

Intermodal Logistics Park North Ltd

INTERMODAL LOGISTICS PARK NORTH (ILPN)

Intermodal Logistics Park North (ILPN) Strategic Rail Freight Interchange (SRFI)

Project reference TR510001

Preliminary Environmental Information Report (PEIR)

Appendix 8.2: Rail Emissions Modelling Methodology

October 2025

Planning Act 2008

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

This document forms a part of a Preliminary Environmental Information Report (PEIR) for the Intermodal Logistics Park North (ILPN) project.

A PEIR presents environmental information to assist consultees to form an informed view of the likely significant environmental effects of a proposed development and provide feedback.

This PEIR has been prepared by the project promoter, Intermodal Logistics Park North Ltd. The Proposed Development is described in Chapter 3 of the PEIR and is the subject of a public consultation.

Details of how to respond to the public consultation are provided at the end of Chapter 1 of the PEIR and on the project website:

<https://www.tritaxbigbox.co.uk/our-spaces/intermodal-logistics-park-north/>

This feedback will be taken into account by Intermodal Logistics Park North Ltd in the preparation of its application for a Development Consent Order for the project.

Appendix 8.2 ♦ Rail Emissions Modelling Methodology

INTRODUCTION

- 8.16 The Proposed Development has the potential to cause air quality effects as a result of emissions associated with diesel locomotives travelling to and from the DCO Site, as well as within the Proposed Development itself, during the operational phase. In order to assess changes in oxides of nitrogen (NO_x) and sulphur dioxide (SO₂) concentrations, as well as nitrogen and acid deposition, at the Highfield Moss Site of Special Scientific Interest (SSSI), detailed dispersion modelling was undertaken in accordance with the following methodology.

DISPERSION MODEL INPUTS

Dispersion Model

- 8.17 Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0.1.3). ADMS-Roads is developed by Cambridge Environmental Research (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion. Modelling predictions from this software package are accepted within the UK by the Environment Agency and the Department for Environment Food and Rural Affairs (DEFRA).

Modelled Receptors

- 8.18 Discrete receptor locations were included in the model to quantify changes in pollution levels throughout Highfield Moss SSSI. These are summarised in Table 8.1.

Table 8.1 Discrete Receptor Locations

Receptor		National Grid Reference (NGR) (m)	
		X	Y
E1	Highfield Moss SSSI	360989.8	395644.7
E2	Highfield Moss SSSI	361153.2	395685.3
E3	Highfield Moss SSSI	361364.1	395733.4
E4	Highfield Moss SSSI	361004.7	395620.2
E5	Highfield Moss SSSI	361219.9	395670.7

Receptor		National Grid Reference (NGR) (m)	
		X	Y
E6	Highfield Moss SSSI	361397.1	395710.0
E7	Highfield Moss SSSI	361534.7	395742.5
E8	Highfield Moss SSSI	361722.4	395791.6
E9	Highfield Moss SSSI	361039.0	395592.2
E10	Highfield Moss SSSI	361085.0	395568.3
E11	Highfield Moss SSSI	361160.9	395534.9
E12	Highfield Moss SSSI	361278.7	395450.9
E13	Highfield Moss SSSI	361348.5	395379.6
E14	Highfield Moss SSSI	361379.2	395356.3
E15	Highfield Moss SSSI	361407.7	395378.8

Critical Loads and Levels

8.19 A critical load is defined by the Air Pollution Information Service (APIS) website¹ as:

'a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.'

8.20 A critical level is defined as:

'concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge.'

¹ www.apis.ac.uk.

- 8.21 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).
- 8.22 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the 'exceedence'. A larger exceedence is often considered to represent a greater risk of damage.
- 8.23 Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as a means for avoiding the risk of damage. However, even a decrease in an exceedence may infer that less damage will occur.
- 8.24 Table 8.2 presents the critical levels for habitats present within Highfield Moss SSSI for the pollutants considered within the assessment.

Table 8.2 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO _x	30	Annual mean
SO ₂	10	Annual mean

- 8.25 Nitrogen deposition critical loads for habitats present within Highfield Moss SSSI were obtained from the APIS website². These are presented in Table 8.3. For the purpose of the assessment it was assumed the most sensitive feature is present at the modelled receptors to ensure a robust analysis.

Table 8.3 Critical Loads for Nitrogen Deposition

Feature	Relevant Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
		Low	High
<i>Carex echinata</i> - <i>Sphagnum Recurvum</i> (fallax) / <i>auriculatum</i> (denticulatum) mire	Valley mires, poor fens and transition mires	5	15

² www.apis.ac.uk.

Feature	Relevant Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
		Low	High
<i>Erica tetralix</i> - <i>Sphagnum compactum</i> wet heath	Northern wet heath: <i>Erica tetralix</i> dominated wet heath (lowland)	5	15
<i>Gentiana pneumonanthe</i>	Raised and blanket bogs	5	10
<i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire	Moist or wet mesotrophic to eutrophic hay meadow	15	25
<i>Sphagnum cuspidatum/recurvum</i> (fallax) bog pool community	Northern wet heath: <i>Erica tetralix</i> dominated wet heath (lowland)	-	-

8.26 Critical loads for acid deposition are summarised in Table 8.3.

Table 8.4 Critical Loads for Acid Deposition

Feature	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
		CLMinN	CLMaxS	CLMaxN
<i>Carex echinata</i> - <i>Sphagnum recurvum</i> (fallax) / <i>auriculatum</i> (<i>denticulatum</i>) mire	Bogs	0.320	0.249	0.570
<i>Erica tetralix</i> - <i>Sphagnum compactum</i> wet heath	Dwarf shrub Heath	0.714	0.470	1.362
<i>Sphagnum cuspidatum/recurvum</i> (fallax) bog pool community	Bogs	0.321	0.249	0.570

Feature	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
		CLMinN	CLMaxS	CLMaxN
<i>Gentiana pneumonanthe</i>	No Critical load assigned	-	-	-

Baseline Pollution Levels

8.27 Baseline annual mean nitrogen dioxide (NO₂) and NO_x concentrations were obtained from the Department for Environment, Food and Rural Affairs (DEFRA) website³ for each discrete receptor location. Baseline annual mean SO₂ concentrations and nitrogen deposition rates were obtained from the APIS website⁴. The relevant values for the Baseline year of 2025 are summarised in Table 8.5.

Table 8.5 Baseline Pollution Levels - 2025

Receptor		Annual Mean Concentration (µg/m ³)			Annual Nitrogen Deposition Rate (kgN/ha/yr)
		NO _x	NO ₂	SO ₂	
E1	Highfield Moss SSSI	14.55	11.07	2.10	17.70
E2	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E3	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E4	Highfield Moss SSSI	12.80	9.83	2.10	17.70
E5	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E6	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E7	Highfield Moss SSSI	12.80	9.83	2.00	17.70

³ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>.

⁴ www.apis.ac.uk.

Receptor		Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)			Annual Nitrogen Deposition Rate ($\text{kgN}/\text{ha}/\text{yr}$)
		NO_x	NO_2	SO_2	
E8	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E9	Highfield Moss SSSI	12.80	9.83	2.10	17.70
E10	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E11	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E12	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E13	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E14	Highfield Moss SSSI	12.80	9.83	2.00	17.70
E15	Highfield Moss SSSI	12.80	9.83	2.00	17.70

8.28 The relevant values for the future assessment year of 2030 are summarised in Table 8.6. It should be noted that APIS does not provide predictions of future pollution levels. As such, these are the same as the 2025 Baseline values. This is considered robust as it does not allow for anticipated future air quality improvements.

Table 8.6 Baseline Pollution Levels - 2030

Receptor		Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)			Annual Nitrogen Deposition Rate ($\text{kgN}/\text{ha}/\text{yr}$)
		NO_x	NO_2	SO_2	
E1	Highfield Moss SSSI	11.13	8.63	2.10	17.70
E2	Highfield Moss SSSI	10.17	7.93	2.00	17.70

Receptor		Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)			Annual Nitrogen Deposition Rate ($\text{kgN}/\text{ha}/\text{yr}$)
		NO_x	NO_2	SO_2	
E3	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E4	Highfield Moss SSSI	10.17	7.93	2.10	17.70
E5	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E6	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E7	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E8	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E9	Highfield Moss SSSI	10.17	7.93	2.10	17.70
E10	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E11	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E12	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E13	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E14	Highfield Moss SSSI	10.17	7.93	2.00	17.70
E15	Highfield Moss SSSI	10.17	7.93	2.00	17.70

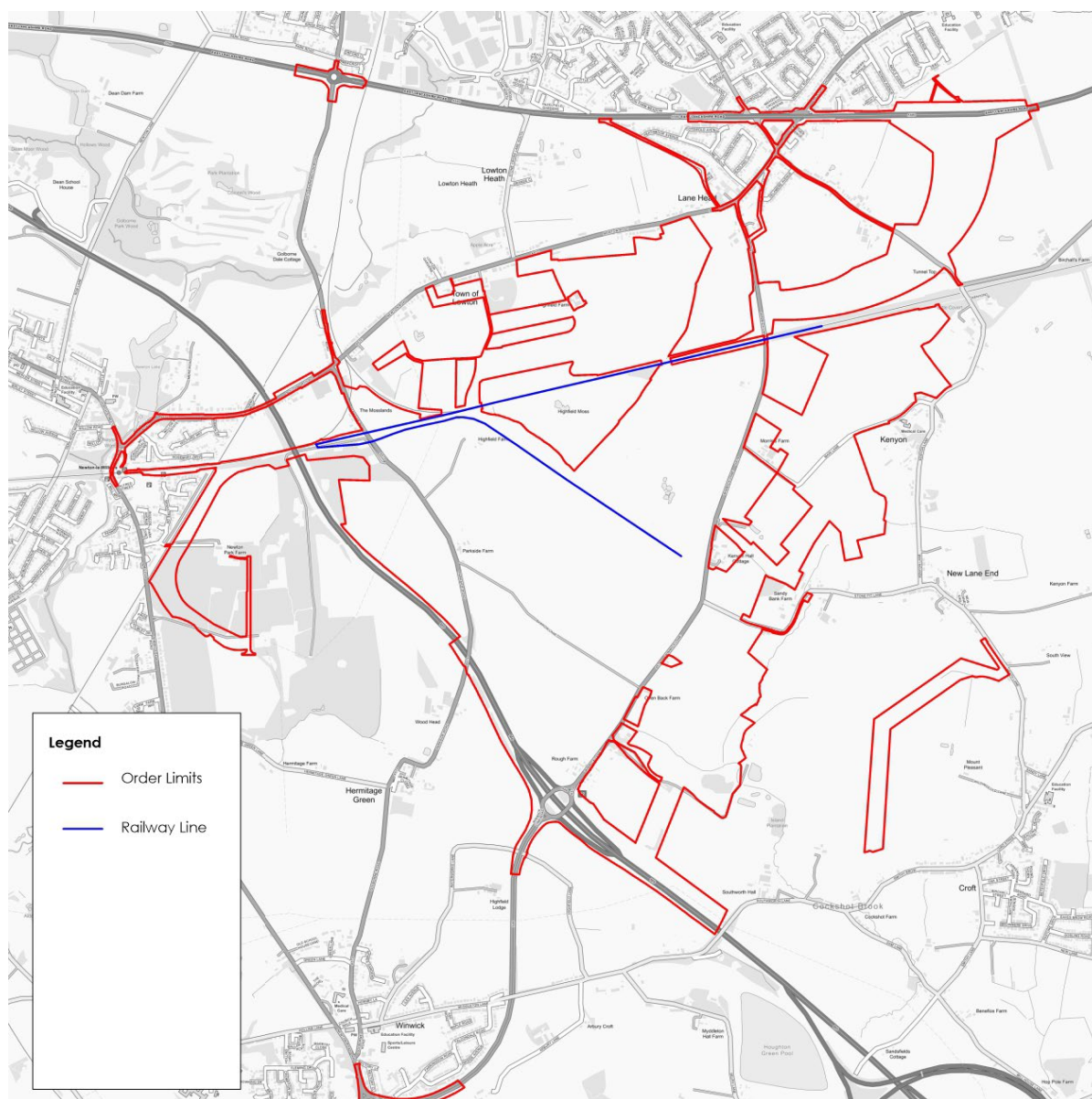
Locomotive Emission Factors

8.29 Class 66 diesel locomotives may be used on a number of freight trains travelling to and from the DCO Site during the operational phase. Emissions factors for these units were therefore

sources from the National Atmospheric Emissions Inventory (NAEI)⁵ and the Rail Safety and Standards Board⁶. Emission rates for inclusion in the model were subsequently calculated using these values and details on anticipated rail movements, as summarised in Chapter 8.

8.30 Rail line widths were estimated from aerial photography for the Chat Moss Line and the specification of the Proposed Development. A map of the modelled emission sources is shown Figure 8 .1 overleaf.

Figure 8.1 Map of the Modelled Emission Sources



Meteorological Data

8.31 Meteorological data used in the assessment was taken from Rostherne Meteorological station over the period 1st January 2023 to 31st December 2023 (inclusive). Rostherne

⁵ The UK National Atmospheric Emissions Inventory (NAEI), <https://naei.energysecurity.gov.uk/>.

⁶ CLEAR: Fleet-Wide Assessment of Rail Emissions Factors, Rail Safety and Standards Board, 2020.

meteorological station is located at NGR: 374772, 384820 which is approximately 17.6km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

- 8.32 All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK.

Roughness Length

- 8.33 The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.3m was used to describe the modelling extents and meteorological site. This is considered appropriate for the morphology of both areas.

Monin-Obukhov Length

- 8.34 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This value is considered appropriate for the nature of the area following construction of the Proposed Development.
- 8.35 A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area.

NO_x to NO₂ Conversion

- 8.36 Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 9.1) provided by DEFRA, which is the method detailed within DEFRA guidance 'Local Air Quality Management Technical Guidance (TG22)'⁷.

Deposition Calculations

- 8.37 Nitrogen and acid deposition rates were calculated using the conversion factors provided within the IAQM document 'A guide to the assessment of air quality impacts on designated nature conservation sites'⁸. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used in the assessment are presented within Table 8.7. It should be noted that the 'dry deposition' module was engaged within ADMS-Roads in line with best practice.

⁷ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

⁸ A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites v1.1., IAQM, 2020.

Table 8.7 Conversion Factors to Determine Dry Deposition Flux for Nitrogen Deposition

Pollutant	Deposition Velocity (m/s)		Nitrogen Deposition Conversion Factor ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{kgN}/\text{ha}/\text{yr}$ of pollutant species)	Acid Deposition Conversion Factor ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{keq}/\text{ha}/\text{yr}$ of pollutant species)
	Grassland	Forest		
NO ₂	0.0015	0.003	95.9	18.5
SO ₂	0.012	0.024	-	9.84

8.38 The relevant deposition velocity for grassland habitat were selected from Table 8.7 and used throughout the assessment.

8.39 The following formula was used to calculate predicted acid deposition PCs as a proportion of the critical load function where baseline levels were identified to be greater than the CLminN value:

$$\text{PC as \%CL function} = ((\text{PC of SO}_2 + \text{NO}_2 \text{ deposition})/\text{CLmaxN}) \times 100$$

8.40 The above formula was obtained from the APIS website⁹.

⁹ www.apis.ac.uk.