5,832	6,212
1,960.0	70	2,201	672	137	2,260	1,145	293	606	2,201	5,507	5,867
1,680.0	60	1,906	613	133	2,030	1,034	259	505	1,906	4,870	5,188
1,400.0	50	1,612	556	128	1,824	931	227	411	1,612	4,254	4,532
1,120.0	40	1,317	501	123	1,563	799	190	301	1,317	3,571	3,805
840.0	30	1,022	445	116	1,254	638	152	192	1,022	2,846	3,031
700.0	25	875	414	111	1,097	550	132	146	875	2,482	2,644
560.0	20	727	378	104	940	452	113	110	727	2,125	2,263
280.0	10	433	312	88.4	585	214	74.1	55.4	433	1,390	1,481

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN	EKW	2,800.0	2,100.0	1,400.0	700.0	280.0
PERCENT LOAD	%	100	75	50	25	10
ENGINE POWER	BKW	3,085	2,349	1,812	875	433
TOTAL NOX (AS NO2)	G/HR	19,326	12,137	6,287	3,396	4,337
TOTAL CO	G/HR	4,178	1,269	819	1,372	1,023
TOTAL HC	G/HR	304	410	396	306	209
TOTAL CO2	KG/HR	2,013	1,528	1,115	649	359
PART MATTER	G/HR	302.7	112.3	113.2	145.3	57.7
TOTAL NOX (AS NO2) (CORR 5% O2)	MG/INM3	2,203.9	1,825.5	1,300.7	1,202.6	3,104.4
TOTAL CO (CORR 5% O2)	MG/INM3	472.2	190.4	169.1	485.0	737.9
TOTAL HC (CORR 5% O2)	MG/INM3	30.1	53.4	70.7	96.2	105.3
PART MATTER (CORR 5% O2)	MG/INM3	28.5	14.2	19.9	44.8	30.3
TOTAL NOX (AS NO2) (CORR 15% O2)	MG/INM3	817.8	577.4	452.7	446.3	1,151.9
TOTAL CO (CORR 15% O2)	MG/INM3	175.2	70.7	62.7	180.0	273.8
TOTAL HC (CORR 15% O2)	MG/INM3	11.2	19.8	26.2	35.3	39.1
PART MATTER (CORR 15% O2)	MG/INM3	10.6	5.3	7.4	16.6	11.2
TOTAL NOX (AS NO2) (CORR 5% O2)	PPM	1,073	889	634	586	1,512
TOTAL CO (CORR 5% O2)	PPM	378	152	135	388	590
TOTAL HC (CORR 5% O2)	PPM	56	100	132	178	197

Page 2 of 8

PERFORMANCE DATA[EM7054]

April 16, 2024

TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	398	330	235	217	561
TOTAL CO	(CORR 15% O2)	PPM	140	57	50	144	219
TOTAL HC	(CORR 15% O2)	PPM	21	37	49	66	73
TOTAL NOX (AS NO2)		G/HP-HR	4.71	3.87	2.92	2.90	7.49
TOTAL CO		G/HP-HR	1.02	0.41	0.38	1.17	1.77
TOTAL HC		G/HP-HR	0.07	0.13	0.18	0.26	0.36
PART MATTER		G/HP-HR	0.07	0.04	0.05	0.12	0.10
TOTAL NOX (AS NO2)		G/KW-HR	6.40	5.27	3.97	3.94	10.18
TOTAL CO		G/KW-HR	1.38	0.55	0.52	1.59	2.40
TOTAL HC		G/KW-HR	0.10	0.18	0.25	0.36	0.49
PART MATTER		G/KW-HR	0.10	0.05	0.07	0.17	0.14
TOTAL NOX (AS NO2)		LB/HR	42.61	26.76	13.86	7.49	9.56
TOTAL CO		LB/HR	9.21	2.80	1.81	3.02	2.26
TOTAL HC		LB/HR	0.67	0.90	0.87	0.68	0.46
TOTAL CO2		LB/HR	4,437	3,368	2,459	1,431	792
PART MATTER		LB/HR	0.67	0.25	0.25	0.32	0.13
OXYGEN IN EXH	%		9.6	10.8	11.7	12.6	14.8
DRY SMOKE OPACITY	%		4.2	1.5	2.1	4.5	1.6
BOGCH SMOKE NUMBER			1.06	0.82	0.86	1.09	0.82

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN	EKW	2,800.0	2,100.0	1,400.0	700.0	280.0
PERCENT LOAD	%	100	76	60	26	10
ENGINE POWER	BKW	3,086	2,348	1,612	876	438
TOTAL NOX (AS NO2)	G/HR	23,191	14,564	7,544	4,075	5,204
TOTAL CO	G/HR	5,849	1,776	1,147	1,921	1,432
TOTAL HC	G/HR	405	546	527	407	279
PART MATTER	G/HR	423.8	157.2	158.4	203.4	80.8
TOTAL NOX (AS NO2) (CORR 5% O2)	MG/NM3	2,644.7	2,190.7	1,560.9	1,443.2	3,725.2
TOTAL CO (CORR 5% O2)	MG/NM3	661.1	266.6	236.7	679.0	1,033.1
TOTAL HC (CORR 5% O2)	MG/NM3	40.0	71.0	94.1	126.6	140.0
PART MATTER (CORR 5% O2)	MG/NM3	39.8	19.9	27.9	62.7	42.4
TOTAL NOX (AS NO2) (CORR 15% O2)	MG/NM3	981.4	812.9	579.2	535.5	1,382.3
TOTAL CO (CORR 15% O2)	MG/NM3	245.3	98.9	87.8	251.9	383.3
TOTAL HC (CORR 15% O2)	MG/NM3	14.8	26.3	34.9	47.0	52.0
PART MATTER (CORR 15% O2)	MG/NM3	14.8	7.4	10.4	23.3	15.7
TOTAL NOX (AS NO2) (CORR 5% O2)	PPM	1,288	1,067	760	703	1,814
TOTAL CO (CORR 5% O2)	PPM	529	213	189	543	826
TOTAL HC (CORR 5% O2)	PPM	75	132	176	236	261
TOTAL NOX (AS NO2) (CORR 15% O2)	PPM	478	396	282	251	673
TOTAL CO (CORR 15% O2)	PPM	195	79	70	202	307
TOTAL HC (CORR 15% O2)	PPM	28	49	65	88	97
TOTAL NOX (AS NO2)	G/HP-HR	5.65	4.65	3.50	3.48	8.99
TOTAL CO	G/HP-HR	1.42	0.57	0.53	1.64	2.47
TOTAL HC	G/HP-HR	0.10	0.17	0.24	0.35	0.48
PART MATTER	G/HP-HR	0.10	0.05	0.07	0.17	0.14
TOTAL NOX (AS NO2)	G/KW-HR	7.68	6.32	4.76	4.73	12.22
TOTAL CO	G/KW-HR	1.94	0.77	0.72	2.23	3.36
TOTAL HC	G/KW-HR	0.13	0.24	0.33	0.47	0.65
PART MATTER	G/KW-HR	0.14	0.07	0.10	0.24	0.19
TOTAL NOX (AS NO2)	LB/HR	51.13	32.11	16.63	8.98	11.47
TOTAL CO	LB/HR	12.89	3.92	2.53	4.23	3.16
TOTAL HC	LB/HR	0.89	1.20	1.16	0.90	0.61
PART MATTER	LB/HR	0.93	0.35	0.35	0.45	0.18

Regulatory Information

EPA EMERGENCY STATIONARY			2011 - ----	
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality U.S. (INCL CALIF)	Agency EPA	Regulation STATIONARY	Tier/Stage EMERGENCY STATIONARY	Max Limits - G/BKW - HR CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

Page 3 of 8

	Model : 16M55G3750/5	Date : 17/11/22
	PowerKit Engine Exhaust Gas Emissions Test Report	Page : 1 / 1

Engine Basic data

Engine model	16M55G3750/5
Max Rated Power of Engine on Test Bench at 1500 Rpm @ kWm	3300
N° of Cylinders / Valves	16 / 64
Cylinders arrangement	At Vee
Displacement (L)	87.5
Thermodynamic Cycle	Diesel 4 stroke
Cooling System	Liquid (water + 50% antifreeze)
Injection System	Direct
Fuel System	High Pressure Common Rail
Aspiration	Turbocharged and Aftercooled
Fuel type	Diesel

Test information

Test Date	01/11/21
Test Cell n°	B08
Test Procedure	ISO 8178 ⁽¹⁾

Measured data^{*(2)(3)}

NOx (gr/kWh)	15.2
NOx (mgr/Nm³)	3813.5
PM (gr/kWh)	0.06
PM (mgr/Nm³)	—
CO (gr/kWh)	0.25
CO (mgr/Nm³)	93.9
HC (gr/kWh)	0.20
HC (mgr/Nm³)	39.1

* Notes: 1. Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

2. mg/Nm³ and PPM values are measured dry and corrected to 5% O2 content and tested in standby power. gr/kWh values are tested in a duty cycle according to ISO8178.

3. This data was taken from a single engine test according to the Test Methods and Conditions specified. This data is subject to instrumentation, measurement, and engine-to-engine variability. Field emissions test data is not guarantee to these levels. For air permit programs, please contact Application Engineering for expected site variation.



Exhaust Emission Data Sheet

C3500 D5

50 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc. QSK95-G4	Bore:	7.48 in. (190 mm)
Type:	4 Cycle, VEE, 16 cylinder diesel	Stroke:	8.27 in. (210 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	5816 cu. in. (95.3 liters)
Compression Ratio:	15.5:1		
Emission Control Device:	Turbocharged and Aftercooled		
Emission Level:	Stationary Emergency		

Performance Data

	Full Prime
Engine BHP @ 1500 RPM (50 Hz)	3642
Fuel Consumption L/Hr (US Gal/Hr)	608 (161)
Exhaust Gas Flow m³/min (CFM)	516 (18227)
Exhaust Gas Temperature °C (°F)	394 (741)

Exhaust Emission Data

HC (Total Unburned Hydrocarbons)	0.07 (36)
NOx (Oxides of Nitrogen as NO ₂)	6.93 (3439)
CO (Carbon Monoxide)	0.10 (51)
PM (Particulate Matter)	0.007 (3)
SO ₂ (Sulfur Dioxide)	0.004 (1.8)
Smoke (FSN)	0.08

All values (except smoke) are cited: g/BHP-hr (mg/Nm³ @ 5% O₂)

Test Conditions

Steady-state emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specification:	40-48 Cetane Number, 0.0015 Wt.% Sulfur; Reference ISO8178-5, 40 CFR 86, 1313—98 Type 2-D and ASTM D975 No. 2-D. Fuel Density at 0.85 Kg/L (7.1 lbs/US Gal)
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H ₂ O/lb) of dry air
Intake Restriction:	Set to 18 in of H ₂ O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg

Note: mg/m³ values are measured dry, corrected to 5% O₂ and normalized to standard temperature and pressure (0°C, 101.325 kPa)

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.



Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	16V2000G76F				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	10				
mg/mN ³ values base on residual oxygen value of [%]	5				

Not to exceed emission values*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	979	734	489	245	98
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1500	1500	1500	1500	1500
Engine speed relative	[-]	1	1	1	1	1
NOX-Emissions specific	g/kWh	7.2	6.58	6.42	8.31	14.81
CO-Emissions specific	g/kWh	0.56	0.67	1.17	2.7	5.24
HC1-Emissions specific	g/kWh	0.14	0.24	0.4	1.1	2.83
NMHC-Emissions specific	g/kWh	0.14	0.23	0.39	1.08	
NOX+HC1-Emissions specific	g/kWh	7.34	6.82	6.82	9.41	17.63
NOX+NMHC-Emissions specific	g/kWh	7.34	6.81	6.81	9.39	
PM-Emissions specific (Meas.)	g/kWh	0.046	0.083	0.176	0.118	1.001
NOX-Emissions (based on 5% O ₂)	mg/m ³ N	2575	2350	2220	2543	3622
NOX+HC1-Emissions (based on 5% O ₂)	mg/m ³ N	2625	2433	2356	2877	4307
NOX+NMHC-Emissions (based on 5% O ₂)	mg/m ³ N	2624	2431	2353	2870	

		PDF		Name		Project no. MSFT		Size A4	
		Configuration		Leifert, Tordis (TARG)		Order no. MSFT			
		Approver1		Krohn, Alexander (TSLC)		EDS-ID			
		Approver2		Kollec, Michael (TV)		2200-12.01.2023			
		Approver3							
Approver4									
User		FN20130452							
Engine model 16V2000G76F						Title Emission data sheet			
Description of Revision		Frequency							
Data generated by EDS Creator version 1.0 and unipilot. Ref.-dataset: 216V05_113_Partikelmessung_TESP_979kW_NEA_D2.nc for 244 in EDS platform.		All industrial property rights reserved. Disclosure, reproduction or use for any other purpose is prohibited unless our express permission has been given. Any infringement results in liability to pay damages.							

APPENDIX F

AQIA Results – All Receptors – Scenario 1

Table F1 Maximum 24-Hour PM10 and PM2.5 concentrations for all receptors - Scenario 1

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
Criterion	50	25
Max. % of criterion	537.4	1 074.9
R1	268.7	268.7
R2	107.0	107.0
R3	147.2	147.2
R4	85.6	85.6
R5	90.4	90.4
R6	66.9	66.9
R7	103.7	103.7
R8	93.7	93.7
R9	67.1	67.1
R10	85.6	85.6
R11	50.1	50.1
R12	41.8	41.8
R13	43.6	43.6
R14	59.9	59.9
R15	58.3	58.3
R16	70.1	70.1
R17	64.1	64.1
R18	46.6	46.6
R19	76.0	76.0
R20	39.2	39.2
R21	52.9	52.9
R22	22.9	22.9
R23	33.3	33.3
R24	41.4	41.4
R25	30.6	30.6
R26	55.6	55.6
R27	28.1	28.1
R28	51.1	51.1
R29	24.3	24.3
R30	42.8	42.8
R31	55.9	55.9
R32	26.4	26.4

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R33	36.8	36.8
R34	45.1	45.1
R35	39.0	39.0
R36	49.0	49.0
R37	34.4	34.4
R38	16.0	16.0
R39	31.2	31.2
R40	33.9	33.9
R41	15.0	15.0
R42	29.5	29.5
R43	13.4	13.4
R44	18.9	18.9
R45	49.1	49.1
R46	36.6	36.6
R47	22.4	22.4
R48	35.3	35.3
R49	21.6	21.6
R50	17.7	17.7
R51	14.3	14.3
R52	18.1	18.1
R53	22.8	22.8
R54	23.2	23.2
R55	25.1	25.1
R56	33.3	33.3
R57	14.4	14.4
R58	28.0	28.0
R59	21.8	21.8
R60	19.3	19.3
R61	19.8	19.8
R62	35.5	35.5
R63	14.6	14.6
R64	14.9	14.9
R65	24.7	24.7
R66	17.5	17.5
R67	17.0	17.0
R68	13.0	13.0
R69	15.2	15.2
R70	15.2	15.2
R71	18.9	18.9
R72	15.8	15.8

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R73	14.2	14.2
R74	16.7	16.7
R75	20.5	20.5
R76	16.1	16.1
R77	17.6	17.6
R78	26.5	26.5
R79	14.0	14.0
R80	18.2	18.2
R81	12.8	12.8
R82	16.2	16.2
R83	12.7	12.7
R84	15.2	15.2
R85	12.1	12.1
R86	14.7	14.7
R87	14.3	14.3
R88	16.8	16.8
R89	15.0	15.0
R90	13.6	13.6
R91	29.8	29.8
R92	12.4	12.4
R93	17.3	17.3
R94	17.1	17.1
R95	17.8	17.8
R96	12.0	12.0
R97	19.8	19.8
R98	14.9	14.9
R99	11.3	11.3
R100	14.3	14.3
R101	10.8	10.8
R102	14.0	14.0
R103	7.0	7.0
R104	10.4	10.4
R105	13.3	13.3
R106	13.5	13.5
R107	12.7	12.7
R108	9.8	9.8
R109	7.7	7.7
R110	7.8	7.8
R111	7.3	7.3
R112	6.8	6.8

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R113	13.0	13.0
R114	10.3	10.3
R115	7.0	7.0
R116	7.9	7.9
R117	14.9	14.9
R118	7.3	7.3
R119	11.4	11.4
R120	11.7	11.7
R121	9.1	9.1
R122	9.5	9.5
R123	13.0	13.0
R124	10.5	10.5
R125	13.4	13.4
R126	14.7	14.7
R127	17.8	17.8
R128	10.8	10.8

Table F2 Predicted 1-hour and annual average NO₂ concentrations for all receptors – Scenario 1

Receptor	NO ₂ Concentration (µg·m ⁻³)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
Criterion	164			31		
Max % of crit.	1731.4	12.5	1732.6	205.1	26.1	231.2
R1	2 286.0	10.3	2 296.3	21.2	8.1	29.3
R2	782.5	4.1	786.6	18.4	8.1	26.5
R3	963.5	8.2	971.7	20.8	8.1	28.9
R4	846.9	8.1	855.0	28.0	8.1	36.1
R5	948.8	10.3	959.1	18.9	8.1	27.0
R6	701.2	8.1	709.3	14.1	8.1	22.2
R7	1 158.9	8.1	1 167.1	21.5	8.1	29.6
R8	1 970.9	12.3	1 983.2	19.7	8.1	27.8
R9	1 102.0	12.3	1 114.3	20.7	8.1	28.8
R10	1 508.8	12.3	1 521.1	47.1	8.1	55.2
R11	1 042.2	6.2	1 048.4	19.7	8.1	27.8
R12	1 648.5	2.1	1 650.5	13.8	8.1	21.9
R13	1 437.6	8.1	1 445.7	23.8	8.1	31.9
R14	1 281.3	10.3	1 291.6	23.5	8.1	31.6
R15	1 516.2	20.5	1 536.7	19.8	8.1	27.9
R16	2 003.1	2.1	2 005.1	22.7	8.1	30.8
R17	1 650.1	6.2	1 656.2	33.2	8.1	41.3
R18	2 467.6	10.3	2 477.8	43.7	8.1	51.8
R19	1 802.4	12.3	1 814.7	54.3	8.1	62.4
R20	1 193.0	6.2	1 199.2	22.2	8.1	30.3
R21	1 650.9	12.3	1 663.2	21.5	8.1	29.6
R22	1 064.6	12.3	1 076.9	24.1	8.1	32.2
R23	1 429.9	8.1	1 438.1	25.1	8.1	33.2
R24	1 650.7	10.3	1 661.0	23.3	8.1	31.4
R25	1 138.7	2.1	1 140.8	21.3	8.1	29.4
R26	2 106.7	2.1	2 108.8	60.2	8.1	68.3
R27	1 267.6	10.3	1 277.9	20.9	8.1	29.0
R28	2 165.7	20.5	2 186.2	52.6	8.1	60.7
R29	2 436.9	2.1	2 438.9	41.9	8.1	50.0
R30	1 876.8	12.3	1 889.1	22.0	8.1	30.1

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R31	1 492.7	12.3	1 505.0	15.3	8.1	23.4
R32	1 044.7	2.1	1 046.7	21.8	8.1	29.9
R33	1 817.1	8.2	1 825.3	22.7	8.1	30.8
R34	1 587.5	6.2	1 593.6	14.7	8.1	22.8
R35	1 982.2	<0.1	1 982.3	37.4	8.1	45.5
R36	1 561.8	2.1	1 563.9	20.4	8.1	28.5
R37	2 295.4	16.4	2 311.8	46.9	8.1	55.0
R38	993.5	2.1	995.6	19.3	8.1	27.4
R39	2 164.0	16.4	2 180.4	29.4	8.1	37.5
R40	2 076.8	8.2	2 085.0	34.6	8.1	42.7
R41	1 272.4	12.3	1 284.7	13.5	8.1	21.6
R42	1 476.4	2.1	1 478.4	14.3	8.1	22.4
R43	1 139.1	2.1	1 141.2	18.4	8.1	26.5
R44	1 163.5	8.1	1 171.6	12.8	8.1	20.9
R45	2 260.5	2.1	2 262.5	62.7	8.1	70.8
R46	1 902.6	20.5	1 923.1	37.3	8.1	45.4
R47	2 839.4	2.1	2 841.5	63.5	8.1	71.6
R48	2 215.0	2.1	2 217.0	52.4	8.1	60.5
R49	2 144.3	4.1	2 148.4	55.5	8.1	63.6
R50	1 511.2	14.4	1 525.5	21.0	8.1	29.1
R51	1 302.7	2.1	1 304.8	25.5	8.1	33.6
R52	1 916.0	4.1	1 920.1	24.0	8.1	32.1
R53	2 164.4	<0.1	2 164.4	39.8	8.1	47.9
R54	2 093.7	4.1	2 097.8	32.5	8.1	40.6
R55	2 269.7	16.4	2 286.1	49.5	8.1	57.6
R56	1 712.6	8.2	1 720.8	43.6	8.1	51.7
R57	1 248.9	12.3	1 261.2	9.5	8.1	17.6
R58	1 932.0	12.3	1 944.3	30.5	8.1	38.6
R59	1 406.1	4.1	1 410.2	26.1	8.1	34.2
R60	1 642.3	4.1	1 646.4	14.3	8.1	22.4
R61	1 634.0	10.3	1 644.3	30.8	8.1	38.9
R62	1 705.3	4.1	1 709.4	23.6	8.1	31.7
R63	951.6	6.2	957.7	17.1	8.1	25.2
R64	1 481.8	4.1	1 485.9	27.1	8.1	35.2

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R65	1 869.2	8.2	1 877.4	59.2	8.1	67.3
R66	2 177.9	4.1	2 182.0	33.0	8.1	41.1
R67	1 241.3	8.1	1 249.4	19.4	8.1	27.5
R68	1 421.4	14.4	1 435.7	28.1	8.1	36.2
R69	1 493.1	14.4	1 507.5	19.1	8.1	27.2
R70	1 282.2	2.1	1 284.3	22.9	8.1	31.0
R71	1 435.0	8.2	1 443.2	47.8	8.1	55.9
R72	1 425.7	4.1	1 429.8	27.3	8.1	35.4
R73	1 141.4	<0.1	1 141.5	18.0	8.1	26.1
R74	2 120.1	4.1	2 124.2	34.4	8.1	42.5
R75	1 940.2	16.4	1 956.6	20.1	8.1	28.2
R76	2 442.9	2.1	2 444.9	46.1	8.1	54.2
R77	1 459.1	2.1	1 461.2	18.9	8.1	27.0
R78	2 141.4	2.1	2 143.4	23.4	8.1	31.5
R79	1 255.1	2.1	1 257.1	13.1	8.1	21.2
R80	1 655.7	2.1	1 657.7	14.9	8.1	23.0
R81	1 537.1	4.1	1 541.2	16.9	8.1	25.0
R82	1 912.7	8.1	1 920.8	22.8	8.1	30.9
R83	1 000.4	8.1	1 008.5	21.7	8.1	29.8
R84	1 677.6	4.1	1 681.7	13.8	8.1	21.9
R85	1 568.1	6.2	1 574.3	37.8	8.1	45.9
R86	1 756.4	<0.1	1 756.5	54.2	8.1	62.3
R87	1 503.8	2.1	1 505.8	32.4	8.1	40.5
R88	1 424.1	2.1	1 426.2	33.6	8.1	41.7
R89	1 492.1	4.1	1 496.2	14.2	8.1	22.3
R90	1 620.5	12.3	1 632.8	21.4	8.1	29.5
R91	1 973.1	6.2	1 979.2	52.0	8.1	60.1
R92	1 623.4	12.3	1 635.7	20.9	8.1	29.0
R93	1 598.3	8.2	1 606.5	30.4	8.1	38.5
R94	2 085.8	8.1	2 093.9	63.6	8.1	71.7
R95	1 611.6	4.1	1 615.7	34.9	8.1	43.0
R96	1 444.2	4.1	1 448.3	18.3	8.1	26.4
R97	1 478.9	8.2	1 487.1	27.8	8.1	35.9
R98	1 572.3	4.1	1 576.4	44.9	8.1	53.0

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R99	1 609.4	14.4	1 623.7	51.4	8.1	59.5
R100	1 400.8	6.2	1 407.0	18.5	8.1	26.6
R101	1 408.7	8.2	1 416.9	26.4	8.1	34.5
R102	1 295.9	6.2	1 302.1	20.3	8.1	28.4
R103	1 005.7	2.1	1 007.7	19.1	8.1	27.2
R104	1 217.2	2.1	1 219.3	19.1	8.1	27.2
R105	1 576.7	6.2	1 582.8	33.0	8.1	41.1
R106	1 486.9	6.2	1 493.1	28.5	8.1	36.6
R107	1 547.0	6.2	1 553.2	54.3	8.1	62.4
R108	1 344.1	<0.1	1 344.2	34.8	8.1	42.9
R109	1 413.5	4.1	1 417.6	22.5	8.1	30.6
R110	1 344.2	8.2	1 352.4	26.4	8.1	34.5
R111	1 296.8	12.3	1 309.1	21.7	8.1	29.8
R112	1 407.3	8.2	1 415.5	37.9	8.1	46.0
R113	1 399.7	6.2	1 405.9	23.5	8.1	31.6
R114	1 504.2	6.2	1 510.3	28.6	8.1	36.7
R115	1 397.1	8.2	1 405.3	16.1	8.1	24.2
R116	1 224.3	8.2	1 232.5	18.7	8.1	26.8
R117	1 842.5	2.1	1 844.6	28.9	8.1	37.0
R118	1 188.2	2.1	1 190.2	21.5	8.1	29.6
R119	1 358.4	2.1	1 360.4	16.9	8.1	25.0
R120	1 510.7	2.1	1 512.8	14.8	8.1	22.9
R121	1 216.3	2.1	1 218.4	22.0	8.1	30.1
R122	1 416.4	4.1	1 420.5	13.1	8.1	21.2
R123	1 525.5	8.2	1 533.7	29.8	8.1	37.9
R124	1 456.7	8.2	1 464.9	32.7	8.1	40.8
R125	1 478.5	12.3	1 490.8	26.8	8.1	34.9
R126	1 515.8	6.2	1 522.0	29.7	8.1	37.8
R127	1 396.3	2.1	1 398.3	40.0	8.1	48.1
R128	1 271.1	2.1	1 273.2	18.2	8.1	26.3

Table F3 Predicted 15-minutes, 1-hour and 8-hour average CO concentrations for all receptors – Scenario 1

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	100			30			10		
Max. % of criterion	17.5	2.1	19.6	44.1	5.3	49.5	59.6	13.0	72.6
R1	17.5	2.1	19.6	13.2	1.6	14.8	6.0	1.3	7.3
R2	10.3	2.1	12.4	7.8	1.6	9.4	3.0	1.3	4.3
R3	7.9	2.1	10.0	6.0	1.6	7.6	2.4	1.3	3.7
R4	6.2	2.1	8.3	4.7	1.6	6.3	2.4	1.3	3.7
R5	5.1	2.1	7.2	3.9	1.6	5.5	2.3	1.3	3.6
R6	5.1	2.1	7.2	3.8	1.6	5.4	2.9	1.3	4.2
R7	4.9	2.1	7.0	3.7	1.6	5.3	2.2	1.3	3.5
R8	4.8	2.1	6.9	3.6	1.6	5.2	1.8	1.3	3.1
R9	4.7	2.1	6.8	3.6	1.6	5.2	1.6	1.3	2.9
R10	4.7	2.1	6.8	3.5	1.6	5.1	2.2	1.3	3.5
R11	4.3	2.1	6.4	3.3	1.6	4.9	2.1	1.3	3.4
R12	3.9	2.1	6.0	3.0	1.6	4.6	1.5	1.3	2.8
R13	3.7	2.1	5.8	2.8	1.6	4.4	1.8	1.3	3.1
R14	3.6	2.1	5.7	2.8	1.6	4.4	1.4	1.3	2.7
R15	3.6	2.1	5.7	2.7	1.6	4.3	1.5	1.3	2.8
R16	3.5	2.1	5.6	2.6	1.6	4.2	1.3	1.3	2.6
R17	3.4	2.1	5.5	2.6	1.6	4.2	1.7	1.3	3.0
R18	3.4	2.1	5.5	2.6	1.6	4.2	1.6	1.3	2.9
R19	3.2	2.1	5.3	2.4	1.6	4.0	1.5	1.3	2.8

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R20	3.2	2.1	5.3	2.4	1.6	4.0	1.5	1.3	2.8
R21	3.1	2.1	5.2	2.4	1.6	4.0	1.0	1.3	2.3
R22	3.1	2.1	5.2	2.3	1.6	3.9	1.4	1.3	2.7
R23	3.0	2.1	5.1	2.3	1.6	3.9	1.6	1.3	2.9
R24	3.0	2.1	5.1	2.3	1.6	3.9	1.2	1.3	2.5
R25	2.8	2.1	4.9	2.1	1.6	3.7	1.0	1.3	2.3
R26	2.7	2.1	4.8	2.1	1.6	3.7	1.6	1.3	2.9
R27	2.7	2.1	4.8	2.0	1.6	3.6	0.9	1.3	2.2
R28	2.6	2.1	4.7	2.0	1.6	3.6	1.1	1.3	2.4
R29	2.6	2.1	4.7	2.0	1.6	3.6	1.4	1.3	2.7
R30	2.5	2.1	4.6	1.9	1.6	3.5	1.5	1.3	2.8
R31	2.5	2.1	4.6	1.9	1.6	3.5	1.1	1.3	2.4
R32	2.5	2.1	4.6	1.9	1.6	3.5	1.0	1.3	2.3
R33	2.4	2.1	4.5	1.8	1.6	3.4	1.0	1.3	2.3
R34	2.4	2.1	4.5	1.8	1.6	3.4	0.8	1.3	2.1
R35	2.3	2.1	4.4	1.8	1.6	3.4	1.0	1.3	2.3
R36	2.3	2.1	4.4	1.8	1.6	3.4	1.4	1.3	2.7
R37	2.3	2.1	4.4	1.7	1.6	3.3	1.1	1.3	2.4
R38	2.2	2.1	4.3	1.7	1.6	3.3	0.8	1.3	2.1
R39	2.2	2.1	4.3	1.7	1.6	3.3	1.1	1.3	2.4
R40	2.2	2.1	4.3	1.7	1.6	3.3	1.3	1.3	2.6
R41	2.1	2.1	4.2	1.6	1.6	3.2	1.0	1.3	2.3
R42	2.1	2.1	4.2	1.6	1.6	3.2	1.1	1.3	2.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R43	2.1	2.1	4.2	1.6	1.6	3.2	1.1	1.3	2.4
R44	2.0	2.1	4.1	1.5	1.6	3.1	0.9	1.3	2.2
R45	2.0	2.1	4.1	1.5	1.6	3.1	0.7	1.3	2.0
R46	2.0	2.1	4.1	1.5	1.6	3.1	1.1	1.3	2.4
R47	1.9	2.1	4.0	1.5	1.6	3.1	0.9	1.3	2.2
R48	1.9	2.1	4.0	1.5	1.6	3.1	0.9	1.3	2.2
R49	1.9	2.1	4.0	1.4	1.6	3.0	0.6	1.3	1.9
R50	1.9	2.1	4.0	1.4	1.6	3.0	0.8	1.3	2.1
R51	1.8	2.1	3.9	1.4	1.6	3.0	0.6	1.3	1.9
R52	1.8	2.1	3.9	1.3	1.6	2.9	1.1	1.3	2.4
R53	1.7	2.1	3.8	1.3	1.6	2.9	0.8	1.3	2.1
R54	1.7	2.1	3.8	1.3	1.6	2.9	0.9	1.3	2.2
R55	1.6	2.1	3.7	1.2	1.6	2.8	0.9	1.3	2.2
R56	1.6	2.1	3.7	1.2	1.6	2.8	0.7	1.3	2.0
R57	1.6	2.1	3.7	1.2	1.6	2.8	0.5	1.3	1.8
R58	1.6	2.1	3.7	1.2	1.6	2.8	1.0	1.3	2.3
R59	1.6	2.1	3.7	1.2	1.6	2.8	0.8	1.3	2.1
R60	1.6	2.1	3.7	1.2	1.6	2.8	0.8	1.3	2.1
R61	1.6	2.1	3.7	1.2	1.6	2.8	0.5	1.3	1.8
R62	1.5	2.1	3.6	1.2	1.6	2.8	0.7	1.3	2.0
R63	1.5	2.1	3.6	1.1	1.6	2.7	0.7	1.3	2.0
R64	1.4	2.1	3.5	1.1	1.6	2.7	0.6	1.3	1.9
R65	1.4	2.1	3.5	1.1	1.6	2.7	0.7	1.3	2.0

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R66	1.4	2.1	3.5	1.1	1.6	2.7	0.8	1.3	2.1
R67	1.4	2.1	3.5	1.0	1.6	2.6	0.7	1.3	2.0
R68	1.4	2.1	3.5	1.0	1.6	2.6	0.7	1.3	2.0
R69	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R70	1.3	2.1	3.4	1.0	1.6	2.6	0.8	1.3	2.1
R71	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R72	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R73	1.3	2.1	3.4	1.0	1.6	2.6	0.8	1.3	2.1
R74	1.3	2.1	3.4	1.0	1.6	2.6	0.5	1.3	1.8
R75	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R76	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R77	1.3	2.1	3.4	1.0	1.6	2.6	0.6	1.3	1.9
R78	1.2	2.1	3.3	0.9	1.6	2.5	0.6	1.3	1.9
R79	1.2	2.1	3.3	0.9	1.6	2.5	0.6	1.3	1.9
R80	1.2	2.1	3.3	0.9	1.6	2.5	0.6	1.3	1.9
R81	1.2	2.1	3.3	0.9	1.6	2.5	0.4	1.3	1.7
R82	1.2	2.1	3.3	0.9	1.6	2.5	0.5	1.3	1.8
R83	1.2	2.1	3.3	0.9	1.6	2.5	0.5	1.3	1.8
R84	1.2	2.1	3.3	0.9	1.6	2.5	0.7	1.3	2.0
R85	1.2	2.1	3.3	0.9	1.6	2.5	0.4	1.3	1.7
R86	1.2	2.1	3.3	0.9	1.6	2.5	0.5	1.3	1.8
R87	1.1	2.1	3.2	0.9	1.6	2.5	0.6	1.3	1.9
R88	1.1	2.1	3.2	0.9	1.6	2.5	0.5	1.3	1.8

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R89	1.1	2.1	3.2	0.9	1.6	2.5	0.7	1.3	2.0
R90	1.1	2.1	3.2	0.8	1.6	2.4	0.6	1.3	1.9
R91	1.1	2.1	3.2	0.8	1.6	2.4	0.6	1.3	1.9
R92	1.1	2.1	3.2	0.8	1.6	2.4	0.5	1.3	1.8
R93	1.1	2.1	3.2	0.8	1.6	2.4	0.5	1.3	1.8
R94	1.1	2.1	3.2	0.8	1.6	2.4	0.5	1.3	1.8
R95	1.0	2.1	3.1	0.8	1.6	2.4	0.5	1.3	1.8
R96	1.0	2.1	3.1	0.8	1.6	2.4	0.5	1.3	1.8
R97	1.0	2.1	3.1	0.8	1.6	2.4	0.6	1.3	1.9
R98	1.0	2.1	3.1	0.8	1.6	2.4	0.6	1.3	1.9
R99	1.0	2.1	3.1	0.8	1.6	2.4	0.5	1.3	1.8
R100	1.0	2.1	3.1	0.8	1.6	2.4	0.5	1.3	1.8
R101	1.0	2.1	3.1	0.8	1.6	2.4	0.4	1.3	1.7
R102	1.0	2.1	3.1	0.7	1.6	2.3	0.5	1.3	1.8
R103	1.0	2.1	3.1	0.7	1.6	2.3	0.4	1.3	1.7
R104	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R105	0.9	2.1	3.0	0.7	1.6	2.3	0.6	1.3	1.9
R106	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R107	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R108	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R109	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R110	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7
R111	0.9	2.1	3.0	0.7	1.6	2.3	0.4	1.3	1.7

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R112	0.8	2.1	2.9	0.6	1.6	2.2	0.5	1.3	1.8
R113	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R114	0.8	2.1	2.9	0.6	1.6	2.2	0.5	1.3	1.8
R115	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R116	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R117	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R118	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R119	0.8	2.1	2.9	0.6	1.6	2.2	0.5	1.3	1.8
R120	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R121	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R122	0.8	2.1	2.9	0.6	1.6	2.2	0.4	1.3	1.7
R123	0.7	2.1	2.8	0.6	1.6	2.2	0.4	1.3	1.7
R124	0.7	2.1	2.8	0.6	1.6	2.2	0.3	1.3	1.6
R125	0.7	2.1	2.8	0.5	1.6	2.1	0.3	1.3	1.6
R126	0.7	2.1	2.8	0.5	1.6	2.1	0.3	1.3	1.6
R127	0.7	2.1	2.8	0.5	1.6	2.1	0.4	1.3	1.7
R128	0.7	2.1	2.8	0.5	1.6	2.1	0.3	1.3	1.6

Table F4 Predicted 1-hour and 24-hour SO₂ concentrations for all receptors – Scenario 1

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	215			57		
Max. % of criterion	8.5	20.0	28.5	9.0	13.9	22.9
R1	18.3	42.9	61.2	5.1	7.9	13.0
R2	5.3	42.9	48.2	2.0	7.9	9.9
R3	10.8	42.9	53.7	2.8	7.9	10.7
R4	4.5	42.9	47.4	1.6	7.9	9.5
R5	5.3	42.9	48.2	1.7	7.9	9.6
R6	3.8	42.9	46.7	1.3	7.9	9.2
R7	6.5	42.9	49.4	2.0	7.9	9.9
R8	8.3	42.9	51.2	1.8	7.9	9.7
R9	4.9	42.9	47.8	1.3	7.9	9.2
R10	5.1	42.9	48.0	1.6	7.9	9.5
R11	2.8	42.9	45.7	1.0	7.9	8.9
R12	5.0	42.9	47.9	0.8	7.9	8.7
R13	3.3	42.9	46.2	0.8	7.9	8.7
R14	2.7	42.9	45.6	1.1	7.9	9.0
R15	3.6	42.9	46.5	1.1	7.9	9.0
R16	5.0	42.9	47.9	1.3	7.9	9.2
R17	3.4	42.9	46.3	1.2	7.9	9.1
R18	4.1	42.9	47.0	0.9	7.9	8.8
R19	3.9	42.9	46.8	1.4	7.9	9.3
R20	2.3	42.9	45.2	0.7	7.9	8.6
R21	3.6	42.9	46.5	1.0	7.9	8.9
R22	1.7	42.9	44.6	0.4	7.9	8.3
R23	2.4	42.9	45.3	0.6	7.9	8.5
R24	3.2	42.9	46.1	0.8	7.9	8.7
R25	2.0	42.9	44.9	0.6	7.9	8.5
R26	3.8	42.9	46.7	1.1	7.9	9.0
R27	2.5	42.9	45.4	0.5	7.9	8.4
R28	3.7	42.9	46.6	1.0	7.9	8.9
R29	3.3	42.9	46.2	0.4	7.9	8.3
R30	3.2	42.9	46.1	0.8	7.9	8.7
R31	2.7	42.9	45.6	1.1	7.9	9.0
R32	1.5	42.9	44.4	0.5	7.9	8.4
R33	2.7	42.9	45.6	0.6	7.9	8.5

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R34	2.2	42.9	45.1	0.9	7.9	8.8
R35	2.9	42.9	45.8	0.7	7.9	8.6
R36	2.2	42.9	45.1	0.9	7.9	8.8
R37	3.1	42.9	46.0	0.7	7.9	8.6
R38	1.3	42.9	44.2	0.3	7.9	8.2
R39	2.5	42.9	45.4	0.6	7.9	8.5
R40	2.3	42.9	45.2	0.6	7.9	8.5
R41	1.3	42.9	44.2	0.3	7.9	8.2
R42	1.7	42.9	44.6	0.6	7.9	8.5
R43	1.3	42.9	44.2	0.3	7.9	8.2
R44	1.4	42.9	44.3	0.4	7.9	8.3
R45	2.8	42.9	45.7	0.9	7.9	8.8
R46	2.4	42.9	45.3	0.7	7.9	8.6
R47	2.9	42.9	45.8	0.4	7.9	8.3
R48	2.7	42.9	45.6	0.7	7.9	8.6
R49	2.3	42.9	45.2	0.4	7.9	8.3
R50	1.7	42.9	44.6	0.3	7.9	8.2
R51	1.4	42.9	44.3	0.3	7.9	8.2
R52	2.0	42.9	44.9	0.3	7.9	8.2
R53	2.5	42.9	45.4	0.4	7.9	8.3
R54	2.2	42.9	45.1	0.4	7.9	8.3
R55	2.1	42.9	45.0	0.5	7.9	8.4
R56	1.8	42.9	44.7	0.6	7.9	8.5
R57	1.2	42.9	44.1	0.3	7.9	8.2
R58	2.1	42.9	45.0	0.5	7.9	8.4
R59	1.5	42.9	44.4	0.4	7.9	8.3
R60	1.7	42.9	44.6	0.4	7.9	8.3
R61	1.6	42.9	44.5	0.4	7.9	8.3
R62	1.7	42.9	44.6	0.7	7.9	8.6
R63	1.0	42.9	43.9	0.3	7.9	8.2
R64	1.3	42.9	44.2	0.3	7.9	8.2
R65	1.6	42.9	44.5	0.4	7.9	8.3
R66	2.1	42.9	45.0	0.3	7.9	8.2
R67	1.2	42.9	44.1	0.3	7.9	8.2
R68	1.2	42.9	44.1	0.2	7.9	8.1
R69	1.5	42.9	44.4	0.3	7.9	8.2
R70	1.2	42.9	44.1	0.3	7.9	8.2

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R71	1.3	42.9	44.2	0.4	7.9	8.3
R72	1.3	42.9	44.2	0.3	7.9	8.2
R73	1.1	42.9	44.0	0.3	7.9	8.2
R74	1.9	42.9	44.8	0.3	7.9	8.2
R75	1.8	42.9	44.7	0.4	7.9	8.3
R76	2.0	42.9	44.9	0.3	7.9	8.2
R77	1.3	42.9	44.2	0.3	7.9	8.2
R78	2.0	42.9	44.9	0.5	7.9	8.4
R79	1.1	42.9	44.0	0.3	7.9	8.2
R80	1.4	42.9	44.3	0.3	7.9	8.2
R81	1.3	42.9	44.2	0.2	7.9	8.1
R82	1.6	42.9	44.5	0.3	7.9	8.2
R83	0.8	42.9	43.7	0.2	7.9	8.1
R84	1.4	42.9	44.3	0.3	7.9	8.2
R85	1.3	42.9	44.2	0.2	7.9	8.1
R86	1.5	42.9	44.4	0.3	7.9	8.2
R87	1.2	42.9	44.1	0.3	7.9	8.2
R88	1.0	42.9	43.9	0.3	7.9	8.2
R89	1.2	42.9	44.1	0.3	7.9	8.2
R90	1.2	42.9	44.1	0.3	7.9	8.2
R91	1.7	42.9	44.6	0.6	7.9	8.5
R92	1.2	42.9	44.1	0.2	7.9	8.1
R93	1.2	42.9	44.1	0.3	7.9	8.2
R94	1.6	42.9	44.5	0.3	7.9	8.2
R95	1.2	42.9	44.1	0.3	7.9	8.2
R96	1.1	42.9	44.0	0.2	7.9	8.1
R97	1.1	42.9	44.0	0.4	7.9	8.3
R98	1.2	42.9	44.1	0.3	7.9	8.2
R99	1.1	42.9	44.0	0.2	7.9	8.1
R100	1.0	42.9	43.9	0.3	7.9	8.2
R101	1.0	42.9	43.9	0.2	7.9	8.1
R102	0.9	42.9	43.8	0.3	7.9	8.2
R103	0.7	42.9	43.6	0.1	7.9	8.0
R104	0.7	42.9	43.6	0.2	7.9	8.1
R105	1.0	42.9	43.9	0.3	7.9	8.2
R106	1.0	42.9	43.9	0.3	7.9	8.2
R107	1.0	42.9	43.9	0.2	7.9	8.1

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R108	0.8	42.9	43.7	0.2	7.9	8.1
R109	0.9	42.9	43.8	0.1	7.9	8.0
R110	0.9	42.9	43.8	0.1	7.9	8.0
R111	0.8	42.9	43.7	0.1	7.9	8.0
R112	0.9	42.9	43.8	0.1	7.9	8.0
R113	0.9	42.9	43.8	0.2	7.9	8.1
R114	0.9	42.9	43.8	0.2	7.9	8.1
R115	0.9	42.9	43.8	0.1	7.9	8.0
R116	0.8	42.9	43.7	0.1	7.9	8.0
R117	1.1	42.9	44.0	0.3	7.9	8.2
R118	0.8	42.9	43.7	0.1	7.9	8.0
R119	0.8	42.9	43.7	0.2	7.9	8.1
R120	0.9	42.9	43.8	0.2	7.9	8.1
R121	0.7	42.9	43.6	0.2	7.9	8.1
R122	0.9	42.9	43.8	0.2	7.9	8.1
R123	0.8	42.9	43.7	0.2	7.9	8.1
R124	0.8	42.9	43.7	0.2	7.9	8.1
R125	1.2	42.9	44.1	0.3	7.9	8.2
R126	1.4	42.9	44.3	0.3	7.9	8.2
R127	1.0	42.9	43.9	0.3	7.9	8.2
R128	0.8	42.9	43.7	0.2	7.9	8.1

Table F5 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations for all receptors – Scenario 1

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	0.0	32.8	1.0	1.3	4.8
R1	1.41E-07	9.52E-03	3.44E-03	2.40E-03	9.67E-04
R2	5.05E-08	3.40E-03	1.23E-03	8.56E-04	3.46E-04
R3	6.57E-08	4.42E-03	1.60E-03	1.11E-03	4.49E-04
R4	4.08E-08	2.75E-03	9.92E-04	6.91E-04	2.79E-04
R5	4.89E-08	3.29E-03	1.19E-03	8.28E-04	3.34E-04
R6	2.49E-08	1.68E-03	6.06E-04	4.22E-04	1.71E-04
R7	4.75E-08	3.20E-03	1.15E-03	8.05E-04	3.25E-04
R8	4.52E-08	3.05E-03	1.10E-03	7.67E-04	3.10E-04
R9	4.07E-08	2.74E-03	9.89E-04	6.90E-04	2.78E-04
R10	4.09E-08	2.75E-03	9.94E-04	6.93E-04	2.80E-04
R11	2.08E-08	1.40E-03	5.07E-04	3.53E-04	1.43E-04
R12	3.83E-08	2.58E-03	9.32E-04	6.50E-04	2.62E-04
R13	3.13E-08	2.11E-03	7.62E-04	5.31E-04	2.14E-04
R14	2.86E-08	1.93E-03	6.96E-04	4.85E-04	1.96E-04
R15	3.35E-08	2.26E-03	8.16E-04	5.69E-04	2.30E-04
R16	3.31E-08	2.23E-03	8.04E-04	5.61E-04	2.26E-04
R17	2.76E-08	1.86E-03	6.70E-04	4.67E-04	1.89E-04
R18	2.86E-08	1.93E-03	6.96E-04	4.85E-04	1.96E-04
R19	3.27E-08	2.20E-03	7.95E-04	5.54E-04	2.24E-04
R20	2.37E-08	1.59E-03	5.76E-04	4.01E-04	1.62E-04
R21	2.87E-08	1.93E-03	6.97E-04	4.86E-04	1.96E-04
R22	1.74E-08	1.17E-03	4.22E-04	2.94E-04	1.19E-04
R23	2.64E-08	1.78E-03	6.41E-04	4.47E-04	1.80E-04
R24	3.20E-08	2.16E-03	7.78E-04	5.42E-04	2.19E-04
R25	1.36E-08	9.15E-04	3.30E-04	2.30E-04	9.30E-05
R26	2.79E-08	1.88E-03	6.79E-04	4.73E-04	1.91E-04
R27	1.84E-08	1.24E-03	4.47E-04	3.12E-04	1.26E-04
R28	2.75E-08	1.86E-03	6.70E-04	4.67E-04	1.88E-04
R29	2.26E-08	1.52E-03	5.50E-04	3.83E-04	1.55E-04
R30	2.47E-08	1.66E-03	6.00E-04	4.18E-04	1.69E-04
R31	2.54E-08	1.71E-03	6.18E-04	4.31E-04	1.74E-04
R32	1.50E-08	1.01E-03	3.64E-04	2.54E-04	1.02E-04
R33	2.28E-08	1.54E-03	5.54E-04	3.86E-04	1.56E-04
R34	2.13E-08	1.43E-03	5.18E-04	3.61E-04	1.46E-04

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R35	2.60E-08	1.75E-03	6.32E-04	4.40E-04	1.78E-04
R36	2.17E-08	1.46E-03	5.28E-04	3.68E-04	1.49E-04
R37	2.50E-08	1.69E-03	6.09E-04	4.24E-04	1.71E-04
R38	1.18E-08	7.97E-04	2.88E-04	2.00E-04	8.09E-05
R39	2.34E-08	1.57E-03	5.68E-04	3.96E-04	1.60E-04
R40	2.09E-08	1.41E-03	5.09E-04	3.55E-04	1.43E-04
R41	1.11E-08	7.45E-04	2.69E-04	1.87E-04	7.56E-05
R42	1.82E-08	1.23E-03	4.42E-04	3.08E-04	1.24E-04
R43	1.18E-08	7.93E-04	2.86E-04	1.99E-04	8.05E-05
R44	1.10E-08	7.43E-04	2.68E-04	1.87E-04	7.55E-05
R45	2.25E-08	1.52E-03	5.48E-04	3.82E-04	1.54E-04
R46	2.13E-08	1.43E-03	5.17E-04	3.60E-04	1.45E-04
R47	1.90E-08	1.28E-03	4.61E-04	3.21E-04	1.30E-04
R48	1.97E-08	1.33E-03	4.80E-04	3.35E-04	1.35E-04
R49	2.04E-08	1.37E-03	4.95E-04	3.45E-04	1.39E-04
R50	1.70E-08	1.14E-03	4.13E-04	2.88E-04	1.16E-04
R51	1.25E-08	8.39E-04	3.03E-04	2.11E-04	8.52E-05
R52	1.95E-08	1.31E-03	4.74E-04	3.30E-04	1.33E-04
R53	1.87E-08	1.26E-03	4.54E-04	3.16E-04	1.28E-04
R54	1.93E-08	1.30E-03	4.68E-04	3.27E-04	1.32E-04
R55	2.05E-08	1.38E-03	4.99E-04	3.48E-04	1.40E-04
R56	2.01E-08	1.35E-03	4.88E-04	3.40E-04	1.37E-04
R57	1.18E-08	7.93E-04	2.86E-04	2.00E-04	8.06E-05
R58	1.83E-08	1.23E-03	4.46E-04	3.11E-04	1.25E-04
R59	1.53E-08	1.03E-03	3.72E-04	2.59E-04	1.05E-04
R60	1.17E-08	7.85E-04	2.83E-04	1.98E-04	7.97E-05
R61	1.19E-08	7.99E-04	2.88E-04	2.01E-04	8.11E-05
R62	1.81E-08	1.22E-03	4.39E-04	3.06E-04	1.24E-04
R63	9.87E-09	6.65E-04	2.40E-04	1.67E-04	6.75E-05
R64	1.43E-08	9.61E-04	3.47E-04	2.42E-04	9.76E-05
R65	1.62E-08	1.09E-03	3.93E-04	2.74E-04	1.11E-04
R66	1.71E-08	1.15E-03	4.15E-04	2.89E-04	1.17E-04
R67	1.13E-08	7.61E-04	2.75E-04	1.91E-04	7.73E-05
R68	1.14E-08	7.70E-04	2.78E-04	1.94E-04	7.82E-05
R69	1.49E-08	1.00E-03	3.62E-04	2.53E-04	1.02E-04
R70	1.30E-08	8.79E-04	3.17E-04	2.21E-04	8.92E-05
R71	1.33E-08	8.96E-04	3.24E-04	2.26E-04	9.10E-05
R72	1.30E-08	8.76E-04	3.16E-04	2.20E-04	8.90E-05

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R73	1.02E-08	6.86E-04	2.48E-04	1.73E-04	6.97E-05
R74	1.64E-08	1.10E-03	3.98E-04	2.77E-04	1.12E-04
R75	1.60E-08	1.08E-03	3.90E-04	2.72E-04	1.10E-04
R76	1.41E-08	9.47E-04	3.42E-04	2.38E-04	9.62E-05
R77	1.13E-08	7.63E-04	2.75E-04	1.92E-04	7.74E-05
R78	1.65E-08	1.11E-03	4.01E-04	2.80E-04	1.13E-04
R79	1.18E-08	7.96E-04	2.87E-04	2.00E-04	8.09E-05
R80	1.25E-08	8.40E-04	3.03E-04	2.11E-04	8.53E-05
R81	1.30E-08	8.73E-04	3.15E-04	2.20E-04	8.87E-05
R82	1.53E-08	1.03E-03	3.73E-04	2.60E-04	1.05E-04
R83	8.76E-09	5.90E-04	2.13E-04	1.49E-04	6.00E-05
R84	1.07E-08	7.22E-04	2.61E-04	1.82E-04	7.34E-05
R85	1.15E-08	7.77E-04	2.80E-04	1.95E-04	7.89E-05
R86	1.30E-08	8.76E-04	3.16E-04	2.20E-04	8.90E-05
R87	1.15E-08	7.72E-04	2.79E-04	1.94E-04	7.84E-05
R88	1.10E-08	7.39E-04	2.67E-04	1.86E-04	7.50E-05
R89	1.05E-08	7.09E-04	2.56E-04	1.78E-04	7.20E-05
R90	1.17E-08	7.89E-04	2.85E-04	1.99E-04	8.02E-05
R91	1.52E-08	1.02E-03	3.69E-04	2.57E-04	1.04E-04
R92	1.12E-08	7.52E-04	2.71E-04	1.89E-04	7.63E-05
R93	1.11E-08	7.45E-04	2.69E-04	1.88E-04	7.57E-05
R94	1.55E-08	1.04E-03	3.76E-04	2.62E-04	1.06E-04
R95	1.10E-08	7.42E-04	2.68E-04	1.87E-04	7.54E-05
R96	1.06E-08	7.11E-04	2.57E-04	1.79E-04	7.23E-05
R97	1.05E-08	7.07E-04	2.55E-04	1.78E-04	7.18E-05
R98	9.84E-09	6.63E-04	2.39E-04	1.67E-04	6.74E-05
R99	9.80E-09	6.60E-04	2.38E-04	1.66E-04	6.71E-05
R100	1.01E-08	6.81E-04	2.46E-04	1.71E-04	6.92E-05
R101	8.81E-09	5.94E-04	2.14E-04	1.49E-04	6.03E-05
R102	8.17E-09	5.50E-04	1.99E-04	1.38E-04	5.59E-05
R103	6.29E-09	4.23E-04	1.53E-04	1.07E-04	4.30E-05
R104	6.85E-09	4.61E-04	1.67E-04	1.16E-04	4.69E-05
R105	8.21E-09	5.53E-04	2.00E-04	1.39E-04	5.62E-05
R106	8.00E-09	5.39E-04	1.95E-04	1.36E-04	5.47E-05
R107	7.93E-09	5.34E-04	1.93E-04	1.34E-04	5.43E-05
R108	9.16E-09	6.17E-04	2.23E-04	1.55E-04	6.27E-05
R109	8.56E-09	5.77E-04	2.08E-04	1.45E-04	5.86E-05
R110	8.52E-09	5.74E-04	2.07E-04	1.44E-04	5.83E-05

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R111	7.17E-09	4.83E-04	1.74E-04	1.22E-04	4.91E-05
R112	8.33E-09	5.61E-04	2.03E-04	1.41E-04	5.70E-05
R113	7.70E-09	5.19E-04	1.87E-04	1.30E-04	5.27E-05
R114	7.62E-09	5.13E-04	1.85E-04	1.29E-04	5.21E-05
R115	8.52E-09	5.74E-04	2.07E-04	1.44E-04	5.83E-05
R116	8.09E-09	5.45E-04	1.97E-04	1.37E-04	5.53E-05
R117	9.61E-09	6.47E-04	2.34E-04	1.63E-04	6.57E-05
R118	7.56E-09	5.09E-04	1.84E-04	1.28E-04	5.17E-05
R119	8.64E-09	5.82E-04	2.10E-04	1.46E-04	5.91E-05
R120	8.45E-09	5.70E-04	2.06E-04	1.43E-04	5.78E-05
R121	7.58E-09	5.11E-04	1.84E-04	1.29E-04	5.19E-05
R122	7.45E-09	5.02E-04	1.81E-04	1.26E-04	5.10E-05
R123	7.72E-09	5.20E-04	1.88E-04	1.31E-04	5.28E-05
R124	7.03E-09	4.74E-04	1.71E-04	1.19E-04	4.81E-05
R125	1.17E-08	7.87E-04	2.84E-04	1.98E-04	8.00E-05
R126	1.32E-08	8.92E-04	3.22E-04	2.24E-04	9.05E-05
R127	1.04E-08	7.02E-04	2.53E-04	1.77E-04	7.13E-05
R128	7.78E-09	5.24E-04	1.89E-04	1.32E-04	5.32E-05

AQIA Results – All Receptors – Scenario 2

Table F6 Maximum 24-Hour PM10 and PM2.5 concentrations for all receptors – Scenario 2

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
Criterion	50	25
Max. % of criterion	5.6	11.2
R1	2.8	2.8
R2	0.9	0.9
R3	1.2	1.2
R4	0.8	0.8
R5	1.0	1.0
R6	1.0	1.0
R7	0.7	0.7
R8	0.7	0.7
R9	0.5	0.5
R10	0.7	0.7
R11	0.5	0.5
R12	0.4	0.4
R13	0.5	0.5
R14	0.4	0.4
R15	0.4	0.4
R16	0.3	0.3
R17	0.4	0.4
R18	0.4	0.4
R19	0.3	0.3
R20	0.3	0.3
R21	0.3	0.3
R22	0.2	0.2
R23	0.3	0.3
R24	0.2	0.2
R25	0.2	0.2
R26	0.3	0.3
R27	0.3	0.3
R28	0.3	0.3
R29	0.2	0.2
R30	0.2	0.2
R31	0.2	0.2
R32	0.3	0.3
R33	0.2	0.2
R34	0.2	0.2
R35	0.2	0.2

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R36	0.2	0.2
R37	0.2	0.2
R38	<0.1	<0.1
R39	0.3	0.3
R40	0.2	0.2
R41	0.1	0.1
R42	0.2	0.2
R43	<0.1	<0.1
R44	0.1	0.1
R45	0.2	0.2
R46	0.2	0.2
R47	0.2	0.2
R48	0.2	0.2
R49	0.1	0.1
R50	0.2	0.2
R51	0.1	0.1
R52	0.1	0.1
R53	<0.1	<0.1
R54	0.1	0.1
R55	0.2	0.2
R56	0.2	0.2
R57	0.1	0.1
R58	0.1	0.1
R59	0.1	0.1
R60	<0.1	<0.1
R61	0.2	0.2
R62	0.2	0.2
R63	<0.1	<0.1
R64	0.1	0.1
R65	0.1	0.1
R66	0.1	0.1
R67	<0.1	<0.1
R68	<0.1	<0.1
R69	0.1	0.1
R70	0.1	0.1
R71	<0.1	<0.1
R72	<0.1	<0.1
R73	<0.1	<0.1
R74	0.1	0.1
R75	<0.1	<0.1

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R76	0.1	0.1
R77	<0.1	<0.1
R78	0.2	0.2
R79	0.1	0.1
R80	0.1	0.1
R81	0.1	0.1
R82	<0.1	<0.1
R83	<0.1	<0.1
R84	<0.1	<0.1
R85	<0.1	<0.1
R86	<0.1	<0.1
R87	0.1	0.1
R88	<0.1	<0.1
R89	<0.1	<0.1
R90	0.1	0.1
R91	0.2	0.2
R92	<0.1	<0.1
R93	<0.1	<0.1
R94	<0.1	<0.1
R95	<0.1	<0.1
R96	<0.1	<0.1
R97	<0.1	<0.1
R98	<0.1	<0.1
R99	<0.1	<0.1
R100	<0.1	<0.1
R101	<0.1	<0.1
R102	<0.1	<0.1
R103	<0.1	<0.1
R104	<0.1	<0.1
R105	<0.1	<0.1
R106	<0.1	<0.1
R107	<0.1	<0.1
R108	<0.1	<0.1
R109	<0.1	<0.1
R110	<0.1	<0.1
R111	<0.1	<0.1
R112	<0.1	<0.1
R113	<0.1	<0.1
R114	<0.1	<0.1
R115	<0.1	<0.1

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
R116	<0.1	<0.1
R117	<0.1	<0.1
R118	<0.1	<0.1
R119	<0.1	<0.1
R120	<0.1	<0.1
R121	<0.1	<0.1
R122	<0.1	<0.1
R123	<0.1	<0.1
R124	<0.1	<0.1
R125	<0.1	<0.1
R126	<0.1	<0.1
R127	<0.1	<0.1
R128	<0.1	<0.1

Table F7 Predicted 1-hour and annual average NO₂ concentrations for all receptors – Scenario 2

Receptor	NO ₂ Concentration (µg·m ⁻³)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
Criterion	164			31		
Max % of crit.	38.9	18.8	40.2	2.0	26.1	28.1
R1	43.7	6.2	49.9	0.6	8.1	8.7
R2	18.3	12.3	30.6	0.6	8.1	8.7
R3	20.4	8.2	28.6	0.5	8.1	8.6
R4	16.3	<0.1	16.3	0.5	8.1	8.6
R5	17.6	14.4	31.9	0.5	8.1	8.6
R6	17.8	10.3	28.0	0.3	8.1	8.4
R7	22.7	8.1	30.9	0.5	8.1	8.6
R8	44.2	12.3	56.5	0.5	8.1	8.6
R9	22.6	12.3	34.9	0.4	8.1	8.5
R10	29.1	12.3	41.4	0.4	8.1	8.5
R11	15.2	6.2	21.3	0.3	8.1	8.4
R12	36.5	2.1	38.5	0.2	8.1	8.3
R13	23.5	14.4	37.9	0.3	8.1	8.4
R14	27.7	2.1	29.7	0.5	8.1	8.6
R15	28.8	16.4	45.2	0.2	8.1	8.3
R16	32.0	8.2	40.2	0.2	8.1	8.3
R17	23.2	6.2	29.3	0.4	8.1	8.5
R18	28.2	4.1	32.3	0.2	8.1	8.3
R19	29.4	12.3	41.7	0.3	8.1	8.4
R20	25.9	4.1	30.0	0.3	8.1	8.4
R21	29.9	16.4	46.3	0.1	8.1	8.2
R22	21.8	22.6	44.4	0.2	8.1	8.3
R23	22.5	2.1	24.6	0.3	8.1	8.4
R24	32.9	<0.1	32.9	0.3	8.1	8.4
R25	11.2	6.2	17.3	0.2	8.1	8.3
R26	37.8	8.2	46.0	0.2	8.1	8.3
R27	21.2	10.3	31.5	0.3	8.1	8.4
R28	35.6	16.4	52.0	0.1	8.1	8.2
R29	51.6	2.1	53.6	0.2	8.1	8.3
R30	26.7	16.4	43.1	0.1	8.1	8.2

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R31	30.8	2.1	32.8	0.3	8.1	8.4
R32	19.6	10.3	29.8	0.2	8.1	8.3
R33	34.5	8.2	42.7	0.1	8.1	8.2
R34	23.7	<0.1	23.8	0.3	8.1	8.4
R35	38.7	6.2	44.9	0.2	8.1	8.3
R36	21.7	6.2	27.8	0.2	8.1	8.3
R37	23.5	2.1	25.6	0.1	8.1	8.2
R38	18.0	<0.1	18.0	0.1	8.1	8.2
R39	32.9	30.8	63.6	<0.1	8.1	<8.2
R40	41.8	8.2	50.0	0.1	8.1	8.2
R41	18.6	22.6	41.2	0.1	8.1	8.2
R42	22.8	4.1	26.9	0.2	8.1	8.3
R43	21.1	<0.1	21.1	0.1	8.1	8.2
R44	15.3	14.4	29.7	0.1	8.1	8.2
R45	27.4	8.2	35.6	0.2	8.1	8.3
R46	37.9	16.4	54.3	<0.1	8.1	<8.2
R47	63.8	2.1	65.9	0.1	8.1	8.2
R48	26.3	10.3	36.5	0.2	8.1	8.3
R49	32.4	2.1	34.4	0.2	8.1	8.3
R50	27.3	2.1	29.3	0.2	8.1	8.3
R51	21.8	22.6	44.4	0.1	8.1	8.2
R52	32.8	2.1	34.8	0.2	8.1	8.3
R53	21.4	<0.1	21.5	0.2	8.1	8.3
R54	24.5	<0.1	24.6	0.2	8.1	8.3
R55	27.8	30.8	58.5	<0.1	8.1	<8.2
R56	34.0	8.2	42.2	0.2	8.1	8.3
R57	19.6	22.6	42.2	0.1	8.1	8.2
R58	19.7	6.2	25.8	<0.1	8.1	<8.2
R59	22.3	18.5	40.7	0.2	8.1	8.3
R60	13.7	6.2	19.9	0.1	8.1	8.2
R61	20.3	10.3	30.5	0.2	8.1	8.3
R62	24.0	<0.1	24.0	0.2	8.1	8.3
R63	15.8	6.2	21.9	<0.1	8.1	<8.2
R64	22.3	2.1	24.4	0.2	8.1	8.3

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R65	37.1	6.2	43.3	0.1	8.1	8.2
R66	30.7	<0.1	30.7	0.2	8.1	8.3
R67	16.4	14.4	30.7	<0.1	8.1	<8.2
R68	25.1	<0.1	25.2	0.1	8.1	8.2
R69	26.2	2.1	28.3	0.2	8.1	8.3
R70	37.8	4.1	41.9	0.2	8.1	8.3
R71	21.6	18.5	40.1	0.2	8.1	8.3
R72	19.7	18.5	38.1	0.2	8.1	8.3
R73	19.5	14.4	33.9	<0.1	8.1	<8.2
R74	31.7	<0.1	31.8	0.2	8.1	8.3
R75	18.0	2.1	20.0	<0.1	8.1	<8.2
R76	56.5	2.1	58.5	0.1	8.1	8.2
R77	19.5	4.1	23.6	0.1	8.1	8.2
R78	27.8	2.1	29.9	0.2	8.1	8.3
R79	30.6	4.1	34.7	0.2	8.1	8.3
R80	34.0	4.1	38.1	0.2	8.1	8.3
R81	26.5	2.1	28.6	0.1	8.1	8.2
R82	27.7	<0.1	27.8	0.1	8.1	8.2
R83	19.1	14.4	33.5	<0.1	8.1	<8.2
R84	21.0	6.2	27.2	0.1	8.1	8.2
R85	18.9	2.1	21.0	0.1	8.1	8.2
R86	21.5	<0.1	21.5	0.1	8.1	8.2
R87	36.3	4.1	40.4	0.2	8.1	8.3
R88	23.4	4.1	27.5	0.1	8.1	8.2
R89	21.5	6.2	27.6	0.1	8.1	8.2
R90	31.4	22.6	54.0	<0.1	8.1	<8.2
R91	29.8	2.1	31.9	0.2	8.1	8.3
R92	24.6	22.6	47.2	<0.1	8.1	<8.2
R93	21.1	18.5	39.6	0.1	8.1	8.2
R94	26.8	<0.1	26.8	0.1	8.1	8.2
R95	16.7	6.2	22.9	0.1	8.1	8.2
R96	17.7	18.5	36.1	0.1	8.1	8.2
R97	19.0	8.2	27.2	0.1	8.1	8.2
R98	23.4	6.2	29.6	0.1	8.1	8.2

Receptor	NO2 Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R99	23.8	22.6	46.4	<0.1	8.1	<8.2
R100	27.7	4.1	31.8	0.1	8.1	8.2
R101	22.6	4.1	26.7	0.1	8.1	8.2
R102	17.9	6.2	24.0	0.1	8.1	8.2
R103	11.1	10.3	21.3	<0.1	8.1	<8.2
R104	18.4	4.1	22.5	<0.1	8.1	<8.2
R105	20.8	6.2	27.0	0.1	8.1	8.2
R106	20.7	6.2	26.8	<0.1	8.1	<8.2
R107	20.9	6.2	27.0	<0.1	8.1	<8.2
R108	27.6	4.1	31.7	0.1	8.1	8.2
R109	22.0	2.1	24.0	0.1	8.1	8.2
R110	26.4	2.1	28.4	0.1	8.1	8.2
R111	17.5	4.1	21.6	<0.1	8.1	<8.2
R112	25.5	2.1	27.5	0.1	8.1	8.2
R113	20.9	6.2	27.1	<0.1	8.1	<8.2
R114	17.5	6.2	23.7	<0.1	8.1	<8.2
R115	27.3	2.1	29.4	0.1	8.1	8.2
R116	23.3	2.1	25.4	0.1	8.1	8.2
R117	21.3	18.5	39.8	0.1	8.1	8.2
R118	19.6	2.1	21.6	<0.1	8.1	<8.2
R119	22.3	28.7	51.0	0.1	8.1	8.2
R120	22.3	6.2	28.5	0.1	8.1	8.2
R121	22.6	22.6	45.2	0.1	8.1	8.2
R122	22.3	4.1	26.4	<0.1	8.1	<8.2
R123	22.2	6.2	28.4	<0.1	8.1	<8.2
R124	20.2	4.1	24.3	<0.1	8.1	<8.2
R125	23.4	22.6	45.9	0.1	8.1	8.2
R126	19.1	2.1	21.1	0.2	8.1	8.3
R127	22.6	4.1	26.7	<0.1	8.1	<8.2
R128	19.5	4.1	23.6	<0.1	8.1	<8.2

Table F8 Predicted 15-minute, 1-hour and 8-hour average CO concentrations for all receptors – Scenario 2

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	100			30			10		
Max. % of criterion	0.3	2.1	2.4	0.8	5.3	6.1	1.1	13.0	14.1
R1	0.3	2.1	2.4	0.2	1.6	1.8	0.1	1.3	1.4
R2	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R3	0.2	2.1	2.3	0.2	1.6	1.8	<0.1	1.3	1.4
R4	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R5	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R6	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R7	0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R8	0.1	2.1	2.2	0.1	1.6	1.7	<0.1	1.3	1.4
R9	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R10	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R11	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R12	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R13	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R14	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R15	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R16	0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R17	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R18	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R19	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R20	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R21	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R22	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R23	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R24	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R25	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R26	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R27	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R28	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R29	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R30	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R31	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R32	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R33	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R34	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R35	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R36	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R37	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R38	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R39	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R40	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R41	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R42	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R43	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R44	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R45	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R46	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R47	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R48	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R49	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R50	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R51	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R52	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R53	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R54	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R55	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R56	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R57	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R58	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R59	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R60	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R61	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R62	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R63	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R64	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R65	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R66	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R67	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R68	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R69	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R70	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R71	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R72	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R73	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R74	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R75	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R76	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R77	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R78	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R79	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R80	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R81	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R82	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R83	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R84	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R85	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R86	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R87	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R88	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R89	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R90	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R91	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R92	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R93	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R94	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R95	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R96	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R97	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R98	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R99	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R100	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R101	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R102	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R103	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R104	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R105	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R106	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R107	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R108	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R109	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R110	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R111	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Rec.	Carbon monoxide (CO) concentration (mg·m ⁻³)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R112	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R113	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R114	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R115	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R116	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R117	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R118	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R119	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R120	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R121	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R122	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R123	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R124	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R125	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R126	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R127	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4
R128	<0.1	2.1	2.2	<0.1	1.6	1.7	<0.1	1.3	1.4

Table F9 Predicted 1-hour and 24-hour SO₂ concentrations for all receptors – Scenario 2

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	215			57		
Max. % of criterion	0.1	20.0	20.1	0.0	13.9	13.9
R1	0.3	42.9	43.2	<0.1	7.9	8.0
R2	<0.1	42.9	43.0	<0.1	7.9	8.0
R3	0.2	42.9	43.1	<0.1	7.9	8.0
R4	<0.1	42.9	43.0	<0.1	7.9	8.0
R5	<0.1	42.9	43.0	<0.1	7.9	8.0
R6	<0.1	42.9	43.0	<0.1	7.9	8.0
R7	0.1	42.9	43.0	<0.1	7.9	8.0
R8	0.2	42.9	43.1	<0.1	7.9	8.0
R9	<0.1	42.9	43.0	<0.1	7.9	8.0
R10	<0.1	42.9	43.0	<0.1	7.9	8.0
R11	<0.1	42.9	43.0	<0.1	7.9	8.0
R12	<0.1	42.9	43.0	<0.1	7.9	8.0
R13	<0.1	42.9	43.0	<0.1	7.9	8.0
R14	<0.1	42.9	43.0	<0.1	7.9	8.0
R15	<0.1	42.9	43.0	<0.1	7.9	8.0
R16	0.1	42.9	43.0	<0.1	7.9	8.0
R17	<0.1	42.9	43.0	<0.1	7.9	8.0
R18	<0.1	42.9	43.0	<0.1	7.9	8.0
R19	<0.1	42.9	43.0	<0.1	7.9	8.0
R20	<0.1	42.9	43.0	<0.1	7.9	8.0
R21	<0.1	42.9	43.0	<0.1	7.9	8.0
R22	<0.1	42.9	43.0	<0.1	7.9	8.0
R23	<0.1	42.9	43.0	<0.1	7.9	8.0
R24	<0.1	42.9	43.0	<0.1	7.9	8.0
R25	<0.1	42.9	43.0	<0.1	7.9	8.0
R26	<0.1	42.9	43.0	<0.1	7.9	8.0
R27	<0.1	42.9	43.0	<0.1	7.9	8.0
R28	<0.1	42.9	43.0	<0.1	7.9	8.0
R29	<0.1	42.9	43.0	<0.1	7.9	8.0
R30	<0.1	42.9	43.0	<0.1	7.9	8.0
R31	<0.1	42.9	43.0	<0.1	7.9	8.0
R32	<0.1	42.9	43.0	<0.1	7.9	8.0
R33	<0.1	42.9	43.0	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R34	<0.1	42.9	43.0	<0.1	7.9	8.0
R35	<0.1	42.9	43.0	<0.1	7.9	8.0
R36	<0.1	42.9	43.0	<0.1	7.9	8.0
R37	<0.1	42.9	43.0	<0.1	7.9	8.0
R38	<0.1	42.9	43.0	<0.1	7.9	8.0
R39	<0.1	42.9	43.0	<0.1	7.9	8.0
R40	<0.1	42.9	43.0	<0.1	7.9	8.0
R41	<0.1	42.9	43.0	<0.1	7.9	8.0
R42	<0.1	42.9	43.0	<0.1	7.9	8.0
R43	<0.1	42.9	43.0	<0.1	7.9	8.0
R44	<0.1	42.9	43.0	<0.1	7.9	8.0
R45	<0.1	42.9	43.0	<0.1	7.9	8.0
R46	<0.1	42.9	43.0	<0.1	7.9	8.0
R47	<0.1	42.9	43.0	<0.1	7.9	8.0
R48	<0.1	42.9	43.0	<0.1	7.9	8.0
R49	<0.1	42.9	43.0	<0.1	7.9	8.0
R50	<0.1	42.9	43.0	<0.1	7.9	8.0
R51	<0.1	42.9	43.0	<0.1	7.9	8.0
R52	<0.1	42.9	43.0	<0.1	7.9	8.0
R53	<0.1	42.9	43.0	<0.1	7.9	8.0
R54	<0.1	42.9	43.0	<0.1	7.9	8.0
R55	<0.1	42.9	43.0	<0.1	7.9	8.0
R56	<0.1	42.9	43.0	<0.1	7.9	8.0
R57	<0.1	42.9	43.0	<0.1	7.9	8.0
R58	<0.1	42.9	43.0	<0.1	7.9	8.0
R59	<0.1	42.9	43.0	<0.1	7.9	8.0
R60	<0.1	42.9	43.0	<0.1	7.9	8.0
R61	<0.1	42.9	43.0	<0.1	7.9	8.0
R62	<0.1	42.9	43.0	<0.1	7.9	8.0
R63	<0.1	42.9	43.0	<0.1	7.9	8.0
R64	<0.1	42.9	43.0	<0.1	7.9	8.0
R65	<0.1	42.9	43.0	<0.1	7.9	8.0
R66	<0.1	42.9	43.0	<0.1	7.9	8.0
R67	<0.1	42.9	43.0	<0.1	7.9	8.0
R68	<0.1	42.9	43.0	<0.1	7.9	8.0
R69	<0.1	42.9	43.0	<0.1	7.9	8.0
R70	<0.1	42.9	43.0	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R71	<0.1	42.9	43.0	<0.1	7.9	8.0
R72	<0.1	42.9	43.0	<0.1	7.9	8.0
R73	<0.1	42.9	43.0	<0.1	7.9	8.0
R74	<0.1	42.9	43.0	<0.1	7.9	8.0
R75	<0.1	42.9	43.0	<0.1	7.9	8.0
R76	<0.1	42.9	43.0	<0.1	7.9	8.0
R77	<0.1	42.9	43.0	<0.1	7.9	8.0
R78	<0.1	42.9	43.0	<0.1	7.9	8.0
R79	<0.1	42.9	43.0	<0.1	7.9	8.0
R80	<0.1	42.9	43.0	<0.1	7.9	8.0
R81	<0.1	42.9	43.0	<0.1	7.9	8.0
R82	<0.1	42.9	43.0	<0.1	7.9	8.0
R83	<0.1	42.9	43.0	<0.1	7.9	8.0
R84	<0.1	42.9	43.0	<0.1	7.9	8.0
R85	<0.1	42.9	43.0	<0.1	7.9	8.0
R86	<0.1	42.9	43.0	<0.1	7.9	8.0
R87	<0.1	42.9	43.0	<0.1	7.9	8.0
R88	<0.1	42.9	43.0	<0.1	7.9	8.0
R89	<0.1	42.9	43.0	<0.1	7.9	8.0
R90	<0.1	42.9	43.0	<0.1	7.9	8.0
R91	<0.1	42.9	43.0	<0.1	7.9	8.0
R92	<0.1	42.9	43.0	<0.1	7.9	8.0
R93	<0.1	42.9	43.0	<0.1	7.9	8.0
R94	<0.1	42.9	43.0	<0.1	7.9	8.0
R95	<0.1	42.9	43.0	<0.1	7.9	8.0
R96	<0.1	42.9	43.0	<0.1	7.9	8.0
R97	<0.1	42.9	43.0	<0.1	7.9	8.0
R98	<0.1	42.9	43.0	<0.1	7.9	8.0
R99	<0.1	42.9	43.0	<0.1	7.9	8.0
R100	<0.1	42.9	43.0	<0.1	7.9	8.0
R101	<0.1	42.9	43.0	<0.1	7.9	8.0
R102	<0.1	42.9	43.0	<0.1	7.9	8.0
R103	<0.1	42.9	43.0	<0.1	7.9	8.0
R104	<0.1	42.9	43.0	<0.1	7.9	8.0
R105	<0.1	42.9	43.0	<0.1	7.9	8.0
R106	<0.1	42.9	43.0	<0.1	7.9	8.0
R107	<0.1	42.9	43.0	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO ₂) concentration (µg·m ⁻³)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R108	<0.1	42.9	43.0	<0.1	7.9	8.0
R109	<0.1	42.9	43.0	<0.1	7.9	8.0
R110	<0.1	42.9	43.0	<0.1	7.9	8.0
R111	<0.1	42.9	43.0	<0.1	7.9	8.0
R112	<0.1	42.9	43.0	<0.1	7.9	8.0
R113	<0.1	42.9	43.0	<0.1	7.9	8.0
R114	<0.1	42.9	43.0	<0.1	7.9	8.0
R115	<0.1	42.9	43.0	<0.1	7.9	8.0
R116	<0.1	42.9	43.0	<0.1	7.9	8.0
R117	<0.1	42.9	43.0	<0.1	7.9	8.0
R118	<0.1	42.9	43.0	<0.1	7.9	8.0
R119	<0.1	42.9	43.0	<0.1	7.9	8.0
R120	<0.1	42.9	43.0	<0.1	7.9	8.0
R121	<0.1	42.9	43.0	<0.1	7.9	8.0
R122	<0.1	42.9	43.0	<0.1	7.9	8.0
R123	<0.1	42.9	43.0	<0.1	7.9	8.0
R124	<0.1	42.9	43.0	<0.1	7.9	8.0
R125	<0.1	42.9	43.0	<0.1	7.9	8.0
R126	<0.1	42.9	43.0	<0.1	7.9	8.0
R127	<0.1	42.9	43.0	<0.1	7.9	8.0
R128	<0.1	42.9	43.0	<0.1	7.9	8.0

Table F10 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations for all receptors – Scenario 2

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	0.0	0.7	0.0	0.0	0.1
R1	2.83E-09	1.90E-04	6.87E-05	4.79E-05	1.93E-05
R2	7.14E-10	4.81E-05	1.74E-05	1.21E-05	4.88E-06
R3	1.16E-09	7.81E-05	2.82E-05	1.97E-05	7.94E-06
R4	5.95E-10	4.01E-05	1.45E-05	1.01E-05	4.07E-06
R5	6.50E-10	4.38E-05	1.58E-05	1.10E-05	4.45E-06
R6	5.65E-10	3.81E-05	1.37E-05	9.58E-06	3.87E-06
R7	8.44E-10	5.68E-05	2.05E-05	1.43E-05	5.77E-06
R8	8.16E-10	5.50E-05	1.98E-05	1.38E-05	5.58E-06
R9	5.45E-10	3.67E-05	1.32E-05	9.23E-06	3.73E-06
R10	7.59E-10	5.11E-05	1.85E-05	1.29E-05	5.19E-06
R11	3.68E-10	2.48E-05	8.95E-06	6.24E-06	2.52E-06
R12	6.59E-10	4.44E-05	1.60E-05	1.12E-05	4.51E-06
R13	3.49E-10	2.35E-05	8.49E-06	5.92E-06	2.39E-06
R14	5.12E-10	3.45E-05	1.25E-05	8.68E-06	3.50E-06
R15	5.91E-10	3.98E-05	1.44E-05	1.00E-05	4.04E-06
R16	5.58E-10	3.76E-05	1.36E-05	9.46E-06	3.82E-06
R17	3.36E-10	2.26E-05	8.17E-06	5.69E-06	2.30E-06
R18	5.49E-10	3.70E-05	1.33E-05	9.30E-06	3.75E-06
R19	5.10E-10	3.44E-05	1.24E-05	8.64E-06	3.49E-06
R20	3.33E-10	2.24E-05	8.09E-06	5.64E-06	2.28E-06
R21	4.96E-10	3.34E-05	1.21E-05	8.40E-06	3.39E-06
R22	1.73E-10	1.16E-05	4.20E-06	2.93E-06	1.18E-06
R23	2.36E-10	1.59E-05	5.74E-06	4.00E-06	1.62E-06
R24	2.84E-10	1.92E-05	6.92E-06	4.82E-06	1.95E-06
R25	1.74E-10	1.17E-05	4.23E-06	2.95E-06	1.19E-06
R26	5.08E-10	3.42E-05	1.24E-05	8.62E-06	3.48E-06
R27	2.54E-10	1.71E-05	6.18E-06	4.31E-06	1.74E-06
R28	4.05E-10	2.73E-05	9.85E-06	6.86E-06	2.77E-06
R29	3.82E-10	2.57E-05	9.29E-06	6.47E-06	2.61E-06
R30	3.73E-10	2.51E-05	9.07E-06	6.32E-06	2.55E-06
R31	3.69E-10	2.49E-05	8.98E-06	6.26E-06	2.53E-06
R32	2.10E-10	1.41E-05	5.11E-06	3.56E-06	1.44E-06
R33	3.37E-10	2.27E-05	8.19E-06	5.71E-06	2.31E-06

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R34	2.45E-10	1.65E-05	5.97E-06	4.16E-06	1.68E-06
R35	2.66E-10	1.79E-05	6.47E-06	4.51E-06	1.82E-06
R36	2.87E-10	1.94E-05	6.99E-06	4.87E-06	1.97E-06
R37	2.72E-10	1.83E-05	6.61E-06	4.61E-06	1.86E-06
R38	1.01E-10	6.79E-06	2.45E-06	1.71E-06	6.90E-07
R39	2.36E-10	1.59E-05	5.73E-06	3.99E-06	1.61E-06
R40	3.06E-10	2.06E-05	7.44E-06	5.19E-06	2.09E-06
R41	7.77E-11	5.24E-06	1.89E-06	1.32E-06	5.32E-07
R42	1.80E-10	1.22E-05	4.39E-06	3.06E-06	1.23E-06
R43	8.72E-11	5.87E-06	2.12E-06	1.48E-06	5.97E-07
R44	7.11E-11	4.79E-06	1.73E-06	1.20E-06	4.86E-07
R45	3.01E-10	2.03E-05	7.31E-06	5.09E-06	2.06E-06
R46	2.30E-10	1.55E-05	5.58E-06	3.89E-06	1.57E-06
R47	2.50E-10	1.68E-05	6.07E-06	4.23E-06	1.71E-06
R48	2.97E-10	2.00E-05	7.23E-06	5.04E-06	2.03E-06
R49	1.48E-10	9.97E-06	3.60E-06	2.51E-06	1.01E-06
R50	1.26E-10	8.47E-06	3.06E-06	2.13E-06	8.61E-07
R51	8.26E-11	5.56E-06	2.01E-06	1.40E-06	5.65E-07
R52	1.39E-10	9.36E-06	3.38E-06	2.35E-06	9.50E-07
R53	1.70E-10	1.14E-05	4.13E-06	2.88E-06	1.16E-06
R54	1.33E-10	8.96E-06	3.24E-06	2.26E-06	9.10E-07
R55	1.79E-10	1.20E-05	4.35E-06	3.03E-06	1.22E-06
R56	2.43E-10	1.64E-05	5.91E-06	4.12E-06	1.66E-06
R57	7.47E-11	5.03E-06	1.82E-06	1.27E-06	5.11E-07
R58	2.00E-10	1.35E-05	4.87E-06	3.39E-06	1.37E-06
R59	1.22E-10	8.23E-06	2.97E-06	2.07E-06	8.36E-07
R60	8.00E-11	5.39E-06	1.95E-06	1.36E-06	5.48E-07
R61	1.64E-10	1.10E-05	3.98E-06	2.78E-06	1.12E-06
R62	1.61E-10	1.08E-05	3.91E-06	2.72E-06	1.10E-06
R63	5.42E-11	3.65E-06	1.32E-06	9.18E-07	3.71E-07
R64	1.02E-10	6.90E-06	2.49E-06	1.74E-06	7.01E-07
R65	1.87E-10	1.26E-05	4.55E-06	3.17E-06	1.28E-06
R66	1.28E-10	8.62E-06	3.11E-06	2.17E-06	8.75E-07
R67	5.83E-11	3.93E-06	1.42E-06	9.88E-07	3.99E-07
R68	7.55E-11	5.09E-06	1.84E-06	1.28E-06	5.17E-07
R69	1.03E-10	6.91E-06	2.49E-06	1.74E-06	7.01E-07
R70	2.04E-10	1.37E-05	4.96E-06	3.46E-06	1.40E-06
R71	1.01E-10	6.79E-06	2.45E-06	1.71E-06	6.90E-07

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R72	8.37E-11	5.64E-06	2.04E-06	1.42E-06	5.73E-07
R73	4.33E-11	2.92E-06	1.05E-06	7.34E-07	2.96E-07
R74	1.11E-10	7.46E-06	2.69E-06	1.88E-06	7.58E-07
R75	1.09E-10	7.34E-06	2.65E-06	1.85E-06	7.45E-07
R76	1.51E-10	1.02E-05	3.67E-06	2.56E-06	1.03E-06
R77	9.80E-11	6.61E-06	2.38E-06	1.66E-06	6.71E-07
R78	2.54E-10	1.71E-05	6.18E-06	4.31E-06	1.74E-06
R79	1.62E-10	1.09E-05	3.94E-06	2.75E-06	1.11E-06
R80	1.44E-10	9.70E-06	3.50E-06	2.44E-06	9.85E-07
R81	7.52E-11	5.06E-06	1.83E-06	1.27E-06	5.14E-07
R82	9.77E-11	6.58E-06	2.38E-06	1.66E-06	6.68E-07
R83	4.16E-11	2.80E-06	1.01E-06	7.05E-07	2.85E-07
R84	7.69E-11	5.18E-06	1.87E-06	1.30E-06	5.26E-07
R85	7.21E-11	4.86E-06	1.75E-06	1.22E-06	4.93E-07
R86	9.94E-11	6.69E-06	2.42E-06	1.68E-06	6.80E-07
R87	1.64E-10	1.10E-05	3.98E-06	2.78E-06	1.12E-06
R88	4.78E-11	3.22E-06	1.16E-06	8.10E-07	3.27E-07
R89	7.45E-11	5.02E-06	1.81E-06	1.26E-06	5.10E-07
R90	7.15E-11	4.81E-06	1.74E-06	1.21E-06	4.89E-07
R91	1.86E-10	1.25E-05	4.52E-06	3.15E-06	1.27E-06
R92	6.07E-11	4.09E-06	1.48E-06	1.03E-06	4.15E-07
R93	9.11E-11	6.14E-06	2.21E-06	1.54E-06	6.23E-07
R94	8.57E-11	5.77E-06	2.08E-06	1.45E-06	5.86E-07
R95	6.34E-11	4.27E-06	1.54E-06	1.07E-06	4.34E-07
R96	7.57E-11	5.10E-06	1.84E-06	1.28E-06	5.18E-07
R97	4.86E-11	3.28E-06	1.18E-06	8.24E-07	3.33E-07
R98	6.85E-11	4.62E-06	1.67E-06	1.16E-06	4.69E-07
R99	5.51E-11	3.71E-06	1.34E-06	9.34E-07	3.77E-07
R100	1.33E-10	8.98E-06	3.24E-06	2.26E-06	9.13E-07
R101	5.51E-11	3.71E-06	1.34E-06	9.33E-07	3.77E-07
R102	3.25E-11	2.19E-06	7.89E-07	5.50E-07	2.22E-07
R103	3.47E-11	2.34E-06	8.45E-07	5.89E-07	2.38E-07
R104	2.90E-11	1.95E-06	7.05E-07	4.91E-07	1.98E-07
R105	4.40E-11	2.96E-06	1.07E-06	7.45E-07	3.01E-07
R106	3.66E-11	2.47E-06	8.91E-07	6.21E-07	2.51E-07
R107	4.42E-11	2.98E-06	1.08E-06	7.50E-07	3.03E-07
R108	1.19E-10	8.04E-06	2.90E-06	2.02E-06	8.17E-07
R109	4.20E-11	2.83E-06	1.02E-06	7.12E-07	2.88E-07

Receptor	99.9 th percentile 1-hour average concentration (mg·m ⁻³)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R110	6.81E-11	4.59E-06	1.65E-06	1.15E-06	4.66E-07
R111	3.67E-11	2.47E-06	8.93E-07	6.22E-07	2.51E-07
R112	7.15E-11	4.82E-06	1.74E-06	1.21E-06	4.89E-07
R113	3.39E-11	2.28E-06	8.24E-07	5.74E-07	2.32E-07
R114	5.93E-11	4.00E-06	1.44E-06	1.01E-06	4.06E-07
R115	7.24E-11	4.88E-06	1.76E-06	1.23E-06	4.95E-07
R116	6.02E-11	4.05E-06	1.46E-06	1.02E-06	4.12E-07
R117	6.41E-11	4.32E-06	1.56E-06	1.09E-06	4.38E-07
R118	4.60E-11	3.10E-06	1.12E-06	7.79E-07	3.15E-07
R119	9.30E-11	6.27E-06	2.26E-06	1.58E-06	6.36E-07
R120	7.35E-11	4.95E-06	1.79E-06	1.25E-06	5.03E-07
R121	9.97E-11	6.72E-06	2.42E-06	1.69E-06	6.82E-07
R122	3.95E-11	2.66E-06	9.60E-07	6.69E-07	2.70E-07
R123	6.25E-11	4.21E-06	1.52E-06	1.06E-06	4.27E-07
R124	5.12E-11	3.45E-06	1.25E-06	8.68E-07	3.50E-07
R125	7.31E-11	4.92E-06	1.78E-06	1.24E-06	5.00E-07
R126	9.29E-11	6.26E-06	2.26E-06	1.57E-06	6.36E-07
R127	4.66E-11	3.14E-06	1.13E-06	7.89E-07	3.19E-07
R128	3.56E-11	2.40E-06	8.65E-07	6.03E-07	2.43E-07

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air quality	Northstar specialises in all aspects of air quality, dust, and odour management, covering monitoring, modelling and assessment, due diligence and process specification, licencing and regulatory advice, peer review and expert witness.
environment	Our team has extensive experience in environmental management, covering environmental policy and management plans, licencing, compliance reporting, auditing, data, and spatial analysis.
sustainability	We look beyond compliance to add value and identify opportunities. Our services range from sustainability strategies, ecologically sustainable development reporting and assessment, to bespoke greenhouse gas and energy estimation and reporting.

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