This document has been prepared for **Plan Project Management Pty Ltd** by:

Northstar Air Quality Pty Ltd,
Head Office: Suite 1504, 275 Alfred Street, North Sydney, NSW 2060
Riverina Office: PO Box 483, Albury, NSW 2640

northstar-env.com | Tel: 1300 708 590

Mamre Road Data Centre Campus (SSD-92743706)

Air Quality Impact Assessment - Appendices

Addressee(s):	Plan Project Management Pty Ltd
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Quality Control

Report	Reference	Status	Prepared by	Checked by	Authorised by
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Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
26	1012	Final	R2	V1
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Final Authority

This report must by 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.

M Doyle **3 December 2025**

CONTENTS

This document contains the Appendices to Mamre Road Data Centre Campus (SSD-92743706) - Air Quality Impact Assessment – Main Report (file ref: 26.1012.FR1V1).

APPENDIX A

Commonly Used Units and Abbreviations

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

Commonly used SI-derived and non-SI units

Symbol	Name	Quantity
$g \cdot m^{-2} \cdot s^{-1}$	gram per square metre per second	rate of mass deposition per unit area
$g \cdot s^{-1}$	gram per second	rate of mass emission
$kg \cdot ha^{-1} \cdot hr^{-1}$	kilogram per hectare per hour	rate of mass deposition per unit area
$kg \cdot m^{-3}$	kilogram per cubic metre	density
$L \cdot s^{-1}$	litres per second	volumetric rate
m^2	square metre	area
m^3	cubic metre	volume
$m \cdot s^{-1}$	metre per second	speed and velocity
$mg \cdot m^{-3}$	milligram per cubic metre	mass concentration per unit volume
$mg \cdot Nm^{-3}$	milligram per normalised cubic metre (of air)	mass concentration per unit volume
$\mu g \cdot m^{-3}$	microgram per cubic metre	mass concentration per unit volume
$mg \cdot m^{-3}$	milligram per cubic metre	mass concentration per unit volume
Pa	pascal	pressure
ppb	parts per billion ($1x10^{-9}$)	volumetric concentration
pphm	parts per hundred million (1×10^{-5})	volumetric concentration
ppm	parts per million ($1x10^{-6}$)	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
CAQMP	construction air quality management plan
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 EPA	New South Wales Environment Protection Authority
NT	Northern Territory
OEMP	operational environmental management plan
O_3	ozone
OU	odour unit
$OU \cdot m^3 \cdot s^{-1}$	odour units times metres cubed per second
$OU \cdot s^{-1}$	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
SEPP	State Environmental Protection Policy

Abbreviation	Term
SO_X	oxides of sulphur
SO_2	sulphur dioxide
SRTM3	Shuttle Radar Topography Mission
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TARP	trigger action response plan
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

Sensitive Receptor Locations

Table B1 Discrete sensitive receptor locations

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R1	1 Bakers Lane, Kemps Creek	Residential	294 844	6 254 331
R2	Mamre Anglican School, Kemps Creek	Educational	295 142	6 254 273
R3	Mamre Christian College, Kemps Creek	Educational	295 169	6 254 330
R4	Little Smarties Early Learning Centre	Educational	295 174	6 254 272
R5	Trinity Catholic Primary School, Kemps Creek	Educational	295 348	6 254 492
R6	Emmaus Catholic College, Kemps Creek	Educational	295 550	6 254 313
R7	Emmaus Retirement Village, Kemps Creek	Residential	295 709	6 254 600
R8	Catholic Healthcare Emmaus Retirement Vill.,	Residential	295 755	6 254 749
R9	Mamre Road, Kemps Creek	Residential	294 635	6 254 591
R10	The Yards, Kemps Creek	Industrial	294 614	6 254 345
R11	The Yards, Kemps Creek	Industrial	294 573	6 254 203
R12	The Yards, Kemps Creek	Industrial	294 607	6 253 972
R13	The Yards, Kemps Creek	Industrial	294 614	6 253 821
R14	Yiribana Logistics Estate, Kemps Creek	Industrial	294 959	6 253 749
R15	Aspect Industrial Estate, Kemps Creek	Industrial	294 906	6 253 400
R16	St Narsai Assyrian Christian College	Educational	299 164	6 253 214
R18	Marion Catholic Primary School	Educational	301 169	6 253 313
R17	Horsely Park Public School, Horsley Park	Educational	301 270	6 253 384
R19	Blackwell Public School, St Clair	Educational	294 779	6 257 025
R20	Erskine Park High School, Erskine Park	Educational	296 604	6 256 986
R21	James Erskine Public School, Erskine Park	Educational	296 665	6 257 203
R22	Clairgate Public School, St Clair	Educational	296 273	6 258 174
R23	St Clair Public School, St Clair	Educational	295 039	6 258 209
R24	St Clair High School, St Clair	Educational	295 130	6 258 366
R25	Holy Spirit Primary School, St Clair	Educational	294 607	6 258 396
R26	Banks Public School, St Clair	Educational	293 881	6 258 444
R27	Do-Re-Mi Early Learning Centre	Educational	297 134	6 250 248
R28	Kidzspot Early Learning Centre – Dilga, EP	Educational	296 112	6 257 556
R29	Kidzspot Early Learning Centre – Lima, EP	Educational	296 438	6 257 575
R30	Phoenix Reserve, Erskine Park	Recreational	296 542	6 257 571
R31	Old MacDonalds Childcare Centre	Educational	294 057	6 255 701
R32	Dutt Medical Centre, St Clair	Medical	294 164	6 257 251
R33	Melville Road Family Medical Centre, St Clair	Medical	294 543	6 258 661
R34	Kindana Children's Centre, St Clair	Educational	294 577	6 258 628
R35	Provincial Medical Centre, St Clair	Medical	295 347	6 258 382
R36	Horsely Park Medical Centre, Horsley Park	Medical	300 854	6 253 331
R37	Horsley Kids Early Childhood Centre	Educational	301 002	6 253 277
R38	Kemps Creek Industrial Estate, Kemps Creek	Industrial	296 363	6 253 578
R39	Kemps Creek Industrial Estate, Kemps Creek	Industrial	296 323	6 252 786

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R40	Aspect Industrial Estate, Kemps Creek	Industrial	295 268	6 253 400
R41	Emporium Avenue, Kemps Creek	Industrial	295 825	6 254 170
R42	Amazon Fulfillment Centre, Emporium Ave	Industrial	296 216	6 254 471
R43	Coles ADC Emporium Ave	Industrial	296 469	6 254 871
R44	The Yards, Kemps Creek	Industrial	294 082	6 254 117
R45	The Yards, Kemps Creek	Industrial	293 884	6 254 133
R46	Fire and Rescue NSW Emergency Services Academy, Distribution Drive, Orchard Hills	Educational	294 304	6 254 914
R47	Warehouse, Sarah Andrews Cl, Erskine Park	Industrial	294 673	6 254 875
R48	Woolworths DC, Sarah Andrews Cl	Industrial	295 037	6 254 949
R49	DHL Supply Chain, Templar Road	Industrial	295 952	6 255 129
R50	Templar Road, Erskine Park	Industrial	295 624	6 255 371
R51	Erskine Park Road, Erskine Park	Industrial	294 748	6 255 827
R52	Grady Crescent, Erskine Park	Industrial	296 744	6 256 156
R53	Erskine Park Road, Erskine Park	Industrial	294 879	6 256 316
R54	Kasie Place, St Clair	Residential	294 353	6 256 556
R55	Coowarra Drive, St Clair	Residential	295 028	6 256 635
R56	Dunstaffnage Place, Erskine Park	Residential	296 079	6 256 719
R57	Mandalong Close, Orchard Hills	Residential	293 985	6 255 988
R58	Mandalong Close, Orchard Hills	Residential	293 537	6 255 820
R59	Mamre Road, Orchard Hills	Residential	293 276	6 255 212
R60	Twin Creeks Drive, Luddenham	Industrial	292 882	6 253 980
R61	Medinah Avenue, Luddenham	Residential	292 999	6 253 792
R62	Medinah Avenue, Luddenham	Residential	293 237	6 253 103
R63	Mamre Road, Kemps Creek	Residential	295 340	6 252 384
R64	Ganton Way, Luddenham	Residential	292 865	6 252 423
R65	Greenway Place, Horsley Park	Residential	298 647	6 253 861
R66	Capitol Hill Drive, Mount Vernon	Residential	298 344	6 253 139
R67	Bowood Road, Mount Vernon	Residential	297 694	6 252 401
R68	Aldington Road, Kemps Creek	Residential	296 259	6 251 744
R69	Mamre Road, Kemps Creek	Residential	295 497	6 251 556
R70	Mamre Road, Kemps Creek	Residential	295 203	6 252 040
R72	Mamre Road, Kemps Creek	Residential	294 727	6 252 701
R71	Mamre Road, Kemps Creek	Residential	294 670	6 252 893
R73	Mamre Road, Kemps Creek	Residential	294 621	6 253 098
R74	Imperata Close, Kemps Creek	Industrial	297 083	6 253 940
R75	Johnston Crescent, Horsley Park	Industrial	298 283	6 254 543
R76	Millner Avenue, Horsley Park	Industrial	298 318	6 254 962
R77	Medinah Avenue, Luddenham	Residential	293 264	6 253 295
R78	Medinah Avenue, Luddenham	Residential	293 139	6 253 624

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R79	Twin Creeks Golf & Country Clu	Recreational	292 776	6 253 762
R80	Farmingdale Court, Luddenham	Residential	292 596	6 251 851
R81	Comargo Lane, Luddenham	Residential	292 591	6 254 168
R82	Luddenham Road, Orchard Hills	Residential	292 680	6 254 624
R83	Luddenham Road, Orchard Hills	Residential	292 593	6 255 034
R84	Luddenham Road, Orchard Hills	Residential	292 839	6 255 196
R85	Crystal Downs Close, Luddenham	Residential	292 759	6 253 448
R86	Pennard Crescent, Luddenham	Residential	292 954	6 253 379
R87	Woodhall Place, Luddenham	Residential	292 724	6 253 034
R88	Woodhall Place, Luddenham	Residential	292 863	6 252 713
R89	Twin Creeks Drive, Luddenham	Residential	292 659	6 252 635
R90	Bridport Place, Luddenham	Residential	292 280	6 252 110
R91	Ventana Court, Luddenham	Residential	292 429	6 252 905
R92	Humewood Place, Luddenham	Residential	292 491	6 252 373
R93	Portrush Crescent, Luddenham	Residential	292 400	6 253 741
R94	Portrush Crescent, Luddenham	Residential	292 274	6 253 495
R95	Portrush Crescent, Luddenham	Residential	291 948	6 253 458
R96	Libra Place, Erskine Park	Residential	296 865	6 256 693
R97	Cetus Place, Erskine Park	Residential	297 356	6 256 604
R98	Peppertree Reserve, Erskine Park	Recreational	296 877	6 257 207
R99	Erskine Park Netball Courts, Erskine Park	Recreational	295 776	6 257 108
R100	Corio Reserve, St Clair	Recreational	294 442	6 256 991
R101	Sennar Reserve, Erskine Park	Recreational	297 236	6 257 322
R102	Shakespeare Drive Reserve, St Clair	Recreational	295 084	6 257 465
R103	Saunders Park, St Clair	Recreational	294 759	6 257 903
R104	Peter Kearns Memorial Oval, St Clair	Recreational	293 924	6 258 257
R105	Mamre Road, Mount Vernon	Residential	296 153	6 250 570
R106	Mount Vernon Road, Mount Vernon	Residential	296 685	6 250 841
R107	Bowood Road, Mount Vernon	Residential	297 396	6 251 644
R108	Garfield Road, Horsley Park	Residential	298 815	6 252 786
R109	Burley Road, Hosley Park	Residential	299 109	6 254 543
R110	Barwar Close, Horsley Park	Residential	300 063	6 254 234
R111	The Appian Way, Mount Vernon	Residential	298 201	6 251 812
R112	Delaware Road, Horsley Park	Residential	299 488	6 253 414
R113	Lincoln Road, Horsley Park	Residential	299 367	6 251 984
R114	Selkirk Avenue, Cecil Park	Residential	298 873	6 250 971
R115	Mount Vernon Road, Mount Vernon	Residential	297 662	6 250 662
R116	Cressy Road, Mount Vernon	Residential	296 988	6 249 926
R117	Warana Road, Cecil Park	Residential	298 316	6 249 676
R118	Horsley Road, Horsley Park	Residential	300 539	6 253 008

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R119	Bowood Road, Mount Vernon	Recreational	297 512	6 252 333
R120	Arundel Road, Horsley Park	Recreational	300 652	6 253 420
R121	ETP Precast Facility, Lenore Drive	Industrial	298 001	6 256 671
R122	TransGrid Sydney West Substation	Substation	298 721	6 255 977
R123	Warehouse, Old Wallgrove Road	Industrial	299 347	6 256 015
R124	CDC Data Centre, Eastern Creek	Data Centre	299 797	6 255 817
R125	Warehouse, Telopea Place, Eastern Creek	Industrial	299 160	6 256 629
R126	Coca-Cola Europacific Partners Eastern Ck	Industrial	300 634	6 255 800
R127	Digital Realty Data Centre SYD11	Data Centre	295 946	6 255 888
R128	Digital Realty Data Centre SYD 14	Data Centre	296 226	6 255 717

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.

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).

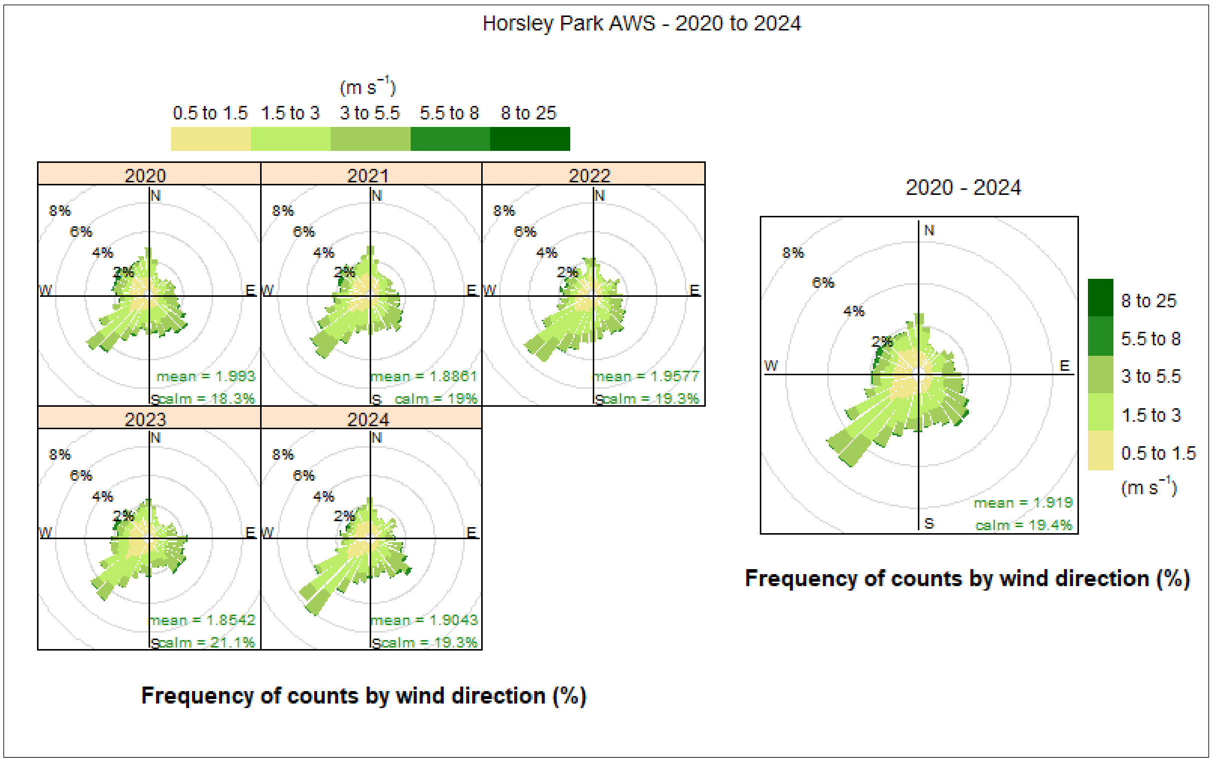
Meteorological conditions at Horsley Park AWS, located approximately 6.4 km to the west-northwest of the Proposal site, have been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent years of data (2020 to 2024) are presented in Figure C1. The annual wind speed frequency distribution for the five-year period is presented in Figure C2.

The wind roses presented in Appendix C indicate that from 2020 to 2024, winds at Horsley Park AWS show similar wind distribution patterns across the years assessed, with a predominant south westerly wind direction.

The majority of wind speeds experienced at Horsley Park AWS between 2020 and 2024 are generally in the range 0.5 meters per second ($m{\cdot}s^{-1}$) to 5.5 $m{\cdot}s^{-1}$ with the highest wind speeds (greater than 5.5 $m{\cdot}s^{-1}$) occurring from primarily north-westerly directions. Winds of this speed are rare and occur during 2.2 % of the observed hours during the years. Calm winds (less than 0.5 $m{\cdot}s^{-1}$) are more common and occur during 19.4 % of hours on average across the years between 2020 and 2024.

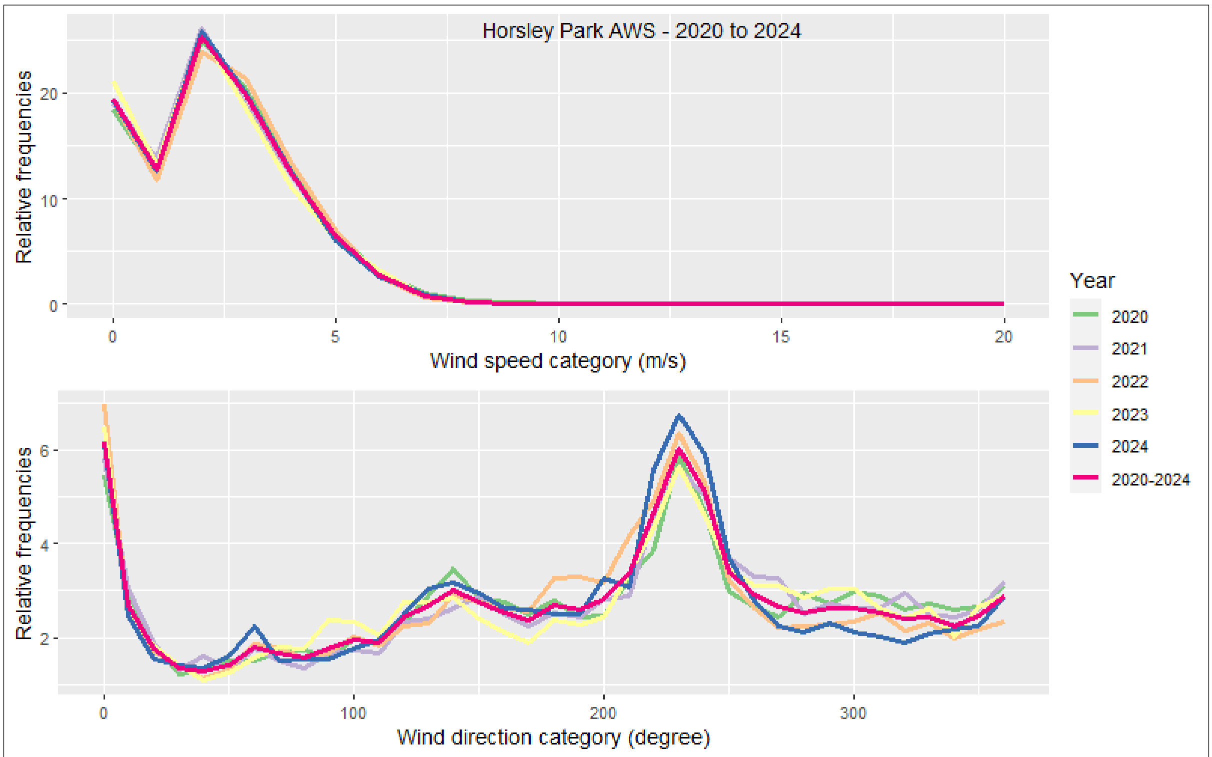
The correlation coefficients between each year and the five-year period for the distribution of wind direction and wind speed, as well as NO_2 concentrations recorded at St Marys AQMS (refer Appendix D), are summarised in Table C1. The correlation coefficients were ranked and aggregated to select the representative year for the meteorological modelling. The rankings are also presented in Table C1.

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



Source: Northstar

Figure C2 Annual wind speed and direction distributions – Horsley Park AWS (2020 to 2024)



Source: Northstar

Table C1 Correlation coefficient analysis – Horsley Park 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	0.9932	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 reasonably 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.

NO_2 concentrations measured for each year are also well correlated against concentrations over the five-year period. The year 2023 is the highest ranked year for NO_2.

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 processor in a format suitable for using in the CALPUFF dispersion model.

CALMET is a meteorological data processor that generates three-dimensional wind and temperature fields across a gridded modelling domain. It serves as the meteorological pre-processor for the CALPUFF modelling system. 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.

A comparison of the TAPM generated meteorological data, and that observed at the Horsley AWS are presented in Figure C3. These data generally compare well which provides confidence that the meteorological conditions modelled as part of this assessment are appropriate.

The parameters used in TAPM and CALMET modelling are presented in Table C2. Further, as per (Barclay & Scire, 2011), the seven critical parameters used in the CALMET modelling are presented in Table C3.

Table C2 CALMET and TAPM meteorological parameters

TAPM v 4.0.5	
Modelling period	1 January 2021 to 31 December 2021
Centre of analysis	294 877 mE, 6 254 114 mS (UTM)
Number of grid points	50 x 50 x 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 31 December 2021
Southwest corner of analysis	287 877 mE, 6 247 113 mS (UTM Coordinates)
Meteorological grid domain (resolution)	14 km x 14 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

Figure C3 Comparison of observed data and TAPM data at Horsley Park AWS

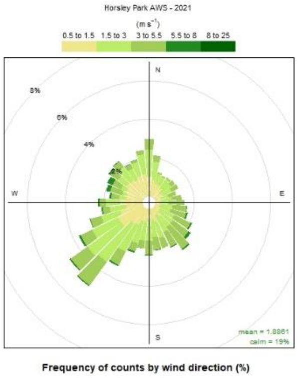
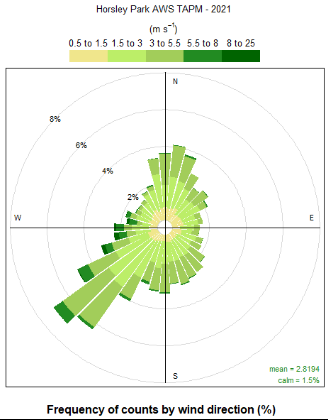
Observed data	Modelled TAPM data
	

Table C3 Seven critical meteorological parameters used in CALMET

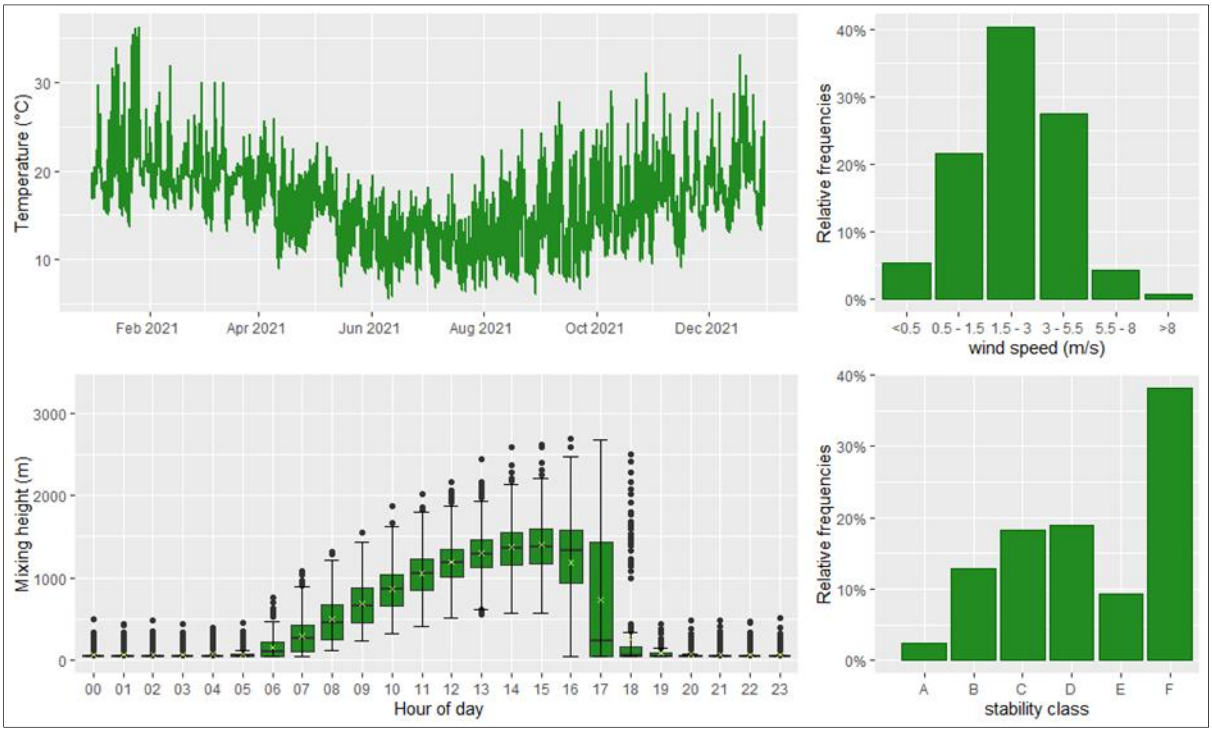
Parameter	Value
TERRAD	5
IEXTRP	1
BIAS (NZ)	0 × 10
R1 and R2	0, 0
RMAX1 and RMAX2	0, 0

As generally required by NSW EPA, the following provides a summary of the modelled meteorological dataset. Given the nature of the pollutant emission sources at the Proposal site, detailed 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 period 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.

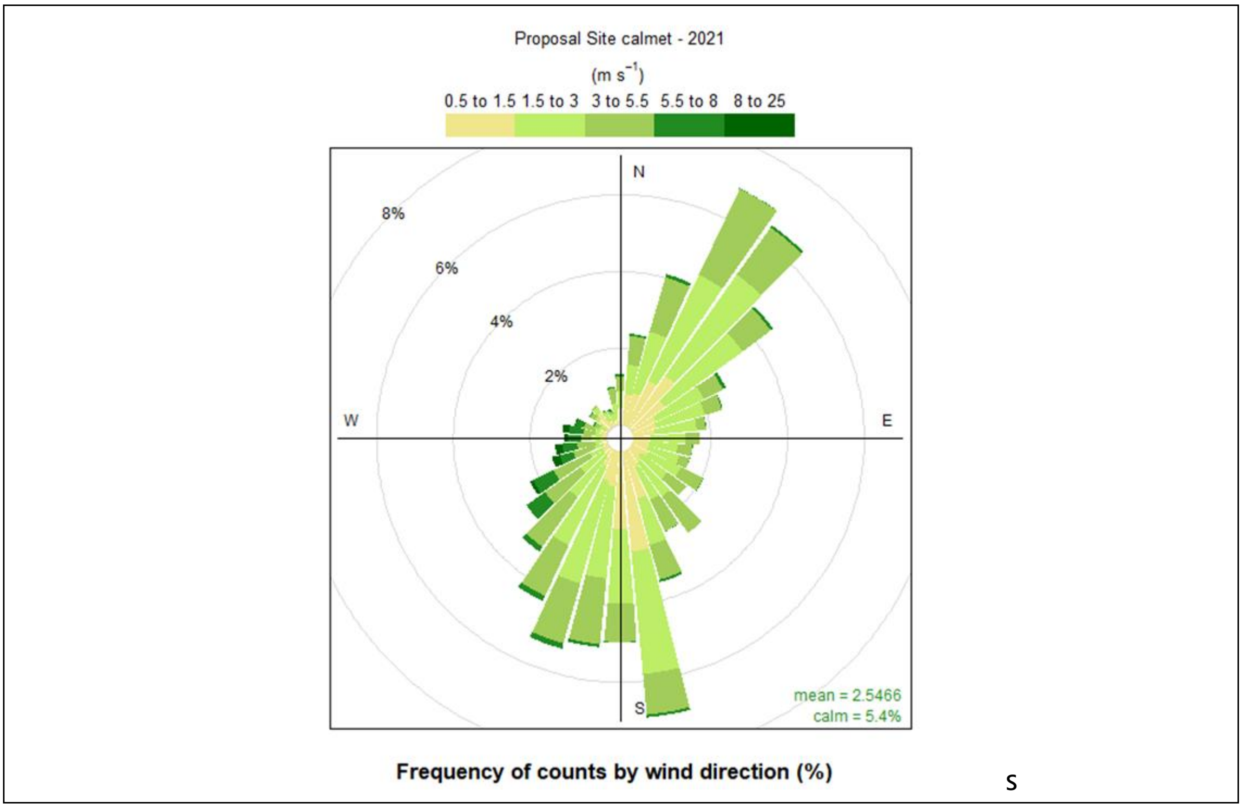
Figure C4 Predicted mixing height, wind speed, and stability class at the Proposal site (2021)



Source: Northstar

The modelled wind speed and direction at the Proposal site during 2021 are presented in Figure C4.

Figure C4 Predicted wind speed and direction – 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).

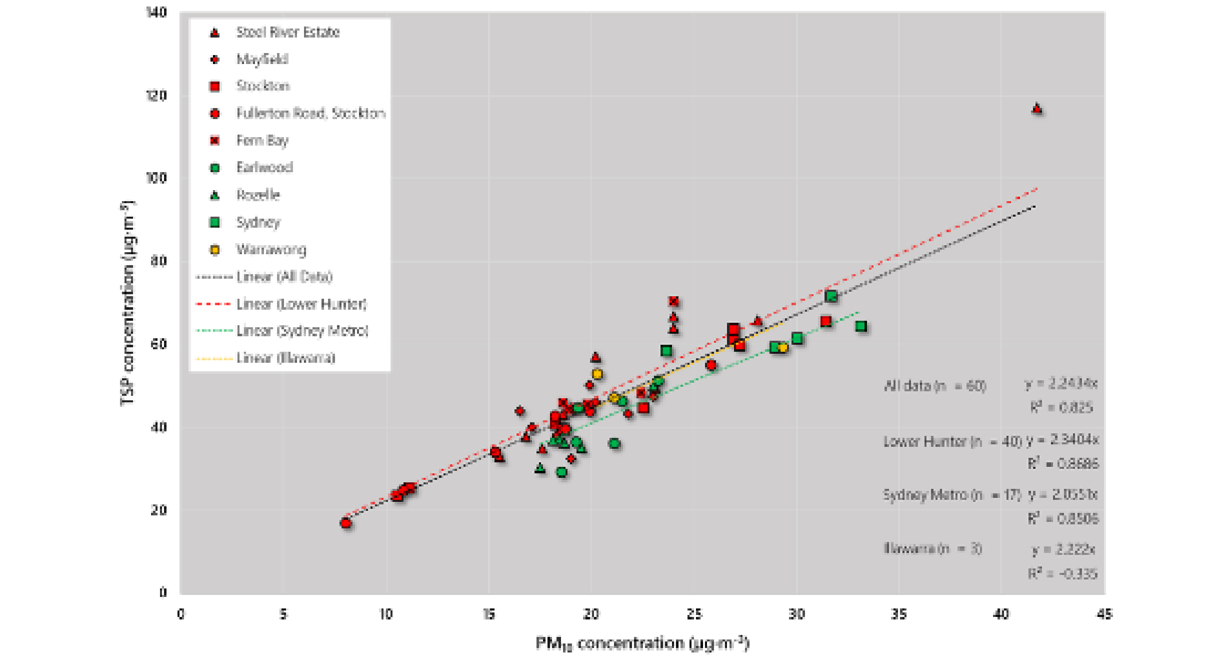
Background air quality monitoring data used within this AQIA has been adopted from St Marys Air Quality Monitoring Station (AQMS), managed by NSW DCCEEW and located approximately 4.1 km to the northwest of the Proposal site. Specifically, air quality monitoring data for the year 2021 (consistent with meteorological modelling [refer Appendix C]) has been adopted for use in this AQIA. Summary statistics for the selected data are presented in Table D1.

It is noted that St Marys AQMS does not measure concentrations of carbon monoxide (CO) and sulphur dioxide (SO_2), which are pollutants required as part of this assessment. Correspondingly, for the purposes of this AQIA, CO and SO_2 concentration data has been adopted from Prospect AQMS.

TSP concentrations are not measured at any AQMS surrounding the Proposal site. Figure D1 presents an analysis of co-located TSP and PM_{10} measurements from the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions. Based on measurements collected across these regions, the analysis supports deriving a general TSP:PM_{10} ratio of 2.0551 : 1 (i.e., PM_{10} accounts for approximately 49 % of TSP) using Sydney Metropolitan data. In the absence of more specific information, this ratio has been applied in this AQIA, resulting in a background annual average TSP concentration of 27.1 $\mu g \cdot m^{-3}$.

Graphs presenting the daily varying PM_{10} and $PM_{2.5}$ data, and hourly varying NO_2 data, recorded at St Marys AQMS in 2021 are presented in Figure D2, Figure D3 and Figure D4 respectively.

Figure D1 Co-located TSP and PM_{10} measurements – Lower Hunter, Sydney Metro and Illawarra



Source: Northstar

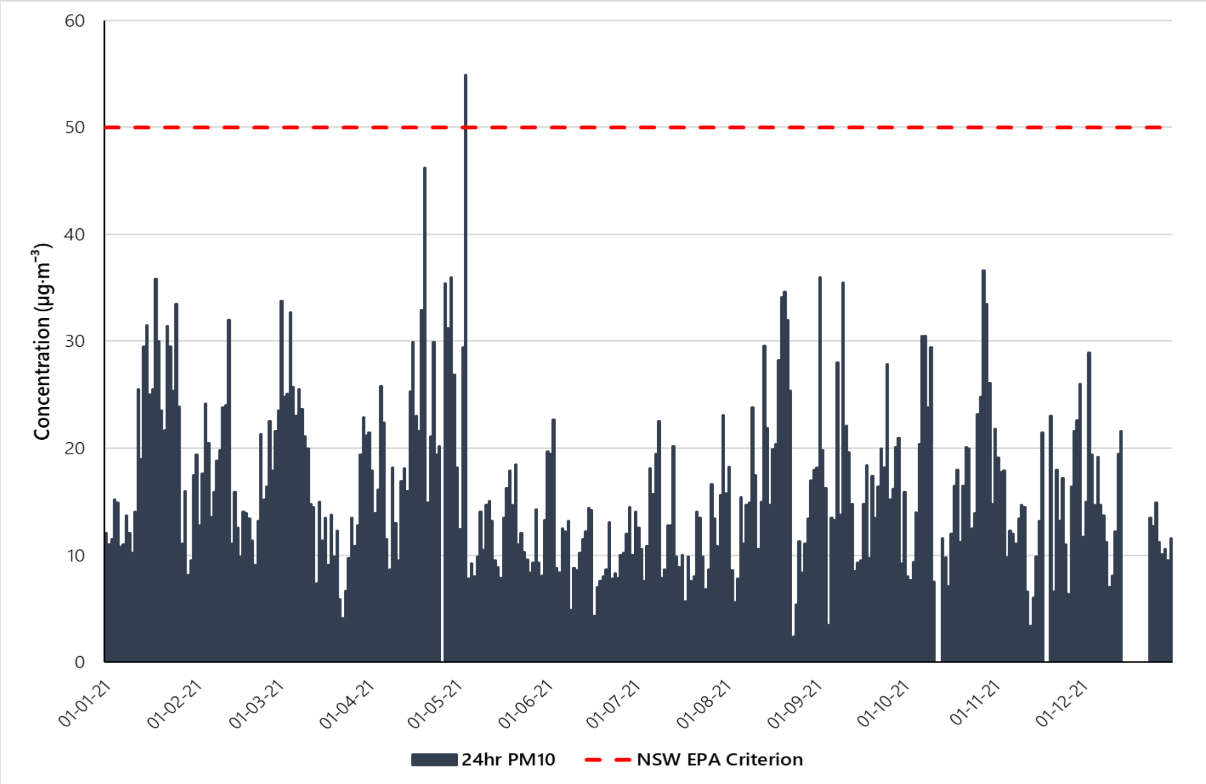
Table D1 Background air quality statistics – Prospect AQMS and St. Marys AQMS (2021)

AQMS	-	St Marys AQMS				Prospect AQMS				
Pollutant	TSP	PM_{10}	$PM_{2.5}$	NO_2	O_3	SO_2	SO_2	CO	CO	CO
Averaging period	Annual	24 hour	24 hour	1 hour	1 hour	24 hour	1 hour	15 minute	1 hour	8 hour (rolling)
Units	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$
Statistics										
Data Points (nb)	351	351	349	8055	7894	354	8193	8190	8190	8549
Mean	33.4	16.2	5.8	8.1	32.7	1.4	1.5	0.1	0.1	0.1
Standard deviation	-	7.7	3.7	8.0	25.7	1.9	2.8	0.2	0.2	0.1
Skew[1]	-	*1.1*	*3.4*	*1.5*	*0.6*	*1.3*	*4.6*	*2.8*	*2.8*	*2.4*
Kurtosis[2]	-	*1.9*	*23.7*	*3.1*	*-0.1*	*1.2*	*36.9*	*11.5*	*11.5*	*7.9*
Minimum	-	2.4	-0.2	-4.1	-2.1	0.0	-2.9	-0.2	-0.1	-0.1
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	2.9	2.9	0.2	0.1	0.1
90^{th}	-	26.1	9.5	18.5	66.3	2.9	2.9	0.3	0.3	0.3
95^{th}	-	31.5	12.0	24.6	74.9	5.7	5.7	0.5	0.4	0.4
97^{th}	-	33.7	13.8	28.7	85.6	5.7	8.6	0.7	0.5	0.5
98^{th}	-	35.4	14.7	30.8	92.0	5.7	8.6	0.8	0.6	0.5
99^{th}	-	36.0	18.1	34.9	98.4	7.1	11.4	1.0	0.8	0.6
Maximum	**33.4**	**54.9**	**40.3**	**67.7**	**149.8**	**8.6**	**42.9**	**2.1**	**1.6**	**1.3**
Data Capture (%)	**95.9**	**95.9**	**95.4**	**91.7**	**89.9**	**96.7**	**93.3**	**93.2**	**93.2**	**97.3**

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.

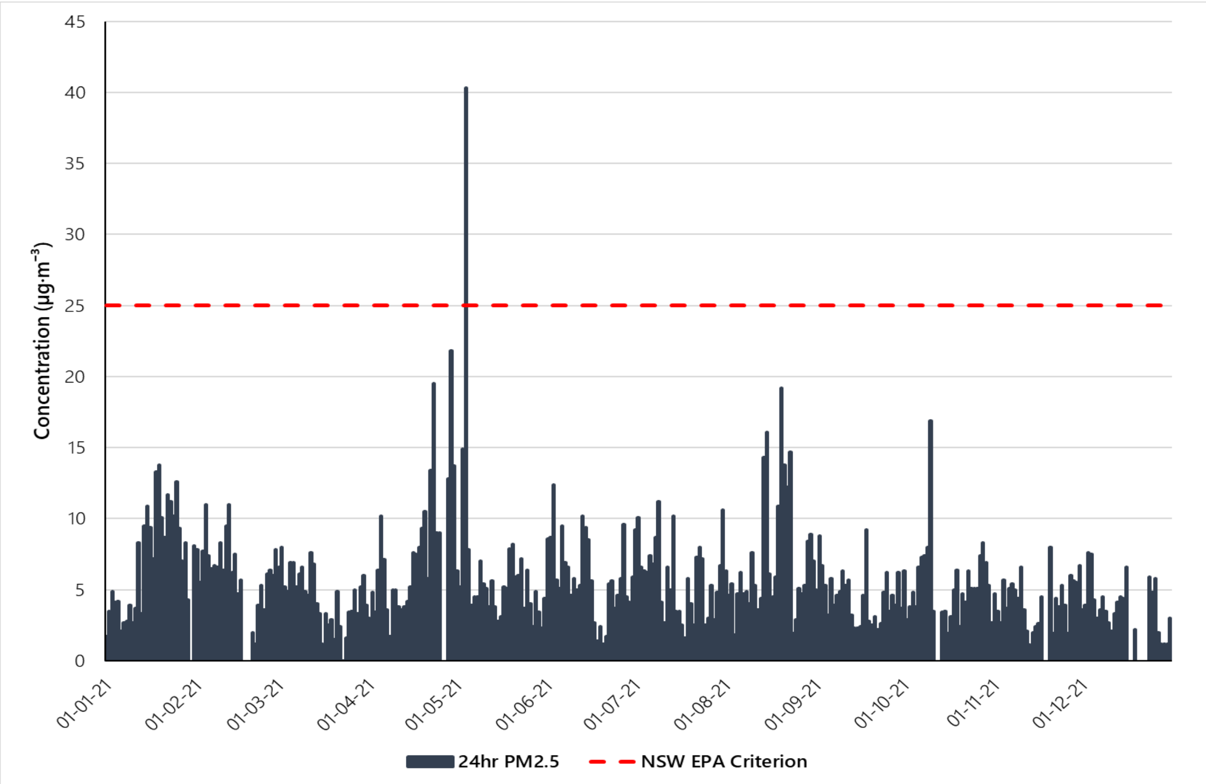
2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive kurtosis represents a more peaked distribution, and negative kurtosis represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Figure D2 Daily varying PM_{10} measurements – St Marys AQMS (2021)



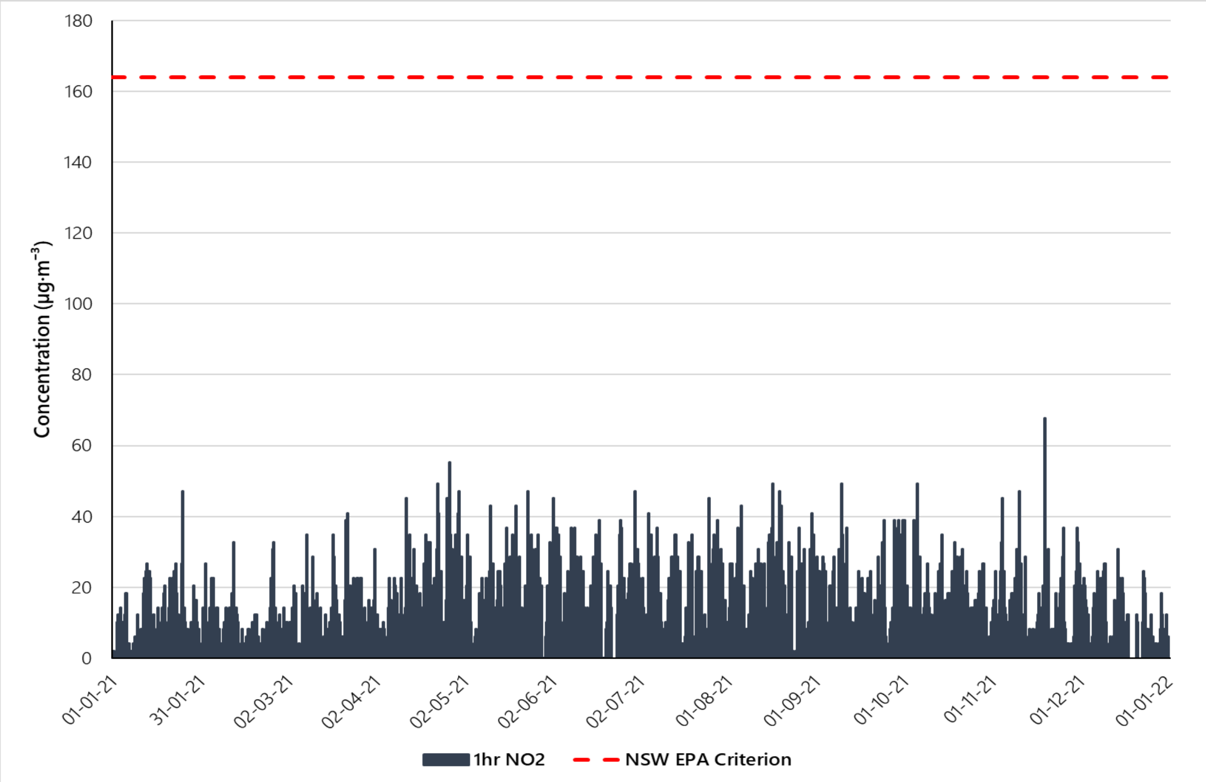
Source: Northstar

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



Source: Northstar

Figure D4 Hourly varying NO_2 measurements – St Marys AQMS (2021)



Source: Northstar

It can be observed from Figures D2 to D4 that in 2021, the St Marys AQMS recorded one exceedance of the respective 24-hour PM_{10} and $PM_{2.5}$ criteria. Table D2 provides further details on the 24-hour PM_{10} and $PM_{2.5}$ exceedances recorded at the St Marys AQMS in 2021. The New South Wales annual compliance report (NSW DPE, 2023) attributes exceptional PM_{10} and $PM_{2.5}$ events in 2021 primarily to hazard reduction burns, particularly in the Sydney region.

Table D2 Calendar days in 2021 when 24-hour PM_{10} & $PM_{2.5}$ criteria exceeded at St Marys AQMS

Date	Measured concentration (µg·m^{-3})	Comments
24-hour PM_{10} 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

APPENDIX E

Generator Technical Specifications

2024 EPA Tier 2 Exhaust Emission Compliance Statement C2750D5BE Stationary Emergency

50 Hz Diesel generator set

Compliance Information:

The engine used in this generator set complies with the Tier 2 emissions limits of U.S EPA New source performance standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart E when tested per ISO8178 D1.

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	RCEXL060.AAD-001
Effective Date:	04/05/2023
Date Issued:	04/05/2023
EPA Diesel Engine Family:	RCEXL060.AAD

Engine Information:

Model:	QSK60-G23	Bore:	6.25 in. (159 mm)
Engine Nameplate HP:	3202	Stroke:	7.48 in. (190 mm)
Type:	4 Cycle, V, 16 Cylinder Diesel	Displacement:	3672 cu. in. (60 liters)
Aspiration:	Turbocharged & Low Temperature Aftercooled	Compression ratio:	14.5:1
Emission Control Device:	Turbocharged and Aftercooled	Exhaust Stack Dia.:	10 in. (254 mm)

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions	Grams per BHP-hr			Grams per kWm-hr		
	NOx NMHC	CO	PM	NOx NMHC	CO	PM
EPA Emissions Limit	4.80	2.60	0.15	6.40	3.50	0.20

Test methods: EPA emissions recorded per 40 CFR Part 60, 89, 1039, 1065 and weighted at load points prescribed in the regulations for constant speed engines.

Diesel fuel specifications: Cetane number: 40-50. Reference: ASTM D975 No. 2-D, 300-500 ppm Sulfur

Reference conditions: Air inlet temperature: 25 °C (77 °F), Fuel inlet temperature: 40 °C (104 °F).
Barometric pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H_2O/lb) of dry air; required for NOx correction, Restrictions: Intake restriction set to a maximum allowable limit for clean filter; Exhaust back pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Exhaust Emission Data Sheet C2750D5BE

50 Hz Diesel Generator Set EPA Tier 2

Engine Information:

Model:	Cummins Inc. QSK60-G23	Bore:	6.25 in. (159 mm)
Type:	4 Cycle, VEE, 16 cylinder diesel	Stroke:	7.48 in. (190 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	3672 cu. in. (60 liters)
Compression Ratio:	14.5:1		
Emission Control Device:	Turbocharged and Aftercooled		
Emission Level:	Stationary Emergency		

Performance Data	**1/4 Standby**	**1/2 Standby**	**3/4 Standby**	**Full Standby**	**Full Prime/DCC**
Engine BHP @ 1500 RPM (50 Hz)	801	1602	2402	3203	2894
Fuel Consumption L/Hr (US Gal/Hr)	163 (43)	315 (83)	436 (115)	552 (146)	497 (131)
Exhaust Gas Flow m^3/min (CFM)	163 (5760)	285 (10066)	350 (12369)	405 (14315)	370 (13052)
Exhaust Gas Temperature °C (°F)	392 (738)	428 (803)	449 (840)	480 (896)	463 (865)
Exhaust Emission Data					
HC (Total Unburned Hydrocarbons)	0.13 (54)	0.07 (30)	0.04 (19)	0.03 (13)	0.03 (15)
NOx (Oxides of Nitrogen as NO_2)	2.99 (1276)	3.07 (1362)	4.13 (2001)	6.13 (3100)	5.78 (2968)
CO (Carbon Monoxide)	0.40 (171)	0.27 (121)	0.16 (79)	0.13 (66)	0.14 (70)
PM (Particulate Matter)	0.05 (22)	0.04 (18)	0.01 (6)	0.02 (8)	0.02 (8)
SO_2 (Sulfur Dioxide)	0.005 (1.9)	0.005 (1.8)	0.004 (1.8)	0.004 (1.8)	0.004 (1.8)
Smoke (FSN)	0.53	0.45	0.20	0.04	0.03

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:	42-48 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_2O/lb) of dry air
Intake Restriction:	Set to 18 in of H_2O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg
Note:	mg/m³ values are measured dry, corrected to 5% O_2 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 results in elevated emission levels.

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	16V4000G84F				
Fuel type	EN590				
Application Group	3D				
Legislative body	Fuel-consumption optimized				
Test cycle	D2				
Fuel sulphur content [ppm]	5				
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	2185	1639	1092	546	218
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
NO_X concentration corr. (5% O_2)	ppm	2199	2629	2010	1675	2625
Carbon monoxide (CO) (5% O_2)	ppm	237	130	247	558	1344
Hydrocarbon (HC) (5% O_2)	ppm	113	162	233	453	1540
Formaldehyde (HCHO) (5% O_2)	ppm	5	5	11	28	76
NO_X mass flow	kg/h	28.83	25.44	13.46	6.19	4.89
CO mass flow	kg/h	1.75	0.71	0.95	1.19	1.48
HC_1 mass flow	kg/h	0.45	0.47	0.47	0.51	0.87
NO_X+HC_1 mass flow	kg/h	29.28	25.91	13.93	6.69	5.76

PDF	Name	Project no.	Size
Configurator	Zwisler, Petra (TVMG)	Order no.	A4
Approver1	Kneifel, Alexander (TSLE)	EDS-ID	
Approver2	Koliwer, Michael (TV)	2903-11.08.2023	
Approver3			
Approver4			
User	FN2\hummerj		

Description of Revision | Frequency

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: br4000_16v4000g_ta_luft;2_d;1.nc for 1257 in EDS platfrom.

Engine model
16V4000G84F

Title
Emission data sheet

Emissionstage
Fuel-consumption optimized

Sheet

Configuration-ID
1257

Documentation

Emissionstage basis
Fuel-consumption optimized

of

Moteurs Baudouin	Model : **20M33G2500/5**	Date : 31/08/21
	PowerKit Engine **Exhaust Gas Emissions Test Report**	Page : 1 / 1

Engine Basic data

Engine model 20M33G2500/5

Injection System..Direct

Fuel System..High Pressure Common Rail

Aspiration..Turbocharged and Aftercooled

Fuel type..Diesel

Test information

Test Date..31/08/21

Test Procedure..GB 20891*

Measured data

Model :	20M33G2500/5	Time :				
PRP :	2010 kW	ESP		2210kW		
	units	--				
Load	%	100%	75%	47%	23%	8%
Power	kW	2010	1508	945	462	161
Rotational speed	rpm	1500	1500	1500	1500	1500
Ambient temperature	°C	24.9	24.8	25.1	25.1	25.0
Exhaust temperature	°C	507	474	446	376	272
Exhaust flow rate	kg/hr	9418	8033	5638	4453	3702
Exhaust back pressure	kPa	A7.4	A3.3	A1.3	A0.3	A0.2
		B8.3	B3.8	B1.4	B0.4	B0.2
O2	ppm	8.72	9.28	10.19	13.32	16.61
NOx	mg/Nm3	1675	2554.5	2967.9	1679.7	616.4
CO	mg/Nm3	75.6	99.6	53.2	109	541.2
CO2	Ppm	8.64	8.19	7.52	5.31	2.97
HC	mg/Nm3	9.4	9	12.7	17.6	30
NOx	mg/Nm3 @5%O2	2182.4	3487.4	4392.9	3499.4	2246.5
CO	mg/Nm3 @5%O2	98.6	136	78.7	227.1	1972.3
HC	mg/Nm3 @5%O2	12.2	12.3	18.8	36.6	227.1
PM	g/kW·h			0.024		
Smoke	FSN	0.134	0.045	0.029	0.059	0.042

3516B Diesel Generator Sets
Electric Power

CAT

Package Performance

Low Emissions (90°C SCAC)

Performance	Standby		Mission Critical		Prime		Continuous	
Frequency	50 Hz		50 Hz		50 Hz		50 Hz	
Gen set power rating with fan	2000 ekW		2000 ekW		1820 ekW		1600 ekW	
Gen set power rating with fan @ 0.8 power factor	2500 kVA		2500 kVA		2275 kVA		2000 kVA	
Emissions	Low Emissions		Low Emissions		Low Emissions		Low Emissions	
Performance number	DM7975-02		EM0619-00		DM7978-01		DM7981-01	
Aftercooler (separate circuit) – °C (°F)	90	(194)	90	(194)	90	(194)	90	(194)
Fuel Consumption								
100% load with fan – L/hr (gal/hr)	525.4	(138.8)	525.4	(138.8)	4781	(126.3)	422.3	(111.6)
75% load with fan – L/hr (gal/hr)	395.8	(104.6)	395.8	(104.6)	359.3	(94.9)	315.7	(83.4)
50% load with fan – L/hr (gal/hr)	268.5	(70.9)	268.5	(70.9)	247.0	(65.2)	221.3	(58.5)
25% load with fan – L/hr (gal/hr)	153.6	(40.6)	153.6	(40.6)	142.8	(37.7)	130.0	(34.3)
Cooling System								
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)
Radiator air flow – m³/min (cfm)	1612	(56927)	1612	(56927)	1612	(56927)	1612	(56927)
Engine coolant capacity – L (gal)	233.0	(61.6)	233.0	(61.6)	233.0	(61.6)	233.0	(61.6)
Radiator coolant capacity – L (gal)	131.0	(34.6)	131.0	(34.6)	131.0	(34.6)	131.0	(34.6)
Total coolant capacity – L (gal)	364.0	(96.2)	364.0	(96.2)	364.0	(96.2)	364.0	(96.2)
Inlet Air								
Combustion air inlet flow rate – m³/min (cfm)	158.2	(5586.2)	158.2	(5586.2)	150.7	(5321.3)	139.3	(4918.9)
Exhaust System								
Exhaust stack gas temperature – °C (°F)	540.0	(1004.0)	540.0	(1004.0)	519.1	(966.4)	499.8	(931.6)
Exhaust gas flow rate – m³/min (cfm)	453.6	(16017.0)	453.6	(16017.0)	540.2	(14837.4)	378.5	(13365.4)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)
Heat Rejection								
Heat rejection to jacket water – kW (Btu/min)	759	(43164)	759	(43164)	711	(40434)	651	(37022)
Heat rejection to exhaust (total) – kW (Btu/min)	2117	(120392)	2117	(120392)	1923	(109358)	1693	(96281)
Heat rejection to aftercooler – kW (Btu/min)	4006	(23089)	4006	(23089)	347	(19733)	274	(15583)
Heat rejection to atmosphere from engine – kW (Btu/min)	175	(9952)	175	(9952)	164	(9326)	153	(8701)
Heat rejection from alternator – kW (Btu/min)	94	(5362)	94	(5362)	83	(4713)	72	(4093)
Emissions* (Nominal)								
NOx mg/Nm³ (g/hp-h)	3059.2	(6.50)	3059.2	(6.50)	3056.5	(6.50)	2749.2	(5.84)
CO mg/Nm³ (g/hp-h)	323.3	(0.69)	323.3	(0.69)	323.8	(0.69)	440.8	(0.94)
HC mg/Nm³ (g/hp-h)	55.2	(0.12)	55.2	(0.12)	55.3	(0.12)	64.4	(0.14)
PM mg/Nm³ (g/hp-h)	12.6	(0.03)	12.6	(0.03)	12.6	(0.03)	17.2	(0.04)
Emissions* (Potential Site Variation)								
NOx mg/Nm³ (g/hp-h)	3671.0	(7.80)	3671.0	(7.80)	3667.8	(7.80)	3299.1	(7.01)
CO mg/Nm³ (g/hp-h)	581.9	(1.24)	581.9	(1.24)	582.9	(1.24)	793.5	(1.69)
HC mg/Nm³ (g/hp-h)	73.4	(0.16)	73.4	(0.16)	73.6	(0.16)	85.7	(0.18)
PM mg/Nm³ (g/hp-h)	17.6	(0.04)	17.6	(0.04)	17.7	(0.04)	24.1	(0.05)

**mg/Nm³ levels are corrected to 5% O_2. Contact your local Cat dealer for further information.*

APPENDIX F

Construction Stage Emissions Estimation

Inputs to the emissions estimation during Stage 1 and Stage 2 earthworks at the Proposal site are presented in Table F1.

Table F1 Summary of assumptions adopted for assessment of Proposal earthworks

Material type	Silt content (%)	Moisture content (%)
All materials	2	2
Parameter	**Stage 1**	**Stage 2**
Haulage route length (1-way)	450	290
Average vehicle weight (t)	47.9	47.9
Haulage route silt content (%)	8.5	8.5
Site area (ha)	33.8	18.5

The activities, activity rates, and emissions anticipated in both Stage 1 and Stage 2 construction works are presented in Table F2 and Table F3. As outlined in section 5.3.1 of the main AQIA, these emissions have been summed and distributed across the relevant area and emitted as an area source. Two area sources have been included for each stage of construction, one representing volume sources during operational hours, and the other representing wind erosion sources which could emit 24 hours per day.

Table F2 Emissions estimates – Stage 1 earthworks

Description	Emission Factor	Emission rate						Emission Controls	Controlled emission (kg.yr-1)		
		TSP	PM10	PM2.5	Units	Activity Rate	Units		TSP	PM10	PM2.5
Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	39,936	t	Water sprays/wet soil (50%)	579.1	144.8	21.7
Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	39,936	t	Moist soil carryover (50%)	28.5	13.5	2.0
Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	58,580	t	Water sprays/wet soil (50%)	41.8	19.8	3.0
Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	964,550	t	Minimise drop height (30%)	963.6	455.8	69.0
Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	945,461	t	Minimise drop height (30%)	944.6	446.7	67.7
Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	9,833	VKT	Moist soil (50%)	934.4	413.0	29.0
Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	28,745	VKT	Watering (75%), speed limits (85%)	4,251.4	1,214.7	121.5
Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	33.8	ha	Assume 50% active, assume only generated in winds >	14,363.3	7,181.6	1,077.2
								TOTAL	**22,106.6**	**9,889.8**	**1,391.1**

Table F3 Emissions estimates – Stage 2 earthworks

Description	Emission Factor	Emission rate						Emission Controls	Controlled emission (kg.yr-1)		
		TSP	PM10	PM2.5	Units	Activity Rate	Units		TSP	PM10	PM2.5
Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	29,866	t	Water sprays/wet soil (50%)	433.1	108.3	16.2
Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	29,866	t	Moist soil carryover (50%)	21.3	10.1	1.5
Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	44,575	t	Water sprays/wet soil (50%)	31.8	15.0	2.3
Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	855,537	t	Minimise drop height (30%)	854.7	404.3	61.2
Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	552,268	t	Minimise drop height (30%)	551.7	261.0	39.5
Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	13,110	VKT	Moist soil (50%)	1,245.9	550.6	38.6
Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	16,431	VKT	Watering (75%), speed limits 85%	2,430.1	694.3	69.4
Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	18.5	ha	Assume 50% active, assume only generated in winds >	7,846.2	3,923.1	588.5
								TOTAL	**13,414.8**	**5,966.7**	**817.3**

Table F3 Emissions estimates – surrounding earthworks activities

Description	Emission Factor	Emission rate						Emission Controls	Controlled emission (kg.yr-1)		
		TSP	PM10	PM2.5	Units	Activity Rate	Units		TSP	PM10	PM2.5
A - Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	-	t	Water sprays/wet soil (50%)	-	-	-
A - Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	-	t	Moist soil carryover (50%)	-	-	-
A - Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	-	t	Water sprays/wet soil (50%)	-	-	-
A - Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	37,976	t	Minimise drop height (30%)	37.9	17.9	2.7
A - Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	101	t	Minimise drop height (30%)	0.1	0.0	0.0
A - Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	19,665	VKT	Moist soil (50%)	1,868.8	825.9	57.9
C - Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	77,333	t	Water sprays/wet soil (50%)	1,121.3	280.3	42.0
C - Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	77,333	t	Moist soil carryover (50%)	55.2	26.1	4.0
C - Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	5,090	t	Water sprays/wet soil (50%)	3.6	1.7	0.3
C - Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	577,010	t	Minimise drop height (30%)	576.5	272.6	41.3
C - Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	739,039	t	Minimise drop height (30%)	738.3	349.2	52.9
C - Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	19,665	VKT	Moist soil (50%)	1,868.8	825.9	57.9
D - Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	40,308	t	Water sprays/wet soil (50%)	584.5	146.1	21.9
D - Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	40,308	t	Moist soil carryover (50%)	28.8	13.6	2.1
D - Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	-	t	Water sprays/wet soil (50%)	-	-	-
D - Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	376,348	t	Minimise drop height (30%)	376.0	177.8	26.9
D - Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	472,411	t	Minimise drop height (30%)	472.0	223.2	33.8
D - Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	8,740	VKT	Moist soil (50%)	830.6	367.1	25.7
E - Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	35,657	t	Water sprays/wet soil (50%)	517.0	129.3	19.4
E - Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	35,657	t	Moist soil carryover (50%)	25.4	12.0	1.8
E - Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	7,407	t	Water sprays/wet soil (50%)	5.3	2.5	0.4
E - Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	121,900	t	Minimise drop height (30%)	121.8	57.6	8.7
E - Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	174,474	t	Minimise drop height (30%)	174.3	82.4	12.5
E - Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	26,220	VKT	Moist soil (50%)	2,491.8	1,101.2	77.2
K - Topsoil stripping	AP-42 - Topsoil removal by scraper - Table 11.9-4	2.9E-02	7.3E-03	1.1E-03	kg·t-1	36,123	t	Water sprays/wet soil (50%)	523.8	130.9	19.6
K - Topsoil unloading	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	36,123	t	Moist soil carryover (50%)	25.8	12.2	1.8
K - Excavation of creeks and dams/sediment basins	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	12,120	t	Water sprays/wet soil (50%)	8.6	4.1	0.6
K - Excavator - load to haul truck	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	1,077,533	t	Minimise drop height (30%)	1,076.5	509.2	77.1
K - Unload at fill location	AP-42 - Batch drop - Section 13.2.4.3	1.4E-03	6.8E-04	1.0E-04	kg·t-1	1,047,853	t	Minimise drop height (30%)	1,046.9	495.1	75.0
K - Grading	AP-42 - Grading - Table 11.9-2	1.9E-01	8.4E-02	5.9E-03	kg·VKT-1	7,866	VKT	Moist soil (50%)	747.5	330.4	23.2
A - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	428	VKT	Watering (75%), speed limits 85%	63.2	18.1	1.8
C - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	22,545	VKT	Watering (75%), speed limits 85%	3,334.5	952.7	95.3
D - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	17,447	VKT	Watering (75%), speed limits 85%	2,580.4	737.3	73.7
E - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	2,018	VKT	Watering (75%), speed limits 85%	298.5	85.3	8.5
K - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	27,830	VKT	Watering (75%), speed limits 85%	4,116.1	1,176.1	117.6
J - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	50,947	VKT	Watering (75%), speed limits 85%	7,535.1	2,152.9	215.3
L - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	535	VKT	Watering (75%), speed limits 85%	79.1	22.6	2.3
N - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	18,211	VKT	Watering (75%), speed limits 85%	2,693.4	769.6	77.0
Q - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	146,370	VKT	Watering (75%), speed limits 85%	21,648.4	6,185.4	618.5
R - Haulage to fill (or offsite)	AP-42 Unpaved roads - Section 13.2.2	3.9E+00	1.1E+00	1.1E-01	kg·VKT-1	9,003	VKT	Watering (75%), speed limits 85%	1,331.6	380.5	38.0
A - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	1.7	ha	Assume 50% active, assume only generated in winds >	714.0	357.0	53.6
C - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	38.6	ha	Assume 50% active, assume only generated in winds >	16,388.0	8,194.0	1,229.1
D - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	33.1	ha	Assume 50% active, assume only generated in winds >	14,067.5	7,033.8	1,055.1
E - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	21.0	ha	Assume 50% active, assume only generated in winds >	8,942.0	4,471.0	670.7
K - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	63.3	ha	Assume 50% active, assume only generated in winds >	26,902.5	13,451.3	2,017.7
J - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	30.4	ha	Assume 50% active, assume only generated in winds >	12,898.8	6,449.4	967.4
L - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	10.1	ha	Assume 50% active, assume only generated in winds >	4,312.5	2,156.2	323.4
N - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	72.1	ha	Assume 50% active, assume only generated in winds >	30,642.5	15,321.3	2,298.2
Q - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	53.7	ha	Assume 50% active, assume only generated in winds >	22,822.5	11,411.3	1,711.7
R - Wind erosion	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	8.5E+02	4.3E+02	6.4E+01	kg·ha-1·yr-1	8.3	ha	Assume 50% active, assume only generated in winds >	3,535.8	1,767.9	265.2
								TOTAL	**200,233.4**	**89,488.1**	**12,526.9**

Note: Refer to Table 24 and Figure 16 of the main AQIA for site references (“A”, “B”, etc)

APPENDIX G

Cumulative Impacts – Maintenance Testing

The potential for cumulative air quality impacts to occur at surrounding sensitive receptor locations due to impacts associated with the Proposal and other surrounding data centres during regular generator maintenance testing has been considered within this AQIA in a quantitative manner, as required by the SEARs.

Eight data centres have been identified within a 5 km radius of the Proposal site (see Figure G1) and relevant documentation associated with each of those developments has been reviewed and adopted as outlined in Table G1 and Table G2.

The specific emissions parameters and exhaust characteristics for each data centre have been adopted as presented in Table G1. Data for three of the eight data centres was not available, and information retrieved from online searches was adopted (e.g. generator manufacturer, make and model). Table G3 provides the input data for dispersion modelling adopted.

Table G1 Information obtained for cumulative assessment

Details	Approved/ operational	Proposed
Generator testing hours	Conditions of Consent	AQIA
Generators permitted to be tested at one time	Conditions of Consent AQIA	AQIA
Generator specifications (emission rates, flue heights, diameters etc.)	AQIA	AQIA

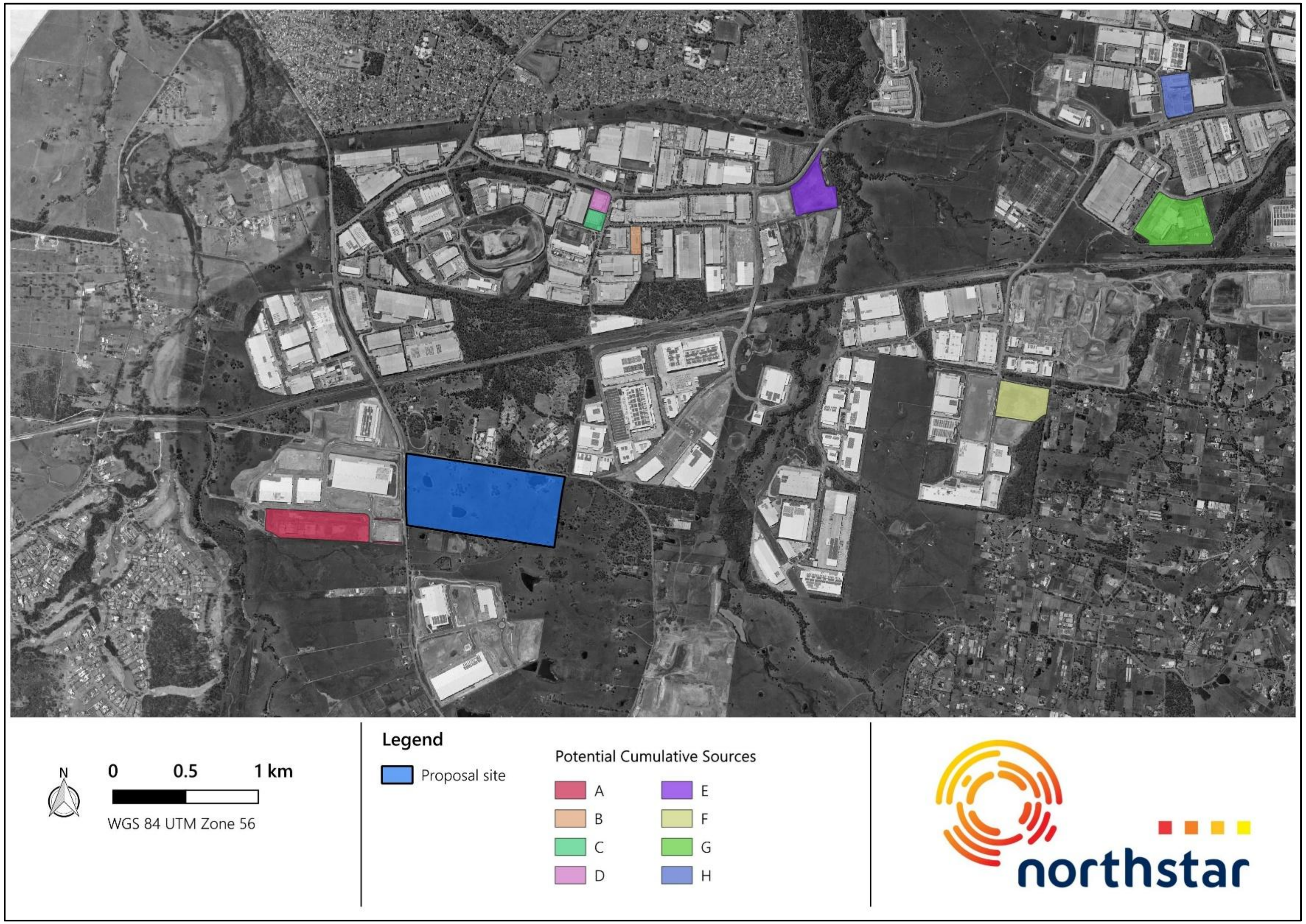
Table G2 Generator testing regimes for surrounding data centres

ID	Data centre	Suburb	No. of generators tested at once	Hours of testing	Consent
A	SYD05	Kemps Creek	1	7am to 6pm (Mon-Fri) 8am to 6pm (Sun and PH)	SSD-10101987
B	CDC	Eastern Creek	5	9am to 4pm (Mon to Fri)	SSD-10330
C	Echidna	Eastern Creek	3	7am to 6pm (Mon to Fri)	SSD-47320208
D[(B)]	NEXTDC S4	Horsley Park	2	7am to 6pm (Mon to Fri) 8am to 6pm (Sundays)	SSD-63741210
E[(A)]	STACK SYD01	Erskine Park	2	7am to 6pm (Mon to Fri)	SSD-82211208
F[(A)]	Digital Realty SYD10	Erskine Park	1	7am to 6pm (Mon to Fri)	-
G[(A)]	Digital Realty SYD11	Erskine Park	1	7am to 6pm (Mon to Fri)	-
H[(A)]	Digital Realty SYD14	Erskine Park	1	7am to 6pm (Mon to Fri)	-

Notes: (A): No data available online – assumptions adopted

(B): Currently at Response to Submissions phase

Figure G1 Surrounding data centres considered in cumulative assessment



Source: Northstar

Table F3 Emission parameters for surrounding data centres – testing regime

Parameter	Units	A	B	C	D	E	F	G	H
Hour start	Hr	0700	0900	0700	0700	0700	0700	0700	0700
Hour end	Hr	1800	1600	1800	1800	1800	1800	1800	1800
Number of active generators	no.	1	5	3	2	2	1	1	1
Stack height [f]	m AGL	20	6	25, 30, 13.2	41.3	33.4	13	13	13
Stack diameter	mm ID	0.5	0.54	0.65, 0.55, 0.4	0.6	0.6	0.5	0.5	0.5
Exit temperature	K	733.9	657.2	730.2, 768.2, 713.2	734.2	793..2	714.3	714.3	714.3
Exit velocity	$m \cdot s^{-1}$	59.8	34.4	33.5, 38.9, 35.8	19.2	43.4	35.8	35.8	35.8
Pollutant emission rates									
NO_X [a]	$g \cdot s^{-1}$	6.3	6.7	6.1, 3.7, 6.5	7.9	13.9	7.7	7.7	7.7
PM (PM_{10} and $PM_{2.5}$) [a][d]	$g \cdot s^{-1}$	0.02	0.01	0.02, 0.04, 0.03	0.03	0.06	0.03	0.03	0.03

APPENDIX H

Schedule of Results

Scenario C1

Receptor category	Incremental impact	Background (regional)	Background (other construction)	Cumulative impact
Annual average TSP (µg·m^{-3})				
Criterion	90			
Max % of criterion	22.4%	37.2%	21.9%	62.0%
Residential	12.2	33.5	7.7	47.9
Educational	20.2	33.5	2.5	55.8
Industrial	5.8	33.5	19.7	53.3
Recreational	0.3	33.5	1.0	34.6
Medical	0.1	33.5	0.4	34.0
Annual average PM_{10} (µg·m^{-3})				
Criterion	25			
Max % of criterion	37.2%	65.1%	37.8%	107.8%
Residential	5.7	16.3	4.4	23.4
Educational	9.3	16.3	1.5	27.0
Industrial	3.0	16.3	9.4	22.9
Recreational	0.2	16.3	0.7	17.1
Medical	0.1	16.3	0.3	16.7
Annual average $PM_{2.5}$ (µg·m^{-3})				
Criterion	8			
Max % of criterion	14.4%	72.2%	15.0%	88.5%
Residential	0.7	5.8	0.4	6.6
Educational	1.2	5.8	0.2	7.1
Industrial	0.4	5.8	1.2	6.4
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8
Annual average deposited dust (g·m^{-2}·month^{-1})				
Criterion	2	-	-	4
Max % of criterion	27.9%	-	-	64.9%
Residential	0.3	2.0	0.2	2.4
Educational	0.6	2.0	< 0.1	2.6
Industrial	0.1	2.0	0.5	2.5
Recreational	< 0.1	2.0	< 0.1	2.0
Medical	< 0.1	2.0	< 0.1	2.0

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Receptor 2 Date	24-hour average PM_{10} concentration ($\mu g{\cdot}m^{-3}$) Incremental Impact	Background	Surrounding sources	Cumulative Impact	Receptor 2 Date	24-hour average PM_{10} concentration ($\mu g{\cdot}m^{-3}$) Incremental Impact	Background	Surrounding sources	Cumulative Impact
20/04/2021	20.7	46.2	< 0.1	66.9	13/06/2021	20.9	11.5	1.6	34.0
4/05/2021	6.9	54.9	1.0	62.8	19/07/2021	20.9	9.9	0.6	31.3
21/08/2021	18.8	34.6	< 0.1	53.4	19/09/2021	20.7	9.7	< 0.1	30.4
23/04/2021	16.6	29.9	3.5	50.0	20/04/2021	20.7	46.2	< 0.1	66.9
28/10/2021	12.1	36.6	1.0	49.7	27/03/2021	20.6	10.9	1.4	32.9
20/08/2021	13.7	34.1	1.4	49.3	18/09/2021	19.9	18.4	< 0.1	38.3
18/01/2021	10.9	35.8	1.7	48.4	21/08/2021	18.8	34.6	< 0.1	53.4
25/01/2021	13.0	33.5	< 0.1	46.5	23/08/2021	18.1	25.4	< 0.1	43.5
27/04/2021	8.7	35.4	2.0	46.1	19/12/2021	17.6	17.6	0.2	35.4
19/04/2021	12.7	32.9	0.2	45.8	25/06/2021	17.5	7.9	< 0.1	25.4

Receptor 2 Date	24-hour average $PM_{2.5}$ concentration ($\mu g{\cdot}m^{-3}$) Incremental Impact	Background	Surrounding sources	Cumulative Impact	Receptor 4 Date	24-hour average $PM_{2.5}$ concentration ($\mu g{\cdot}m^{-3}$) Incremental Impact	Background	Surrounding sources	Cumulative Impact
4/05/2021	0.8	40.3	0.1	41.1	27/03/2021	2.6	5.0	0.1	7.7
29/04/2021	0.7	21.8	0.3	22.5	19/09/2021	2.5	2.8	< 0.1	5.3
23/04/2021	2.0	19.5	0.3	21.5	18/09/2021	2.5	9.2	< 0.1	11.7
20/08/2021	1.7	19.2	0.2	20.9	20/04/2021	2.4	10.5	< 0.1	12.9
15/08/2021	1.6	16.1	0.2	17.7	19/07/2021	2.4	5.8	< 0.1	8.3
10/10/2021	0.8	16.9	0.2	17.7	13/06/2021	2.4	10.2	0.1	12.7
23/08/2021	2.4	14.7	< 0.1	17.1	23/08/2021	2.3	14.7	< 0.1	17.0
3/05/2021	1.8	14.9	< 0.1	16.7	19/12/2021	2.3	2.2	< 0.1	4.5
21/08/2021	2.2	13.8	< 0.1	16.0	21/08/2021	2.2	13.8	< 0.1	16.0
14/08/2021	1.3	14.3	< 0.1	15.6	25/06/2021	2.2	4.6	< 0.1	6.8

Scenario C2

Receptor category	Incremental impact	Background (regional)	Background (other construction)	Cumulative impact
Annual average TSP ($\mu g \cdot m^{-3}$)				
Criterion	90			
Max % of criterion	11.5%	37.2%	21.9%	60.3%
Residential	2.3	33.5	7.7	41.3
Educational	5.7	33.5	2.5	41.6
Industrial	10.4	33.5	19.7	54.3
Recreational	0.2	33.5	1.0	34.3
Medical	< 0.1	33.5	0.4	33.5
Annual average PM_{10} ($\mu g \cdot m^{-3}$)				
Criterion	25			
Max % of criterion	19.7%	65.1%	37.8%	105.9%
Residential	1.4	16.3	4.4	19.0
Educational	2.9	16.3	1.5	20.7
Industrial	4.9	16.3	9.4	26.5
Recreational	0.2	16.3	0.7	17.0
Medical	< 0.1	16.3	0.3	16.3
Annual average $PM_{2.5}$ ($\mu g \cdot m^{-3}$)				
Criterion	8			
Max % of criterion	7.3%	72.2%	15.0%	87.3%
Residential	0.2	5.8	0.4	6.1
Educational	0.3	5.8	0.2	6.3
Industrial	0.6	5.8	1.2	7.0
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8
Annual average deposited dust ($g \cdot m^{-2} \cdot month^{-1}$)				
Criterion	2	-	-	4
Max % of criterion	13.1%	-	-	63.7%
Residential	< 0.1	2.0	0.2	2.2
Educational	0.1	2.0	< 0.1	2.2
Industrial	0.3	2.0	0.5	2.5
Recreational	< 0.1	2.0	< 0.1	2.0
Medical	< 0.1	2.0	< 0.1	2.0

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Receptor 6	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)				Receptor 41	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)			
Date	Incremental Impact	Background	Surrounding sources	Cumulative Impact	Date	Incremental Impact	Background	Surrounding sources	Cumulative Impact
4/05/2021	4.9	54.9	2.3	62.1	20/05/2021	16.1	14.7	13.5	44.3
20/04/2021	<0.1	46.2	< 0.1	46.2	27/03/2021	15.3	10.9	4.1	30.2
27/04/2021	6.5	35.4	2.6	44.5	8/05/2021	15.1	9.9	6.6	31.5
29/04/2021	5.3	36.0	2.7	43.9	27/06/2021	14.9	10.2	5.1	30.2
18/01/2021	5.6	35.8	1.7	43.0	23/04/2021	14.0	29.9	3.9	47.7
28/10/2021	2.3	36.6	1.4	40.4	22/04/2021	12.7	21.1	4.3	38.1
2/03/2021	4.8	33.8	1.6	40.1	5/07/2021	12.6	10.9	4.4	27.8
20/08/2021	3.7	34.1	2.1	39.9	6/06/2021	12.4	12.5	7.3	32.2
5/03/2021	4.2	32.7	2.0	38.9	15/04/2021	12.3	25.3	6.1	43.6
16/04/2021	5.6	29.9	3.0	38.5	6/08/2021	12.0	15.4	3.6	30.9

Receptor 6	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)				Receptor 41	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			
Date	Incremental Impact	Background	Surrounding sources	Cumulative Impact	Date	Incremental Impact	Background	Surrounding sources	Cumulative Impact
4/05/2021	0.6	40.3	0.3	41.2	20/05/2021	1.9	8.2	1.6	11.7
29/04/2021	0.6	21.8	0.3	22.8	27/03/2021	1.8	5.0	0.4	7.2
23/04/2021	0.2	19.5	0.2	19.9	8/05/2021	1.8	4.5	0.7	7.0
20/08/2021	0.5	19.2	0.3	19.9	27/06/2021	1.7	9.6	0.6	11.9
10/10/2021	0.3	16.9	0.3	17.5	23/04/2021	1.6	19.5	0.4	21.6
15/08/2021	0.8	16.1	0.3	17.2	22/04/2021	1.5	13.4	0.5	15.4
14/08/2021	0.7	14.3	< 0.1	15.0	6/06/2021	1.5	9.5	0.9	11.8
3/05/2021	<0.1	14.9	< 0.1	14.9	5/07/2021	1.5	6.2	0.5	8.1
23/08/2021	<0.1	14.7	< 0.1	14.7	15/04/2021	1.4	5.2	0.7	7.3
19/01/2021	0.7	13.8	0.4	14.8	7/05/2021	1.4	4.5	0.9	6.8

Emergency Operations

Scenario E1

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	395.5 %	6.3 %	395.5 %
Residential	599.9	<0.1	600.0
Educational	561.4	6.2	567.5
Industrial	648.6	<0.1	648.7
Recreational	575.1	10.3	585.4
Medical	413.1	2.1	415.1

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	186.4 %	372.8 %
Residential	54.0	54.0
Educational	78.8	78.8
Industrial	93.2	93.2
Recreational	10.7	10.7
Medical	27.9	27.9

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)			Receptor 14 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	93.2	46.2	139.4	20/04/2021	93.2	46.2	139.4
19/09/2021	87.7	9.7	97.4	17/06/2021	89.7	4.3	94.0
17/06/2021	89.7	4.3	94.0	19/09/2021	87.7	9.7	97.4
20/08/2021	58.0	34.1	92.1	24/03/2021	78.1	6.7	84.8
24/07/2021	77.4	9.9	87.3	24/07/2021	77.4	9.9	87.3
24/03/2021	78.1	6.7	84.8	14/04/2021	68.5	16.0	84.5
14/04/2021	68.5	16.0	84.5	6/02/2021	65.6	13.6	79.2
18/09/2021	61.4	18.4	79.8	26/07/2021	64.1	8.7	72.8
6/02/2021	65.6	13.6	79.2	25/02/2021	62.6	16.4	79.0
25/02/2021	62.6	16.4	79.0	18/06/2021	62.4	7.0	69.4

Maximum 24-hour $PM_{2.5}$

Receptor 14 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 14 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	93.2	10.5	103.7	20/04/2021	93.2	10.5	103.7
17/06/2021	89.7	2.7	92.4	17/06/2021	89.7	2.7	92.4
19/09/2021	87.7	2.8	90.5	19/09/2021	87.7	2.8	90.5
24/07/2021	77.4	7.2	84.6	24/03/2021	78.1	1.6	79.7
24/03/2021	78.1	1.6	79.7	24/07/2021	77.4	7.2	84.6
20/08/2021	58.0	19.2	77.2	14/04/2021	68.5	4.2	72.7
14/04/2021	68.5	4.2	72.7	6/02/2021	65.6	6.5	72.1
6/02/2021	65.6	6.5	72.1	26/07/2021	64.1	3.0	67.1
18/09/2021	61.4	9.2	70.6	25/02/2021	62.6	6.1	68.7
25/02/2021	62.6	6.1	68.7	18/06/2021	62.4	1.4	63.8

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg{\cdot}m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	6.7%	2.1%	8.8%
Residential	3.9	2.1	6.0
Educational	3.5	2.1	5.6
Industrial	6.7	2.1	8.8
Recreational	0.9	2.1	3.0
Medical	0.8	2.1	2.9
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	16.9%	5.3%	22.2%
Residential	3.0	1.6	4.6
Educational	2.6	1.6	4.2
Industrial	5.1	1.6	6.7
Recreational	0.7	1.6	2.3
Medical	0.6	1.6	2.2
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	34.5%	13.0%	47.5%
Residential	1.6	1.3	2.9
Educational	1.9	1.3	3.2
Industrial	3.5	1.3	4.8
Recreational	0.5	1.3	1.8
Medical	0.3	1.3	1.6

Two or Three Feeder Outage

Maximum 1-hour NO2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	779.2 %	6.3 %	779.2 %
Residential	1 181.9	<0.1	1 182.0
Educational	1 106.0	6.2	1 112.1
Industrial	1 277.9	<0.1	1 278.0
Recreational	1 133.1	10.3	1 143.4
Medical	813.8	2.1	815.9

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	367.2 %	734.4 %
Residential	106.5	106.5
Educational	155.2	155.2
Industrial	183.6	183.6
Recreational	21.0	21.0
Medical	54.9	54.9

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	183.6	46.2	229.8	20/04/2021	183.6	46.2	229.8
19/09/2021	172.8	9.7	182.5	17/06/2021	176.7	4.3	181.0
17/06/2021	176.7	4.3	181.0	19/09/2021	172.8	9.7	182.5
24/07/2021	152.5	9.9	162.4	24/03/2021	153.9	6.7	160.6
24/03/2021	153.9	6.7	160.6	24/07/2021	152.5	9.9	162.4
14/04/2021	134.9	16.0	150.9	14/04/2021	134.9	16.0	150.9
20/08/2021	114.3	34.1	148.4	6/02/2021	129.3	13.6	142.9
6/02/2021	129.3	13.6	142.9	26/07/2021	126.2	8.7	134.9
25/02/2021	123.4	16.4	139.8	25/02/2021	123.4	16.4	139.8
18/09/2021	120.9	18.4	139.3	18/06/2021	123.0	7.0	130.0

Maximum 24-hour $PM_{2.5}$

Receptor 14 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 14 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	183.6	10.5	194.1	20/04/2021	183.6	10.5	194.1
17/06/2021	176.7	2.7	179.4	17/06/2021	176.7	2.7	179.4
19/09/2021	172.8	2.8	175.6	19/09/2021	172.8	2.8	175.6
24/07/2021	152.5	7.2	159.7	24/03/2021	153.9	1.6	155.5
24/03/2021	153.9	1.6	155.5	24/07/2021	152.5	7.2	159.7
14/04/2021	134.9	4.2	139.1	14/04/2021	134.9	4.2	139.1
6/02/2021	129.3	6.5	135.8	6/02/2021	129.3	6.5	135.8
20/08/2021	114.3	19.2	133.5	26/07/2021	126.2	3.0	129.2
18/09/2021	120.9	9.2	130.1	25/02/2021	123.4	6.1	129.5
25/02/2021	123.4	6.1	129.5	18/06/2021	123.0	1.4	124.4

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	13.1%	2.1%	15.2%
Residential	7.8	2.1	9.9
Educational	6.8	2.1	8.9
Industrial	13.1	2.1	15.2
Recreational	1.8	2.1	3.9
Medical	1.5	2.1	3.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	33.2%	5.3%	38.5%
Residential	5.9	1.6	7.5
Educational	5.2	1.6	6.8
Industrial	10.0	1.6	11.6
Recreational	1.4	1.6	3.0
Medical	1.1	1.6	2.7
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	68.1%	13.0%	81.1%
Residential	3.2	1.3	4.5
Educational	3.7	1.3	5.0
Industrial	6.8	1.3	8.1
Recreational	1.0	1.3	2.3
Medical	0.6	1.3	1.9

Scenario E2

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	704.9 %	6.3 %	706.0 %
Residential	1 147.6	10.3	1 157.9
Educational	1 062.8	6.2	1 068.9
Industrial	1 156.1	<0.1	1 156.1
Recreational	1 094.2	10.3	1 104.4
Medical	797.4	<0.1	797.5

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	323.6 %	647.2 %
Residential	80.5	80.5
Educational	130.5	130.5
Industrial	161.8	161.8
Recreational	21.2	21.2
Medical	55.9	55.9

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
15/04/2021	161.8	25.3	187.1	15/04/2021	161.8	25.3	187.1
9/04/2021	129.2	18.2	147.4	19/07/2021	137.2	9.9	147.1
19/07/2021	137.2	9.9	147.1	20/06/2021	134.5	8.0	142.5
20/06/2021	134.5	8.0	142.5	9/04/2021	129.2	18.2	147.4
8/07/2021	122.1	19.5	141.6	19/03/2021	123.0	13.8	136.8
3/03/2021	113.4	24.8	138.2	8/07/2021	122.1	19.5	141.6
19/03/2021	123.0	13.8	136.8	10/07/2021	120.5	7.9	128.4
4/09/2021	114.1	16.3	130.4	14/09/2021	115.7	8.5	124.2
19/01/2021	99.7	30.0	129.7	22/07/2021	114.2	14.1	128.3
10/07/2021	120.5	7.9	128.4	4/09/2021	114.1	16.3	130.4

Maximum 24-hour $PM_{2.5}$

Receptor 14 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 14 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
15/04/2021	161.8	5.2	167.0	15/04/2021	161.8	5.2	167.0
19/07/2021	137.2	5.8	143.0	19/07/2021	137.2	5.8	143.0
20/06/2021	134.5	1.2	135.7	20/06/2021	134.5	1.2	135.7
9/04/2021	129.2	5.0	134.2	9/04/2021	129.2	5.0	134.2
8/07/2021	122.1	8.7	130.8	19/03/2021	123.0	2.9	125.9
19/03/2021	123.0	2.9	125.9	8/07/2021	122.1	8.7	130.8
10/07/2021	120.5	4.1	124.6	10/07/2021	120.5	4.1	124.6
22/07/2021	114.2	7.3	121.5	14/09/2021	115.7	2.3	118.0
4/09/2021	114.1	5.3	119.4	22/07/2021	114.2	7.3	121.5
27/06/2021	109.4	9.6	119.0	4/09/2021	114.1	5.3	119.4

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	11.3%	2.1%	13.4%
Residential	5.8	2.1	7.9
Educational	6.5	2.1	8.6
Industrial	11.3	2.1	13.4
Recreational	1.8	2.1	3.9
Medical	1.5	2.1	3.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	28.4%	5.3%	33.8%
Residential	4.4	1.6	6.0
Educational	4.9	1.6	6.5
Industrial	8.5	1.6	10.1
Recreational	1.4	1.6	3.0
Medical	1.1	1.6	2.7
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	46.1%	13.0%	59.1%
Residential	2.3	1.3	3.6
Educational	3.2	1.3	4.5
Industrial	4.6	1.3	5.9
Recreational	1.0	1.3	2.3
Medical	0.6	1.3	1.9

Two or Three Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1388.7 %	6.3 %	1388.7 %
Residential	2 260.7	10.3	2 271.0
Educational	2 093.6	6.2	2 099.7
Industrial	2 277.4	<0.1	2 277.5
Recreational	2 155.5	10.3	2 165.7
Medical	1 570.9	<0.1	1 570.9

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	637.5 %	1 275.0 %
Residential	158.5	158.5
Educational	257.1	257.1
Industrial	318.8	318.8
Recreational	41.7	41.7
Medical	110.1	110.1

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
15/04/2021	318.8	25.3	344.1	15/04/2021	318.8	25.3	344.1
19/07/2021	270.3	9.9	280.2	19/07/2021	270.3	9.9	280.2
20/06/2021	264.9	8.0	272.9	20/06/2021	264.9	8.0	272.9
9/04/2021	254.5	18.2	272.7	9/04/2021	254.5	18.2	272.7
8/07/2021	240.6	19.5	260.1	19/03/2021	242.2	13.8	256.0
19/03/2021	242.2	13.8	256.0	8/07/2021	240.6	19.5	260.1
3/03/2021	223.4	24.8	248.2	10/07/2021	237.4	7.9	245.3
10/07/2021	237.4	7.9	245.3	14/09/2021	228.0	8.5	236.5
4/09/2021	224.9	16.3	241.2	22/07/2021	225.0	14.1	239.1
22/07/2021	225.0	14.1	239.1	4/09/2021	224.9	16.3	241.2

Maximum 24-hour $PM_{2.5}$

Receptor 14 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 14 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
15/04/2021	318.8	5.2	324.0	15/04/2021	318.8	5.2	324.0
19/07/2021	270.3	5.8	276.1	19/07/2021	270.3	5.8	276.1
20/06/2021	264.9	1.2	266.1	20/06/2021	264.9	1.2	266.1
9/04/2021	254.5	5.0	259.5	9/04/2021	254.5	5.0	259.5
8/07/2021	240.6	8.7	249.3	19/03/2021	242.2	2.9	245.1
19/03/2021	242.2	2.9	245.1	8/07/2021	240.6	8.7	249.3
10/07/2021	237.4	4.1	241.5	10/07/2021	237.4	4.1	241.5
22/07/2021	225.0	7.3	232.3	14/09/2021	228.0	2.3	230.3
14/09/2021	228.0	2.3	230.3	22/07/2021	225.0	7.3	232.3
4/09/2021	224.9	5.3	230.2	4/09/2021	224.9	5.3	230.2

Maximum 1-hour and 24-hour SO_2

Receptor category	SO_2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	22.2%	2.1%	24.3%
Residential	11.4	2.1	13.5
Educational	12.8	2.1	14.9
Industrial	22.2	2.1	24.3
Recreational	3.6	2.1	5.7
Medical	3.0	2.1	5.1
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	56.0%	5.3%	61.3%
Residential	8.6	1.6	10.2
Educational	9.7	1.6	11.3
Industrial	16.8	1.6	18.4
Recreational	2.8	1.6	4.4
Medical	2.2	1.6	3.8
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	90.7%	13.0%	103.7%
Residential	4.5	1.3	5.8
Educational	6.4	1.3	7.7
Industrial	9.1	1.3	10.4
Recreational	1.9	1.3	3.2
Medical	1.2	1.3	2.5

Scenario E3

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m⁻³)		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	654.7 %	7.5 %	660.9 %
Residential	1 052.0	12.3	1 064.3
Educational	924.6	10.3	934.8
Industrial	984.4	12.3	996.7
Recreational	1 073.7	10.3	1 084.0
Medical	770.2	2.1	772.3

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m⁻³)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	198.6 %	397.2 %
Residential	64.3	64.3
Educational	99.3	99.3
Industrial	90.3	90.3
Recreational	20.6	20.6
Medical	47.1	47.1

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m⁻³)			Receptor 2 Date	24-hour average PM_{10} concentration (µg·m⁻³)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	90.3	46.2	136.5	13/08/2021	100.7	15.0	115.7
2/09/2021	84.0	36.0	120.0	6/07/2021	89.6	18.1	107.7
24/01/2021	83.1	25.4	108.5	27/06/2021	85.0	10.2	95.2
28/10/2021	70.8	36.6	107.4	26/04/2021	84.3	20.2	104.5
22/01/2021	73.1	31.4	104.5	15/04/2021	79.2	25.3	104.5
8/03/2021	77.0	25.5	102.5	24/04/2021	79.0	19.4	98.4
21/08/2021	66.7	34.6	101.3	30/05/2021	77.7	8.1	85.8
11/09/2021	79.2	22.1	101.3	13/09/2021	76.2	14.8	91.0
9/10/2021	77.2	23.8	101.0	12/05/2021	76.1	15.1	91.2
20/08/2021	65.4	34.1	99.5	21/06/2021	75.9	8.7	84.6

Maximum 24-hour $PM_{2.5}$

Receptor 2 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 2 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
13/08/2021	100.7	4.4	105.1	13/08/2021	100.7	4.4	105.1
6/07/2021	89.6	7.4	97.0	6/07/2021	89.6	7.4	97.0
26/04/2021	84.3	10.9	95.2	27/06/2021	85.0	9.6	94.6
27/06/2021	85.0	9.6	94.6	26/04/2021	84.3	10.9	95.2
24/04/2021	79.0	9.0	88.0	15/04/2021	79.2	5.2	84.4
23/04/2021	67.1	19.5	86.6	24/04/2021	79.0	9.0	88.0
15/04/2021	79.2	5.2	84.4	30/05/2021	77.7	2.3	80.0
30/05/2021	77.7	2.3	80.0	13/09/2021	76.2	3.2	79.4
7/08/2021	75.2	4.7	79.9	12/05/2021	76.1	3.8	79.9
12/05/2021	76.1	3.8	79.9	21/06/2021	75.9	1.7	77.6

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration ($mg\cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	7.9%	2.1%	10.0%
Residential	4.6	2.1	6.7
Educational	5.3	2.1	7.4
Industrial	7.9	2.1	10.0
Recreational	1.8	2.1	3.9
Medical	1.4	2.1	3.5
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	20.0%	5.3%	25.3%
Residential	3.5	1.6	5.1
Educational	4.0	1.6	5.6
Industrial	6.0	1.6	7.6
Recreational	1.4	1.6	3.0
Medical	1.1	1.6	2.7
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	59.9%	13.0%	72.9%
Residential	3.5	1.3	4.8
Educational	4.0	1.3	5.3
Industrial	6.0	1.3	7.3
Recreational	1.4	1.3	2.7
Medical	1.1	1.3	2.4

Two Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration ($\mu g\cdot m^{-3}$)		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1604.8 %	7.5 %	1611.0 %
Residential	2 578.5	12.3	2 590.8
Educational	2 266.3	10.3	2 276.5
Industrial	2 413.0	12.3	2 425.3
Recreational	2 631.8	10.3	2 642.0
Medical	1 887.9	2.1	1 889.9

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	486.8 %	973.5 %
Residential	157.6	157.6
Educational	243.4	243.4
Industrial	221.5	221.5
Recreational	50.4	50.4
Medical	115.5	115.5

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 2 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	221.5	46.2	267.7	13/08/2021	246.9	15.0	261.9
2/09/2021	205.9	36.0	241.9	6/07/2021	219.5	18.1	237.6
24/01/2021	203.8	25.4	229.2	27/06/2021	208.4	10.2	218.6
24/07/2021	206.4	9.9	216.3	26/04/2021	206.7	20.2	226.9
11/09/2021	194.2	22.1	216.3	15/04/2021	194.2	25.3	219.5
14/04/2021	198.2	16.0	214.2	24/04/2021	193.7	19.4	213.1
8/03/2021	188.6	25.5	214.1	30/05/2021	190.5	8.1	198.6
9/10/2021	189.2	23.8	213.0	13/09/2021	186.7	14.8	201.5
22/01/2021	179.3	31.4	210.7	12/05/2021	186.5	15.1	201.6
28/10/2021	173.6	36.6	210.2	21/06/2021	186.1	8.7	194.8

Maximum 24-hour $PM_{2.5}$

Receptor 2 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 2 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
13/08/2021	246.9	4.4	251.3	13/08/2021	246.9	4.4	251.3
6/07/2021	219.5	7.4	226.9	6/07/2021	219.5	7.4	226.9
27/06/2021	208.4	9.6	218.0	27/06/2021	208.4	9.6	218.0
26/04/2021	206.7	10.9	217.6	26/04/2021	206.7	10.9	217.6
24/04/2021	193.7	9.0	202.7	15/04/2021	194.2	5.2	199.4
15/04/2021	194.2	5.2	199.4	24/04/2021	193.7	9.0	202.7
30/05/2021	190.5	2.3	192.8	30/05/2021	190.5	2.3	192.8
12/05/2021	186.5	3.8	190.3	13/09/2021	186.7	3.2	189.9
13/09/2021	186.7	3.2	189.9	12/05/2021	186.5	3.8	190.3
7/08/2021	184.3	4.7	189.0	21/06/2021	186.1	1.7	187.8

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg{\cdot}m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	19.4%	2.1%	21.5%
Residential	11.4	2.1	13.5
Educational	12.9	2.1	15.0
Industrial	19.4	2.1	21.5
Recreational	4.5	2.1	6.6
Medical	3.5	2.1	5.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	49.0%	5.3%	54.3%
Residential	8.6	1.6	10.2
Educational	9.8	1.6	11.4
Industrial	14.7	1.6	16.3
Recreational	3.4	1.6	5.0
Medical	2.7	1.6	4.3
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	70.7%	13.0%	83.7%
Residential	4.2	1.3	5.5
Educational	6.1	1.3	7.4
Industrial	7.1	1.3	8.4
Recreational	2.1	1.3	3.4
Medical	1.4	1.3	2.7

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1929.6 %	7.5 %	1935.9 %
Residential	3 100.5	12.3	3 112.8
Educational	2 725.1	10.3	2 735.3
Industrial	2 901.5	12.3	2 913.8
Recreational	3 164.6	10.3	3 174.9
Medical	2 270.1	2.1	2 272.2

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	585.3 %	1 170.6 %
Residential	189.5	189.5
Educational	292.7	292.7
Industrial	266.3	266.3
Recreational	60.6	60.6
Medical	138.9	138.9

Maximum 24-hour PM_{10}

Receptor 14 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 2 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
20/04/2021	266.3	46.2	312.5	13/08/2021	296.9	15.0	311.9
2/09/2021	247.6	36.0	283.6	6/07/2021	264.0	18.1	282.1
24/01/2021	245.0	25.4	270.4	27/06/2021	250.6	10.2	260.8
24/07/2021	248.2	9.9	258.1	26/04/2021	248.5	20.2	268.7
11/09/2021	233.5	22.1	255.6	15/04/2021	233.5	25.3	258.8
14/04/2021	238.3	16.0	254.3	24/04/2021	232.9	19.4	252.3
8/03/2021	226.8	25.5	252.3	30/05/2021	229.1	8.1	237.2
9/10/2021	227.6	23.8	251.4	13/09/2021	224.5	14.8	239.3
25/11/2021	237.0	11.0	248.0	12/05/2021	224.2	15.1	239.3
7/12/2021	232.7	14.7	247.4	21/06/2021	223.8	8.7	232.5

Maximum 24-hour $PM_{2.5}$

Receptor 2 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 2 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
13/08/2021	296.9	4.4	301.3	13/08/2021	296.9	4.4	301.3
6/07/2021	264.0	7.4	271.4	6/07/2021	264.0	7.4	271.4
27/06/2021	250.6	9.6	260.2	27/06/2021	250.6	9.6	260.2
26/04/2021	248.5	10.9	259.4	26/04/2021	248.5	10.9	259.4
24/04/2021	232.9	9.0	241.9	15/04/2021	233.5	5.2	238.7
15/04/2021	233.5	5.2	238.7	24/04/2021	232.9	9.0	241.9
30/05/2021	229.1	2.3	231.4	30/05/2021	229.1	2.3	231.4
12/05/2021	224.2	3.8	228.0	13/09/2021	224.5	3.2	227.7
13/09/2021	224.5	3.2	227.7	12/05/2021	224.2	3.8	228.0
7/08/2021	221.6	4.7	226.3	21/06/2021	223.8	1.7	225.5

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	23.3%	2.1%	25.4%
Residential	13.7	2.1	15.8
Educational	15.5	2.1	17.6
Industrial	23.3	2.1	25.4
Recreational	5.4	2.1	7.5
Medical	4.2	2.1	6.3
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	58.9%	5.3%	64.2%
Residential	10.4	1.6	12.0
Educational	11.8	1.6	13.4
Industrial	17.7	1.6	19.3
Recreational	4.1	1.6	5.7
Medical	3.2	1.6	4.8
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	85.1%	13.0%	98.1%
Residential	5.0	1.3	6.3
Educational	7.4	1.3	8.7
Industrial	8.5	1.3	9.8
Recreational	2.5	1.3	3.8
Medical	1.7	1.3	3.0

Scenario E4

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m⁻³)		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	974.6 %	6.3 %	974.6 %
Residential	1 598.3	<0.1	1 598.3
Educational	1 472.1	10.3	1 482.4
Industrial	1 392.0	<0.1	1 392.1
Recreational	1 498.8	10.3	1 509.1
Medical	1 155.7	2.1	1 157.8

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m⁻³)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	262.5 %	525.0 %
Residential	84.5	84.5
Educational	131.2	131.2
Industrial	117.1	117.1
Recreational	31.9	31.9
Medical	78.0	78.0

Maximum 24-hour PM_{10}

Receptor 6 Date	24-hour average PM_{10} concentration (µg·m⁻³)			Receptor 6 Date	24-hour average PM_{10} concentration (µg·m⁻³)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	129.7	29.9	159.6	5/07/2021	131.2	10.9	142.1
5/07/2021	131.2	10.9	142.1	23/04/2021	129.7	29.9	159.6
6/08/2021	121.2	15.4	136.6	27/08/2021	124.1	8.4	132.5
27/08/2021	124.1	8.4	132.5	6/08/2021	121.2	15.4	136.6
22/04/2021	110.3	21.1	131.4	27/05/2021	118.7	9.3	128.0
13/05/2021	115.3	13.2	128.5	27/06/2021	117.9	10.2	128.1
27/06/2021	117.9	10.2	128.1	4/06/2021	116.4	8.8	125.2
27/05/2021	118.7	9.3	128.0	13/05/2021	115.3	13.2	128.5
15/04/2021	101.6	25.3	126.9	22/04/2021	110.3	21.1	131.4
4/06/2021	116.4	8.8	125.2	7/08/2021	104.3	11.1	115.4

Maximum 24-hour $PM_{2.5}$

Receptor 6 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 6 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	129.7	19.5	149.2	5/07/2021	131.2	6.2	137.4
5/07/2021	131.2	6.2	137.4	23/04/2021	129.7	19.5	149.2
27/08/2021	124.1	4.7	128.8	27/08/2021	124.1	4.7	128.8
27/06/2021	117.9	9.6	127.5	6/08/2021	121.2	6.2	127.4
6/08/2021	121.2	6.2	127.4	27/05/2021	118.7	2.4	121.1
22/04/2021	110.3	13.4	123.7	27/06/2021	117.9	9.6	127.5
4/06/2021	116.4	5.7	122.1	4/06/2021	116.4	5.7	122.1
27/05/2021	118.7	2.4	121.1	13/05/2021	115.3	5.6	120.9
13/05/2021	115.3	5.6	120.9	22/04/2021	110.3	13.4	123.7
7/08/2021	104.3	4.7	109.0	7/08/2021	104.3	4.7	109.0

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	10.1%	2.1%	12.2%
Residential	5.6	2.1	7.7
Educational	6.9	2.1	9.0
Industrial	10.1	2.1	12.2
Recreational	2.6	2.1	4.7
Medical	2.0	2.1	4.1
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	25.5%	5.3%	30.8%
Residential	4.3	1.6	5.9
Educational	5.2	1.6	6.8
Industrial	7.7	1.6	9.3
Recreational	1.9	1.6	3.5
Medical	1.5	1.6	3.1
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	32.6%	13.0%	45.6%
Residential	2.1	1.3	3.4
Educational	3.2	1.3	4.5
Industrial	3.3	1.3	4.6
Recreational	1.1	1.3	2.4
Medical	0.8	1.3	2.1

Two Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1919.7 %	6.3 %	1919.8 %
Residential	3 148.4	<0.1	3 148.4
Educational	2 899.9	10.3	2 910.1
Industrial	2 742.0	<0.1	2 742.1
Recreational	2 952.4	10.3	2 962.7
Medical	2 276.6	2.1	2 278.6

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	517.1 %	1 034.1 %
Residential	166.5	166.5
Educational	258.5	258.5
Industrial	230.7	230.7
Recreational	62.8	62.8
Medical	153.6	153.6

Maximum 24-hour PM_{10}

Receptor 6 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 6 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	255.4	29.9	285.3	5/07/2021	258.5	10.9	269.4
5/07/2021	258.5	10.9	269.4	23/04/2021	255.4	29.9	285.3
6/08/2021	238.8	15.4	254.2	27/08/2021	244.5	8.4	252.9
27/08/2021	244.5	8.4	252.9	6/08/2021	238.8	15.4	254.2
27/05/2021	233.8	9.3	243.1	27/05/2021	233.8	9.3	243.1
27/06/2021	232.2	10.2	242.4	27/06/2021	232.2	10.2	242.4
13/05/2021	227.2	13.2	240.4	4/06/2021	229.3	8.8	238.1
22/04/2021	217.3	21.1	238.4	13/05/2021	227.2	13.2	240.4
4/06/2021	229.3	8.8	238.1	22/04/2021	217.3	21.1	238.4
15/04/2021	200.1	25.3	225.4	7/08/2021	205.5	11.1	216.6

Maximum 24-hour $PM_{2.5}$

Receptor 6 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 6 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	255.4	19.5	274.9	5/07/2021	258.5	6.2	264.7
5/07/2021	258.5	6.2	264.7	23/04/2021	255.4	19.5	274.9
27/08/2021	244.5	4.7	249.2	27/08/2021	244.5	4.7	249.2
6/08/2021	238.8	6.2	245.0	6/08/2021	238.8	6.2	245.0
27/06/2021	232.2	9.6	241.8	27/05/2021	233.8	2.4	236.2
27/05/2021	233.8	2.4	236.2	27/06/2021	232.2	9.6	241.8
4/06/2021	229.3	5.7	235.0	4/06/2021	229.3	5.7	235.0
13/05/2021	227.2	5.6	232.8	13/05/2021	227.2	5.6	232.8
22/04/2021	217.3	13.4	230.7	22/04/2021	217.3	13.4	230.7
7/08/2021	205.5	4.7	210.2	7/08/2021	205.5	4.7	210.2

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg\cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	19.9%	2.1%	22.0%
Residential	11.1	2.1	13.2
Educational	13.5	2.1	15.6
Industrial	19.9	2.1	22.0
Recreational	5.1	2.1	7.2
Medical	3.9	2.1	6.0
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	50.3%	5.3%	55.6%
Residential	8.4	1.6	10.0
Educational	10.2	1.6	11.8
Industrial	15.1	1.6	16.7
Recreational	3.8	1.6	5.4
Medical	2.9	1.6	4.5
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	64.2%	13.0%	77.2%
Residential	4.2	1.3	5.5
Educational	6.2	1.3	7.5
Industrial	6.4	1.3	7.7
Recreational	2.2	1.3	3.5
Medical	1.5	1.3	2.8

Three Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	2556.4 %	6.3 %	2556.4 %
Residential	4 192.5	<0.1	4 192.5
Educational	3 861.6	10.3	3 871.8
Industrial	3 651.4	<0.1	3 651.4
Recreational	3 931.5	10.3	3 941.8
Medical	3 031.5	2.1	3 033.6

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	688.5 %	1 377.1 %
Residential	221.7	221.7
Educational	344.3	344.3
Industrial	307.2	307.2
Recreational	83.6	83.6
Medical	204.5	204.5

Maximum 24-hour PM_{10}

Receptor 6 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 6 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	340.1	29.9	370.0	5/07/2021	344.3	10.9	355.2
5/07/2021	344.3	10.9	355.2	23/04/2021	340.1	29.9	370.0
27/08/2021	325.6	8.4	334.0	27/08/2021	325.6	8.4	334.0
6/08/2021	318.0	15.4	333.4	6/08/2021	318.0	15.4	333.4
27/05/2021	311.4	9.3	320.7	27/05/2021	311.4	9.3	320.7
27/06/2021	309.3	10.2	319.5	27/06/2021	309.3	10.2	319.5
13/05/2021	302.5	13.2	315.7	4/06/2021	305.3	8.8	314.1
4/06/2021	305.3	8.8	314.1	13/05/2021	302.5	13.2	315.7
22/04/2021	289.4	21.1	310.5	22/04/2021	289.4	21.1	310.5
15/04/2021	266.5	25.3	291.8	7/08/2021	273.7	11.1	284.8

Maximum 24-hour $PM_{2.5}$

Receptor 6 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 6 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	340.1	19.5	359.6	5/07/2021	344.3	6.2	350.5
5/07/2021	344.3	6.2	350.5	23/04/2021	340.1	19.5	359.6
27/08/2021	325.6	4.7	330.3	27/08/2021	325.6	4.7	330.3
6/08/2021	318.0	6.2	324.2	6/08/2021	318.0	6.2	324.2
27/06/2021	309.3	9.6	318.9	27/05/2021	311.4	2.4	313.8
27/05/2021	311.4	2.4	313.8	27/06/2021	309.3	9.6	318.9
4/06/2021	305.3	5.7	311.0	4/06/2021	305.3	5.7	311.0
13/05/2021	302.5	5.6	308.1	13/05/2021	302.5	5.6	308.1
22/04/2021	289.4	13.4	302.8	22/04/2021	289.4	13.4	302.8
7/08/2021	273.7	4.7	278.4	7/08/2021	273.7	4.7	278.4

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	26.5%	2.1%	28.6%
Residential	14.7	2.1	16.8
Educational	18.0	2.1	20.1
Industrial	26.5	2.1	28.6
Recreational	6.7	2.1	8.8
Medical	5.2	2.1	7.3
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	66.9%	5.3%	72.3%
Residential	11.2	1.6	12.8
Educational	13.6	1.6	15.2
Industrial	20.1	1.6	21.7
Recreational	5.1	1.6	6.7
Medical	3.9	1.6	5.5
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	85.4%	13.0%	98.4%
Residential	5.6	1.3	6.9
Educational	8.3	1.3	9.6
Industrial	8.5	1.3	9.8
Recreational	3.0	1.3	4.3
Medical	2.0	1.3	3.3

Scenario E5

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1233.0 %	6.3 %	1233.0 %
Residential	2 022.2	<0.1	2 022.2
Educational	1 776.7	10.3	1 787.0
Industrial	1 990.3	<0.1	1 990.3
Recreational	1 396.3	10.3	1 406.5
Medical	1 402.7	2.1	1 404.7

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	298.4 %	596.7 %
Residential	87.2	87.2
Educational	102.1	102.1
Industrial	149.2	149.2
Recreational	37.4	37.4
Medical	80.1	80.1

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)			Receptor 41 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	135.6	29.9	165.5	27/08/2021	149.2	8.4	157.6
22/04/2021	137.5	21.1	158.6	13/05/2021	144.8	13.2	158.0
13/05/2021	144.8	13.2	158.0	14/05/2021	138.2	9.5	147.7
27/08/2021	149.2	8.4	157.6	22/04/2021	137.5	21.1	158.6
14/05/2021	138.2	9.5	147.7	23/04/2021	135.6	29.9	165.5
2/10/2021	132.8	8.0	140.8	2/10/2021	132.8	8.0	140.8
29/07/2021	125.8	10.9	136.7	29/07/2021	125.8	10.9	136.7
5/07/2021	123.8	10.9	134.7	5/07/2021	123.8	10.9	134.7
6/10/2021	111.7	20.4	132.1	4/06/2021	121.4	8.8	130.2
18/01/2021	96.1	35.8	131.9	18/07/2021	120.5	5.7	126.2

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	135.6	19.5	155.1	27/08/2021	149.2	4.7	153.9
27/08/2021	149.2	4.7	153.9	13/05/2021	144.8	5.6	150.4
22/04/2021	137.5	13.4	150.9	14/05/2021	138.2	3.8	142.0
13/05/2021	144.8	5.6	150.4	22/04/2021	137.5	13.4	150.9
14/05/2021	138.2	3.8	142.0	23/04/2021	135.6	19.5	155.1
2/10/2021	132.8	2.9	135.7	2/10/2021	132.8	2.9	135.7
29/07/2021	125.8	4.8	130.6	29/07/2021	125.8	4.8	130.6
5/07/2021	123.8	6.2	130.0	5/07/2021	123.8	6.2	130.0
4/06/2021	121.4	5.7	127.1	4/06/2021	121.4	5.7	127.1
3/10/2021	120.5	3.8	124.3	18/07/2021	120.5	1.6	122.1

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	10.1%	2.1%	12.2%
Residential	5.6	2.1	7.7
Educational	7.0	2.1	9.1
Industrial	10.1	2.1	12.2
Recreational	2.6	2.1	4.7
Medical	1.9	2.1	4.0
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	25.6%	5.3%	31.0%
Residential	4.2	1.6	5.8
Educational	5.3	1.6	6.9
Industrial	7.7	1.6	9.3
Recreational	2.0	1.6	3.6
Medical	1.4	1.6	3.0
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	34.6%	13.0%	47.6%
Residential	2.3	1.3	3.6
Educational	2.9	1.3	4.2
Industrial	3.5	1.3	4.8
Recreational	1.2	1.3	2.5
Medical	0.9	1.3	2.2

Two Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	2924.5 %	6.3 %	2924.6 %
Residential	4 796.3	<0.1	4 796.3
Educational	4 214.2	10.3	4 224.4
Industrial	4 720.6	<0.1	4 720.7
Recreational	3 311.8	10.3	3 322.1
Medical	3 326.9	2.1	3 328.9

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	707.7 %	1 415.3 %
Residential	206.8	206.8
Educational	242.2	242.2
Industrial	353.8	353.8
Recreational	88.6	88.6
Medical	190.1	190.1

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	353.8	8.4	362.2	27/08/2021	353.8	8.4	362.2
13/05/2021	343.4	13.2	356.6	13/05/2021	343.4	13.2	356.6
23/04/2021	321.6	29.9	351.5	14/05/2021	327.9	9.5	337.4
22/04/2021	326.2	21.1	347.3	22/04/2021	326.2	21.1	347.3
14/05/2021	327.9	9.5	337.4	23/04/2021	321.6	29.9	351.5
2/10/2021	315.0	8.0	323.0	2/10/2021	315.0	8.0	323.0
29/07/2021	298.4	10.9	309.3	29/07/2021	298.4	10.9	309.3
5/07/2021	293.5	10.9	304.4	5/07/2021	293.5	10.9	304.4
4/06/2021	288.0	8.8	296.8	4/06/2021	288.0	8.8	296.8
3/10/2021	285.7	7.7	293.4	18/07/2021	285.8	5.7	291.5

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	353.8	4.7	358.5	27/08/2021	353.8	4.7	358.5
13/05/2021	343.4	5.6	349.0	13/05/2021	343.4	5.6	349.0
23/04/2021	321.6	19.5	341.1	14/05/2021	327.9	3.8	331.7
22/04/2021	326.2	13.4	339.6	22/04/2021	326.2	13.4	339.6
14/05/2021	327.9	3.8	331.7	23/04/2021	321.6	19.5	341.1
2/10/2021	315.0	2.9	317.9	2/10/2021	315.0	2.9	317.9
29/07/2021	298.4	4.8	303.2	29/07/2021	298.4	4.8	303.2
5/07/2021	293.5	6.2	299.7	5/07/2021	293.5	6.2	299.7
4/06/2021	288.0	5.7	293.7	4/06/2021	288.0	5.7	293.7
3/10/2021	285.7	3.8	289.5	18/07/2021	285.8	1.6	287.4

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	24.1%	2.1%	26.2%
Residential	13.3	2.1	15.4
Educational	16.5	2.1	18.6
Industrial	24.1	2.1	26.2
Recreational	6.2	2.1	8.3
Medical	4.5	2.1	6.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	60.8%	5.3%	66.1%
Residential	10.1	1.6	11.7
Educational	12.5	1.6	14.1
Industrial	18.2	1.6	19.8
Recreational	4.7	1.6	6.3
Medical	3.4	1.6	5.0
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	82.1%	13.0%	95.1%
Residential	5.4	1.3	6.7
Educational	6.8	1.3	8.1
Industrial	8.2	1.3	9.5
Recreational	2.9	1.3	4.2
Medical	2.1	1.3	3.4

Three Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	4238.1 %	6.3 %	4238.1 %
Residential	6 950.5	<0.1	6 950.6
Educational	6 107.0	10.3	6 117.2
Industrial	6 840.9	<0.1	6 841.0
Recreational	4 799.3	10.3	4 809.6
Medical	4 821.2	2.1	4 823.2

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m⁻³)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	1 025.5 %	2 051.0 %
Residential	299.6	299.6
Educational	351.0	351.0
Industrial	512.8	512.8
Recreational	128.5	128.5
Medical	275.5	275.5

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)			Receptor 41 Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	512.8	8.4	521.2	27/08/2021	512.8	8.4	521.2
13/05/2021	497.7	13.2	510.9	13/05/2021	497.7	13.2	510.9
23/04/2021	466.1	29.9	496.0	14/05/2021	475.1	9.5	484.6
22/04/2021	472.7	21.1	493.8	22/04/2021	472.7	21.1	493.8
14/05/2021	475.1	9.5	484.6	23/04/2021	466.1	29.9	496.0
2/10/2021	456.5	8.0	464.5	2/10/2021	456.5	8.0	464.5
29/07/2021	432.4	10.9	443.3	29/07/2021	432.4	10.9	443.3
5/07/2021	425.4	10.9	436.3	5/07/2021	425.4	10.9	436.3
4/06/2021	417.4	8.8	426.2	4/06/2021	417.4	8.8	426.2
3/10/2021	414.0	7.7	421.7	18/07/2021	414.2	5.7	419.9

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	512.8	4.7	517.5	27/08/2021	512.8	4.7	517.5
13/05/2021	497.7	5.6	503.3	13/05/2021	497.7	5.6	503.3
22/04/2021	472.7	13.4	486.1	14/05/2021	475.1	3.8	478.9
23/04/2021	466.1	19.5	485.6	22/04/2021	472.7	13.4	486.1
14/05/2021	475.1	3.8	478.9	23/04/2021	466.1	19.5	485.6
2/10/2021	456.5	2.9	459.4	2/10/2021	456.5	2.9	459.4
29/07/2021	432.4	4.8	437.2	29/07/2021	432.4	4.8	437.2
5/07/2021	425.4	6.2	431.6	5/07/2021	425.4	6.2	431.6
4/06/2021	417.4	5.7	423.1	4/06/2021	417.4	5.7	423.1
3/10/2021	414.0	3.8	417.8	18/07/2021	414.2	1.6	415.8

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	34.9%	2.1%	37.0%
Residential	19.2	2.1	21.3
Educational	24.0	2.1	26.1
Industrial	34.9	2.1	37.0
Recreational	9.0	2.1	11.1
Medical	6.5	2.1	8.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	88.1%	5.3%	93.4%
Residential	14.6	1.6	16.2
Educational	18.2	1.6	19.8
Industrial	26.4	1.6	28.0
Recreational	6.8	1.6	8.4
Medical	4.9	1.6	6.5
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	119.0%	13.0%	132.0%
Residential	7.8	1.3	9.1
Educational	9.9	1.3	11.2
Industrial	11.9	1.3	13.2
Recreational	4.2	1.3	5.5
Medical	3.0	1.3	4.3

Scenario E6

One Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	1414.5 %	6.3 %	1414.5 %
Residential	2 319.7	<0.1	2 319.8
Educational	2 000.1	10.3	2 010.3
Industrial	2 274.6	<0.1	2 274.6
Recreational	1 560.6	10.3	1 570.9
Medical	1 610.3	2.1	1 612.3

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	340.6 %	681.3 %
Residential	99.5	99.5
Educational	116.6	116.6
Industrial	170.3	170.3
Recreational	42.7	42.7
Medical	91.5	91.5

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
23/04/2021	154.8	29.9	184.7	27/08/2021	170.3	8.4	178.7
27/08/2021	170.3	8.4	178.7	13/05/2021	165.3	13.2	178.5
13/05/2021	165.3	13.2	178.5	14/05/2021	157.8	9.5	167.3
22/04/2021	157.0	21.1	178.1	22/04/2021	157.0	21.1	178.1
14/05/2021	157.8	9.5	167.3	23/04/2021	154.8	29.9	184.7
2/10/2021	151.6	8.0	159.6	2/10/2021	151.6	8.0	159.6
29/07/2021	143.6	10.9	154.5	29/07/2021	143.6	10.9	154.5
5/07/2021	141.3	10.9	152.2	5/07/2021	141.3	10.9	152.2
6/10/2021	127.5	20.4	147.9	4/06/2021	138.6	8.8	147.4
6/08/2021	132.1	15.4	147.5	18/07/2021	137.6	5.7	143.3

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	170.3	4.7	175.0	27/08/2021	170.3	4.7	175.0
23/04/2021	154.8	19.5	174.3	13/05/2021	165.3	5.6	170.9
13/05/2021	165.3	5.6	170.9	14/05/2021	157.8	3.8	161.6
22/04/2021	157.0	13.4	170.4	22/04/2021	157.0	13.4	170.4
14/05/2021	157.8	3.8	161.6	23/04/2021	154.8	19.5	174.3
2/10/2021	151.6	2.9	154.5	2/10/2021	151.6	2.9	154.5
29/07/2021	143.6	4.8	148.4	29/07/2021	143.6	4.8	148.4
5/07/2021	141.3	6.2	147.5	5/07/2021	141.3	6.2	147.5
4/06/2021	138.6	5.7	144.3	4/06/2021	138.6	5.7	144.3
3/10/2021	137.5	3.8	141.3	18/07/2021	137.6	1.6	139.2

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	11.6%	2.1%	13.7%
Residential	6.4	2.1	8.5
Educational	8.0	2.1	10.1
Industrial	11.6	2.1	13.7
Recreational	3.0	2.1	5.1
Medical	2.2	2.1	4.3
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	29.3%	5.3%	34.6%
Residential	4.8	1.6	6.4
Educational	6.0	1.6	7.6
Industrial	8.8	1.6	10.4
Recreational	2.3	1.6	3.9
Medical	1.6	1.6	3.2
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	39.5%	13.0%	52.5%
Residential	2.6	1.3	3.9
Educational	3.3	1.3	4.6
Industrial	4.0	1.3	5.3
Recreational	1.4	1.3	2.7
Medical	1.0	1.3	2.3

Two Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (μg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	2788.6 %	6.3 %	2788.7 %
Residential	4 573.4	<0.1	4 573.4
Educational	3 943.2	10.3	3 953.5
Industrial	4 484.4	<0.1	4 484.5
Recreational	3 076.8	10.3	3 087.1
Medical	3 174.7	2.1	3 176.7

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	671.6 %	1 343.1 %
Residential	196.2	196.2
Educational	229.8	229.8
Industrial	335.8	335.8
Recreational	84.1	84.1
Medical	180.4	180.4

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	335.8	8.4	344.2	27/08/2021	335.8	8.4	344.2
13/05/2021	325.9	13.2	339.1	13/05/2021	325.9	13.2	339.1
23/04/2021	305.2	29.9	335.1	14/05/2021	311.1	9.5	320.6
22/04/2021	309.6	21.1	330.7	22/04/2021	309.6	21.1	330.7
14/05/2021	311.1	9.5	320.6	23/04/2021	305.2	29.9	335.1
2/10/2021	298.9	8.0	306.9	2/10/2021	298.9	8.0	306.9
29/07/2021	283.1	10.9	294.0	29/07/2021	283.1	10.9	294.0
5/07/2021	278.6	10.9	289.5	5/07/2021	278.6	10.9	289.5
4/06/2021	273.3	8.8	282.1	4/06/2021	273.3	8.8	282.1
3/10/2021	271.1	7.7	278.8	18/07/2021	271.2	5.7	276.9

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	335.8	4.7	340.5	27/08/2021	335.8	4.7	340.5
13/05/2021	325.9	5.6	331.5	13/05/2021	325.9	5.6	331.5
23/04/2021	305.2	19.5	324.7	14/05/2021	311.1	3.8	314.9
22/04/2021	309.6	13.4	323.0	22/04/2021	309.6	13.4	323.0
14/05/2021	311.1	3.8	314.9	23/04/2021	305.2	19.5	324.7
2/10/2021	298.9	2.9	301.8	2/10/2021	298.9	2.9	301.8
29/07/2021	283.1	4.8	287.9	29/07/2021	283.1	4.8	287.9
5/07/2021	278.6	6.2	284.8	5/07/2021	278.6	6.2	284.8
4/06/2021	273.3	5.7	279.0	4/06/2021	273.3	5.7	279.0
3/10/2021	271.1	3.8	274.9	18/07/2021	271.2	1.6	272.8

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	22.8%	2.1%	24.9%
Residential	12.6	2.1	14.7
Educational	15.7	2.1	17.8
Industrial	22.8	2.1	24.9
Recreational	5.9	2.1	8.0
Medical	4.3	2.1	6.4
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	57.7%	5.3%	63.0%
Residential	9.5	1.6	11.1
Educational	11.9	1.6	13.5
Industrial	17.3	1.6	18.9
Recreational	4.5	1.6	6.1
Medical	3.2	1.6	4.8
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	77.9%	13.0%	90.9%
Residential	5.1	1.3	6.4
Educational	6.5	1.3	7.8
Industrial	7.8	1.3	9.1
Recreational	2.7	1.3	4.0
Medical	2.0	1.3	3.3

Three Feeder Outage

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})		
	Maximum incremental impact	Background (regional)	Cumulative
Criterion	164		
Max % of criterion	4258.5 %	6.3 %	4258.5 %
Residential	6 983.9	<0.1	6 983.9
Educational	6 021.6	10.3	6 031.8
Industrial	6 848.0	<0.1	6 848.1
Recreational	4 698.5	10.3	4 708.8
Medical	4 848.0	2.1	4 850.0

Note: Maximum impact at any receptor presented. Values may not sum to cumulative total.

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	1 025.5 %	2 051.0 %
Residential	299.6	299.6
Educational	351.0	351.0
Industrial	512.8	512.8
Recreational	128.5	128.5
Medical	275.5	275.5

Maximum 24-hour PM_{10}

Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})			Receptor 41 Date	24-hour average PM_{10} concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	512.8	8.4	521.2	27/08/2021	512.8	8.4	521.2
13/05/2021	497.7	13.2	510.9	13/05/2021	497.7	13.2	510.9
23/04/2021	466.1	29.9	496.0	14/05/2021	475.1	9.5	484.6
22/04/2021	472.7	21.1	493.8	22/04/2021	472.7	21.1	493.8
14/05/2021	475.1	9.5	484.6	23/04/2021	466.1	29.9	496.0
2/10/2021	456.5	8.0	464.5	2/10/2021	456.5	8.0	464.5
29/07/2021	432.4	10.9	443.3	29/07/2021	432.4	10.9	443.3
5/07/2021	425.4	10.9	436.3	5/07/2021	425.4	10.9	436.3
4/06/2021	417.4	8.8	426.2	4/06/2021	417.4	8.8	426.2
3/10/2021	414.0	7.7	421.7	18/07/2021	414.2	5.7	419.9

Maximum 24-hour $PM_{2.5}$

Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})			Receptor 41 Date	24-hour average $PM_{2.5}$ concentration (µg·m^{-3})		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
27/08/2021	512.8	4.7	517.5	27/08/2021	512.8	4.7	517.5
13/05/2021	497.7	5.6	503.3	13/05/2021	497.7	5.6	503.3
22/04/2021	472.7	13.4	486.1	14/05/2021	475.1	3.8	478.9
23/04/2021	466.1	19.5	485.6	22/04/2021	472.7	13.4	486.1
14/05/2021	475.1	3.8	478.9	23/04/2021	466.1	19.5	485.6
2/10/2021	456.5	2.9	459.4	2/10/2021	456.5	2.9	459.4
29/07/2021	432.4	4.8	437.2	29/07/2021	432.4	4.8	437.2
5/07/2021	425.4	6.2	431.6	5/07/2021	425.4	6.2	431.6
4/06/2021	417.4	5.7	423.1	4/06/2021	417.4	5.7	423.1
3/10/2021	414.0	3.8	417.8	18/07/2021	414.2	1.6	415.8

Maximum 1-hour and 24-hour SO_2

Receptor category	SO2 concentration (mg·m^{-3})		
	Increment	Background	Cumulative
Maximum 1-hour average SO2			
Criterion	215		
Max % of criterion	< 0.1 %	20.0%	20.0%
Residential	< 0.1	42.9	43.0
Educational	< 0.1	42.9	43.0
Industrial	< 0.1	42.9	43.0
Recreational	< 0.1	42.9	43.0
Medical	< 0.1	42.9	43.0
Maximum 24-hour average SO2			
Criterion	57		
Max % of criterion	< 0.1 %	15.1%	15.2%
Residential	< 0.1	8.6	8.7
Educational	< 0.1	8.6	8.7
Industrial	< 0.1	8.6	8.7
Recreational	< 0.1	8.6	8.7
Medical	< 0.1	8.6	8.7

Maximum 15-min, 1-hour and 24-hour CO

Receptor category	CO concentration ($mg \cdot m^{-3}$)		
	Increment	Background	Cumulative
Maximum 15-minute average CO			
Criterion	100		
Max % of criterion	34.9%	2.1%	37.0%
Residential	19.2	2.1	21.3
Educational	24.0	2.1	26.1
Industrial	34.9	2.1	37.0
Recreational	9.0	2.1	11.1
Medical	6.5	2.1	8.6
Maximum 1-hour average CO			
Criterion	30		
Max % of criterion	88.1%	5.3%	93.4%
Residential	14.6	1.6	16.2
Educational	18.2	1.6	19.8
Industrial	26.4	1.6	28.0
Recreational	6.8	1.6	8.4
Medical	4.9	1.6	6.5
Maximum 8-hour average CO			
Criterion	10		
Max % of criterion	119.0%	13.0%	132.0%
Residential	7.8	1.3	9.1
Educational	9.9	1.3	11.2
Industrial	11.9	1.3	13.2
Recreational	4.2	1.3	5.5
Medical	3.0	1.3	4.3

Maintenance Testing

Scenario M1

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	24.4 %	6.3 %	3.8 %	28.7 %
Residential	32.0	< 0.1	0.5	32.5
Educational	26.0	10.3	< 0.1	36.2
Industrial	40.0	4.1	3.0	47.1
Recreational	23.0	2.1	6.3	31.3
Medical	23.7	2.1	< 0.1	25.8
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	9.8 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	16.0	12.3	55.3	83.6
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m^{-3})			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	1.6 %	28.4 %
Residential	< 0.1	8.3	0.4	8.7
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.4	8.7
Recreational	< 0.1	8.3	0.5	8.8
Medical	< 0.1	8.3	0.4	8.7

Annual average PM

Receptor category	Annual average concentration (µg·m^{-3})			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.5
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.1 %	65.3 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.2 %	72.2 %	0.3 %	72.7 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	
Max % of criterion	6.3 %	12.5 %
Residential	1.7	1.7
Educational	2.1	2.1
Industrial	3.1	3.1
Recreational	< 0.1	0.4
Medical	< 0.1	0.1

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration ($ug{\cdot}m^{-3}$)				Receptor 10	24-hour average PM_{10} concentration ($ug{\cdot}m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
15/07/21	3.1	9.9	< 0.1	13.0	04/05/21	0.8	54.9	< 0.1	55.7
20/04/21	3.1	46.2	< 0.1	49.3	20/04/21	< 0.1	46.2	< 0.1	46.2
26/01/21	2.5	23.9	< 0.1	26.4	28/10/21	< 0.1	36.6	< 0.1	36.6
22/01/21	2.4	31.4	< 0.1	33.8	29/04/21	0.2	36.0	< 0.1	36.3
25/06/21	2.2	7.9	< 0.1	10.1	02/09/21	< 0.1	36.0	0.1	36.1
18/10/21	2.0	16.5	< 0.1	18.5	18/01/21	< 0.1	35.8	< 0.1	35.8
11/09/21	2.0	22.1	< 0.1	24.1	27/04/21	0.3	35.4	< 0.1	35.7
09/10/21	2.0	23.8	< 0.1	25.8	10/09/21	< 0.1	35.5	< 0.1	35.6
19/09/21	1.8	9.7	< 0.1	11.5	21/08/21	< 0.1	34.6	< 0.1	34.6
20/08/21	1.8	34.1	< 0.1	35.9	02/03/21	0.4	33.8	< 0.1	34.2

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration ($ug{\cdot}m^{-3}$)				Receptor 10	24-hour average $PM_{2.5}$ concentration ($ug{\cdot}m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
15/07/21	3.1	3.5	< 0.1	6.6	04/05/21	0.8	40.3	< 0.1	41.1
20/04/21	3.1	10.5	< 0.1	13.6	29/04/21	0.2	21.8	< 0.1	22.1
26/01/21	2.5	9.3	< 0.1	11.8	23/04/21	< 0.1	19.5	< 0.1	19.5
22/01/21	2.4	11.7	< 0.1	14.1	20/08/21	< 0.1	19.2	< 0.1	19.2
25/06/21	2.2	4.6	< 0.1	6.8	10/10/21	0.1	16.9	< 0.1	17.0
18/10/21	2.0	5.0	< 0.1	7.0	15/08/21	< 0.1	16.1	< 0.1	16.1
11/09/21	2.0	5.3	< 0.1	7.3	03/05/21	< 0.1	14.9	< 0.1	15.0
09/10/21	2.0	8.0	< 0.1	10.0	23/08/21	< 0.1	14.7	< 0.1	14.7
19/09/21	1.8	2.8	< 0.1	4.6	14/08/21	0.3	14.3	< 0.1	14.6
20/08/21	1.8	19.2	< 0.1	21.0	19/01/21	0.8	13.8	< 0.1	14.6

Scenario M2

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration ($\mu g{\cdot}m^{-3}$)			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	33.0 %	7.5 %	5.7 %	39.1 %
Residential	49.6	< 0.1	0.5	50.0
Educational	42.5	12.3	9.4	64.2
Industrial	54.1	2.1	< 0.1	56.1
Recreational	44.4	4.1	< 0.1	48.5
Medical	36.0	2.1	< 0.1	38.0
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	20.8 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	34.1	12.3	55.3	101.7
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m^{-3})			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	2.1 %	28.9 %
Residential	< 0.1	8.3	0.5	8.8
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.4	8.7
Recreational	< 0.1	8.3	0.7	9.0
Medical	< 0.1	8.3	0.4	8.7

Annual average PM

Receptor category	Annual average concentration (µg·m^{-3})			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.5
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.2 %	65.3 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.3 %	72.2 %	0.5 %	72.8 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	
Max % of criterion	7.4 %	14.8 %
Residential	2.0	2.0
Educational	2.8	2.8
Industrial	3.7	3.7
Recreational	< 0.1	0.5
Medical	< 0.1	0.2

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration (ug·m^{-3})				Receptor 1	24-hour average PM_{10} concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.7	23.9	< 0.1	27.6	04/05/21	1.3	54.9	< 0.1	56.2
15/07/21	3.5	9.9	< 0.1	13.4	20/04/21	< 0.1	46.2	< 0.1	46.2
24/01/21	3.3	25.4	< 0.1	28.8	29/04/21	0.8	36.0	< 0.1	36.8
22/01/21	3.2	31.4	< 0.1	34.6	28/10/21	< 0.1	36.6	< 0.1	36.7
20/04/21	3.2	46.2	< 0.1	49.4	02/09/21	< 0.1	36.0	0.1	36.1
18/10/21	3.0	16.5	< 0.1	19.5	27/04/21	0.7	35.4	< 0.1	36.1
25/06/21	2.8	7.9	< 0.1	10.7	18/01/21	0.2	35.8	< 0.1	36.0
11/09/21	2.5	22.1	< 0.1	24.7	10/09/21	0.4	35.5	< 0.1	35.9
25/02/21	2.5	16.4	< 0.1	19.0	02/03/21	0.8	33.8	< 0.1	34.6
14/01/21	2.5	29.5	< 0.1	32.0	21/08/21	< 0.1	34.6	< 0.1	34.6

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})				Receptor 1	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.7	9.3	< 0.1	13.0	04/05/21	1.3	40.3	< 0.1	41.6
15/07/21	3.5	3.5	< 0.1	7.0	29/04/21	0.8	21.8	< 0.1	22.6
24/01/21	3.3	10.2	< 0.1	13.6	23/04/21	< 0.1	19.5	< 0.1	19.6
22/01/21	3.2	11.7	< 0.1	14.9	20/08/21	< 0.1	19.2	< 0.1	19.2
20/04/21	3.2	10.5	< 0.1	13.7	10/10/21	0.2	16.9	< 0.1	17.1
18/10/21	3.0	5.0	< 0.1	8.0	15/08/21	0.2	16.1	< 0.1	16.3
25/06/21	2.8	4.6	< 0.1	7.4	14/08/21	0.7	14.3	< 0.1	15.1
11/09/21	2.5	5.3	< 0.1	7.9	03/05/21	< 0.1	14.9	< 0.1	15.0
25/02/21	2.5	6.1	< 0.1	8.7	19/01/21	1.1	13.8	< 0.1	14.9
14/01/21	2.5	9.5	< 0.1	12.0	23/08/21	< 0.1	14.7	< 0.1	14.7

Scenario M3

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	36.0 %	17.5 %	0.2 %	52.2 %
Residential	56.9	28.7	< 0.1	85.7
Educational	53.7	4.1	< 0.1	57.9
Industrial	59.1	4.1	0.3	63.5
Recreational	56.5	28.7	< 0.1	85.2
Medical	36.2	2.1	< 0.1	38.2
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	17.4 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	28.5	12.3	55.3	96.1
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m^{-3})			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	1.6 %	28.5 %
Residential	< 0.1	8.3	0.5	8.8
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.4	8.7
Recreational	< 0.1	8.3	0.5	8.8
Medical	< 0.1	8.3	0.4	8.7

Annual average PM

Receptor category	Annual average concentration ($\mu g \cdot m^{-3}$)			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.6
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.2 %	65.4 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.3 %	72.2 %	0.5 %	72.9 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
Criterion	50	
Max % of criterion	6.3 %	12.6 %
Residential	1.9	1.9
Educational	2.5	2.5
Industrial	3.2	3.2
Recreational	< 0.1	0.5
Medical	< 0.1	0.2

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration ($ug \cdot m^{-3}$)				Receptor 1	24-hour average PM_{10} concentration ($ug \cdot m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	23.9	< 0.1	27.1	04/05/21	1.2	54.9	< 0.1	56.2
15/07/21	3.0	9.9	< 0.1	12.9	20/04/21	< 0.1	46.2	< 0.1	46.2
20/04/21	2.7	46.2	< 0.1	48.9	29/04/21	0.7	36.0	< 0.1	36.8
24/01/21	2.5	25.4	< 0.1	27.9	28/10/21	< 0.1	36.6	< 0.1	36.7
22/01/21	2.5	31.4	< 0.1	33.9	02/09/21	< 0.1	36.0	0.1	36.1
25/06/21	2.5	7.9	< 0.1	10.4	27/04/21	0.6	35.4	< 0.1	36.0
18/10/21	2.3	16.5	< 0.1	18.8	18/01/21	0.2	35.8	< 0.1	36.0
11/09/21	2.1	22.1	< 0.1	24.2	10/09/21	0.4	35.5	< 0.1	35.9
19/09/21	2.0	9.7	< 0.1	11.7	02/03/21	0.8	33.8	< 0.1	34.6
20/08/21	1.9	34.1	< 0.1	36.0	21/08/21	< 0.1	34.6	< 0.1	34.6

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration ($ug \cdot m^{-3}$)				Receptor 1	24-hour average $PM_{2.5}$ concentration ($ug \cdot m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	9.3	< 0.1	12.5	04/05/21	1.2	40.3	< 0.1	41.6
15/07/21	3.0	3.5	< 0.1	6.5	29/04/21	0.7	21.8	< 0.1	22.6
20/04/21	2.7	10.5	< 0.1	13.2	23/04/21	< 0.1	19.5	< 0.1	19.6
24/01/21	2.5	10.2	< 0.1	12.7	20/08/21	< 0.1	19.2	< 0.1	19.2
22/01/21	2.5	11.7	< 0.1	14.2	10/10/21	0.2	16.9	< 0.1	17.1
25/06/21	2.5	4.6	< 0.1	7.1	15/08/21	0.1	16.1	< 0.1	16.2
18/10/21	2.3	5.0	< 0.1	7.3	14/08/21	0.7	14.3	< 0.1	15.1
11/09/21	2.1	5.3	< 0.1	7.4	03/05/21	< 0.1	14.9	< 0.1	15.0
19/09/21	2.0	2.8	< 0.1	4.8	19/01/21	1.1	13.8	< 0.1	14.9
20/08/21	1.9	19.2	< 0.1	21.1	23/08/21	< 0.1	14.7	< 0.1	14.7

Scenario M4

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	39.0 %	17.5 %	3.6 %	51.7 %
Residential	56.1	28.7	< 0.1	84.8
Educational	62.1	4.1	5.9	72.1
Industrial	64.0	4.1	0.3	68.4
Recreational	55.6	28.7	< 0.1	84.3
Medical	36.2	2.1	< 0.1	38.2
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	17.4 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	28.5	12.3	55.3	96.1
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m^{-3})			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	2.1 %	28.9 %
Residential	< 0.1	8.3	0.5	8.8
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.4	8.7
Recreational	< 0.1	8.3	0.7	9.0
Medical	< 0.1	8.3	0.4	8.7

Annual average PM

Receptor category	Annual average concentration (µg·m^{-3})			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.5
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.2 %	65.3 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.3 %	72.2 %	0.5 %	72.8 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	
Max % of criterion	6.3 %	12.6 %
Residential	1.9	1.9
Educational	2.5	2.5
Industrial	3.2	3.2
Recreational	< 0.1	0.5
Medical	< 0.1	0.2

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration (ug·m^{-3})				Receptor 4	24-hour average PM_{10} concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	23.9	< 0.1	27.1	04/05/21	1.4	54.9	< 0.1	56.3
15/07/21	3.0	9.9	< 0.1	12.9	20/04/21	< 0.1	46.2	< 0.1	46.2
20/04/21	2.7	46.2	< 0.1	48.9	29/04/21	0.8	36.0	< 0.1	36.9
24/01/21	2.5	25.4	< 0.1	27.9	28/10/21	< 0.1	36.6	0.1	36.8
22/01/21	2.5	31.4	< 0.1	33.9	27/04/21	0.8	35.4	< 0.1	36.2
25/06/21	2.5	7.9	< 0.1	10.4	02/09/21	< 0.1	36.0	0.1	36.1
18/10/21	2.3	16.5	< 0.1	18.8	18/01/21	0.2	35.8	< 0.1	36.0
11/09/21	2.1	22.1	< 0.1	24.2	10/09/21	0.4	35.5	< 0.1	35.9
19/09/21	2.0	9.7	< 0.1	11.7	02/03/21	1.0	33.8	< 0.1	34.8
20/08/21	1.9	34.1	< 0.1	36.0	21/08/21	< 0.1	34.6	< 0.1	34.6

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})				Receptor 4	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	9.3	< 0.1	12.5	04/05/21	1.4	40.3	< 0.1	41.7
15/07/21	3.0	3.5	< 0.1	6.5	29/04/21	0.8	21.8	< 0.1	22.7
20/04/21	2.7	10.5	< 0.1	13.2	23/04/21	< 0.1	19.5	< 0.1	19.6
24/01/21	2.5	10.2	< 0.1	12.7	20/08/21	< 0.1	19.2	< 0.1	19.3
22/01/21	2.5	11.7	< 0.1	14.2	10/10/21	0.2	16.9	< 0.1	17.2
25/06/21	2.5	4.6	< 0.1	7.1	15/08/21	0.2	16.1	< 0.1	16.3
18/10/21	2.3	5.0	< 0.1	7.3	14/08/21	0.9	14.3	0.1	15.3
11/09/21	2.1	5.3	< 0.1	7.4	19/01/21	1.4	13.8	< 0.1	15.2
19/09/21	2.0	2.8	< 0.1	4.8	03/05/21	< 0.1	14.9	0.2	15.1
20/08/21	1.9	19.2	< 0.1	21.1	23/08/21	< 0.1	14.7	< 0.1	14.8

Scenario M5

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m^{-3})			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	39.0 %	17.5 %	3.6 %	51.7 %
Residential	56.1	28.7	< 0.1	84.8
Educational	62.1	4.1	5.9	72.1
Industrial	64.0	4.1	0.3	68.4
Recreational	55.6	28.7	< 0.1	84.3
Medical	36.2	2.1	< 0.1	38.2
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	17.4 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	28.5	12.3	55.3	96.1
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m^{-3})			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	2.1 %	28.9 %
Residential	< 0.1	8.3	0.5	8.8
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.4	8.7
Recreational	< 0.1	8.3	0.7	9.0
Medical	< 0.1	8.3	0.4	8.7

Annual average PM

Receptor category	Annual average concentration (µg·m^{-3})			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.5
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.2 %	65.3 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.3 %	72.2 %	0.5 %	72.8 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	
Max % of criterion	6.3 %	12.6 %
Residential	1.9	1.9
Educational	2.5	2.5
Industrial	3.2	3.2
Recreational	< 0.1	0.5
Medical	< 0.1	0.2

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration (ug·m^{-3})				Receptor 4	24-hour average PM_{10} concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	23.9	< 0.1	27.1	04/05/21	1.4	54.9	< 0.1	56.3
15/07/21	3.0	9.9	< 0.1	12.9	20/04/21	< 0.1	46.2	< 0.1	46.2
20/04/21	2.7	46.2	< 0.1	48.9	29/04/21	0.8	36.0	< 0.1	36.9
24/01/21	2.5	25.4	< 0.1	27.9	28/10/21	< 0.1	36.6	0.1	36.8
22/01/21	2.5	31.4	< 0.1	33.9	27/04/21	0.8	35.4	< 0.1	36.2
25/06/21	2.5	7.9	< 0.1	10.4	02/09/21	< 0.1	36.0	0.1	36.1
18/10/21	2.3	16.5	< 0.1	18.8	18/01/21	0.2	35.8	< 0.1	36.0
11/09/21	2.1	22.1	< 0.1	24.2	10/09/21	0.4	35.5	< 0.1	35.9
19/09/21	2.0	9.7	< 0.1	11.7	02/03/21	1.0	33.8	< 0.1	34.8
20/08/21	1.9	34.1	< 0.1	36.0	21/08/21	< 0.1	34.6	< 0.1	34.6

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})				Receptor 4	24-hour average $PM_{2.5}$ concentration (ug·m^{-3})			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	9.3	< 0.1	12.5	04/05/21	1.4	40.3	< 0.1	41.7
15/07/21	3.0	3.5	< 0.1	6.5	29/04/21	0.8	21.8	< 0.1	22.7
20/04/21	2.7	10.5	< 0.1	13.2	23/04/21	< 0.1	19.5	< 0.1	19.6
24/01/21	2.5	10.2	< 0.1	12.7	20/08/21	< 0.1	19.2	< 0.1	19.3
22/01/21	2.5	11.7	< 0.1	14.2	10/10/21	0.2	16.9	< 0.1	17.2
25/06/21	2.5	4.6	< 0.1	7.1	15/08/21	0.2	16.1	< 0.1	16.3
18/10/21	2.3	5.0	< 0.1	7.3	14/08/21	0.9	14.3	0.1	15.3
11/09/21	2.1	5.3	< 0.1	7.4	19/01/21	1.4	13.8	< 0.1	15.2
19/09/21	2.0	2.8	< 0.1	4.8	03/05/21	< 0.1	14.9	0.2	15.1
20/08/21	1.9	19.2	< 0.1	21.1	23/08/21	< 0.1	14.7	< 0.1	14.8

Scenario M6

Maximum 1-hour NO_2

Receptor category	Maximum 1-hour average NO2 concentration (µg·m⁻³)			
	Maximum incremental impact	Background (regional)	Background (other DC)	Cumulative
Criterion	164			
Max % of criterion	39.0 %	2.5 %	5.6 %	46.0 %
Residential	60.0	4.1	1.4	65.5
Educational	63.8	4.1	5.9	73.9
Industrial	64.0	4.1	0.3	68.4
Recreational	62.1	4.1	9.2	75.4
Medical	36.2	2.1	< 0.1	38.2
Receptor category	Incremental impact	Background (regional)	Background (other DC)	Maximum cumulative impact
Criterion	164			
Max % of criterion	17.4 %	41.3 %	67.5 %	75.0 %
Residential	< 0.1	10.3	80.5	90.7
Educational	< 0.1	12.3	101.1	113.4
Industrial	28.5	12.3	55.3	96.1
Recreational	< 0.1	12.3	110.7	123.0
Medical	< 0.1	67.7	2.2	69.9

Annual average NO_2

Receptor category	Annual average NO2 concentration (µg·m⁻³)			
	Incremental impact	Background (regional)	Background (other DC)	Cumulative impact
Criterion	31			
Max % of criterion	0.1 %	26.7 %	2.1 %	28.9 %
Residential	< 0.1	8.3	0.5	8.8
Educational	< 0.1	8.3	0.5	8.8
Industrial	< 0.1	8.3	0.5	8.8
Recreational	< 0.1	8.3	0.7	9.0
Medical	< 0.1	8.3	0.4	8.7

Annual average particulate matter

Receptor category	Annual average concentration (µg·m^{-3})			
	TSP			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	90			
Max % of criterion	0.0 %	37.2 %	0.1 %	37.3 %
Residential	< 0.1	33.5	< 0.1	33.5
Educational	< 0.1	33.5	< 0.1	33.5
Industrial	< 0.1	33.5	< 0.1	33.5
Recreational	< 0.1	33.5	< 0.1	33.5
Medical	< 0.1	33.5	< 0.1	33.5
Receptor category	PM_{10}			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	25			
Max % of criterion	0.1 %	65.1 %	0.2 %	65.3 %
Residential	< 0.1	16.3	< 0.1	16.3
Educational	< 0.1	16.3	< 0.1	16.3
Industrial	< 0.1	16.3	< 0.1	16.3
Recreational	< 0.1	16.3	< 0.1	16.3
Medical	< 0.1	16.3	< 0.1	16.3
Receptor category	$PM_{2.5}$			
	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
Criterion	8			
Max % of criterion	0.3 %	72.2 %	0.5 %	72.8 %
Residential	< 0.1	5.8	< 0.1	5.8
Educational	< 0.1	5.8	< 0.1	5.8
Industrial	< 0.1	5.8	< 0.1	5.8
Recreational	< 0.1	5.8	< 0.1	5.8
Medical	< 0.1	5.8	< 0.1	5.8

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$

Receptor category	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of criterion	6.3 %	12.6 %
Residential	1.9	1.9
Educational	2.5	2.5
Industrial	3.2	3.2
Recreational	< 0.1	0.6
Medical	< 0.1	0.2

Maximum 24-hour PM_{10}

Receptor 14	24-hour average PM_{10} concentration ($ug \cdot m^{-3}$)				Receptor 4	24-hour average PM_{10} concentration ($ug \cdot m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	23.9	< 0.1	27.1	04/05/21	1.4	54.9	< 0.1	56.3
15/07/21	3.0	9.9	< 0.1	12.9	20/04/21	< 0.1	46.2	< 0.1	46.2
20/04/21	2.7	46.2	< 0.1	48.9	29/04/21	0.8	36.0	< 0.1	36.9
24/01/21	2.5	25.4	< 0.1	27.9	28/10/21	< 0.1	36.6	0.1	36.8
22/01/21	2.5	31.4	< 0.1	33.9	27/04/21	0.8	35.4	< 0.1	36.2
25/06/21	2.5	7.9	< 0.1	10.4	02/09/21	< 0.1	36.0	0.1	36.1
18/10/21	2.3	16.5	< 0.1	18.8	18/01/21	0.2	35.8	< 0.1	36.0
11/09/21	2.1	22.1	< 0.1	24.2	10/09/21	0.4	35.5	< 0.1	35.9
19/09/21	2.0	9.7	< 0.1	11.7	02/03/21	1.0	33.8	< 0.1	34.8
20/08/21	1.9	34.1	< 0.1	36.0	21/08/21	< 0.1	34.6	< 0.1	34.6

Maximum 24-hour $PM_{2.5}$

Receptor 14	24-hour average $PM_{2.5}$ concentration ($ug \cdot m^{-3}$)				Receptor 4	24-hour average $PM_{2.5}$ concentration ($ug \cdot m^{-3}$)			
Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.	Date	Incr.	Bkg. (regional)	Bkg. (other DC)	Cumul.
26/01/21	3.2	9.3	< 0.1	12.5	04/05/21	1.4	40.3	< 0.1	41.7
15/07/21	3.0	3.5	< 0.1	6.5	29/04/21	0.8	21.8	< 0.1	22.7
20/04/21	2.7	10.5	< 0.1	13.2	23/04/21	< 0.1	19.5	< 0.1	19.6
24/01/21	2.5	10.2	< 0.1	12.7	20/08/21	< 0.1	19.2	< 0.1	19.3
22/01/21	2.5	11.7	< 0.1	14.2	10/10/21	0.2	16.9	< 0.1	17.1
25/06/21	2.5	4.6	< 0.1	7.1	15/08/21	0.2	16.1	< 0.1	16.3
18/10/21	2.3	5.0	< 0.1	7.3	14/08/21	0.9	14.3	0.1	15.3
11/09/21	2.1	5.3	< 0.1	7.4	19/01/21	1.3	13.8	< 0.1	15.1
19/09/21	2.0	2.8	< 0.1	4.8	03/05/21	< 0.1	14.9	0.2	15.1
20/08/21	1.9	19.2	< 0.1	21.1	23/08/21	< 0.1	14.7	< 0.1	14.8

APPENDIX I

Correspondence with CASA

Martin Doyle

From:	Windebank, Matthew <Matthew.Windebank@casa.gov.au>
Sent:	Monday, 27 October 2025 11:19 AM
To:	Martin Doyle; ANAA Corro
Cc:	Adam Pavlovic
Subject:	F21 26508-7 Proposed data centre, 706-752 Mamre Road, Kemps Creek NSW - CASA REPLY [SEC=OFFICIAL]

OFFICIAL

Good morning Martin,

CASA has reviewed the data as provided for the plume at 706-752 Mamre Road Kemps Creek as requested.

The CASA assessment toll indicates that the plume will reduce to a vertical velocity of 4.3 ms at a height of 51 m AGL. Ground height at the site is approx.. 75 m AHD. Total height will be approx. 126 m AHD. The OLS at this location is 231 m AHD. Therefore, the plume from this development will not be a hazard to aircraft operations and no CASA mitigation are required. CASA has no objection to the proposal as detailed below.

Regards

Matthew Windebank
Senior Aerodrome Specialist | Geospatial Assessment
Air Navigation, Airspace & Aerodromes Branch
CASA Air Navigation, Transformation and Risk Division

APPENDIX J

Review of Feasible Best Available Techniques (BAT) Measures

The following additional controls demonstrate how air quality impacts could be further reduced through the application of feasible Best Available Techniques (BAT), consistent with the operational and site-specific conditions of the Proposal. To prevent or minimise emissions during operation, BAT ensures through proper design, operation, and maintenance, that emission control techniques are utilised at their optimal capacity and availability.

Source – Pathway – Receptor Model

The source-pathway-receptor (SPR) model is useful for understanding the hypothetical relationships between contributing factors to create exposure linkages and also how controls may be applied to manage the risk of exposure from those linkages. Each component of the SPR model is defined below, as relates to the context of this AQIA:

- **Source** – the origin of air emissions, which in this case is the discharge points from the back-up generators.
- **Pathway** – the route through which pollutants disperse from source to receptor. In this case the pathway assessed in through atmospheric dispersion which can be influenced by various parameters such as meteorological conditions, terrain, and characteristics of the emission source(s).
- **Receptor** – The presence of receptors that could be adversely affected by a contaminant. In this case receptors are assessed as the receptor locations identified in Section 4.

For air emissions to have an impact on the receiving environment, there needs to be a connection through the SPR model. This means that the source of pollution, the way it travels (pathway), and the affected area (receptor) must all be linked for there to be a potential risk.

Identification of the SPR model allows for targeted management interventions to manage the environmental risks and prevent pollution from reaching sensitive areas.

Hierarchy of Controls

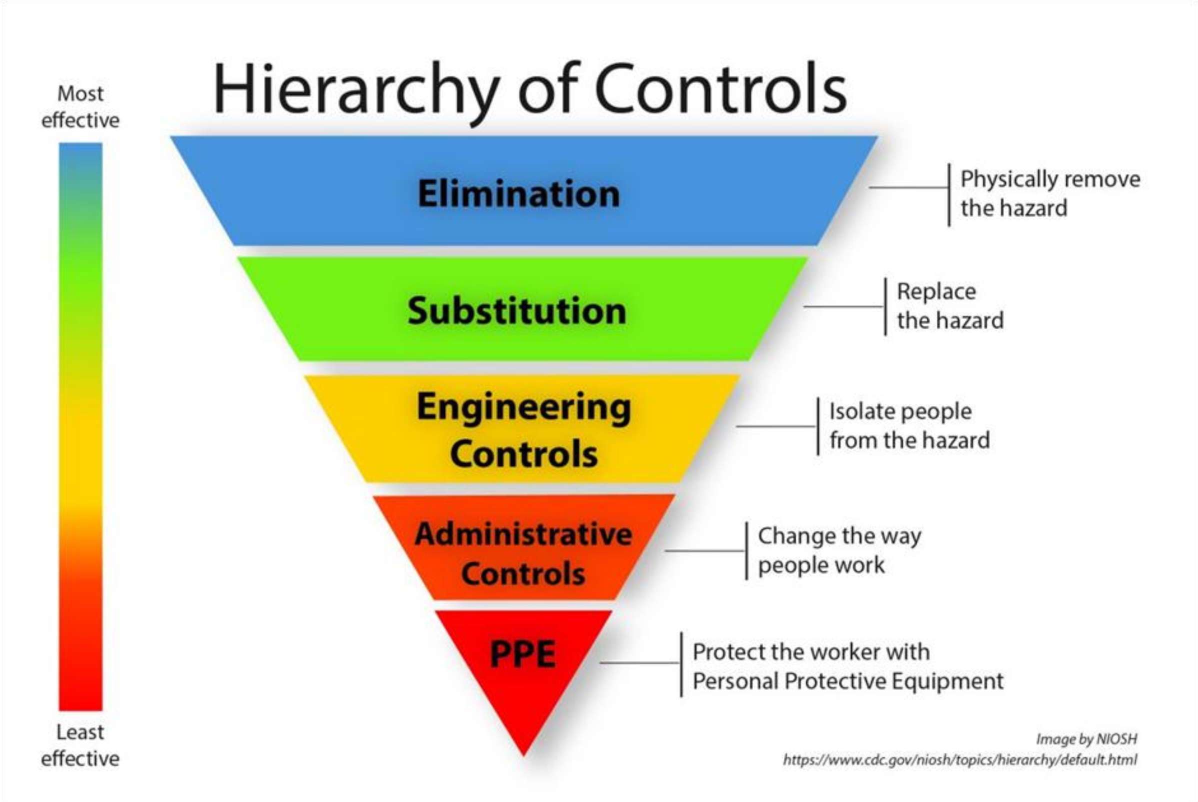
The hierarchy of controls are a well-documented and utilised tool for evaluating the efficacy and reliability for the control of hazards. An example of the hierarchy is presented in Figure J1.

The hierarchy of controls shows 'elimination' of the hazard as the most desirable control, through 'substitution', 'engineering' and 'administrative controls' to 'PPE' (i.e. protection from the hazard at the point of exposure) being the least effective.

For each identified potential control that is subsequently evaluated below, each control has been given a unique identifier that is **[S*x*]**, **[P*x*]** or **[R*x*]** relating to how they fit into the SPR model and ***x*** being a sequential number (e.g. **[S1]**, **[S2]**, **[S3]**... for identified controls at source).

It is noted that these references may occur in multiple places in the following sections.

Figure J1 Hierarchy of controlling hazards and risks



Source: Centres for Disease Control and Prevention (CDC) / National Institute for Occupational Safety & Health (NIOSH)

Controls at Source

Air pollution controls at the source may involve the installation of emission control devices and adoption of efficient power generation techniques to minimise pollutant releases from the Proposal site.

Selection of Generators

The capacity, number and configuration of the back-up generators at the Proposal site will have been dependant on the requirements sought by the Applicant during the detailed design phase of the development.

Key factors which may have influenced the selection of generators at the Proposal site include (in no order) fuel efficiency, reliability, capabilities to retrofit air pollution control (APC) techniques, start-up times and compliance with appropriate emissions limit values as specified in legislative and regulatory requirements.

The UK Environment Agency's working draft guide on the approach to the permitting and regulatory aspects for Data Centres (UK Environment Agency, 2018) notes that:

> *"It is generally accepted that the BAT for data centre back-up generation is presently a set of diesel generators – this allows for an on-site store of fuel for reliability and a scalable provision of MWelec."*

Other technologies identified for standby power generation purposes include the Diesel Rotary Uninterruptible Power Supply engine (DRUPS) and natural gas-fuelled back-up generators utilising either combined-cycle or open-cycle gas turbine technologies or employing spark ignition.

In terms of generator selection for the Proposal site:

- Diesel engines can offer a faster response speed relative to the demanded load; making them a crucial component for data centre operations which require fast response times. Rapid start-up of back-up generators is essential where a near instantaneous supply of electricity is imperative in the event of a power outage.
- Diesel engines typically have lower maintenance cost compared to gas-fired generators; and,
- Ensuring a reliable fuel supply, particularly diesel, is essential for maintaining dependability. Use of a natural gas generator for example would necessitate reliance on an off-site supply network.

In terms of pollutants, NO_X is a predominant byproduct obtained from the combustion process. The adoption of low NO_X engine technology would aide in reducing emissions at source. It is acknowledged that gas engines are known to emit lower amounts of NO_X, SO_X, and PM in comparison to diesel fired engines.

As each generator has a unique specification for operating conditions (such as fuel consumption rate, operating temperature, and resultant emission specifications), the selection of generators to account for the different emission specification is a consideration for control **[S1]**.

In Chapter 3 of the BAT Reference Document (BREF) for Large Combustion Plants (LCP BREF) (Lecomte, et al., 2017) low NO_x burners are described as employing a combination of air staging, fuel staging and internal flue-gas recirculation techniques to achieve low NO_X emission from combustion. The control efficiency can vary depending on the specific design of the burner, the combustion technology applied and fuel type, with low NO_x burners generally achieving between 20 % and 70 % of a reduction of NO_x emissions (Lecomte, et al., 2017) **[S2]**.

Emissions Standards

In NSW, standby generators are not required to comply with emissions standards, as long as their operation does not exceed a specific annual hour limit or if maintenance and testing activities are conducted for less than a designated number of hours per year (refer Section 3 of main report).

Schedule 2 of the POEO CAR sets out emission limits relevant to standby electricity generators as a scheduled activity. Table J1 outlines the relevant standards of concentrations for scheduled premises where it relates to standby diesel generator power electricity generation.

Table J1 POEO CAR Schedule 2 – standards of concentrations for scheduled premises

Air impurity	Activity or plant	Standard of concentration [(B)]
Solid particles (total)	An activity or plant using a liquid or solid standard fuel or a non-standard fuel	50 mg·Nm^{-3}
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	Stationary reciprocating internal combustion engines	450 mg·Nm^{-3} [(A)]
Volatile organic compounds (VOCs), as n-propane	A stationary reciprocating internal combustion engine using a liquid fuel	1 140 mg·Nm^{-3} [(A)] VOCs or 5 880 mg·Nm^{-3} [(A)] CO
Smoke	Any activity or plant in connection with which liquid or gaseous fuel is burnt	Ringelmann 1 or 20 % opacity

Notes: (A): POEO CAR Sch 2, Pt 3, Div 1: dry, 273 K, 101.3 kPa, 7 % O_2

(B): Concentrations derived for Group 6.

Standby generators in Australia commonly adhere to either United States (US) emissions standards (Tier 1 to Tier 4) or European Union (EU) emissions standards (Stage I to Stage V) due to the prevalent manufacturing of diesel engines in these regions.

The US non-road emissions standards are categorised by engine horsepower and model year, regulated by the US EPA. Tier 1 standards were phased in from 1996 to 2000, followed by more stringent Tier 2 from 2001 to 2006, and Tier 3 from 2006 to 2008 (applicable to engines from 37 kW to 560 kW).

Current US EPA Tier 4 standards, implemented from 2008 to 2015, require around a 90 % reduction in NO_x and PM emissions, achieved through exhaust gas aftertreatment technologies. The California Air Resources Board (CARB) is developing US EPA Tier 5 standards to be in place between 2028 and 2030, aiming to further reduce NO_x and PM emissions by between 50 %-90 %, which currently under consideration by the US EPA for adoption into their respective non-road engine regulations.

An air information report published by NSW EPA on the reduction of emissions from non-road diesel engines (NSW EPA, 2014) notes that:

> *Tier 4 emission standards make provision for the following reductions compared to Tier 1 emission standards:*
>
> - *95 % reduction in NOx for engines less than 560 kW and 60% reduction for larger engines;*
> - *85 % reduction in HC for engines less than 560 kW and 70% reduction for larger engines, and,*
> - *50–60% reduction in PM during first phase (2008), and 80–95% reduction in second phase (2013–2015).*

Table J2 provides details of the corresponding US EPA Tier 1 to Tier 3 emissions standards for engines rated above 560 kW and Table J3 outlines the respective requirements under US EPA Tier 4 emissions standards.

Table J2 US EPA Tier 1 to Tier 3 emissions standards – engines above 560 kW

Rated power	Tier	Model year	Emissions standards					
			Units	CO	HC	NMHC + NO_x	NO_x	PM
≥ 560 kW (≥ 750 hp)	Tier 1	2000	$g{\cdot}kWh^{-1}$	11.4	1.3	-	9.2	0.54
			$g{\cdot}bhp\text{-}hr^{-1}$	8.5	1.0	-	6.9	0.4
	Tier 2	2006	$g{\cdot}kWh^{-1}$	3.5	-	6.4	-	0.2
			$g{\cdot}bhp\text{-}hr^{-1}$	2.6	-	4.8	-	0.15

Note: NMHC – non-methane hydrocarbon

The US EPA Tier 4 emission standards were phased in from 2008 to 2015 and introduced substantial reductions of NO_x (for engines above 56 kW) and PM (above 19 kW), as well as more stringent HC limits. CO emission limits remain unchanged from the US EPA Tier 2 and 3 stages. The 2011 standards as listed in Table J3 are sometimes referred to as 'transitional Tier 4', whilst the 2015 limits represent final US EPA Tier 4 standards.

Table J3 US EPA Tier 4 emissions standards – engines above 560 kW

Model year	Category	Emissions standards				
		Units	CO	NMHC	NO_x	PM
2011 - 2014	Generator sets > 900 kW	$g{\cdot}kWh^{-1}$	3.5	0.40	0.67	0.10
		$g{\cdot}bhp\text{-}hr^{-1}$	2.6	0.30	0.50	0.075
	All engines except gensets > 900 kw	$g{\cdot}kWh^{-1}$	3.5	0.40	3.5	0.10
		$g{\cdot}bhp\text{-}hr^{-1}$	2.6	0.30	2.6	0.075
2015	Generator sets	$g{\cdot}kWh^{-1}$	3.5	0.19	0.67	0.03
		$g{\cdot}bhp\text{-}hr^{-1}$	2.6	0.14	0.5	0.022
	All engines except gensets	$g{\cdot}kWh^{-1}$	3.5	0.19	3.5	0.04
		$g{\cdot}bhp\text{-}hr^{-1}$	2.6	0.14	2.6	0.03

Note: NMHC – non-methane hydrocarbon

European emissions standards are set under a tiered system, similar to the US approach. EU Stages I–IV were established under Directive 97/68/EC and subsequent amendments which apply to non-road mobile machinery and stationary engines, including generators.

An overview of the key EU Stage emissions standards for diesel generators is provided below:

- **EU Stage I and II –** Early standards setting limits on NO_X, CO, HC, and PM emissions, phased in during the late 1990s and early 2000s.
- **EU Stage IIIA and IIIB –** Introduced tighter emissions limits with Stage IIIB requiring particulate filters to reduce PM emissions significantly. These stages correspond broadly to US EPA Tier 2 and Tier 3 standards.

- **EU Stage IV –** Requires advanced aftertreatment such as Selective Catalytic Reduction (SCR) and Diesel Particulate Filters (DPF) to meet lower NO_X and PM limits, similar to US EPA Tier 4.
- **EU Stage V –** The latest regulations effective from 2019 to 2021, tightening limits further and setting particle number limits for some engine sizes. EU Stage V covers power ranges above 56 kW, including large generator engines. It drives adoption of the latest aftertreatment technologies and cleaner engine designs.

EU Directive 2015/2193 on Medium Combustion Plant (MCPD) establishes requirements for stationary combustion plants with a thermal rating of equal to or more than 1 MW and less than 50 MW with limits for SO_2, NO_X, and PM. According to MCPD Article 6, emergency plants operating less than 500 hours per year, as a five-year rolling average, are exempt from emission limit values. Each generator with its own discharge stack, under MCPD provisions, can operate for testing or emergencies for up to 500 hours per calendar year without emission limit values under the MCPD. If generators share a common discharge stack, the set can be tested and maintained without emissions limit values for up to 500 hours per year.

Other non-road engine emissions in Europe adhere to EU Directive 2016/1628, known as the NRMM Regulation. This regulation sets emission limits for various power ranges and applications, outlining procedures for engine manufacturers to obtain type-approval. European Stage V standards, derived from Directive 2016/1628, mandates stringent limits on PM emissions, necessitating diesel particulate filters (DPFs) for non-road engines rated between 19 kW and 560 kW. Stage V emissions limits are also established for engines above 560 kW and examination of advanced aftertreatment technologies.

It is noted that no specific EU emissions standards explicitly covering diesel generators above 560 kW before the introduction of EU Stage V regulations as previous regulations such as EU Stages I through IV mainly targeted engines below 560 kW.

Table J4 provides the EU Stage V emissions limits for generators set engines rated above 560 kW.

Table J4 EU Stage V emissions standards for nonroad diesel engines

Engine category	Ignition type	Net power (kW)	Date	Emission limit ($g \cdot kWh^{-1}$)			
				CO	HC	NO_X	PM
NRG-v-1 NRG-c-1	All	P > 560	2019	3.5	0.19	0.67	0.035

While the standby generators **[S1]** for the Proposal are yet to be finalised, indicative engine specifications for candidate models are provided in Appendix E.

Selection of Fuel

The Proposal site is anticipated to utilise diesel for the purposes of standby power generation **[S2].** Diesel is typically the fuel used for emergency generators, and reciprocating engines fuelled by low-sulphur diesel are the most common choice for other developments of this nature. Diesel fuel in Australia is subject to specified parameters governing environmental factors like sulphur and hydrocarbons (HC), as well as operational considerations such as carbon residue and sediments, which can impact engine performance.

The Fuel Standard (Automotive Diesel) Determination 2001, as authorised by the Fuel Quality Standard Act 2000 denotes that diesel fuels must not contain more than 10 $mg \cdot kg^{-1}$ (ppm) from 1 January 2009.

In the US, non-road engine emission regulations allowed higher sulphur content (up to 0.5 %) at Tier 1 to Tier 3 stages. However, to accommodate sulphur-sensitive control technologies in Tier 4 engines, like catalytic particulate filters, the US EPA mandated a reduction in sulphur content to 15 ppm for non-road diesel fuels.

An emerging and potentially viable alternative fuel source for standby generators pertains to Hydrotreated Vegetable Oil (HVO) which is a renewable fuel for standby power generation **[S3]**. HVO, a biofuel produced from waste fats and oils through hydrocracking or hydrogenation, has properties similar to diesel but burns cleaner, significantly lowering CO_2, NO_X, and particulate emissions. It provides a cost-effective alternative, as it can be blended with diesel in any ratio and integrated into existing generator systems. When used alongside Selective Catalytic Reduction (SCR) technology, HVO further enhances NO_X and particulate emissions reduction.

Key properties of HVO include:

- Reliable performance in colder temperature;
- Low tendency for deposit formation in fuel systems;
- Compatibility with engine oil, without dilution issues;
- Potential for more efficient, low-emission diesel engines; and
- Greenhouse gas emissions reduction between 50 % - 90 % depending on feedstock and blend.

Compared to diesel, HVO can reduce[1]:

- Fine particles (PM) by up to 33 %;
- Nitrogen oxides (NO_X) by up to 9 %;
- Hydrocarbons (HC) by up to 30 %;
- Carbon monoxide (CO) by up to 24 %;

HVO meets EN 15940 standards for paraffinic fuels and can blend with EN 590 diesel. The adoption of HVO is growing due to compatibility with existing generators and reduced initial costs. However, its current adoption is limited by supply chain constraints and higher costs. Supply chains are expanding to meet increasing demand, essential for broader uptake in carbon reduction efforts.

[1] https://www.neste.be/sites/neste.com/files/neste_my_renewable_diesel_a4-factsheet_be-english.pdf

Hydrogen (H_2) fuel cells (HFC) **[S4]** present a promising pathway towards decarbonising data centre backup and auxiliary power[2]. When powered by green H_2, fuel cells can deliver near-zero carbon emissions with only water and heat as byproducts, making them attractive for hyperscale operators aiming to match sustainability targets. Major pilot and commercial demonstration projects, such as those by Microsoft and Caterpillar[3], have shown that HFC systems are technically capable of delivering reliable backup power to data centre operations by successfully supporting power loads for extended periods and performing well under challenging conditions (e.g., at high elevation and sub-zero temperatures). Modular scalability and integration with battery and grid systems can add resilience and operational flexibility.

However, several critical constraints remain for the widespread selection of hydrogen fuel cells as the primary backup solution:

- **Implementation Costs –** High initial capital expenditure on HFC and associated storage / compression infrastructure; green H_2 supply is currently much more expensive than grid electricity or conventional fuels.
- **Regulatory Requirements –** On site H_2 use is governed by stringent safety and environmental regulations, and permitting remains a challenge within urban or densely built environments.
- **Environmental Impacts –** The carbon abatement potential directly depends on the source of H_2. Green H_2 provides full benefits, but 'grey' or 'blue' hydrogen still involve some fossil fuel use or lifecycle emissions. 'Pink' H_2 which is produced using nuclear energy offers significant carbon reduction potential however involves other environmental considerations.
- **Safety Implications –** H_2's flammability, low ignition energy, and high storage pressure present greater fire / explosion risks than diesel, necessitating advanced monitoring, containment, and emergency management.
- **System Compatibility –** Adoption typically requires conversion from DC to AC, changes to site electrical architecture, adaptation of generator control logic, and significant re-engineering of mechanical systems for safe, on-demand hydrogen storage and fuel delivery.

Given these factors, HFCs are best viewed as an emerging, potentially transformative solution for decarbonising data centre power, particularly where commercial-scale green H_2 and the necessary Proposal site infrastructure are available. In the current market, they are most feasible in demonstration or hybrid setups, often paired with batteries and conventional generators to ensure both technical reliability and regulatory compliance.

Battery Energy Storage Systems (BESS) [**S5**] are essentially large-scale rechargeable battery banks and have evolved from niche pilots to essential components in modern data centres, driven by increasing power demand, the need for uninterrupted uptime, rising energy costs, and sustainability goals. BESS provide near-

2 https://www.fastechus.com/blog/ai-evolution-hydrogen-sustainable-data-centers

3 https://www.powermag.com/hydrogen-fuel-cell-provides-backup-power-for-microsoft-data-center/

instantaneous power backup, eliminate reliance on diesel fuel, reduce operational maintenance, and enable integration with renewable energy sources[4]. They offer key benefits including rapid response times, high reliability with built-in redundancy, lower operational costs through peak shaving and load management, and significant reductions in carbon emissions. Additionally, BESS support grid stability and can participate in demand response programs, enhancing overall energy efficiency and cost savings.

However, BESS adoption faces challenges such as high upfront capital costs, space and scalability limitations[5] especially for long-duration backup, complex integration with existing infrastructure, and ongoing safety and lifecycle management requirements. Long-duration outages still pose difficulties as large battery banks to cover extended events can be prohibitively expensive, making diesel generators a necessary complement in many cases. Regulatory hurdles and dependence on grid-sourced electricity for charging may also constrain the full environmental benefits of BESS.

Overall, while BESS deliver transformative advantages to align with BAT, their current limitations mean they are best implemented in hybrid strategies alongside diesel backup for comprehensive, resilient power solutions in large-scale data centres.

Alternative fuel types identified through the desktop review include natural gas, propane, gasoline, liquefied natural gas (LNG). These fuels may provide gas engines with higher thermal efficiencies when compared to use over diesel generators. However, it is important to note that gas engines may come with relatively higher levels of investment, operating and maintenance costs. Additionally, whilst the use of gas engines may have the potential for lower NO_X emissions compared to diesel engines, there would be a reliance on the national gas grid for an uninterruptable supply, which may not provide the Applicant with fuel security **[S6]**.

Discharge Design

According to (UK Environment Agency, 2018), data centres can have short, below roof level emissions stacks, which can impact on the efficiency of dispersion of emissions. With reference to BATT, the following techniques are noted for the adequate dispersion of exhaust emissions:

1. Increased stack height
2. Vertical ports
3. Increased distances from buildings to be above roof line
4. 'Common windshield' combining several individual flues.

Stack Height

By raising the stack height, this can facilitate a higher level of dispersion of exhaust gases as they mix with the surrounding air beyond the stack plume. Although this does not decrease the pollutant concentration at

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4 https://www.delfos.energy/blog-posts/data-centers-battery-storage-ensuring-reliable-sustainable-power

5 https://www.pv-magazine-australia.com/2025/10/15/dealing-with-demands-of-power-hungry-data-centres/

source, this does aide in reducing pollutant concentrations at ground level. Elevating the stack height serves to mitigate the impact of building wake and the entrainment of emissions in the locality of the emission source.

When wind interacts with buildings or structures, turbulent eddies form on the downwind side, potentially forcing a stack plume down to the ground if it's located within approximately five times the height of the nearby structure. This turbulence, known as building downwash, can lead to increased ground-level pollutant concentrations downstream of the building or structure.

Elevating the stack height above the highest point of the building in which it is located (or nearby buildings) will help mitigate building downwash effects and reduce air quality impacts beyond the Proposal site, where feasible **[S7]**.

Discharge Velocity

Decreases in ground-level pollutant concentrations can be accomplished through improved mixing with the surrounding air once the exhaust gas plume terminates from the stack. A higher emission velocity generates increased momentum, increasing the height of the plume in the atmosphere beyond the stack exit point. This increased vertical mixing contributes to lower pollutant concentrations at surrounding receptors.

Any increase in discharge velocity should be considered alongside any improvements to the stack height to optimise plume dispersion conditions.

Increasing discharge velocities associated with the standby generators may be achieved by:

- Increasing the volumetric flow rate to from the discharge point;
- Decreasing the physical dimensions of the discharge point; and / or
- The addition of dilution air into the exhaust stream prior to discharge.

Exhaust stack restriction devices can regulate the corresponding exhaust flow through adjustment of the cross-sectional area of the stack at point of discharge **[S8]**

Enhanced discharge velocity may also be gained through the use of dilution fans (for example[6]). They operate by drawing in additional air below the point of discharge to increase volumetric flow and increasing discharge velocity. The effect of this is to significantly increase vertical momentum, which can increase the effective discharge height to conditions that are less affected by turbulent air flows over buildings and enhance dispersion.

They can be configured by multiple inlet manifold and variable speed drive fans to serve multiple discharge points, and as such may offer a practical solution for data centres that are designed with nested discharge points and have highly variable discharge flows.

[6] https://www.criticalairflow.com/site/assets/files/1080/critical_airflow_tristactech.pdf

Such devices have been used on other developments in the Greater Sydney region to good effect **[S9]**.

Discharge Temperature

High stack exhaust temperatures can increase both buoyancy and plume rise dispersion conditions. Plumes tend to rise more rapidly when the associated gases are warmer compared to the atmospheric temperature, which in turn contributes to a higher plume rise which can affect the dispersion pattern.

Combustion modification such as changes to the flame temperature and O_2 content of the air-fuel (stoichiometric) mixture aim to reduce NO_X pollution by ensuring that the fuel is burned completely or reducing the amount of nitrogen from the air that is burnt in the combustion process. Such approaches include lean burn, water injection, exhaust gas recirculation or low-NO_X boiler designs that reduce the flame temperature.

Secondary abatement technologies such as SCR operated within a narrow temperature range. Operating at lighter loads typically results in emissions at lower temperature, resulting in poorer performance of SCR aftertreatment **[S10]**.

Multi-Stack Configuration

By physically bringing together the exhaust streams for multiple engines, it is possible to improve the mixing of flue gases with the surrounding air. This plume aggregation does not decrease the absolute quantities of pollutants being emitted however it can lead to enhanced plume dispersion which results in lower concentration at ground level.

A multi-flue stack configuration pertains to a chimney or exhaust system that contains several flues, where each generator can discharge independently through its own flue but is constrained within that stack. Multi-flue stacks are common in facilities with multiple combustion processes. Each flue may lead to a specific emission control system or stack gas treatment unit.

A combined flue stack configuration involves the use of a single exhaust stack system for the collective discharge of combustion byproducts from various power generation sources. This serves as the termination point with each flue feeding into the shared exhaust system **[S11]**.

Air Pollution Control

Air pollution control (APC) encompasses a range of technologies and strategies aimed at eliminating or minimising the release of pollutants into the atmosphere. With regard to standby power generation from diesel combustion, the application of exhaust aftertreatment technologies is common.

Known air pollution control technologies that are available to reduce diesel combustion pollutant emissions include:

- **Diesel Oxidisation Catalyst (DOC) –** use of a catalyst to promote the oxidation of CO and hydrocarbons (HC) contained in the diesel exhaust gas to produce CO_2 and water as byproducts.
- **Diesel Particulate Filters (DPF) –** filters particulate matter (PM) from the exhaust gas and is 'burned off' through either active of passive filter regeneration.
- **Selective Catalytic Reduction (SCR) –** emissions control method that reduces NO_x emissions within exhaust gases by injecting a reducing agent which initiates a chemical reaction that converts NO_x into N_2, water, and small amounts of CO_2.
- **Non-selective Catalytic Reduction (NSCR) –** use of a catalyst reaction to simultaneously reduce NOx, CO, and hydrocarbon (HC) to water, CO_2, and N_2.

A diesel oxidisation catalyst (DOC) is an aftertreatment component that is designed specifically for modern diesel engines to convert CO and HC and are commonly used alongside other emission control devices such as DPF and SCR systems. DOCs can achieve a higher level of performance with the use of low sulphur diesel. General information provided by the US EPA[7] indicates that DOCs are typically effective at reducing emissions of particulate matter (PM) between 20 % to 40 %, HC emissions can be reduced between 40 % and 75 % and CO emissions between 10 % and 60 % **[S12]**.

A Diesel Particulate Filter (DPF) serves as an APC device aimed at minimising particulate matter (PM) emissions linked to diesel engine exhaust. Positioned downstream of the engine, the DPF employs a filtration medium, typically a porous ceramic filter, to capture PM. Subsequently, the accumulated PM undergoes combustion at elevated temperatures to ensure effective removal. This technology can be combined with other emissions controls including SCR and DOC as DPF has a limited effect on other pollutants such as $NO_{X.}$

Passive regeneration takes place when the exhaust gas temperatures reach a level that initiates the combustion of collected PM within the DPF without the need for additional fuel, heat, or driver intervention. Conversely, Active regeneration may necessitate external sources of fuel or heat to elevate the DPF temperature to a point where the accumulated PM can be effectively combusted.

The associated control efficiencies for DPF technology, as verified by US EPA[8] ranges between 85 % and 90 % for PM emissions **[S13]**.

Selective catalytic reduction (SCR) control devices are considered to be one of the most effective abatement techniques for NO_X releases. SCRs induce a chemical reduction via a reducing agent and catalyst to convert NO_X to molecular nitrogen (N_2) and water in the presence of a catalyst. In mobile source applications, an aqueous urea solution is typically preferred as the reductant. The LCP BREF (Lecomte, et al., 2017) notes that, *"A higher NO_X reduction is achieved with the use of several layers of catalyst. The technique design can be*

[7] https://www.epa.gov/sites/default/files/2016-03/documents/420f10031.pdf

[8] https://www.epa.gov/sites/default/files/2016-03/documents/420f10029.pdf

modular; a special catalyst and / or preheating can be used to cope with low loads or with a wide flue-gas temperature window."

Conversion of NO_X occurs on the catalyst surface with an ideal temperature range of between 300 °C and 450 °C, and less effectively over a wider temperature range of 170 °C and 510 °C depending on the catalyst type and/or configuration employed.

SCR can typically reduce NO_X emissions between 75 % and 90 %, HC emissions by up to 80 %, and PM emissions between 20 % and 30 %[9]. SCR requires the engine and exhaust system to reach operating temperature to be effective, requiring special pre-heaters for NO_X reduction in standby generators, which may reflect a higher cost for implementation **[S14]**.

Selective Non-Catalytic Reduction (SNCR) involves reducing NO_X to N_2 through the reaction with ammonia (NH_3) or urea (CH_4N_2O) at a temperature between 800 °C and 1 100 °C for optimal reaction. The LCP BREF (Lecomte, et al., 2017) provides a technical description for SNCR, whereby, "*Using ammonia as a reagent, the following chemical reactions take place more or less at the same time. At the lower temperature, both reactions are too slow; at the higher temperature, the unwanted by-reaction dominates with an increase in NO_X emissions."*

In contrast to SCR technology, a catalyst is not required, which lowers investment and maintenance costs, and less space is required to house the SNCR technology at the generator location. The LCP BREF (Lecomte, et al., 2017) notes that SNCR cannot be applied to gas engines or turbines due to the residence time and temperature window required for operation. SNCR processes can typically achieve a NO_X reduction level of between 30 % and 50 % (Lecomte, et al., 2017).

In NSCR technology, the engine exhaust flows through a catalyst bed where NO_X is converted to N_2. Simultaneously, VOCs and CO undergo oxidation, resulting in the formation of water and CO_2 under optimal conditions.

A technical progress report on reciprocating engine emissions control (Chapman, 2004) notes that, *"For an NSCR system to operate optimally (i.e., to minimize NO_x emissions), the inlet exhaust stream must have very low oxygen content, as well as proper concentrations of NO_X, hydrocarbons, and carbon monoxide. This requires initial engine adjustments, followed by careful monitoring of oxygen content in the exhaust."*

The catalyst demands exhaust with less than 0.5 % O_2 content. Although employing a fuel-rich mixture increases engine fuel consumption due to back pressure, it enables effective NO_X control, typically achieving levels between 90 % and 98 %[10] **[S15]**.

9 https://archive.epa.gov/international/air/web/pdf/default-file_dieselfact_0106.pdf

10 https://www3.epa.gov/ttncatc1/dir1/fnoxdoc.pdf

Various standby generator manufacturers have developed retrofit emission control device (RECD) systems[11] based on electrostatic precipitation (ESP) fundamentals for use with diesel generator sets. The RECD is installed after the standby generator exhaust and no modifications to the exhaust are required. However, the RECD would have additional spacing requirements which may be constrained at the Proposal site **[S16]**.

Each air pollution control device identified in this section requires retrofitting to each standby generator (or each discharge point in the event of co-vented discharges), incurring associated costs. Retrofitting involves integrating or adding these devices to existing plant to enhance their emission control capabilities. The costs associated with this process include expenses for purchasing the control devices, installation, and potentially ongoing maintenance **[S13-16]**.

Controls in the Pathway

Enhancing the dilution and dispersion of a pollutant plume during its journey from the source to the receptor will lower the concentration at the receptor, subsequently minimising exposure. For instance, extending the pathway, such as by emitting emissions from a tall stack, will generally, under constant conditions, increase both dilution and dispersion conditions.

Green Infrastructure

The integration of Green Infrastructure (GI) in the environment has the potential to reduce the effectiveness of the pathway from the emission source to the receptor. Introducing natural elements, like vegetation or green spaces, as contiguous barriers can disrupt the usual flow of pollutants, creating obstacles that impede the direct transmission of emissions. This interference promotes dispersion, dilution, and absorption of pollutants by greenery, which can aide in lowering the concentration of pollutants reaching the receptor.

Strategically placed Vegetative Environment Buffers (VEB) along the perimeter of industrial areas, abutting sensitive areas such as residential, child-care and educational facilities can aide in mitigation human exposure to air pollution.

According to recent research (Barwise & Kumar, 2020), the optimal configuration and plant composition of GI are unclear. Furthermore, the effectiveness of GI depends on factors such as the condition of the built environment, as well as the type, location, and configuration of GI (Kumar, et al., 2019) **[P1]**.

Structural Barriers

Structural barriers such as sound walls or shelterbelts can influence the exposure pathway by obstructing the pollutant plume. These barriers can induce turbulence in the airflow, leading to enhanced dispersion and are used in industrial settings to reduce direct exposure to emissions at receptors. These methods may be more

[11] http://www.jnmachineries.com/cummins_retrofit_emission_control_device.php

feasible in comparison to GI which would also require additional considerations with regard to establishment and maintenance activities.

While the discharges are released at a height, the implementation of structural barriers may be limited to the immediate vicinity of the Proposal site due to the distance to sensitive land uses and the magnitude of the discharge and structural constraints due to the increased loads of such structures **[P2]**.

Stack Height Optimisation

Increasing the stack height can influence the dispersion pattern of pollutants emitted from a stack. A taller stack emits the discharge at greater height and into atmospheric conditions which can enhance more effective dispersion.

Stack heights may be increased through retrofitting, noting that the increased height may have an effect of duct pressure which may affect performance of APC devices.

Often, planning restrictions may also impose limitations on stack heights to limit other environmental effects such as visual impact and design aesthetics **[S4, P3]**.

Controls at Receptors

Air Filtration Systems

Air filtration systems reduce indoor pollutant levels in buildings by extracting contaminants from airflow and commonly feature filters like activated carbon and HEPA filters, which capture airborne pollutants, particularly particulates, effectively.

Research conducted by the Public Health Research & Practice[12] assessed the effectiveness of air filtration, particularly those utilising HEPA filtration, in residential settings, focusing on their potential to increase infiltration rates. The research focused on the quantification of HEPA filters in residential settings during smoke events and notes that:

> *"The percentage reduction of $PM_{2.5}$ attributable to using the HEPA cleaner, which ranged between 30 % and 75 %. Other international studies suggest that HEPA cleaners can provide approximately 52 % – 67% reductions in PM….*
>
> *The effectiveness of HEPA cleaners depends on several factors, including outdoor smoke concentrations, room size, housing characteristics and building ventilation"*

Commercial and industrial buildings in the surrounding environment likely incorporate air handling units (AHU) within their respective building design whilst residential dwellings may also have some uses.

12 https://www.phrp.com.au/issues/online-early/residential-indoor-air-quality-and-hepa-cleaner-use/

This control is by definition, only of value inside engineered airtight buildings and of limited value in non-airtight buildings (such as residential properties), and of no value in outdoor locations **[R1]**.

Alerts and Alarms

Implementation of air quality monitoring networks and early warning systems can assist in safeguarding sensitive receptors in proximity to the Proposal site. These systems can detect pollutant levels in real-time and can issue timely alerts, which can alert the local community to any potential pollution episodes. Alarm and alert systems that could be potentially implemented include:

- Real-time air quality monitoring stations that detect elevated levels of pollutants.
- Automated warning systems that send alerts via SMS, email, or mobile apps to the local community when pollution levels exceed any impact assessment criterion or predetermined thresholds.
- Integration with weather forecasting data to anticipate changes in air quality due to meteorological conditions.
- Online platforms or dashboards providing up-to-date information on air quality advisories for the community.

Increased community engagement, through mediums such as public forums, community advisory boards and meetings can help educate the local community to understand the Proposal site's procedures for standby power generation and the potential implications on air quality. The associated costs of implementing real time air quality monitoring and automated warning systems may not be viable given the likelihood of the Proposal site suffering a catastrophic power outage.

If implemented, each standby generator will feature operational alarms to alert in case of faults and will adhere to maintenance schedules and compliance monitoring programs to ensure emission control equipment functions correctly and complies with regulations. Regular testing and monitoring of the standby generators would incur costs **[R2]**.

Summary

The feasibility of implementing the identified control options in the SPR model have been evaluated by considering the following factors:

- Implementations cost;
- Regulatory requirements;
- Environmental impacts;
- Safety implications; and
- Compatibility with current processes.

This summary assesses the measures that may constrain the implementation of the control measures outlined above. Each measure is provided a risk rating (**low**, **medium**, or **high**) which identifies the constraints which may result in the implementation of the measure not being practical at the Proposal site. Where any of the measures of practicability are rated as high, these measures are not considered further.

It is noted that for the assessment of implementation costs, this review has adopted a relative and qualitative approach as follows:

- **Low** = $
- **Medium** = $$
- **High** = $$$

Table J5 provides a summary of the additional controls that could be employed at the Proposal site to minimise and reduce air pollution impacts from the standby generator operations.

Table J5 Practicality of implementing control measures at the Proposal site

Control measure	Potential Constraints					Conclusion of evaluation
	Implementation costs	Regulatory requirements	Environmental impacts	Safety implications	System compatibility	
Source						
S1 generator specification	$$$	Low	Low	Low	High	• Selecting alternative generator sets would be a high-cost option and would be difficult to implement once the facility is operating.
S2 low NO_X burners	$$$	Low	Low	Medium	Low	• Change in designed operational conditions (combustion stability, heat exchange) represents some safety issues that would require due consideration. • May offer additional air pollution control however would require extensive retrofitting to each standby generator.
S3 use of HVO as alternative to diesel fuel	$$	Low	Low	Low	Low	• Provides emissions reductions due to the lower carbon intensity of a renewable fuel source, with each proposed standby generator approved for renewable fuel compatibility.
S4 hydrogen fuel cells (HFC)	$$$	High	Medium	High	Medium	• High upfront capital costs for HFC and storage infrastructure; green H_2 fuel remains expensive currently. Dependent on source, green and pink H_2 offer near-zero emissions, while grey / blue H_2 emits some lifecycle carbon. • H_2's flammability, high pressure storage, and risk profiles require rigorous safety systems and emergency preparedness. Requires significant electrical and mechanical system modification from diesel or conventional backup systems, including DC-AC conversion and storage integration.

Control measure	Potential Constraints					Conclusion of evaluation
	Implementation costs	Regulatory requirements	Environmental impacts	Safety implications	System compatibility	
S5 Battery Energy Storage System (BESS)	$$$	Medium	Low	Medium	Medium	• High upfront capital costs ($400-$600 per kWh or more), plus installation and integration expenses. Evolving safety and permitting standards can delay deployment, but guidance and experience exist. • Generally positive, with zero local emissions and enabling renewables, though lifecycle impacts exist. Battery fire risk and thermal runaway require robust safety systems and maintenance. • Complex integration with existing power infrastructure and controls needed for seamless operation.
S6 other alternative fuels (LNG, natural gas, propane, gasoline)	$$	Low	Low	High	High	• Compatibility, storage and handling capabilities and combustion characteristics. Standby generators utilise diesel fuel and would require significant modification, and/or re-specification.
S7 stack height	$	Low	Low	Medium	Low	• Compatibility with clearance requirements to negate building downwash effects, stability, and structural integrity considerations.
S8 increased stack velocities	$	Low	Low	Medium	Low	• Change in designed operational conditions which may then require structural integrity considerations to stack configuration.
S9 dilution fans	$$	Low	Low	Low	Medium	• Higher capital cost but reduced operating cost due to inlet manifolds serving multiple discharges and variable drives. Retrofitting may require load considerations.

Control measure	Potential Constraints					Conclusion of evaluation
	Implementation costs	Regulatory requirements	Environmental impacts	Safety implications	System compatibility	
S10 stack temperature	$$	Low	Medium	Medium	Medium	• Maintaining optimal stack temperature is critical to avoid wet stacking (incomplete combustion) which causes buildup of unburned fuel / carbon in the exhaust, affecting performance and emissions. Load management and periodic load banking are necessary to sustain temperature and ensure combustion efficiency.
S11 multi-stack configuration	$$	Low	Low	Medium	Medium	• Structural and maintenance considerations required from design perspective. • Additional works required to combine flues into a multi-stack configuration. • Separating exhaust into multiple stacks may aide in optimizes airflow, reducing backpressure, and enhancing generator performance.
S12 diesel oxidisation catalyst	$$	Low	Low	Medium	Low	• Require additional design considerations and may offer additional air pollution control, requires retrofitting to each standby generator.
S13 diesel particulate filters	$$	Low	Low	Medium	Low	• Require additional design considerations and may offer additional air pollution control, requires retrofitting to each standby generator.
S14 selective catalytic reduction	$$	Low	Low	Medium	Medium	• Require additional design considerations and may offer additional air pollution control, requires retrofitting to each standby generator.
S15 non-selective catalytic reduction	$$	Low	Low	Medium	Medium	• Require additional design considerations and may offer additional air pollution control, would require retrofitting to each standby generator.
S16 electrostatic precipitation	$$	Low	Low	Medium	Medium	• Require additional design considerations and may offer additional air pollution control, would require retrofitting to each standby generator.

Control measure	Potential Constraints					Conclusion of evaluation
	Implementation costs	Regulatory requirements	Environmental impacts	Safety implications	System compatibility	
Pathway						
P1 green infrastructure	$	Low	Low	Low	Medium	• Green infrastructure often supports compliance with local planning and environmental regulations, particularly for visual screening and noise abatement. • Positive benefits include improved local air quality through pollutant filtration, enhanced aesthetics, biodiversity support, and microclimate cooling reducing local heat impacts from exhaust stacks.
P2 structural barriers	$$	Medium	Low	Medium	Low	• Require compliance with building codes, planning policies. • Choice, design, and stability capabilities for type of barrier used. • Strategic use of barriers may provide airflow restriction from source to receptor.
P3 optimised stack height	$$	Low	Low	Medium	Low	• Compatibility with clearance requirements to negate building downwash effects, stability, and structural integrity considerations.
Receptor						
R1 air filtration systems	$$	Low	Low	Low	Low	• High-quality filtration systems such as HEPA or multi-stage filters involve upfront equipment and installation costs. Regular filter replacement and maintenance add to ongoing operating expenses.
R2 alerts and alarms	$	Medium	Low	Medium	Low	• Promotes timely maintenance and prevention of excessive emissions or malfunctions, indirectly supporting environmental compliance. Critical for early detection of hazardous conditions (e.g., exhaust temperature anomalies, fuel leaks), enabling prompt response to prevent accidents or equipment damage.

air quality | environment | sustainability

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Head Office

Suite 1504, 275 Alfred Street,
North Sydney NSW 2060

Riverina Office

PO Box 483
Albury NSW 2640

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Tel: 1300 708 590 | admin@northstar-env.com | northstar-env.com