DV4 Cumulative Air Quality Assessment

For: DataVita DV4 Limited

Site: DV4 Data Centre, Chapelhall

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Quality Assurance

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1. Introduction

1.1 Background

DataVita DV4 Limited (the Client), part of the HFD Group, is intending to develop the DV4 data centre at a site near Chapelhall, North Lanarkshire (hereafter referred to as the 'Proposed Development').

DataVita has already built the DV1 data centre and construction has commenced on the adjacent DV3 data centre. Arthian has recently provided assistance to DataVita and HFD Construction relating to the submission of an environmental permit application for the DV1 site under the Environmental Authorisations Scotland Regulations (EASR).

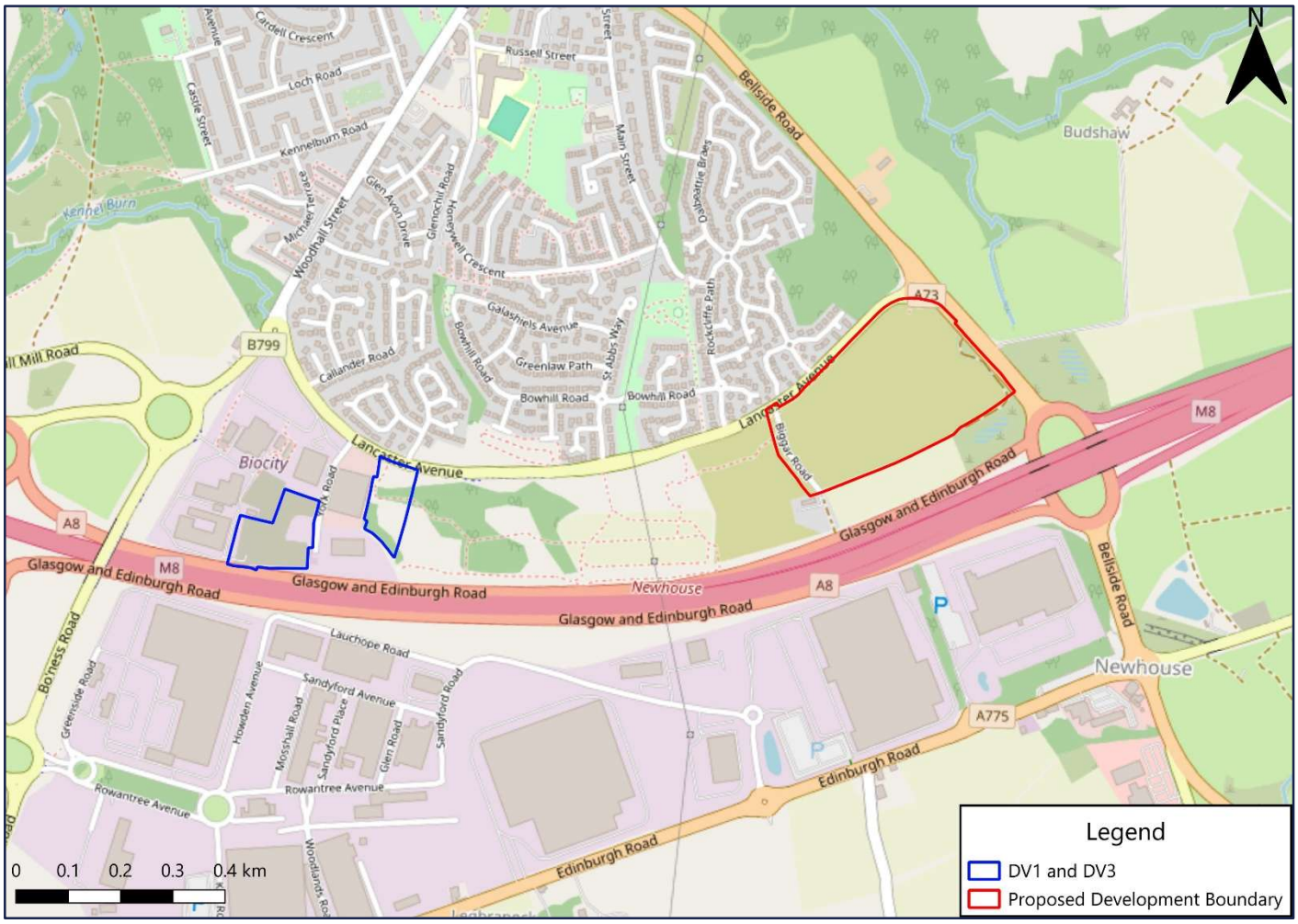
Preliminary design work has been completed for the DV4 installation, with the intention being to submit an application for Planning Permission in Principle (PPiP). Arthian has been requested to undertake a cumulative air quality assessment of the DV4 development, which also includes emissions from DV1 and DV3, to inform the application.

Initial modelling results indicated that nitrogen dioxide (NO_2) impacts were of greatest potential impact. As such, only the NO_2 concentrations have been presented in this report. Full model results for the other pollutants can be provided on request for particulate matter, carbon monoxide, sulphur dioxide and benzene.

1.2 Site Description

The site is located off Lancaster Avenue in Chapelhall, North Lanarkshire. It is bounded to the north by residential developments, to the east by open fields and farmlands, to the south by the M8 and to the west by undeveloped land. Data centres DV1 and DV3 are located west of the Proposed Development. A location plan of the Proposed Development and the surrounding area is shown below in Figure 1.1.

Figure 1.1: Site Location



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2. Environmental Standards & Guidance

2.1 Ambient Air Directive (AAD) Limit Values

Table 2.1 summarises the relevant AAD limit values[1] which have been used in this assessment. Emissions from the site must not lead to an exceedance of these legally binding limit values.

Table 2.1: AADT Limit Values

Pollutant	Objective	Reference	Additional Information
Nitrogen Dioxide (NO_2)	200 µg/m^3	1-Hour Mean	Not to be exceeded more than 18 times a year (99.79th percentile)
	40 µg/m^3	Annual Mean	-
Particulate Matter (PM_{10})	50 µg/m^3	24-Hour Mean	Not to be exceeded more than 7 times a year (98.08th percentile)
	40 µg/m^3	Annual Mean	-
Particulate Matter ($PM_{2.5}$)	20 µg/m^3	Annual Mean	-
Carbon Monoxide (CO)	10,000 µg/m^3	8-Hour Mean	Running mean
Sulphur Dioxide (SO_2)	266 µg/m^3	15-Minute Mean	Not to be exceeded more than 35 times a year (99.90th percentile)
	350 µg/m^3	1-Hour Mean	Not to be exceeded more than 24 times a year (98.73rd percentile)
	125 µg/m^3	24-Hour Mean	Not to be exceeded more than 3 times a year (99.18th percentile)
Benzene	3.25 µg/m^3	Annual Mean	-

Local Air Quality Management (LAQM) Technical Guidance document LAQM.TG22 summarises locations at which these objectives should apply, based on associated averaging periods. This has been reproduced in Appendix A. It is also noted that the objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (e.g. centre of roadways).

[1] https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update.pdf

2.2 Environmental Assessment Levels (EALs)

EALs are used to help regulators assess the acceptability of an operator's emissions to air and their relative contribution to the environment. They represent a pollutant concentration in ambient air at which no significant risks to public health are expected. Relevant EALs, which are supplementary to the AAD Limit Value described above in Section 2.1, are summarised below.

Table 2.2: EALs

Pollutant	Objective	Reference	Additional Information
CO	30,000 µg/m^3	1-Hour Mean	-
Benzene	30 µg/m^3	24-Hour Mean	-

2.3 Guidance

A summary of the publications referred to in the undertaking of this assessment is provided below.

2.3.1 Local Air Quality Management Review and Assessment Technical Guidance

Defra has published technical guidance for use by local authorities in their review and assessment work. This guidance, referred to in this document as LAQM.TG22, has been used where appropriate in the assessment presented herein.

2.3.2 SEPA Air Emissions Risk Assessment for Environmental Permits

SEPA's 'Air Emissions Risk Assessment (AERA) for Environmental Permits' provides guidance on determining the impacts of emissions to air and the standards that are required to be met. The AERA guidance provides a methodology for carrying out detailed dispersion modelling, which has been followed in the preparation of this assessment.

3. Sensitive Receptors and Background Air Quality

3.1 Sensitive Receptors

3.1.1 Human Receptors

A review of the surrounding area was undertaken to identify potentially sensitive receptors. This focused on identifying the high sensitivity receptors nearest to the Proposed Development in all directions. The discrete sensitive receptors included in the assessment are detailed in Table 3.1 and Figure 3.1. All receptors were modelled at a breathing height of 1.5m.

Table 3.1 includes the receptors that were included in the Air Quality Assessment completed in relation to the Environmental Permit submission for DV1[2].

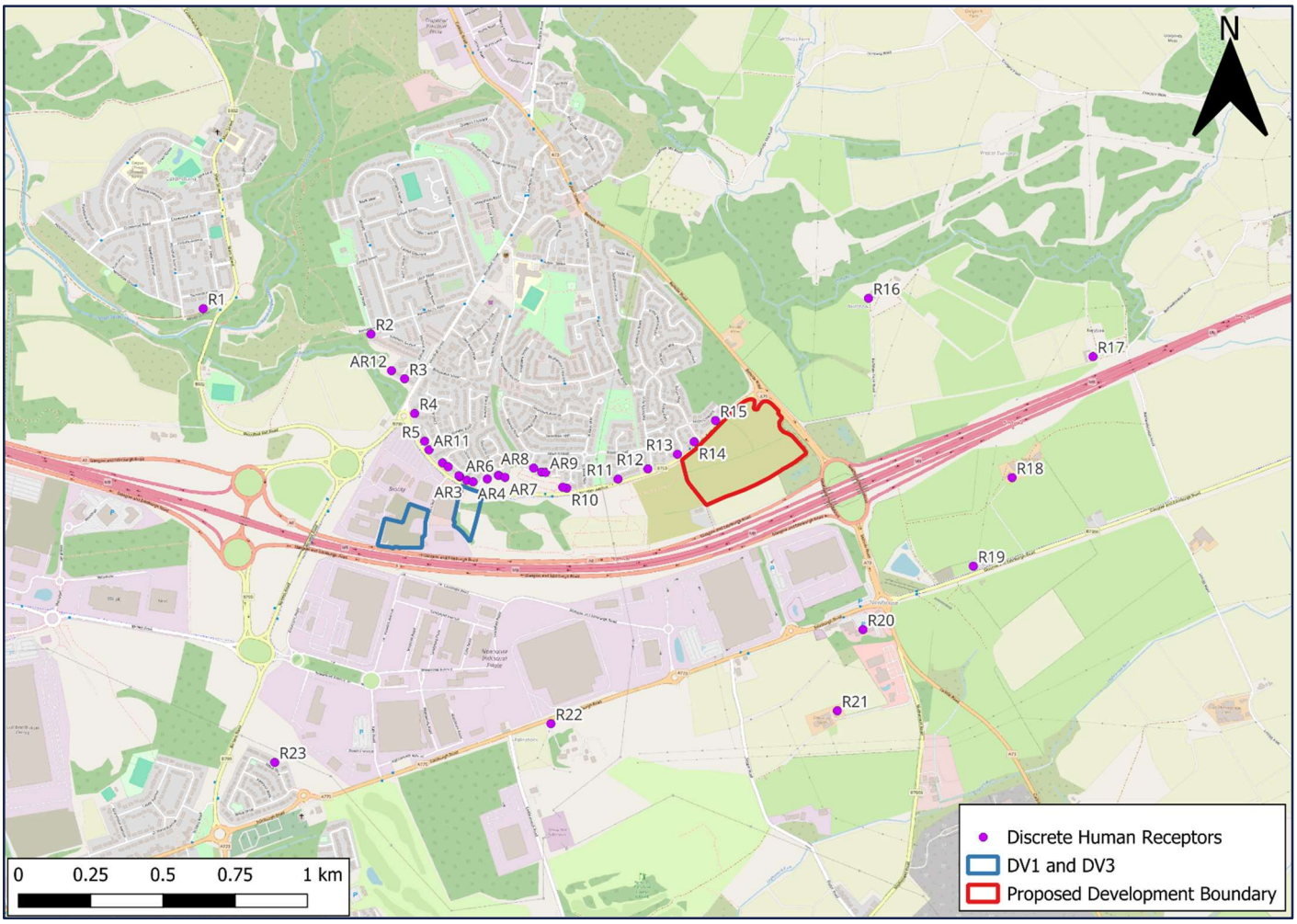
Table 3.1: Modelled Human Health Sensitive Receptors

Receptor ID	Location	X Coordinate (m)	Y Coordinate (m)	Z Coordinate (m)
All Environmental Standards Apply				
R1	Woodhall Road - Residential	276974	662540	1.5
R2	Kennelburn Road - Residential	277554	662452	1.5
R3	Michael Terrace - Residential	277670	662298	1.5
R4	Doune Crescent - Residential	277705	662178	1.5
R5	Drunmore Avenue - Residential	277740	662082	1.5
R6	Girvan Crescent - Residential	277802	662008	1.5
R7	Girvan Crescent - Residential	277861	661960	1.5
R8	Dalry Place - Residential	277996	661964	1.5
R9	Lindean Drive - Residential	278144	661976	1.5
R10	Coldstream Grove - Residential	278232	661920	1.5
R11	Anton Road - Residential	278409	661951	1.5
R12	Rockcliffe Path -Residenital	278512	661987	1.5
R13	Castlehill Crescent - Residenital	278614	662037	1.5
R14	Lammermuir Way - Residential	278672	662080	1.5
R15	Eldon Crescent - Residential	278746	662153	1.5

[2] Lucion. Dispersion Modelling Assessment Glasgow Data Centre. August 2026

Receptor ID	Location	X Coordinate (m)	Y Coordinate (m)	Z Coordinate (m)
R16	Budshaw Farm - Residential	279276	662576	1.5
R17	Fairybank Farm - Residenital	280052	662375	1.5
R18	Sandyford Farm - Residential	279772	661957	1.5
R19	Glasgow and Edinburgh Road - Residential	279638	661650	1.5
R20	Premier Inn - Hotel	279257	661431	1.5
R21	Greenside Farm - Residential	279168	661148	1.5
R22	Edinburgh Road - Residential	278177	661103	1.5
R23	Wilkie Drive - Residential	277221	660969	1.5
AR1	Girvan Crescent - Residential	277821	661994	1.5
AR2	Girvan Crescent - Residential	277858	661963	1.5
AR3	Girvan Crescent - Residential	277886	661947	1.5
AR4	Tarbolton Crescent - Residential	277907	661942	1.5
AR5	Tarbolton Crescent - Residential	277957	661952	1.5
AR6	Dalry Place - Residential	277995	661964	1.5
AR7	Dalry Place - Residential	278018	661957	1.5
AR8	Bowhill Road - Residential	278117	661990	1.5
AR9	Lindean Drive - Residential	278158	661974	1.5
AR10	Goldstream Grove - Residential	278217	661924	1.5
AR11	Callander Road - Residential	277755	662052	1.5
AR12	Michael Terrace - Residential	277625	662326	1.5

Figure 3.1: Modelled Sensitive Human Receptors



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3.1.2 Ecological Receptors

Ecological receptors, including Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites and Sites of Special Scientific Interest (SSSIs) within 10km of the Proposed Development boundary, were considered in the assessment.

Based on the 10km screening distance, the following sensitive receptors have been identified:

- Lady Bell's Moss SSSI
- Longriggend Moss SSSI
- Hassockrigg and North Shotts Mosses SSSI/SAC
- Woodend Loch SSSI
- Bishop Loch SSSI
- Bothwell Castle Grounds SSSI
- Hamilton High Parks SSSI
- Garrion Gill SSSI
- Black Loch Moss SSSI/SAC

- North Bellstane Plantation SSSI
- Slamannan Plateau SSSI
- Hamilton Low Parks SSSI

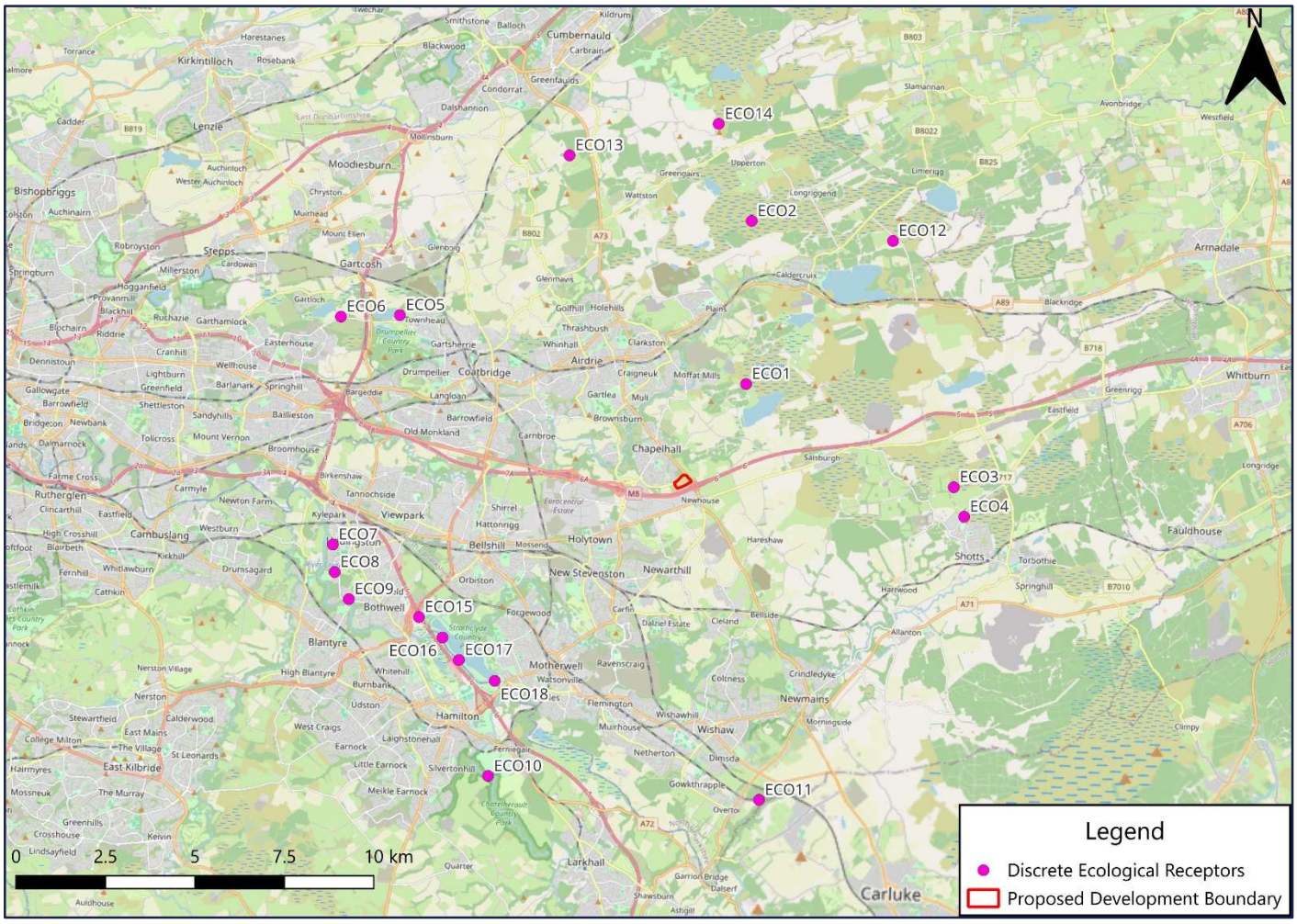
The sensitivities of each ecological site were checked using APIS. APIS is a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology.

The assessment has considered potential impact in terms of NO_x, SO_2, nitrogen deposition (eutrophication) and acidification. The modelled receptors included in the assessment are shown in Table 3.2 and Figure 3.2. All ecological receptors were modelled at a height of 0m.

Table 3.2: Modelled Ecological Sensitive Receptors

Receptor ID	Location	X Coordinate (m)	Y Coordinate (m)	Z Coordinate (m)
ECO1	Lady Bell's Moss SSSI	280583	664812	0
ECO2	Longriggend Moss SSSI	280767	669331	0
ECO3	Hassockrigg and North Shotts Mosses SSSI	286417	661887	0
ECO4		286707	661062	0
ECO5	Woodend Loch SSSI	270935	666699	0
ECO6	Bishop Loch SSSI	269287	666658	0
ECO7	Bothwell Castle Grounds SSSI	269062	660285	0
ECO8		269112	659516	0
ECO9		269506	658759	0
ECO10	Hamilton High Parks SSSI	273398	653816	0
ECO11	Garrion Gill SSSI	280972	653147	0
ECO12	Black Loch Moss SSSI/SAC	284719	668773	0
ECO13	North Bellstane Plantation SSSI	275676	671165	0
ECO14	Slamannan Plateau SSSI	279846	672046	0
ECO15	Hamilton Low Parks SSSI	271466	658258	0
ECO16		272127	657687	0
ECO17		272584	657060	0
ECO18		273577	656475	0

Figure 3.2: Modelled Sensitive Ecological Receptors



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3.2 Background Air Quality

3.2.1 Human Receptors

Background concentration data was initially considered from three sources: Scottish Air Quality Database (SAQD) background concentration maps, local monitoring station and local diffusion tubes.

A review of the available local monitoring data within North Lanarkshire Council's latest Annual Progress Report[3] has been undertaken. NLC operated 10 automatic monitoring sites and 51 NO_2 diffusion tubes in 2024. The locations of these monitoring locations are shown in Figure 3.3 below.

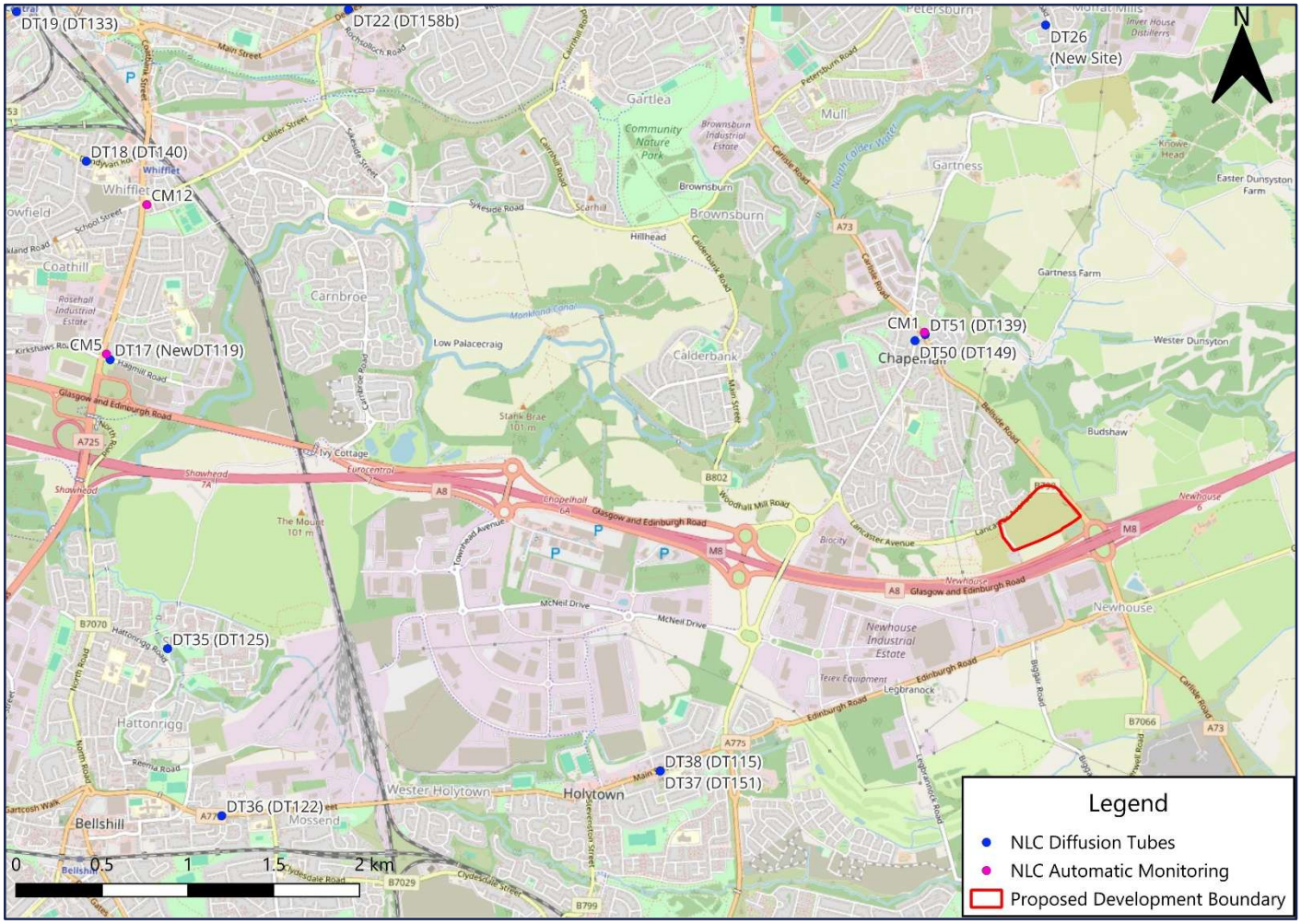
As shown in Figure 3.3, no monitoring locations are located in proximity to the site boundary or the identified modelled receptors (Table 3.1). The closest NLC monitors to the Proposed Development are located off

[3] North Lanarkshire Council. 2025 Air Quality Annual Progress Report. September 2025

Chapelhall Main Street approximately 1.1km north of the site boundary, adjacent to the A73. These monitoring locations are not considered representative of background conditions at the Proposed Development or identified sensitive receptors, the majority of which are located in a residential area set back from any major roads.

As such, background concentrations have been assessed using background maps as detailed below.

Figure 3.3: NLC Air Quality Monitoring Locations



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In the absence of representative local monitoring data, 1km square background data (as per SAQD and Defra mapping data) was reviewed. Maximum annual mean data is presented in Table 3.3 below for the identified sensitive receptors.

Table 3.3: Annual Mean Background NO_2, PM_{10}, $PM_{2.5}$, CO, SO_2 and Benzene

Pollutant	Year	Annual Mean Background Concentration (µg/m³)
NO_2	2026	12.4
PM_{10}	2026	12.1
$PM_{2.5}$	2026	5.8
CO	2001	306
SO_2	2001	8.1

Pollutant	Year	Annual Mean Background Concentration (µg/m³)
Benzene	2001	0.5

In line with industry guidance, annual mean backgrounds have been doubled to derive short-term backgrounds.

3.2.2 Background Air Quality (Ecological)

Annual mean background NO_x and SO_2 (2024 – 2024, 3-year average) and nitrogen and acid deposition rates and critical loads, sourced from APIS, are provided below. These were derived using the location search on the APIS website to provide specific data for each receptor. The Habitat Map of Scotland (HabMos), satellite imagery and professional judgement were used to identify the most applicable habitat type for each receptor. Where multiple habitat types were identified, the habitat with the lowest critical load was selected, this is considered a worst-case approach and ensures a conservative assessment.

3.2.2.1 NO_x and SO_2

The maximum 3-year average (2022 – 2024) baseline concentrations of annual mean NO_x and SO_2 from the identified receptors are presented in Table 3.4.

Table 3.4: Baseline Concentrations of Annual Mean NO_x and SO_2

Receptor ID	Location	Annual Mean NO_x (µg/m³)	Annual Mean SO_2 (µg/m³)
ECO1	Lady Bell's Moss SSSI	7.5	1.0
ECO2	Longriggend Moss SSSI	6.8	1.1
ECO3	Hassockrigg and North Shotts Mosses SSSI	5.3	0.8
ECO4		6.0	0.9
ECO5	Woodend Loch SSSI	12.3	1.6
ECO6	Bishop Loch SSSI	13.5	1.4
ECO7	Bothwell Castle Grounds SSSI	12.8	1.5
ECO8		12.8	1.5
ECO9		12.8	1.5
ECO10	Hamilton High Parks SSSI	8.8	1.2
ECO11	Garrion Gill SSSI	6.5	0.9
ECO12	Black Loch Moss SSSI/SAC	6.0	0.9
ECO13	North Bellstane Plantation SSSI	8.1	1.2
ECO14	Slamannan Plateau SSSI	6.7	1.1
ECO15	Hamilton Low Parks SSSI	18.5	1.3
ECO16		18.5	1.3
ECO17		18.5	1.3

Receptor ID	Location	Annual Mean NO_x (µg/m³)	Annual Mean SO_2 (µg/m³)
ECO18		18.5	1.3

3.2.2.2 Nitrogen Deposition

The maximum 3-year average (2022 – 2024) nitrogen deposition current loads and habitat specific critical loads from the identified sensitive receptors are presented in Table 3.5.

Table 3.5: Nitrogen Deposition Rates and Habitat Specific Critical Loads

Receptor ID	APIS Nitrogen Critical Load Class	Nitrogen Deposition (kg N/ha/yr)	
		Critical Load Range	Current Load
ECO1	Raised Bog	5-10	9.6
ECO2			9.3
ECO3			9.9
ECO4	Raised and blanket bogs	5-10	9.9
ECO5	Permanent oligotrophic lakes, ponds and pools	2-10	9.2
ECO6			9.3
ECO10	Broadleaved deciduous woodland	10-15	17.8
ECO11			17.7
ECO12	Raised and blanket bogs	5-10	9.6
ECO13	Broadleaved deciduous woodland	10-15	15.0
ECO14	Raised and blanket bogs	5-10	9.6

3.2.2.3 Acid Deposition

The 3-year average (2022 – 2024) acid deposition current loads and habitat specific critical loads from the identified sensitive receptors are presented in Table 3.6.

Table 3.6: Acid Deposition Rates and Habitat Specific Critical Loads

Receptor ID	APIS Acid Critical Load Class	Acid Deposition (keq/ha/yr)			
		MinCLminN	MinCLmaxN	MinCLmaxS	Current Load
ECO1	Bogs	0.321	0.569	0.248	0.8
ECO2	Bogs	0.321	0.595	0.274	0.7
ECO3	Bogs	0.321	0.564	0.243	0.8
ECO4	Bogs	0.321	0.564	0.243	0.8
ECO10	Unmanaged Broadleafed/Coniferous Woodland	0.357	2.449	2.092	1.4
ECO11		0.142	2.11	1.968	1.3

Receptor ID	APIS Acid Critical Load Class	Acid Deposition (keq/ha/yr)			
		MinCLminN	MinCLmaxN	MinCLmaxS	Current Load
ECO12	Bogs	0.321	0.597	0.276	0.8
ECO13	Unmanaged Broadleafed/Coniferous Woodland	0.285	2.261	1.976	1.2
ECO14	Bogs	0.321	0.607	0.286	0.8

4. Point Source Emissions Methodology

4.1 Model Choice

ADMS 6.0, the model used to undertake this exercise, is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters (the boundary layer depth and the Monin-Obukhov length) rather than in terms of the single parameter Pasquill-Gifford class. Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

4.2 Modelling Scenarios

Two scenarios have been considered as detailed below. The modelling assessment has considered impacts from the Proposed Development in isolation and also considered potential cumulative impacts with DV1 and DV3.

4.2.1 Routine Testing & Maintenance

The DV4 generators will operate for 18-hours each year, in accordance with a regular schedule that will include the following:

- Weekly: Each generator will operate individually for 10-minutes off-load every week.
- Monthly: Each generator will operate individually for 30-minutes every month at approximately 30% load.
- Annually: Each generator will operate individually for 3-hours every year at 100% load.

As such, a 0.21% factor (which equates to approximately 18 hours annually) has been applied to the annual mean modelling results to account for a more realistic annual average run time.

For modelling purposes, it is assumed that all generators are running at the same time. This is considered to represent a conservative worst-case scenario for assessment of 1-hour mean nitrogen dioxide as it is unlikely that all generators will be tested concurrently. The pollutants and objectives considered in this operating scenario are detailed in Table 4.1 below.

Table 4.1: Routine Testing & Maintenance Scenario

Air Quality Standard	Short-Term	Long-Term
Human Health Receptors		
NO_2	100th percentile 1-hour mean	Annual mean
Ecological Receptors		
NO_x	100th percentile 24-hour mean	Annual mean
Nitrogen Deposition	-	Annual mean
Acid Deposition	-	Annual mean

4.2.2 Emergency Blackout Event

In an emergency blackout event, all generators will run simultaneously in the extremely unlikely event of a power failure from the grid. Given the unpredictability of this occurrence, defining accurate operating hours is not possible.

For the purpose of modelling air quality concentrations, it has been assumed that all generators will operate for 72 hours in a single event where the generators operate at 100% load. The maximum hourly (100th percentile) nitrogen dioxide concentration have been assessed which is considered to be conservative.

For long-term assessment, a 0.82% factor (which equates to approximately 72 hours annually) has been applied to the annual mean modelling results to account for a more realistic annual average run time.

The pollutants and objectives considered in the emergency blackout event scenario are detailed in Table 4.2 below.

Table 4.2: Emergency Scenario

Air Quality Standard	Short-Term	Long-Term
Human Health Receptors		
NO_2	100th percentile 1-hour mean	Annual mean
Ecological Receptors		
NO_x	100th percentile 24-hour mean	Annual mean
Nitrogen Deposition	-	Annual mean
Acid Deposition	-	Annual mean

4.2.3 Ambient Load Shedding

The DV4 engines could be used in future to provide additional generation capacity during periods of unusually high ambient temperatures and/ or extremely high demand, an operational mode known as Ambient Load Shedding (ALS). Projections for the utilisation of the DV4 engines for ALS are not currently available and so this operational mode has not been evaluated in this air quality assessment. A detailed appraisal of the air quality impacts of ALS will be provided in an updated assessment in support of a detailed planning application for DV4.

4.3 Emission Parameters

It is understood that 48 generators will be installed at the Proposed Development, each equipped with an individual exhaust flue. These generators will be distributed equally across 4 generator buildings. The modelled emissions parameters for each stack were derived from the generator specifications sheet. The modelled inputs used in this assessment are shown in Table 4.3 with their location show in Figure 4.1.

Selective Catalytic Reduction (SCR) technology will be installed at all 48 generators to help reduce NO_x emissions.

In addition, emissions from the DV1 and DV3 site have been included in the model and presented as a cumulative assessment. It is understood that SCRs will be installed at all generators at all three sites. An 85% SCR reduction

has been applied to NO_x emissions at all DV3 emission points while a 95% reduction has been applied to all DV4 emission points. Model inputs from these sites are also included in Table 4.3.

As a worst-case approach, emissions have been modelled assuming all generators will be running 100% of the year.

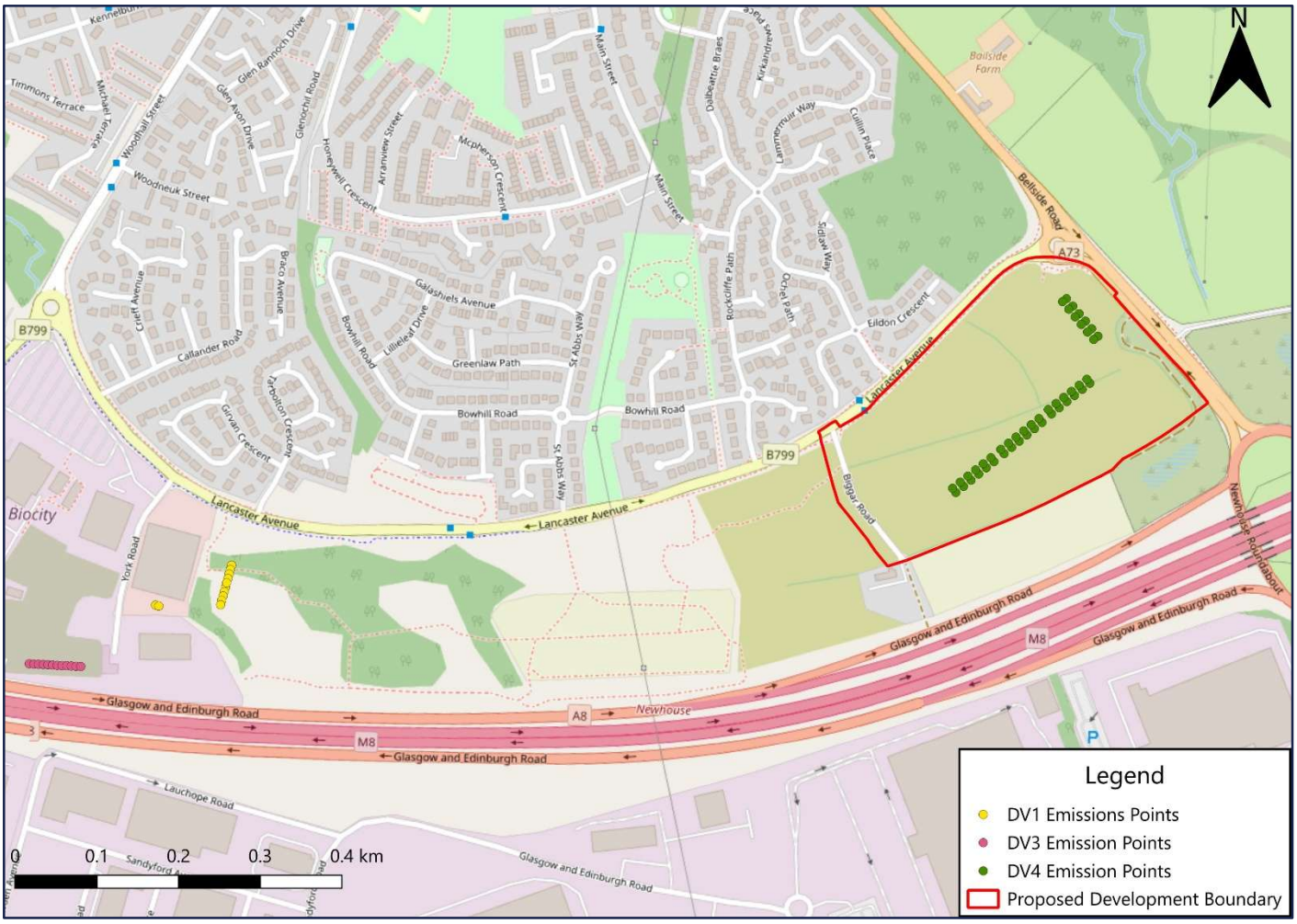
Table 4.3: Modelled Emission Parameters

Parameter	DV4 Generators	DV3 Generators	DV1 Generators		
			P2500	QSK78 – G24	QSK78 – G16
Proposed Stack Location X(m), Y(m)	Assumed to be evenly spread among the 4 buildings, as shown in Figure 4.1.	The centre of the generator buildings as shown in Figure 4.1.	Based on the locations provided in the previous assessment2.		
Preliminary Stack Height (m)	10	9.4	7.5	9.4	9.4
Stack Internal Diameter (m)	0.8	0.8	0.6	0.6	0.6
Exit Temperature (°C)	406	406	475	448	463
Efflux Velocity – actual (m/s)	22.6	22.6	30.95	26.58	27.47
Volumetric Flow Rate - normalised (m^3/hr)	16,416	16,416	7,545	7,172	7,393
NO_x as NO_2 Emission Rate (g/s) - SCR	0.311*	0.933**	1.062	1.450	1.041
PM Emission Rate (g/s)	0.011	0.014	0.084	0.056	0.029
CO Emission Rate (g/s)	0.194	0.014	0.084	0.056	0.029
SO_2 Emission Rate (g/s)	0.005	0.202	0.440	0.845	0.500
HC (as Benzene) Emission Rate (g/s)	0.077	0.005	0.004	0.004	0.004

*95% SCR reduction

**85% SCR reduction

Figure 4.1: Modelled Emissions Points



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4.4 Modelled Buildings

Turbulence can be induced by nearby buildings and structures, causing pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. The on-site buildings that were deemed to have the biggest potential to impact on emissions were included in the dispersion model.

The parameters for the selected modelling buildings are detailed in Table 4.4 below. Modelled building parameters derived from information provided by the Client, GIS data and the previous DV1 report2.

For the purpose of the dispersion modelling assessment, the buildings have been simplified. This results in a set-up as shown in Figure 4.2 and Figure 4.3.

Table 4.4: Modelled Buildings

Building ID	Building Centre		Modelled Height (m)	Length (m)	Width (m)
	X Coordinate (m)	Y Coordinate (m)			
DV4 – 1	278809	662061	29.0	229.5	62.8
DV4 – 3	278928	662155	7.0	68.3	18.1

Building ID	Building Centre		Modelled Height (m)	Length (m)	Width (m)
	X Coordinate (m)	Y Coordinate (m)			
DV4- 6	278915	662060	7.0	68.6	18.0
DV4 – 9	278856	662012	7.0	68.6	18.0
DV4 - 12	278797	661964	7.0	68.6	18.0
DV1 – Main	277807	661858	15	79.6	61.1
DV1 – South	277808	661755	10	31.4	62.9
DV1 – West	277736	661910	9	59.8	47.8
DV1 – Transformers	277839	661837	7.6	57.5	11.4
DV3 – 1	277641	661734	6.4	17.6	3.9
DV3 – 2	277647	661733	6.4	17.6	3.9
DV3 – 3	277653	661733	6.4	17.6	3.9
DV3 – 4	277659	661734	6.4	17.6	3.9
DV3 – 5	277664	661732	6.4	17.6	3.9
DV3 – 6	277670	661732	6.4	17.6	3.9
DV3 – 7	277676	661732	6.4	17.6	3.9
DV3 – 8	277682	661731	6.4	17.6	3.9
DV3 – 9	277687	661731	6.4	17.6	3.9
DV3 -10	277693	661731	6.4	17.6	3.9
DV3 – 11	277699	661730	6.4	17.6	3.9
DV3 – 12	277705	661730	6.4	17.6	3.9
DV3 - 13	277689	661813	25.5	91.7	33

Figure 4.2: 3D Model Layout – DV4

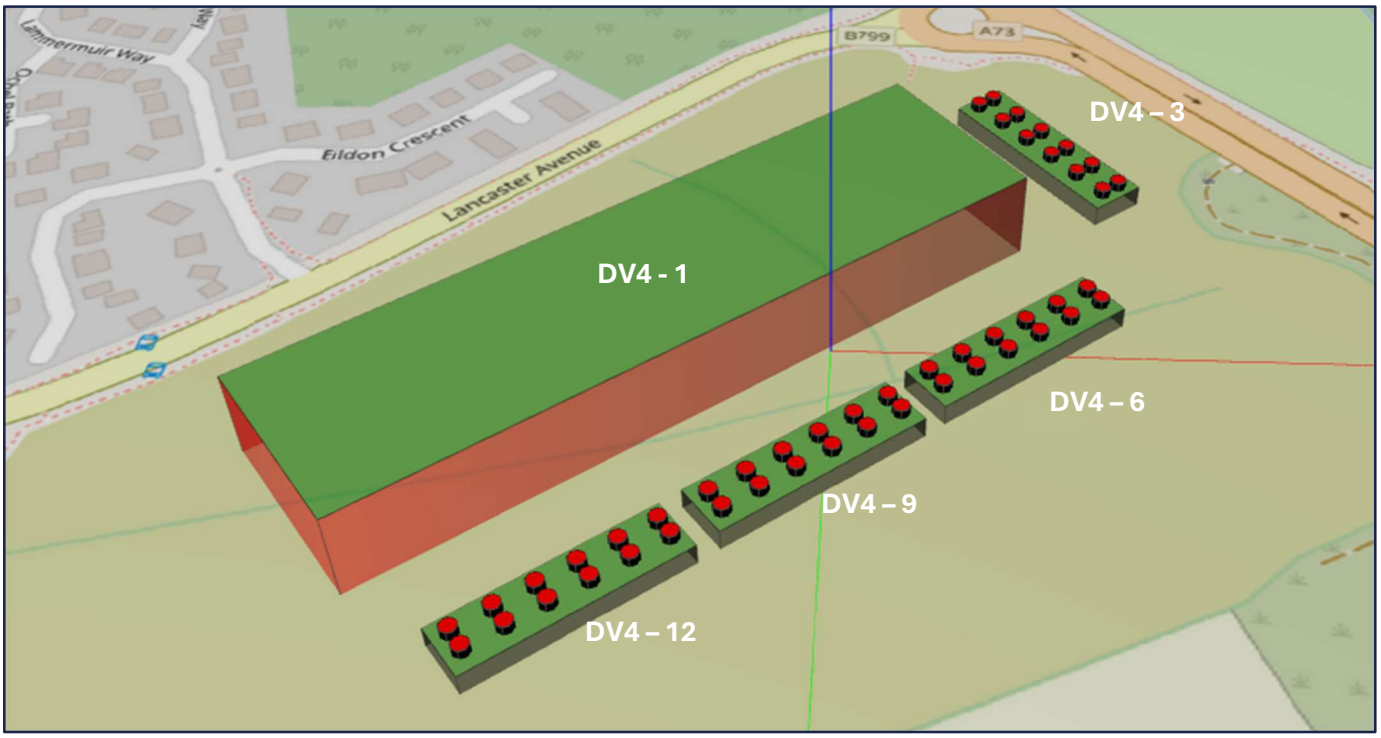

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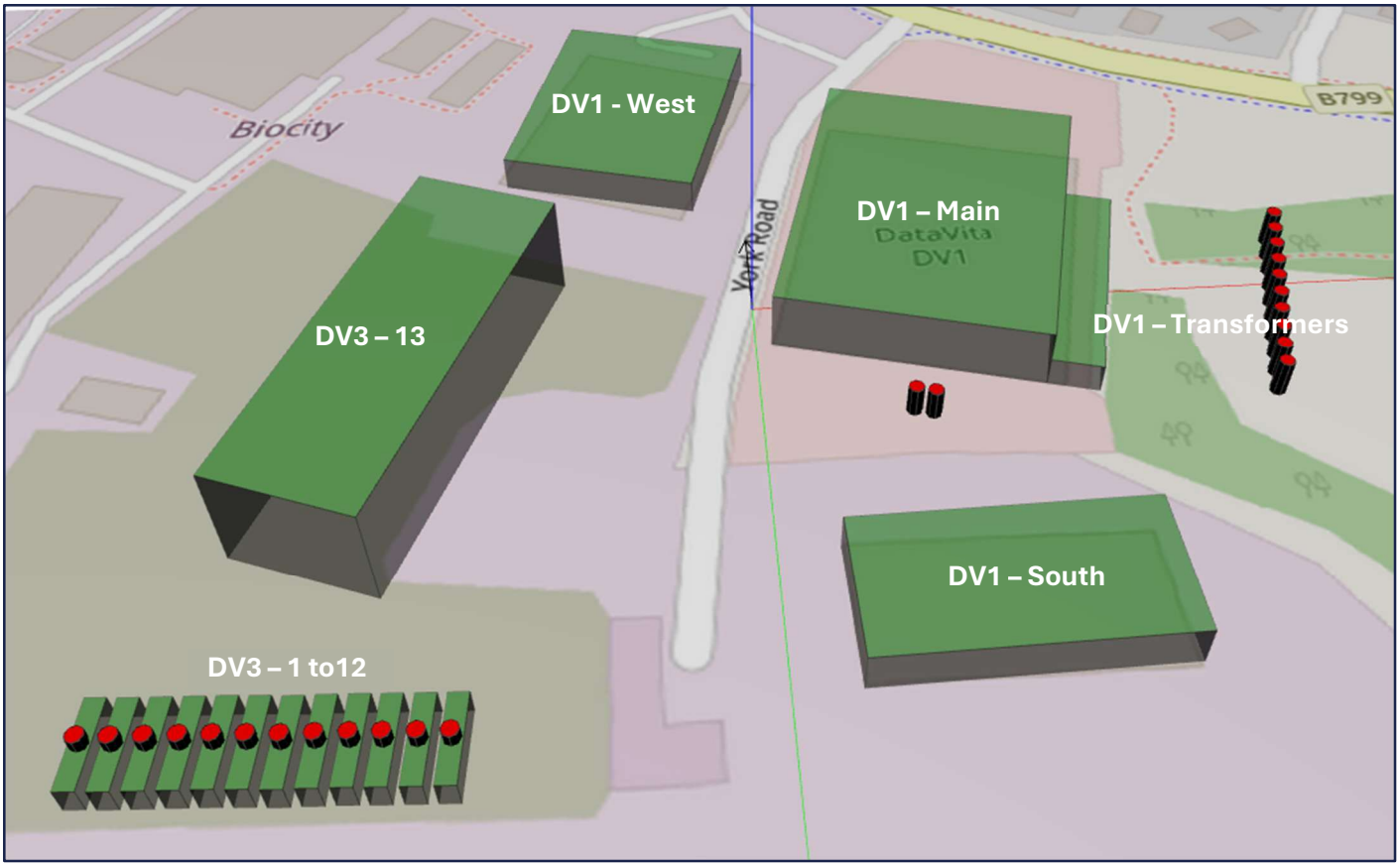
Figure 4.3: 3D Model Layout – DV3 and DV1



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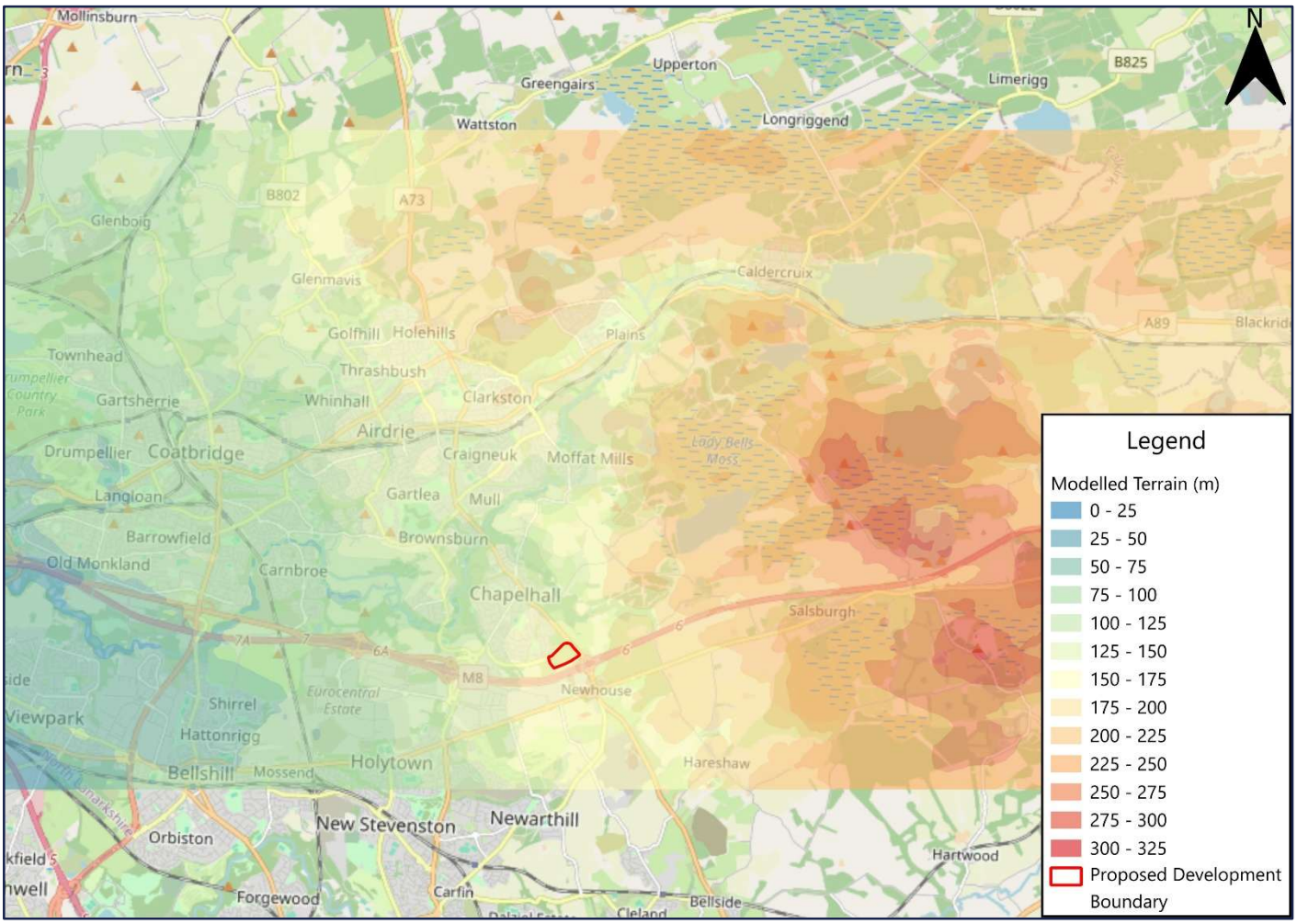
4.5 Modelled Terrain

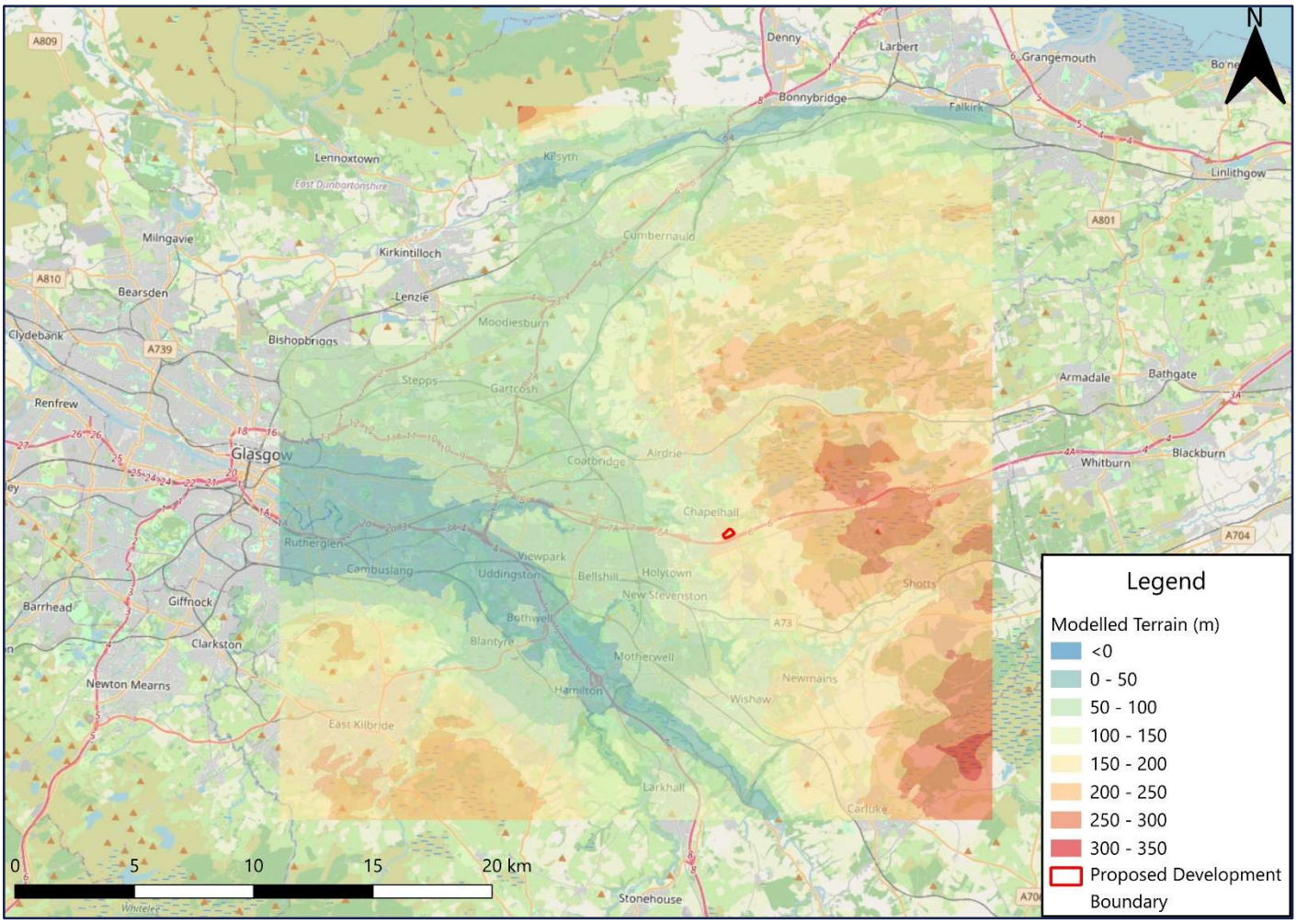
The terrain around the site is variable in all directions and has the potential to impact dispersion and requires inclusion in the model as it may impact dispersion of pollutants. Terrain data was obtained from Ordnance Survey in 'OS Terrain 50, ASCII Grid and GML' format. The terrain grid is necessarily larger than the modelled domain. Two terrain grids were modelled to allow an assessment against human and ecological receptors. The human receptor terrain grid was modelled at a resolution of 50m and is visualised in Figure 4.4. Given the larger distances to the ecological receptors, the ecological grid was modelled at a lower resolution of 100m and is visualised in Figure 4.5.

Figure 4.4: Modelled Terrain – Human Receptors



Contains OpenStreetMap Data © 2026

Figure 4.5: Modelled Terrain – Ecological Receptors



Contains OpenStreetMap Data © 2026

4.6 NO_x to NO_2 Conversion

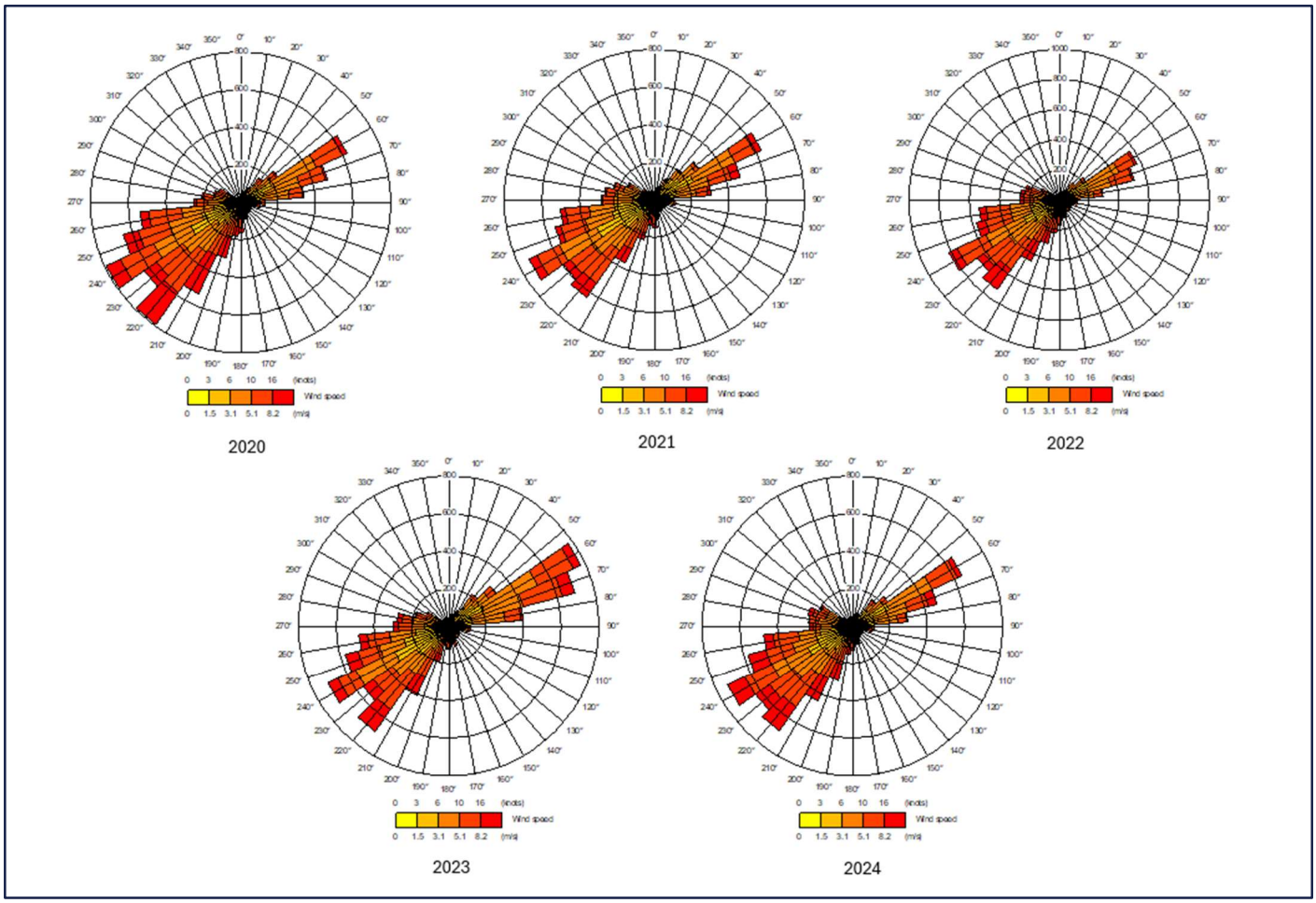
Combustion emissions of NO_x are mainly in the form of nitric oxide (NO). NO_2 forms where the NO is oxidised due to excess oxygen in the combustion gases or other atmospheric reactions. In accordance with SEPA guidance, the NO_x to NO_2 conversions (at the point of impact) were assumed to be 70% for long-term average concentrations and 35% for short-term average concentrations.

The application of the 35% conversion factor for NO_x to NO_2 concentrations is an established rule of thumb for industrial combustion emissions in isolation. However, recent research on data centre clusters commissioned by the Environment Agency, has demonstrated that the use of the standard conversion factor (35%) can lead to over-estimates of up to 7 times in the near field and 2 times up to 5km from the centre of a data centre cluster. It has been demonstrated that the clustering of data centres of sufficient thermal input can lead to ozone concentrations becoming a limiting factor for the formation of nitrogen dioxide from NO. As such, predicted short-term NO_2 results from application of the 35% conversion factor may not be achievable in practice. The Applicant will seek further discussion with SEPA regarding the application of a realistic NO_x to NO_2 conversion factor.

4.7 Meteorology

Glasgow Airport weather station (around 30 km north-west of the Proposed Development) was used to provide hourly sequential meteorological data for the dispersion model. Five full years of meteorological data from years 2020-2024 were used in the dispersion modelling; the wind rose for each year is shown in Figure 4.6.

Figure 4.6: Glasgow Airport Meteorological Station 2020-2024 Wind Rose Data



4.8 Surface Characteristics

A surface roughness length is used to characterise the texture of land as this can impact dispersion of pollutants. With respect to the site, a length of 0.5 m (e.g. open suburbia has been used. Around the weather station, a value of 0.2 m (agricultural areas (min)) has been used.

4.9 Minimum Monin-Obukhov Length

A minimum Monin-Obukhov length of 30 m (e.g. mixed urban/industrial and cities/large towns) was used for the site and length of 1 m for the meteorological site to account for the effects of buoyancy on turbulent flows.

4.10 Special Treatments

No special treatment (such as: dry or wet deposition; short-term releases; coastal modules; fluctuations; or chemistry) were deemed appropriate or used within the dispersion model.

4.11 Modelling Uncertainty

There are a variety of factors which can lead to potential uncertainty in dispersion modelling predictions. Arthian aimed to control these uncertainties by following relevant modelling good practice, and where unknowns exist to use suitably conservative assumptions/estimates. It is noted:

- The atmospheric dispersion model ADMS-6 has been verified by CERC through a number of studies to ensure predictions are suitably robust;
- Emission rates and operational plant parameters were derived from information provides by the Client;
- Where available, background pollutant concentrations and loads were obtained from SAQD and Defra websites to provide an estimate of baseline conditions at human health receptors;
- To help account for inter-year variability in meteorological conditions, five years of meteorological data was used in the assessment, with the maximum (worst case year) concentration at each receptor considered/reported; and,
- Surface roughness and the Monin-Obukhov length for the dispersion site and meteorological site were defined based on the land use guidance provided by CERC.

4.12 Model Output

Predicted pollutant concentrations were summarised in the following formats:

- Process contribution (PC) - Predicted pollutant level due to emissions from the facility only; and,
- Predicted environmental concentration (PEC) - Total predicted pollutant level due to emissions from the facility and existing baseline conditions.

4.13 Calculation of Contribution to Critical Load

Deposition rates were calculated using empirical methods recommended by the EA technical guidance AQTAG06. Dry deposition flux was calculated using the following equation:

Dry deposition flux ($\mu g/m^2/s$) = ground level concentration ($\mu g/m^3$) x deposition velocity (m/s)

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow and is not considered significant over short distances (AQTAG06) compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered consistent with AQTAG06.

The applied deposition velocities are as shown in Table 4.5. For the purposes of this assessment, (based on the respective critical load class, see Section 3.2.2).

Table 4.5: Deposition Velocities

Pollutant	Deposition Velocity (m/s)	
NO_2	Grassland	0.0015

Pollutant	Deposition Velocity (m/s)	
	Woodland	0.0030

The predicted deposition rates were converted from µg/m^2/s to units of nitrogen and acid deposition as detailed in Table 4.6.

Table 4.6: Applied Deposition Conversion Factors

Pollutant	Conversion	Factor
NO_2 to Nitrogen Deposition	µg/m^2/s to kg/ha/year	95.9
NO_2 to Acid Deposition	µg/m^2/s to keq/ha/year	6.84

4.14 Assessment Significance

4.14.1 Human Receptors

In accordance with the EA's AERA guidance, a PC for any substance can be considered 'insignificant' if the PC meets the following criteria:

- The long term PC is less than 1% of the long-term environmental standard.
- The short-term PC is less than 10% of the short-term environmental standard.

Initially, the maximum predicted PC across the modelled grid has been assessed against these criteria. If the above criteria are achieved at the point of maximum impact, then it can be concluded that impacts are 'insignificant' at all locations and that no further assessment is required.

If these criteria are exceeded, the predicted environmental concentration (PEC - defined as the PC plus the background concentration) is then calculated and consideration given to predicted impacts at discrete receptor locations.

Further action is not required, and impacts are considered to be acceptable and not to constitute 'significant pollution' if both of the following criteria are met:

- The proposed emissions comply with Best Available Techniques Associated Emission Levels (BAT AEL) or equivalent where there is no BAT AEL; and
- The resulting PECs are predicted to not exceed environmental standards.

4.14.2 Ecological Receptors

In addition to the AERA guidance, the EA's Operational Instruction 66_12 details how the air quality impacts on ecological sites can be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for SSSIs, as follows:

- PC <1% long-term critical level and/or critical load for European sites and SSSIs; and
- PC <10% short-term critical level for NO_x and hydrogen fluoride (if applicable) for European sites and SSSIs.

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with EAs Operational Instruction 67_12. This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- If the PEC<100% of the appropriate critical level and/or critical load it can be assumed there will be no adverse effect.
- If the background is below the critical level and/or critical load, but a small PC leads to an exceedance – decision based on local considerations.
- If the background is currently above the critical level and/or critical load and the additional PC will cause a small increase – decision based on local considerations.
- If the background is below the critical level and/or critical load, but a significant PC leads to an exceedance – cannot conclude no adverse effect.

If the background is currently above the critical level and/or critical load and the additional PC is large - cannot conclude no adverse effect.

4.15 Hypergeometric Probability Distribution

The EA have published online guidance [4] for carrying out detailed modelling assessments for specified generators. The guidance states that statistical analysis must be carried out if the model results indicate that 1-hour mean NO_2 concentrations exceed the 200 µg/m^3 limit value, at sensitive receptors, for 19 hour or more per year.

The EA methodology is a conservative probabilistic approach which uses the emergency generators maximum hourly emissions to determine the number of hours that all the generators could operate simultaneously in any one year with a 1% chance of exceeding the 1-hour mean objective based on the worst modelled meteorological year.

The hourly emissions and the allowable operating hours for emergency operation are estimated from a statistical analysis of the likelihood of breaching the 1-hour objective for NO_2 concentrations by using the hypergeometric distribution function. The allowable operating hours are calculated for a 1% probability of exceeding the one-hour mean objective at the most impacted receptor location.

The parameters included in the hypergeometric probability distribution calculation are:

[4] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

- Number of hours where the PEC exceeds the standard - the number of failures in the population denoted by 'e'.
- Number of non-exceedance hours - the number of successes in the population denoted by 'K'.
- Number of operating hours per year - the sample size denoted by 'N'.
- Defined operational envelope - the population size denoted by 'M'.

The probability of randomly selecting 19 or more exceedance hours (failures) in “X” sample trials, is the same as selecting at most 'N' minus 19 non-exceedance hours (successes) in “X” sample trials (N - 19 = X - 19).

The probability of an exceedance, ‘P’ can be calculated using the cumulative hypergeometric distribution.

$$P = \sum_{i=0}^{N-19} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}}$$

The calculated probability must then be multiplied by a factor of 2.5 where both of the following apply:

- Statistical method assumes independent and random operational hours, for example the hypergeometric distribution.
- Defined operating envelope included continuous operations of more than an hour.

Where the calculated probability percentage is:

- 1% or less – Exceedances are highly unlikely.
- Less than 5% - Exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years.
- More than or equal to 5% - There is potential for exceedances, and the regulator will consider if acceptable on a case-by-case basis.

5. DV4 Only - Dispersion Modelling Results

As summarised in Section 4.7, five years of weather data have been run to help account for the variation in weather conditions at the site. The results presented below represent the maximum predicted concentrations from these five modelled years from the Proposed Development (DV4) only.

Initial modelling results indicated that NO_2 and NO_x impacts were of higher concern than PM, CO, SO_2 and HC. As such, only the NO_2 concentrations have been presented in this report. However, SO_2 concentrations have been retained for the assessment acid deposition impacts at ecological receptors. Full model results for the other pollutants can be provided on request.

5.1 Discrete Human Receptors

5.1.1 Annual Mean NO_2 – Routine Testing and Maintenance

The maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 5.1Table 6.1. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 5.1: Routine Testing and Maintenance Maximum Predicted Concentrations of Annual Mean NO_2 at Human Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	<0.1	<0.1%	SCREENED	
R2	<0.1	<0.1%	SCREENED	
R3	<0.1	<0.1%	SCREENED	
R4	<0.1	<0.1%	SCREENED	
R5	<0.1	<0.1%	SCREENED	
R6	<0.1	<0.1%	SCREENED	
R7	<0.1	<0.1%	SCREENED	
R8	<0.1	<0.1%	SCREENED	
R9	<0.1	<0.1%	SCREENED	
R10	<0.1	<0.1%	SCREENED	
R11	<0.1	<0.1%	SCREENED	
R12	<0.1	<0.1%	SCREENED	
R13	<0.1	<0.1%	SCREENED	
R14	<0.1	<0.1%	SCREENED	
R15	<0.1	<0.1%	SCREENED	
R16	<0.1	<0.1%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R17	<0.1	<0.1%	SCREENED	
R18	<0.1	<0.1%	SCREENED	
R19	<0.1	<0.1%	SCREENED	
R20	<0.1	<0.1%	SCREENED	
R21	<0.1	<0.1%	SCREENED	
R22	<0.1	<0.1%	SCREENED	
R23	<0.1	<0.1%	SCREENED	
AR1	<0.1	<0.1%	SCREENED	
AR2	<0.1	<0.1%	SCREENED	
AR3	<0.1	<0.1%	SCREENED	
AR4	<0.1	<0.1%	SCREENED	
AR5	<0.1	<0.1%	SCREENED	
AR6	<0.1	<0.1%	SCREENED	
AR7	<0.1	<0.1%	SCREENED	
AR8	<0.1	<0.1%	SCREENED	
AR9	<0.1	<0.1%	SCREENED	
AR10	<0.1	<0.1%	SCREENED	
AR11	<0.1	<0.1%	SCREENED	
AR12	<0.1	<0.1%	SCREENED	

The results from Table 5.1 show that the annual mean NO_2 PCs are below 1% of the limit value at all modelled receptors. A maximum PC of 0.02 µg/m³ is predicted at receptor R14 and R15 which are residential dwellings 20m from the Proposed Development boundary.

5.1.2 Annual Mean NO_2 – Emergency Blackout Event

The maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 5.2Table 6.1. Results have been factorised by 0.82% to account for an emergency blackout event.

Table 5.2: Emergency Blackout Event Maximum Predicted Concentrations of Annual Mean NO_2 at Human Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	<0.1	<0.1%	SCREENED	
R2	<0.1	<0.1%	SCREENED	
R3	<0.1	<0.1%	SCREENED	
R4	<0.1	<0.1%	SCREENED	
R5	<0.1	<0.1%	SCREENED	
R6	<0.1	<0.1%	SCREENED	
R7	<0.1	<0.1%	SCREENED	
R8	<0.1	<0.1%	SCREENED	
R9	<0.1	<0.1%	SCREENED	
R10	<0.1	<0.1%	SCREENED	
R11	0.1	<0.1%	SCREENED	
R12	0.1	<0.1%	SCREENED	
R13	0.1	<0.1%	SCREENED	
R14	0.1	<0.1%	SCREENED	
R15	0.1	<0.1%	SCREENED	
R16	0.1	<0.1%	SCREENED	
R17	<0.1	<0.1%	SCREENED	
R18	<0.1	<0.1%	SCREENED	
R19	<0.1	<0.1%	SCREENED	
R20	<0.1	<0.1%	SCREENED	
R21	<0.1	<0.1%	SCREENED	
R22	<0.1	<0.1%	SCREENED	
R23	<0.1	<0.1%	SCREENED	
AR1	<0.1	<0.1%	SCREENED	
AR2	<0.1	<0.1%	SCREENED	
AR3	<0.1	<0.1%	SCREENED	
AR4	<0.1	<0.1%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
AR5	<0.1	<0.1%	SCREENED	
AR6	<0.1	<0.1%	SCREENED	
AR7	<0.1	<0.1%	SCREENED	
AR8	<0.1	<0.1%	SCREENED	
AR9	<0.1	<0.1%	SCREENED	
AR10	<0.1	<0.1%	SCREENED	
AR11	<0.1	<0.1%	SCREENED	
AR12	<0.1	<0.1%	SCREENED	

The results from Table 5.2 show that the annual mean NO_2 PCs are below 1% of the limit value at all modelled receptors. A maximum PC of 0.1 µg/m³ is predicted at receptor R15.

5.1.3 1-Hour Mean NO_2 100th Percentile

The maximum predicted 100th percentile 1-hour mean NO_2 concentrations at the receptor locations are summarised in Table 5.3. These results are representative of both the routine testing and emergency blackout scenarios.

Table 5.3: Maximum Predicted 100th Percentile Concentrations of 1-Hour Mean NO_2 at Human Receptors (Short Term)

Receptor ID	100th Percentile 1-Hour Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	18.1	9%	SCREENED	
R2	**21.3**	**11%**	46.0	23%
R3	**24.4**	**12%**	49.1	25%
R4	**24.8**	**12%**	49.5	25%
R5	**27.8**	**14%**	52.5	26%
R6	**29.2**	**15%**	53.9	27%
R7	**30.3**	**15%**	55.0	27%
R8	**34.1**	**17%**	58.8	29%
R9	**39.1**	**20%**	63.9	32%
R10	**42.5**	**21%**	67.2	34%
R11	**45.4**	**23%**	70.1	35%
R12	**53.6**	**27%**	78.3	39%

Receptor ID	100th Percentile 1-Hour Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R13	**64.8**	**32%**	89.5	45%
R14	**65.4**	**33%**	90.1	45%
R15	**63.8**	**32%**	88.5	44%
R16	**71.9**	**36%**	96.6	48%
R17	**43.2**	**22%**	67.9	34%
R18	**50.2**	**25%**	75.0	37%
R19	**35.5**	**18%**	60.2	30%
R20	**40.5**	**20%**	65.2	33%
R21	**39.0**	**19%**	63.7	32%
R22	**29.8**	**15%**	54.5	27%
R23	**22.7**	**11%**	47.4	24%
AR1	**29.4**	**15%**	54.1	27%
AR2	**30.1**	**15%**	54.8	27%
AR3	**31.2**	**16%**	56.0	28%
AR4	**32.0**	**16%**	56.7	28%
AR5	**33.3**	**17%**	58.0	29%
AR6	**34.1**	**17%**	58.8	29%
AR7	**35.1**	**18%**	59.8	30%
AR8	**37.3**	**19%**	62.0	31%
AR9	**39.7**	**20%**	64.4	32%
AR10	**42.3**	**21%**	67.0	34%
AR11	**28.3**	**14%**	53.1	27%
AR12	**24.0**	**12%**	48.7	24%

The 100th percentile 1-hour mean NO_2 PCs exceed 10% of the limit value at all but one of the modelled receptors. However, the corresponding NO_2 PECs are below the 200 µg/m³ limit value at all modelled receptors. A maximum PEC of 71.9 µg/m³ is predicted at receptor R16, which is a residential dwelling approximately 500m north-east of the Proposed Development boundary. This is below the 1-hour mean objective by 52%.

5.2 Discrete Ecological Receptors

5.2.1 Annual Mean NO_x – Routine Testing and Maintenance

The maximum predicted annual mean NO_2 concentrations at the ecological receptor locations are summarised in Table 5.4Table 6.1. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 5.4: Routine Testing and Maintenance Maximum Predicted Concentrations of Annual Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO1	<0.1	<1%	SCREENED	
ECO2	<0.1	<1%	SCREENED	
ECO3	<0.1	<1%	SCREENED	
ECO4	<0.1	<1%	SCREENED	
ECO5	<0.1	<1%	SCREENED	
ECO6	<0.1	<1%	SCREENED	
ECO7	<0.1	<1%	SCREENED	
ECO8	<0.1	<1%	SCREENED	
ECO9	<0.1	<1%	SCREENED	
ECO10	<0.1	<1%	SCREENED	
ECO11	<0.1	<1%	SCREENED	
ECO12	<0.1	<1%	SCREENED	
ECO13	<0.1	<1%	SCREENED	
ECO14	<0.1	<1%	SCREENED	
ECO15	<0.1	<1%	SCREENED	
ECO16	<0.1	<1%	SCREENED	
ECO17	<0.1	<1%	SCREENED	
ECO18	<0.1	<1%	SCREENED	

The annual mean NO_x PCs are below 1% of the limit value at all modelled receptors. Furthermore, the PECs are also well below the annual mean limit value at all modelled receptors.

5.2.2 Annual Nitrogen Deposition – Routine Testing and Maintenance

The maximum predicted nitrogen deposition at the ecological receptor locations are summarised in Table 5.5. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 5.5: Routine Testing and Maintenance Maximum Predicted Nitrogen Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	PC (kgN/ha/yr)	PC: % of Lower Critical Load	PC: % of Upper Critical Load	PEC (kgN/ha/yr)	PEC: % of Lower Critical Load	PEC: % of Upper Critical Load
ECO1	<0.001	<0.1%	<0.1%	SCREENED		
ECO2	<0.001	<0.1%	<0.1%	SCREENED		
ECO3	<0.001	<0.1%	<0.1%	SCREENED		
ECO4	<0.001	<0.1%	<0.1%	SCREENED		
ECO5	<0.001	<0.1%	<0.1%	SCREENED		
ECO6	<0.001	<0.1%	<0.1%	SCREENED		
ECO10	<0.001	<0.1%	<0.1%	SCREENED		
ECO11	<0.001	<0.1%	<0.1%	SCREENED		
ECO12	<0.001	<0.1%	<0.1%	SCREENED		
ECO13	<0.001	<0.1%	<0.1%	SCREENED		
ECO14	<0.001	<0.1%	<0.1%	SCREENED		

The annual nitrogen deposition PCs are below 1% of the lower and upper critical loads at all modelled receptors. Furthermore, the actual contribution of the Proposed Development to nitrogen deposition PC is relatively low with a maximum concentration of <0.001 kgN/ha/yr predicted from the modelled receptors.

5.2.3 Annual Acid Deposition – Routine Testing and Maintenance

The maximum predicted acid deposition at the ecological receptor locations are summarised in Table 5.6. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 5.6: Routine Testing and Maintenance Maximum Predicted Acid Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO1	<0.0001	0.5690	<0.1%	SCREENED		
ECO2	<0.0001	0.5950	<0.1%	SCREENED		

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO3	<0.0001	0.5640	<0.1%	SCREENED		
ECO4	<0.0001	0.5640	<0.1%	SCREENED		
ECO10	<0.0001	2.4490	<0.1%	SCREENED		
ECO11	<0.0001	2.1100	<0.1%	SCREENED		
ECO12	<0.0001	0.5970	<0.1%	SCREENED		
ECO13	<0.0001	2.2610	<0.1%	SCREENED		
ECO14	<0.0001	0.6070	<0.1%	SCREENED		

The annual acid deposition PCs are below 1% of the CLmanN at all modelled receptors. Furthermore, the actual contribution of the Proposed Development to acid deposition PC is relatively low with a maximum concentration of <0.0001 keq/ha/yr predicted from the modelled receptors.

5.2.4 Annual Mean NO_x – Emergency Blackout Event

The maximum predicted annual mean NO_2 concentrations at the ecological receptor locations are summarised in Table 5.7Table 6.1. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 5.7: Emergency Blackout Event Maximum Predicted Concentrations of Annual Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO1	<0.1	<1%	SCREENED	
ECO2	<0.1	<1%	SCREENED	
ECO3	<0.1	<1%	SCREENED	
ECO4	<0.1	<1%	SCREENED	
ECO5	<0.1	<1%	SCREENED	
ECO6	<0.1	<1%	SCREENED	
ECO7	<0.1	<1%	SCREENED	
ECO8	<0.1	<1%	SCREENED	
ECO9	<0.1	<1%	SCREENED	
ECO10	<0.1	<1%	SCREENED	
ECO11	<0.1	<1%	SCREENED	
ECO12	<0.1	<1%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO13	<0.1	<1%	SCREENED	
ECO14	<0.1	<1%	SCREENED	
ECO15	<0.1	<1%	SCREENED	
ECO16	<0.1	<1%	SCREENED	
ECO17	<0.1	<1%	SCREENED	
ECO18	<0.1	<1%	SCREENED	

The annual mean NO_x PCs are below 1% of the limit value at all modelled receptors. Furthermore, the PECs are also well below the annual mean limit value at all modelled receptors.

5.2.5 Annual Nitrogen Deposition – Emergency Blackout Event

The maximum predicted nitrogen deposition at the ecological receptor locations are summarised in Table 5.8. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 5.8: Emergency Blackout Event Maximum Predicted Nitrogen Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	PC (kgN/ha/yr)	PC: % of Lower Critical Load	PC: % of Upper Critical Load	PEC (kgN/ha/yr)	PEC: % of Lower Critical Load	PEC: % of Upper Critical Load
ECO1	0.001	<0.1%	<0.1%	SCREENED		
ECO2	<0.001	<0.1%	<0.1%	SCREENED		
ECO3	<0.001	<0.1%	<0.1%	SCREENED		
ECO4	<0.001	<0.1%	<0.1%	SCREENED		
ECO5	<0.001	<0.1%	<0.1%	SCREENED		
ECO6	<0.001	<0.1%	<0.1%	SCREENED		
ECO10	0.001	<0.1%	<0.1%	SCREENED		
ECO11	<0.001	<0.1%	<0.1%	SCREENED		
ECO12	<0.001	<0.1%	<0.1%	SCREENED		
ECO13	<0.001	<0.1%	<0.1%	SCREENED		
ECO14	<0.001	<0.1%	<0.1%	SCREENED		

The annual nitrogen deposition PCs are below 1% of the lower and upper critical loads at all modelled receptors. Furthermore, the actual contribution of the Proposed Development to nitrogen deposition PC is relatively low with a maximum concentration of 0.001 kgN/ha/yr predicted from the modelled receptors.

5.2.6 Annual Acid Deposition – Emergency Blackout Event

The maximum predicted acid deposition at the ecological receptor locations are summarised in Table 5.9. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 5.9: Emergency Blackout Event Maximum Predicted Acid Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO1	0.0001	0.5690	<0.1%	SCREENED		
ECO2	<0.0001	0.5950	<0.1%	SCREENED		
ECO3	<0.0001	0.5640	<0.1%	SCREENED		
ECO4	<0.0001	0.5640	<0.1%	SCREENED		
ECO10	<0.0001	2.4490	<0.1%	SCREENED		
ECO11	<0.0001	2.1100	<0.1%	SCREENED		
ECO12	<0.0001	0.5970	<0.1%	SCREENED		
ECO13	<0.0001	2.2610	<0.1%	SCREENED		
ECO14	<0.0001	0.6070	<0.1%	SCREENED		

The annual acid deposition PCs are below 1% of the CLmanN at all modelled receptors. Furthermore, the actual contribution of the Proposed Development to acid deposition PC is relatively low with a maximum concentration of 0.0001 keq/ha/yr predicted from the modelled receptors.

5.2.7 24-Hour Mean NO_x 100th Percentile

The maximum predicted 100th percentile 24-hour mean NO_x concentrations at the receptor locations are summarised in Table 5.10. These results are representative of both the routine testing and emergency blackout scenarios.

Table 5.10: Maximum Predicted 100th Percentile Concentrations of 24-Hour Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m^3)	PC: % of Limit	PEC (µg/m^3)	PEC: % of Limit
ECO1	**11.3**	**15.0%**	26.3	35%
ECO2	1.5	2.0%	SCREENED	
ECO3	2.7	3.6%	SCREENED	
ECO4	2.4	3.2%	SCREENED	
ECO5	1.5	2.0%	SCREENED	
ECO6	1.2	1.7%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO7	2.8	3.7%	SCREENED	
ECO8	3.7	5.0%	SCREENED	
ECO9	4.1	5.5%	SCREENED	
ECO10	2.1	2.9%	SCREENED	
ECO11	1.5	2.0%	SCREENED	
ECO12	2.9	3.9%	SCREENED	
ECO13	1.5	2.0%	SCREENED	
ECO14	1.2	1.7%	SCREENED	
ECO15	4.7	6.3%	SCREENED	
ECO16	4.6	6.2%	SCREENED	
ECO17	4.5	6.0%	SCREENED	
ECO18	3.4	4.5%	SCREENED	

The 100th percentile 24-hour mean NO_x PCs are above 10% of the limit value at one of the eighteen modelled receptors. A maximum PC of 11.3 µg/m^3 is predicted at receptor ECO1 (Lady Bell's Moss SSSI) which corresponds to 15% of the limit value. However, the corresponding PECs are below the 75 µg/m^3 limit value at all modelled receptors. A maximum PEC of 40.7 µg/m^3 is predicted at receptor ECO15 (Hamilton Low Parks SSSI) which is below the limit value by 44%.

6. DV4 Cumulative - Dispersion Modelling Results

As summarised in Section 4.7, five years of weather data have been run to help account for the variation in weather conditions at the site. The results presented below represent the maximum predicted cumulative concentrations from these five modelled years from all three sites (DV1, DV3 and DV4).

6.1 Discrete Human Receptors

6.1.1 Annual Mean NO_2 – Routine Testing and Maintenance

The maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 6.1Table 6.1. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 6.1: Routine Testing and Maintenance Maximum Predicted Concentrations of Annual Mean NO_2 at Human Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	<0.1	<1%	SCREENED	
R2	<0.1	<1%	SCREENED	
R3	<0.1	<1%	SCREENED	
R4	<0.1	<1%	SCREENED	
R5	<0.1	<1%	SCREENED	
R6	0.1	<1%	SCREENED	
R7	0.1	<1%	SCREENED	
R8	0.2	<1%	SCREENED	
R9	0.1	<1%	SCREENED	
R10	0.1	<1%	SCREENED	
R11	0.1	<1%	SCREENED	
R12	0.1	<1%	SCREENED	
R13	<0.1	<1%	SCREENED	
R14	<0.1	<1%	SCREENED	
R15	<0.1	<1%	SCREENED	
R16	<0.1	<1%	SCREENED	
R17	<0.1	<1%	SCREENED	
R18	<0.1	<1%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R19	<0.1	<1%	SCREENED	
R20	<0.1	<1%	SCREENED	
R21	<0.1	<1%	SCREENED	
R22	<0.1	<1%	SCREENED	
R23	<0.1	<1%	SCREENED	
AR1	0.1	<1%	SCREENED	
AR2	0.1	<1%	SCREENED	
AR3	0.1	<1%	SCREENED	
AR4	0.2	<1%	SCREENED	
AR5	0.2	<1%	SCREENED	
AR6	0.2	<1%	SCREENED	
AR7	0.2	<1%	SCREENED	
AR8	0.1	<1%	SCREENED	
AR9	0.1	<1%	SCREENED	
AR10	0.1	<1%	SCREENED	
AR11	<0.1	<1%	SCREENED	
AR12	<0.1	<1%	SCREENED	

The results from Table 6.1 show that the annual mean NO_2 PCs are below 1% of the limit value at all modelled receptors. A maximum PC of 0.2 µg/m³ is predicted at receptors R8 and AR5 which are a residential dwelling approximately 620m west of the Proposed Development boundary. This receptor is considered to be more influenced by emissions from DV1 and DV3 than DV4.

6.1.2 Annual Mean NO_2 – Emergency Blackout Event

The maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 6.2Table 6.1. Results have been factorised by 0.82% to account for an emergency blackout event.

Table 6.2: Emergency Blackout Event Maximum Predicted Concentrations of Annual Mean NO_2 at Human Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	<0.1	<1%	SCREENED	
R2	<0.1	<1%	SCREENED	
R3	0.1	<1%	SCREENED	
R4	0.1	<1%	SCREENED	
R5	0.1	<1%	SCREENED	
R6	0.2	<1%	SCREENED	
R7	**0.4**	**1%**	12.8	32%
R8	**0.6**	**2%**	13.0	33%
R9	0.3	<1%	SCREENED	
R10	0.3	<1%	SCREENED	
R11	0.2	<1%	SCREENED	
R12	0.2	<1%	SCREENED	
R13	0.2	<1%	SCREENED	
R14	0.2	<1%	SCREENED	
R15	0.2	<1%	SCREENED	
R16	0.1	<1%	SCREENED	
R17	0.1	<1%	SCREENED	
R18	0.1	<1%	SCREENED	
R19	<0.1	<1%	SCREENED	
R20	<0.1	<1%	SCREENED	
R21	<0.1	<1%	SCREENED	
R22	<0.1	<1%	SCREENED	
R23	<0.1	<1%	SCREENED	
AR1	0.3	<1%	SCREENED	
AR2	**0.4**	**1%**	12.8	32%
AR3	**0.6**	**1%**	12.9	32%
AR4	**0.7**	**2%**	13.1	33%

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
AR5	**0.8**	**2%**	13.1	33%
AR6	**0.6**	**2%**	13.0	33%
AR7	**0.6**	**2%**	13.0	32%
AR8	0.4	<1%	SCREENED	
AR9	0.3	<1%	SCREENED	
AR10	0.3	<1%	SCREENED	
AR11	0.2	<1%	SCREENED	
AR12	<0.1	<1%	SCREENED	

The results from Table 6.2 show that the annual mean NO_2 PCs are above 1% of the limit value at eight of the modelled receptors. A maximum PC of 0.6 µg/m^3 is predicted at receptors AR4 and AR5 which corresponds to 2% of the limit value. However, the corresponding PECs are below the 40 µg/m^3 limit value at all modelled receptors. A maximum PEC of 13.1 µg/m^3 is predicted at receptors AR4 and AR5 which is below the limit value by 67%.

6.1.3 1-Hour Mean NO_2 100th Percentile

The maximum predicted 100th percentile 1-hour mean NO_2 concentrations at the receptor locations are summarised in Table 6.3. These results are representative of both the routine testing and emergency blackout scenarios.

Table 6.3: Maximum Predicted 100th Percentile Concentrations of 1-Hour Mean NO_2 at Human Receptors (Short Term)

Receptor ID	100th Percentile 1-Hour Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R1	**70.7**	**35%**	95.4	48%
R2	**82.6**	**41%**	107.4	54%
R3	**110.7**	**55%**	135.4	68%
R4	**139.2**	**70%**	163.9	82%
R5	**188.5**	**94%**	**213.2**	**107%**
R6	**268.2**	**134%**	**292.9**	**146%**
R7	**334.4**	**167%**	**359.1**	**180%**
R8	**285.4**	**143%**	**310.1**	**155%**
R9	**216.3**	**108%**	**241.1**	**121%**
R10	**203.6**	**102%**	**228.3**	**114%**

Receptor ID	100th Percentile 1-Hour Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
R11	**174.3**	**87%**	**199.0**	**100%**
R12	**155.0**	**77%**	179.7	90%
R13	**154.4**	**77%**	179.1	90%
R14	**152.7**	**76%**	177.4	89%
R15	**145.4**	**73%**	170.1	85%
R16	**125.3**	**63%**	150.0	75%
R17	**93.8**	**47%**	118.5	59%
R18	**103.0**	**52%**	127.7	64%
R19	**86.0**	**43%**	110.7	55%
R20	**88.7**	**44%**	113.4	57%
R21	**87.0**	**43%**	111.7	56%
R22	**110.1**	**55%**	134.8	67%
R23	**88.8**	**44%**	113.5	57%
AR1	**274.7**	**137%**	**299.4**	**150%**
AR2	**325.1**	**163%**	**349.9**	**175%**
AR3	**351.0**	**175%**	**375.7**	**188%**
AR4	**362.3**	**181%**	**387.0**	**193%**
AR5	**324.6**	**162%**	**349.3**	**175%**
AR6	**285.4**	**143%**	**310.1**	**155%**
AR7	**273.3**	**137%**	**298.0**	**149%**
AR8	**219.2**	**110%**	**243.9**	**122%**
AR9	**211.8**	**106%**	**236.5**	**118%**
AR10	**201.6**	**101%**	**226.3**	**113%**
AR11	**216.0**	**108%**	**240.7**	**120%**
AR12	**100.3**	**50%**	125.0	63%

The 100th percentile 1-hour mean NO_2 PCs exceed 10% of the limit value at all modelled receptors. Furthermore, the corresponding NO_2 PECs exceed the 200 µg/m³ limit value at eighteen of the modelled receptors. As such, an additional statistical analysis of 1-hour mean NO_2 concentrations has been undertaken as detailed in Section 6.1.4.

6.1.4 Statistical Analysis

6.1.4.1 Background

As referred in Section 4.15, the EA guidance[4] states that statistical analysis must be carried out if the model results indicate that 1-hour mean NO_2 concentrations exceed the 200 µg/m^3 limit value, at sensitive receptors, for 19 hours or more per year. As shown in Table 6.3, the 100th percentile 1-hour mean NO_2 concentrations exceed the limit value at discrete modelled receptors. Further statistical analysis using hypergeometric probability distribution has been carried out as detailed below.

6.1.4.2 Approach

Based on the proposed operating hours (8,760 hours), additional dispersion modelling was undertaken at the modelled discrete sensitive human receptors for a series of percentiles. All five years of meteorological data were considered within the analysis.

Using the 'goal seek' method, the PECs were determined for a series of percentiles (with associated exceedance hours).

6.1.4.3 Results

For the five modelled years, 89% percentile (964 exceedance hours) is the lowest percentile within which the predicted 1 hour NO_2 PECs are less than 200 µg/m^3 for all modelled receptors.

Table 6.4: Percentile Analysis

Met Year	First Percentile where PEC below 200 ug/m^3 for all receptors	Maximum 100th Percentile PEC (ug/m^3)	Maximum Receptor
2020	89th	193.2	AR4
2021	92nd	199.7	AR4
2022	89th	196.1	AR4
2023	91st	196.3	AR4
2024	89th	195.6	AR4

For 964 exceedance hours:

- The potential for an exceedance of the hourly nitrogen dioxide air quality objective is statistically "unlikely" (less than 5%) for 100 run hours per year.
- The potential for an exceedance of the hourly nitrogen dioxide air quality objective is statistically "highly unlikely" (less than 1%) for 87 run hours per year.

The above analysis demonstrates that DV4 engines fitted with SCR can be run for more than 72 hours of continuous operation following loss of on-site power during an emergency event, in combination with DV3 engines (85% SCR) and DV1.

6.2 Discrete Ecological Receptors

6.2.1 Annual Mean NO_x – Routine Testing and Maintenance

The maximum predicted annual mean NO_2 concentrations at the ecological receptor locations are summarised in Table 6.5Table 6.1. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 6.5: Routine Testing and Maintenance Maximum Predicted Concentrations of Annual Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO1	<0.1	<0.1%	SCREENED	
ECO2	<0.1	<0.1%	SCREENED	
ECO3	<0.1	<0.1%	SCREENED	
ECO4	<0.1	<0.1%	SCREENED	
ECO5	<0.1	<0.1%	SCREENED	
ECO6	<0.1	<0.1%	SCREENED	
ECO7	<0.1	<0.1%	SCREENED	
ECO8	<0.1	<0.1%	SCREENED	
ECO9	<0.1	<0.1%	SCREENED	
ECO10	<0.1	<0.1%	SCREENED	
ECO11	<0.1	<0.1%	SCREENED	
ECO12	<0.1	<0.1%	SCREENED	
ECO13	<0.1	<0.1%	SCREENED	
ECO14	<0.1	<0.1%	SCREENED	
ECO15	<0.1	<0.1%	SCREENED	
ECO16	<0.1	<0.1%	SCREENED	
ECO17	<0.1	<0.1%	SCREENED	
ECO18	<0.1	<0.1%	SCREENED	

The annual mean NO_x PCs are below 1% of the limit value at all modelled receptors. Furthermore, the PECs are also well below the annual mean limit value at all modelled receptors.

6.2.2 Annual Nitrogen Deposition – Routine Testing and Maintenance

The maximum predicted nitrogen deposition at the ecological receptor locations are summarised in Table 6.6. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 6.6: Routine Testing and Maintenance Maximum Predicted Nitrogen Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	PC (kgN/ha/yr)	PC: % of Lower Critical Load	PC: % of Upper Critical Load	PEC (kgN/ha/yr)	PEC: % of Lower Critical Load	PEC: % of Upper Critical Load
ECO1	<0.001	<0.1%	<0.1%	SCREENED		
ECO2	<0.001	<0.1%	<0.1%	SCREENED		
ECO3	<0.001	<0.1%	<0.1%	SCREENED		
ECO4	<0.001	<0.1%	<0.1%	SCREENED		
ECO5	<0.001	<0.1%	<0.1%	SCREENED		
ECO6	<0.001	<0.1%	<0.1%	SCREENED		
ECO10	<0.001	<0.1%	<0.1%	SCREENED		
ECO11	<0.001	<0.1%	<0.1%	SCREENED		
ECO12	<0.001	<0.1%	<0.1%	SCREENED		
ECO13	<0.001	<0.1%	<0.1%	SCREENED		
ECO14	<0.001	<0.1%	<0.1%	SCREENED		

The annual nitrogen deposition PCs are below 1% of the lower and upper critical loads at all modelled receptors. Furthermore, the actual cumulative contribution of the three sites to nitrogen deposition PC is relatively low with a maximum concentration of <0.001 kgN/ha/yr predicted from the modelled receptors.

6.2.3 Annual Acid Deposition – Routine Testing and Maintenance

The maximum predicted acid deposition at the ecological receptor locations are summarised in Table 6.7. Results have been factorised by 0.21% to account for expected annual run time for routine maintenance and testing.

Table 6.7: Routine Testing and Maintenance Maximum Predicted Acid Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO1	<0.0001	0.5690	<0.1%	SCREENED		
ECO2	<0.0001	0.5950	<0.1%	SCREENED		

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO3	<0.0001	0.5640	<0.1%	SCREENED		
ECO4	<0.0001	0.5640	<0.1%	SCREENED		
ECO10	<0.0001	2.4490	<0.1%	SCREENED		
ECO11	<0.0001	2.1100	<0.1%	SCREENED		
ECO12	<0.0001	0.5970	<0.1%	SCREENED		
ECO13	<0.0001	2.2610	<0.1%	SCREENED		
ECO14	<0.0001	0.6070	<0.1%	SCREENED		

The annual acid deposition PCs are below 1% of the CLmanN at all modelled receptors. Furthermore, the actual cumulative contribution of the three sites to acid deposition PC is relatively low with a maximum concentration of <0.0001 keq/ha/yr predicted from the modelled receptors.

6.2.4 Annual Mean NO_x – Emergency Blackout Event

The maximum predicted annual mean NO_2 concentrations at the ecological receptor locations are summarised in Table 6.8Table 6.1. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 6.8: Emergency Blackout Event Maximum Predicted Concentrations of Annual Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO1	<0.1	<0.1%	SCREENED	
ECO2	<0.1	<0.1%	SCREENED	
ECO3	<0.1	<0.1%	SCREENED	
ECO4	<0.1	<0.1%	SCREENED	
ECO5	<0.1	<0.1%	SCREENED	
ECO6	<0.1	<0.1%	SCREENED	
ECO7	<0.1	<0.1%	SCREENED	
ECO8	<0.1	<0.1%	SCREENED	
ECO9	<0.1	<0.1%	SCREENED	
ECO10	<0.1	<0.1%	SCREENED	
ECO11	<0.1	<0.1%	SCREENED	
ECO12	<0.1	<0.1%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO13	<0.1	<0.1%	SCREENED	
ECO14	<0.1	<0.1%	SCREENED	
ECO15	<0.1	<0.1%	SCREENED	
ECO16	<0.1	<0.1%	SCREENED	
ECO17	<0.1	<0.1%	SCREENED	
ECO18	<0.1	<0.1%	SCREENED	

The annual mean NO_x PCs are below 1% of the limit value at all modelled receptors. Furthermore, the PECs are also well below the annual mean limit value at all modelled receptors.

6.2.5 Annual Nitrogen Deposition – Emergency Blackout Event

The maximum predicted nitrogen deposition at the ecological receptor locations are summarised in Table 6.9. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 6.9: Emergency Blackout Event Maximum Predicted Nitrogen Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	PC (kgN/ha/yr)	PC: % of Lower Critical Load	PC: % of Upper Critical Load	PEC (kgN/ha/yr)	PEC: % of Lower Critical Load	PEC: % of Upper Critical Load
ECO1	0.003	<0.1%	<0.1%	SCREENED		
ECO2	<0.001	<0.1%	<0.1%	SCREENED		
ECO3	<0.001	<0.1%	<0.1%	SCREENED		
ECO4	<0.001	<0.1%	<0.1%	SCREENED		
ECO5	<0.001	<0.1%	<0.1%	SCREENED		
ECO6	<0.001	<0.1%	<0.1%	SCREENED		
ECO10	0.001	<0.1%	<0.1%	SCREENED		
ECO11	<0.001	<0.1%	<0.1%	SCREENED		
ECO12	<0.001	<0.1%	<0.1%	SCREENED		
ECO13	<0.001	<0.1%	<0.1%	SCREENED		
ECO14	<0.001	<0.1%	<0.1%	SCREENED		

The annual nitrogen deposition PCs are below 1% of the lower and upper critical loads at all modelled receptors. Furthermore, the actual cumulative contribution of the three sites to nitrogen deposition PC is relatively low with a maximum concentration of 0.003 kgN/ha/yr predicted from the modelled receptors.

6.2.6 Annual Acid Deposition – Emergency Blackout Event

The maximum predicted acid deposition at the ecological receptor locations are summarised in Table 6.10. Results have been factorised by 0.82% to account for expected annual run time for an emergency blackout event.

Table 6.10: Emergency Blackout Event Maximum Predicted Acid Deposition at Ecological Receptors

Receptor ID	Annual Deposition					
	N PC (keq/ha/yr)	CLmaxN (keq/ha/yr)	PC% of Critical Load	S PEC (keq/ha/yr)	N PEC (keq/ha/yr)	PEC% of Critical Load
ECO1	0.0003	0.5690	<0.1%	SCREENED		
ECO2	<0.0001	0.5950	<0.1%	SCREENED		
ECO3	<0.0001	0.5640	<0.1%	SCREENED		
ECO4	<0.0001	0.5640	<0.1%	SCREENED		
ECO10	<0.0001	2.4490	<0.1%	SCREENED		
ECO11	<0.0001	2.1100	<0.1%	SCREENED		
ECO12	<0.0001	0.5970	<0.1%	SCREENED		
ECO13	<0.0001	2.2610	<0.1%	SCREENED		
ECO14	<0.0001	0.6070	<0.1%	SCREENED		

The annual acid deposition PCs are below 1% of the CLmanN at all modelled receptors. Furthermore, the actual cumulative contribution of the three sites to acid deposition PC is relatively low with a maximum concentration of 0.0003 keq/ha/yr predicted from the modelled receptors.

6.2.7 24-Hour Mean NO_x 100th Percentile

The maximum predicted 100th percentile 24-hour mean NO_x concentrations at the receptor locations are summarised in Table 6.11. These results are representative of both the routine testing and emergency blackout scenarios.

Table 6.11: Maximum Predicted 100th Percentile Concentrations of 24-Hour Mean NO_x at Ecological Receptors (Long Term)

Receptor ID	Annual Mean			
	PC (µg/m^3)	PC: % of Limit	PEC (µg/m^3)	PEC: % of Limit
ECO1	**19.9**	**26.6%**	34.9	47%
ECO2	4.6	6.1%	SCREENED	
ECO3	6.0	8.0%	SCREENED	
ECO4	5.9	7.8%	SCREENED	
ECO5	4.7	6.3%	SCREENED	
ECO6	3.5	4.6%	SCREENED	

Receptor ID	Annual Mean			
	PC (µg/m³)	PC: % of Limit	PEC (µg/m³)	PEC: % of Limit
ECO7	**7.8**	**10.4%**	33.4	45%
ECO8	**11.0**	**14.6%**	36.6	49%
ECO9	**12.3**	**16.4%**	37.9	50%
ECO10	5.3	7.1%	SCREENED	
ECO11	3.9	5.2%	SCREENED	
ECO12	5.5	7.4%	SCREENED	
ECO13	3.6	4.9%	SCREENED	
ECO14	2.7	3.6%	SCREENED	
ECO15	**14.2**	**18.9%**	51.2	68%
ECO16	**13.2**	**17.6%**	50.2	67%
ECO17	**12.0**	**16.1%**	49.0	65%
ECO18	**10.7**	**14.2%**	47.7	64%

The 100th percentile 24-hour mean NO_x PCs are above 10% of the limit value at eight of the eighteen modelled receptors. A maximum PC of 19.9 µg/m^3 is predicted at receptor ECO1 (Lady Bell's Moss SSSI) which corresponds to 26.6% of the limit value. However, the corresponding PECs are below the 75 µg/m^3 limit value at all modelled receptors. A maximum PEC of 51.2 µg/m^3 is predicted at receptor ECO15 (Hamilton Low Parks SSSI) which is below the limit value by 32%.

7. Conclusions

Arthian were appointed by DataVita DV4 Limited to undertake a preliminary air quality dispersion modelling assessment of emissions from their proposed DV4 data centre in Chapelhall, North Lanarkshire.

Initial modelling indicated that potential NO_2 and NO_X impacts on nearby sensitive human and ecological receptors were of the greatest potential impact and as such were the focus of this assessment.

For the Proposed Development (DV4) in isolation, the dispersion model results were compared against the relevant limits, as summarised below:

- Under the Routine Testing & Maintenance scenario
    - Annual mean NO_2 PCs are below 1% of the limit value at all modelled discrete modelled receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - Annual mean NO_x PCs, nitrogen deposition and acid deposition are below 1% of the limit value at all discrete modelled ecological receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - The 100th percentile 24-hour mean NOx PC is above 10% of the limit value at one of the eighteen modelled receptors. However, the corresponding PECs are below the 200 µg/m^3 limit value.
- Under the Emergency Blackout Event scenario:
    - Annual mean NO_2 PCs are below 1% of the limit value at all modelled discrete modelled receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - 1-hour mean NO_2 PCs are predicted to be above 10% of the limit value at all but one of the discrete modelled receptors. However, corresponding PECs are below the 200 µg/m^3 limit value at all modelled receptors. As such, a further statistical analysis of 1-hour mean NO_2 is not required.
    - Annual mean NO_x PCs, nitrogen deposition and acid deposition are below 1% of the limit value at all discrete modelled ecological receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - The 100th percentile 24-hour mean NOx PC is above 10% of the limit value at one of the eighteen modelled receptors. However, the corresponding PECs are below the 200 µg/m^3 limit value.

The Proposed Development was also considered in combination with DV1 and DV3.

- Under the Routine Testing & Maintenance scenario
    - Annual mean NO_2 PCs are below 1% of the limit value at all modelled discrete modelled receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - Annual mean NO_x PCs, nitrogen deposition and acid deposition are below 1% of the limit value at all discrete modelled ecological receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
    - The 100th percentile 24-hour mean NOx PC is above 10% of the limit value at one of the eighteen modelled receptors. However, the corresponding PECs are below the 200 µg/m^3 limit value.

- Under the Emergency Blackout Event scenario:
  - Annual mean NO_2 PCs are above 1% of the limit value at eight modelled discrete modelled receptors. However, the corresponding PECs are below the 40 µg/m^3 limit value. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
  - 1-hour mean NO_2 PCs are predicted to be above 10% of the limit value at all but one of the discrete modelled receptors. The corresponding PECs are above the 200 µg/m^3 limit value at eighteen modelled receptors. As such, a further statistical analysis of 1-hour mean NO_2 was undertaken.
  - Annual mean NO_x PCs, nitrogen deposition and acid deposition are below 1% of the limit value at all discrete modelled ecological receptors. This is considered to be 'insignificant' in accordance with EA's AERA guidance.
  - The 100th percentile 24-hour mean NOx PC is above 10% of the limit value at eight of the eighteen modelled receptors. However, the corresponding PECs are below the 200 µg/m^3 limit value.

A cumulative hypergeometric distribution statistical analysis was undertaken for 1-hour mean NO_2. This demonstrated:

- The potential for an exceedance of the hourly nitrogen dioxide air quality objective is statistically "unlikely" (less than 5%) for 100 run hours per year.
- The potential for an exceedance of the hourly nitrogen dioxide air quality objective is statistically "highly unlikely" (less than 1%) for 86 run hours per year.

The statistical analysis demonstrated that DV4 engines fitted with SCR can be run for more than 72 hours of continuous operation following loss of on-site power during an emergency event.

The Air Quality Assessment has been completed using a series of worst-case assumptions including but not limited to:

- The application of the 35% conversion factor for NO_x to NO_2 concentrations is an established rule of thumb for industrial combustion emissions in isolation. However, recent research on data centre clusters commissioned by the Environment Agency, has demonstrated that the use of the standard conversion factor (35%) can lead to over-estimates of up to 7 times in the near field and 2 times up to 5km from the centre of a data centre cluster. It has been demonstrated that the clustering of data centres of sufficient thermal input can lead to ozone concentrations becoming a limiting factor for the formation of nitrogen dioxide from NO. As such, predicted short-term NO_2 results from application of the 35% conversion factor may not be achievable in practice. The Applicant will seek further discussion with SEPA regarding the application of a realistic NO_x to NO_2 conversion factor.
- The use of 1% (highly unlikely) statistical analysis to determine the likelihood of impact.
- The separation distance between data centres DV1 and DV3 is significant (circa 1km) although it has been included.

Appendices

Appendix A: Examples of Where Air Quality Objectives Should Apply

Averaging Period	Objectives should apply at:	Objectives should not generally apply at:
Annual Mean	• All locations where members of the public might be regularly exposed. • Building facades of residential properties, schools, hospitals, care homes, etc.	• Building facades of offices or other places of work where members of the public do not have regular access. • Hotels, unless people live there as their permanent residence. • Gardens of residential properties. • Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24 Hour Mean and 8 Hour Mean	• All locations where the annual mean objectives would apply, together with hotels. • Gardens of residential properties.	• Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1 Hour Mean	• All locations where the annual mean and 24 and 8 hour mean objectives would apply. • Kerbside sites (e.g. pavements of busy shopping streets). • Those parts of car parks, bus stations and railway stations, etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. • Any outdoor locations at which the public may be expected to spend one hour or longer.	• Kerbside sites where the public would not be expected to have regular access.
15 Minute Mean	• All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	